Declared Rare Flora and Other Plants in Need of Special Protection in the Metro Area

by Anne E. Kelly, Anne Taylor, Margaret A. Langley, Amanda Spooner, David J. Coates

1993

Wildlife Management Program No 10

Department of Conservation and Land Management

WESTERN AUSTRALIAN WILDLIFE MANAGEMENT PROGRAM NO. 10

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Illustrations by Susan Patrick
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Cover illustration: *Calytrix breviseta* subsp. *breviseta*
by Donna Terrington

Editor	Wendy Searle
Illustrations	Susan Patrick and Donna Terrington
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FOREWORD

Western Australian Wildlife Management Programs are a series of publications produced by the Department of Conservation and Land Management. The programs are prepared in addition to Regional Management Plans to provide detailed information and guidance for the management and protection of certain exploited or endangered species (e.g. Kangaroos, Noisy Scrub-birds and the Rose Mallee).

This program provides a brief description of the appearance, distribution, habitat and conservation status of the Declared Rare and Priority Flora in the Metropolitan Area and makes recommendations for research and management action necessary to ensure their continued survival. By ranking the species in priority order for these requirements, Departmental staff and resources can be allocated to species most urgently in need of attention.

The information contained in this program is accurate to December 1991. Further data on some species will become available subsequent to the completion of the program as a result of continuing research and survey.

NB: The area covered by this program comprises the former CALM Metropolitan Region, and will be referred to throughout the text as the Metropolitan Area (see figure 2 and part 1.6 for boundaries of the Metropolitan Area covered by this program). The Metropolitan Region recently (October 1991) amalgamated with the Northern Forest Region to form the new Swan Region. Figure 1 shows the location of the former Metropolitan Region and new Swan Region in relation to other CALM Management Regions of the State.

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ABBREVIATIONS

A	City of Armadale	P	City of Perth
B	City of Belmont	S	Shire of Swan
C	City of Canning	S/J	Shire of Serpentine-Jarrahdale
Co	City of Cockburn	SP	City of South Perth
G	City of Gosnells	St	City of Stirling
K	Shire of Kalamunda	W	City of Wanneroo
Kw	Town of Kwinana	CALM	Department of Conservation and Land Management
M	City of Melville		
VCL	Vacant Crown Land	APB	Agriculture Protection Board
SEC	State Energy Commission	DOLA	Department of Land Administration
DPUD	Department of Planning and Urban Development	EPA	Environmental Protection Authority
		RAAF	Royal Australian Air Force

TABLE OF CONTENTS

PART ONE: INTRODUCTION

1. The Need for Management

Western Australia has a unique flora world renowned for its diversity and high level of endemism. The vascular flora contains over 7000 described taxa (Green 1985), with the total likely to exceed 10 000 once botanists have completed surveying, researching and describing the flora (Hopper *et al.* 1990). More than 2000 taxa have been recognised as rare, geographically restricted or poorly collected (Marchant and Keighery 1979). According to Briggs and Leigh (1988) the State has 43 per cent of the Australian total of rare, threatened or poorly known plant species, 82 per cent of these being restricted to the south-west.

Although some plants are rare because of their requirement for a specific restricted habitat, the majority have become rare because of the activities of European settlers. Extensive clearing and modification of the environment has resulted in the extinction of some species and placed the survival of many others is jeopardy. Continued land clearing, inappropriate fire regimes, exotic weeds, pests and diseases, road-works and indiscriminate herbicide use continue to threaten the flora.

The State Conservation Strategy, Wildlife Conservation Act (1950-1985), and Conservation and Land Management Act (1984-1987) provide the guidelines and legislative basis for the conservation of the State's indigenous plant and animal species. Under the Wildlife Conservation Act, the Department of Conservation and Land Management (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 for CALM statutory responsibility for the protection of those classes of flora declared to be rare.

In 1991, 260 taxa were classified as extant Declared Rare Flora. A further 53 species were listed on the schedule as presumed extinct (Appendix II). In addition to those formally protected, some 1200 taxa are listed on CALM's priority flora list. These taxa either require further survey so that their conservation status can be accurately assessed, or are rare but not threatened and are being monitored. Hopper *et al.* (1990) provide illustrations of Declared Rare Flora, discuss the conservation of Western Australia's endangered species and review the relevant legislation, policy, research and management activities of CALM.

This Wildlife Management Program collates the available biological and management information on the Declared Rare Flora and priority taxa in the Metropolitan Area. The area covered by this program comprises the former CALM Metropolitan Region which was recently (October 1991) amalgamated with the Northern Forest Region to form the Swan Region. Figure 1 shows the location of the former Metropolitan Region and new Swan Region in relation to other CALM Management Regions of the State.

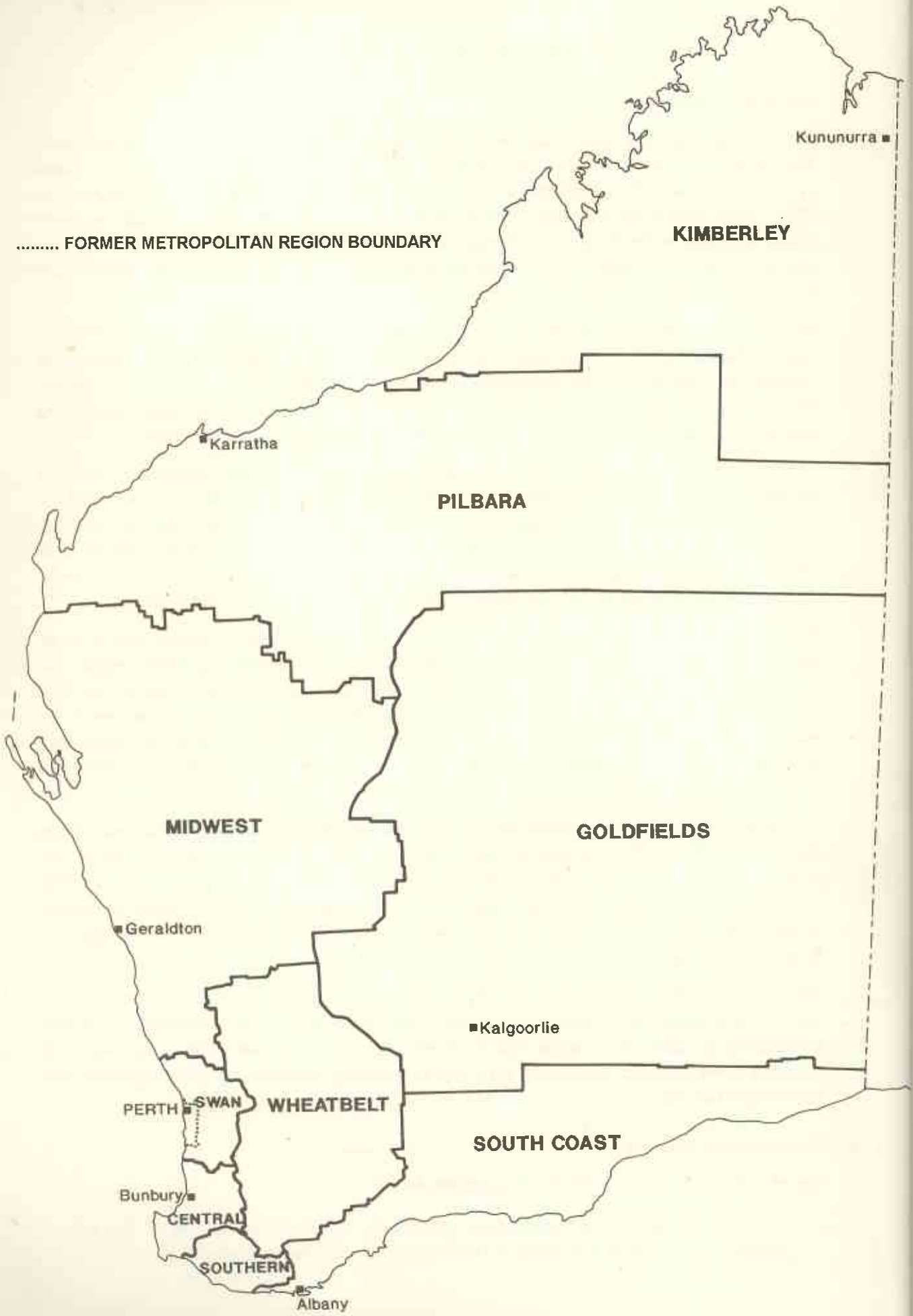
The majority of DRF populations in the Metropolitan Area occur on private and other non-CALM lands so close liaison and cooperative management with landowners and land managers is essential. Competition for land uses is intense and continued expansion of the metropolitan population will inevitably result in greater demands on space and an increasing impact on the native vegetation, and in particular rare flora.

2. Objective of the Program

The objective of this program for the Metropolitan Area is:

- to ensure and enhance, by appropriate management, the continued survival in the wild of populations of Declared Rare Flora and other plants in need of special protection.

Figure 1. Location of the former Metropolitan Region and the new Swan Region in relation to other CALM Management Regions of the State.



It aims to achieve this by:

- providing a useful reference document to CALM staff and other landowners for the day to day management and protection of Declared Rare Flora populations;
- directing Departmental resources within the Metropolitan Area to those taxa most urgently in need of attention;
- assisting in the identification of Declared Rare and priority species and their likely habitats;
- fostering an appreciation and increased awareness of the importance of protecting and conserving Declared Rare Flora and other plants in need of special protection.

3. Rare flora legislation and guidelines for gazettal

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) considered by the Minister for CALM to be:

- Endangered (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;
- Rare - less than a few thousand adult plants of the taxon existing in the wild;
- 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 could threaten its survival in the wild;

  or

- Presumed Extinct - the taxon has not been collected, or otherwise verified, over the past 50 years despite thorough searching, or all known wild populations have been destroyed more recently.

This is achieved by declaring them to be 'rare' by notice published in the *Government Gazette*. CALM's Policy Statement No. 9 - Conservation of Endangered Flora in the Wild (Appendix III) outlines the legislation and departmental policy and guidelines for Declared Rare Flora conservation.

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

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

The schedule published in the Government Gazette is revised annually to accommodate additions and deletions to the Declared Rare Flora. To qualify for gazettal, plants (not including hybrids) must satisfy certain requirements as defined in Policy Statement No. 9:

- the taxon (species, subspecies, variety) must be well-defined, readily identifiable and represented by a voucher specimen in a State or National Herbarium. It need not 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;
- the taxon must have been thoroughly searched for in most likely habitats in the wild by competent botanists during the past five years;
- the searches have established that the plant in the wild is either rare, endangered, presumed extinct or deemed to be threatened and in need of special protection.

Plants may be deleted from the Rare Flora schedule where:

- recent botanical survey has shown that the taxon is no longer rare, endangered, presumed extinct or in need of special protection;
- the taxon is shown to be a hybrid;

or

- the taxon is no longer endangered because it has been adequately protected by reservation of land on which it occurs or because population numbers have increased beyond the danger point.

4. CALM's Priority Species List

CALM maintains a priority species list to provide priorities for survey of plants of uncertain conservation status. The list comprises some 1296 taxa (at November 1991) that are poorly known and in need of high priority survey or are adequately surveyed but in need of monitoring. The poorly known taxa are possibly at risk but do not meet the survey requirements for gazettal as Declared Rare Flora, as outlined in Policy Statement No. 9 (Appendix III). Only those plants considered to be threatened on the basis of thorough survey can be included on the DRF schedule.

The priority flora list is divided into the following categories according to the degree of threat.

Priority One - Poorly Known Taxa

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

Priority Two - Poorly Known Taxa

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

Priority Three - Poorly Known Taxa

Taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

Priority Four - Rare Taxa

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

The priority flora list is updated annually.

5. **Responsibilities within the Department**

- reviewing Departmental policy on Declared Rare Flora is the responsibility of the Department of Conservation and Land Management's Corporate Executive;
- identification of Declared Rare Flora and priority taxa is the initial responsibility of Herbarium and Flora Conservation Research Program staff, but should, with appropriate training, become a Regional responsibility;
- locating Declared Rare Flora and priority taxa is the responsibility of Flora Conservation Research Program staff, the Wildlife Branch, Regional operations staff and volunteers outside CALM;
- determination of land status and preparation of material for notification to landowners is the responsibility of Wildlife Branch;
- hand-delivered notification to landowners of Declared Rare Flora populations is the responsibility of Regional staff and Wildlife Branch;
- production and maintenance of a Declared Rare Flora and priority taxa register, to provide status and location information for operational procedures on CALM land, is the responsibility of the Wildlife Branch and Regional operations staff;
- advice on management prescriptions is the responsibility of Flora Conservation Research Program staff and the Senior Botanist, Wildlife Branch;
- management, protection and regular inspection of Declared Rare Flora and priority taxa populations is the responsibility of Regional operations staff;
- enforcement matters relating to the provisions of the Wildlife Conservation Act are the responsibility of Wildlife Officers in the Wildlife Branch;
- implementation and revision of this management program is the responsibility of Regional staff, Flora Conservation Research Program and Wildlife Branch.

6. The Metropolitan Area

The area covered by this program (Figure 2) comprises the former CALM Metropolitan Region, and will be referred to throughout the text as the Metropolitan Area. The boundary of the Metropolitan Area extends from Burns Beach, Wanneroo, Gnangara and West Swan Roads in the north to the southern boundaries of the Shires of Rockingham and Serpentine-Jarrahdale. The eastern boundary follows the Great Northern, Roe, Tonkin, Albany and South Western Highways. It is bounded on the west by the Indian Ocean. The offshore islands and an isolated area of land to the north-east, containing the Twin Swamps and Ellen Brook Nature Reserves, are also included.

The Metropolitan Area has a total area of approximately 1500 km^2. It contains 26 local government authorities (cities, shires, towns) and more than 3/4 of the entire State population. Its largest centres are Perth, Fremantle, Midland, Rockingham and Armadale. Approximately 4200 ha (excluding marine parks) is managed by the Department, including nature reserves such as Forrestdale and Thomsons Lakes, Cardup, Twin Swamps, Casuarina, Woodman Point and Carnac Island. Additional to these areas are a number of conservation reserves managed by local authorities (e.g. Star Swamp, Carine Swamp, Wireless Hill and Booragoon Lake). A series of Regional Parks, under joint management, are proposed and will provide for flora and fauna conservation and recreation.

The Metropolitan Area lies within the South Western Botanical Province (Beard 1980) and Drummond subdistrict (Beard 1981) where it experiences a Mediterranean climate characterised by hot, dry summers and mild, wet winters. Average annual rainfall is 840 mm, most of it falling in the May-August period. The maximum mean monthly temperature is 31.7C and the minimum is 7.9C (Bureau of Meteorology, Perth 1990).

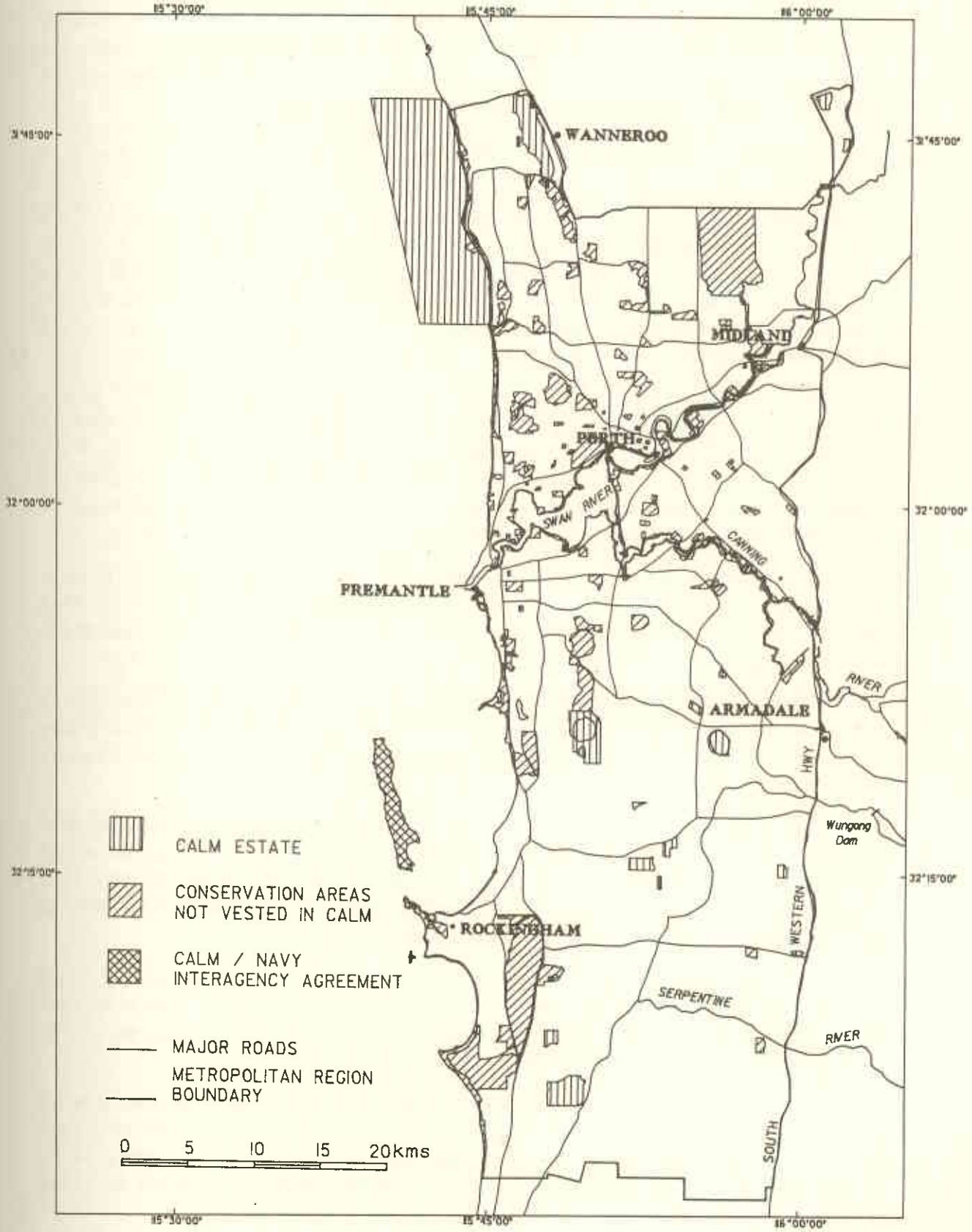
Geographically, the Metropolitan Area is comprised of the Swan Coastal Plain, a narrow strip of land bordered on the east by the Darling Scarp and on the west by the Indian Ocean. Powell (1990) provides a map and discussion of the soils and vegetation of the Perth region, simplified from maps of the *Atlas of Natural Resources* (Department of Conservation and Environment, 1980). The western section consists of a series of sandy ridges running in a north-south orientation. The soils are of poor quality and range from white and yellow near the coast to brown and grey further inland. In areas close to the coast, limestone occurs near the surface and is sometimes outcropping.

Mixed heath and *Acacia* scrub dominate the near coastal vegetation. Deep sands support woodlands and forests of tuart (*Eucalyptus gomphocephala*), jarrah (*E. marginata*) and marri (*E. calophylla*) with a *Banksia* and sheoak (*Allocasuarina fraseriana*) understorey. In the shallower soils, tuart is more common, sometimes occurring in pure stands. Further inland on the grey sands are *Banksia menziesii, B. attenuata* and pricklybark (*Eucalyptus todtiana*) woodlands and forests over a diverse shrub understorey.

A chain of wetlands extend through the Metropolitan Area parallel to the ridge system, some of the major bodies including Lake Joondalup, Herdsman Lake, Lake Monger, Bibra Lake, Yangebup Lake and Thomsons Lake. The wetland areas are surrounded by flooded gum (*Eucalyptus rudis*) woodlands and low paperbark (*Melaleuca preissiana* and *M. rhaphiophylla*) forests over a rush and sedge understorey. Paperbarks, flooded gum and salt sheoak (*Casuarina obesa*) are associated with the river systems.

The eastern part of the Metropolitan Area is flat to gently undulating with clay to sandy clay soils of alluvial origin. These include some of the most fertile soils in the region and were among the first to be developed for agriculture (Powell 1990). They support woodlands and forests of marri, wandoo (*Eucalyptus wandoo*) and jarrah. Thickets and heath of *Pericalymma ellipticum* and *Melaleuca* species occur in shallow, winter-wet swamps in areas of sand over clay.

Figure 2. The Metropolitan Area covered by this program.



The Metropolitan Area is largely settled and has been highly modified by human activity. Many of the taxa recognised as rare occur in habitats, such as ephemeral wetlands, that have been extensively cleared for development. The remnant bush areas and the rare flora they contain will come under increasing pressure from development and other factors (e.g. weed invasion, rubbish dumping, fire) as competition for land uses in the Metropolitan Area become more intense.

7. Botanical History of the Metropolitan Area (from Beard 1981, Grieve 1975 and Marchant *et al.* 1987).

The first collections of the flora of the Perth region were made by Dutch explorer Wilhelm Vlamingh who visited and named the Swan River in 1696. More than a century later, French botanist Leschenault de la Tour, in company with Captain Hamelin of the 'Naturaliste', explored and collected from Rottnest, Carnac and Garden Islands and the Swan River. In 1827, Captain Stirling and New South Wales Colonial Botanist Charles Fraser explored and collected along the Swan and Canning Rivers to determine their suitability for European settlement.

More extensive botanical exploration commenced in the Perth area with the arrival of the first settlers in 1829. James Drummond, Curator of the Botanical Gardens at Cork in Ireland, arrived at the Swan River with Captain Stirling's colonising party. He settled at Toodyay and soon began surveys and collecting that continued for three decades. His specimens were sent to England and distributed to herbaria in Europe. Unfortunately, he did not record precise locality details and his collections are of little use in determining past distribution of species in the area.

Captain James Mangles and Baron von Huegel collected around Perth during visits to the colony in the early 1830s. In 1839, John Lindley produced 'A Sketch of the Vegetation of the Swan River Colony' in which he described many species, based largely on herbarium collections forwarded to England by Drummond and Mangles.

German botanist Ludwig Preiss visited the colony from 1838-1842 and accompanied Drummond on some of his expeditions. Preiss collected mainly in the well-settled areas and provided precise locality information. His collections were published in 'Plantae Preissianae' (Lehmann 1844-1848) and are valuable early distribution records.

During the latter half of the nineteenth century, botanical collection was continued by local enthusiasts who sent their specimens to Ferdinand von Mueller, the government botanist in Melbourne. Ludwig Diels and Ernst Pritzel surveyed widely in the region during 1900-1901. Their collections were described in 'Fragmenta Phytographiae Australiae Occidentalis' (1904-1905), an illustrated book and major authority on the Western Australian flora.

William Fitzgerald, Alexander Morrison and Cecil Andrews were notable collectors in and around Perth over the period extending from 1900-1920. During this time a key to the flora of the Swan Coastal Plain was commenced by Dr Cayzen of the University of Western Australia, but was not completed before his departure from the State.

Charles Gardner in his position as government botanist and Curator of the State Herbarium collected widely throughout Western Australia over the period 1929-1961. He described many new species and prepared numerous papers and books on the flora. He was accompanied on a number of his expeditions by amateur botanist William Blackall who developed an illustrated key for the recognition of Western Australia's flora.

The Perth region has received a considerable amount of study in recent years compared to many other parts of the State. Nathanial Speck was one of the first to undertake detailed work with his

research on plant ecology of the metropolitan section of the Swan Coastal Plain (Speck 1952) and vegetation of the Darling and Irwin botanical districts (Speck 1959). Seddon (1972) summarised Speck's 1952 work in his treatment of the vegetation of Perth's environs.

In 1964, an overall mapping project for the State, the Vegetation Survey of Western Australia, was established. John Beard systematically described and mapped the vegetation, defining distinct regions on the basis of characteristic landscape and vegetation. Vegetation maps were prepared at a 1:1 000 000 and 1:250 000 scale for the area covered by this program (Beard 1979a & b, 1981).

The coastal islands, in particular Rottnest Island, have been the subject of several papers (Churchill 1960, Marchant and Abbott 1981, Marsh and Hodgkin 1962, McArthur 1957, Pen and Green 1983, Storr *et al.* 1959, Storr 1961, 1962, 1963). Key works focussing on the flora of the Perth area include Baird's study of regeneration after fire on Garden Island and in Kings Park (Baird 1958, 1977), and Beard's (1967) account of the original natural vegetation of Kings Park.

In 1980, the Department of Conservation and Environment (now Environmental Protection Authority) conducted a broad ecological study of the area known as System 6 - the Darling Range and Swan Coastal Plain from Bridgetown to north of the Moore River. An Atlas of Natural Resources was published for the area and included vegetation maps at a scale of 1:250 000 (Heddle 1979, Heddle *et al.* 1980). The study was the basis of a report to Government to resolve land use and conservation conflicts by developing a system of parks and reserves.

In 1987, botanists of the Western Australian Herbarium published a two-volume Flora of the Perth Region (Marchant *et al.* 1987). It keys out and describes species recorded from the coastal plain and western edge of the Darling Plateau near Perth and contains almost all of the species represented in the Metropolitan Area.

Numerous detailed vegetation and ecological studies have been conducted on a local scale (e.g. Bell *et al.* 1979, Bridgewater and Wheeler 1980, Keighery *et al.* 1990, Keighery 1991a and 1991b, Keighery and Keighery 1991, McArthur 1987, Pen 1983, Speck and Baird 1984). Many of these relate to potential land use and proposed developments in the Metropolitan Area.

PART TWO: DECLARED RARE FLORA IN THE METROPOLITAN AREA

In 1991, eight taxa of Declared Rare Flora were known to be extant within the boundaries of the Metropolitan Area. An additional species (*Dryandra mimica*) occurs just east of the Metropolitan Area boundary, and has been included in this program. Two species listed as presumed extinct on the Declared Rare Flora schedule are also included. While they have been collected from the Metropolitan Area in the past, no extant populations are recorded.

An illustration and brief description of the morphology, distribution, habitat, and conservation status is provided for each of the taxa. The impact of certain management techniques (fire, mechanical disturbance, weed invasion and dieback) is noted and recommendations made for management and protection action necessary to ensure their continued survival. The Declared Rare Flora (excluding *Dryandra mimica, Calytrix breviseta* subsp. *breviseta* and *Epiblema grandiflorum* var. *'cyanea'*) are illustrated in a book on Western Australia's Endangered Flora (Hopper *et al.* 1990).

Descriptions of species were compiled by consulting references and discussion with botanists. Distribution and habitat were recorded from Departmental Rare Flora files. Emphasis was placed on the particular habitat characteristics of locations in the Metropolitan Area. Only extant populations surveyed by officers of the Department in recent years are included. Herbarium records may indicate a wider range and larger numbers of populations, some of which are known to have been destroyed since the time of collection.

Conservation status was determined from field observations and population and location data on Departmental files. It is a brief summary of the number and condition of Rare Flora populations throughout the species' range and the threats to their survival. Success with propagation and the extent of general cultivation are also noted. A table for each species lists the location, size, condition, land status and local government authority for populations in the Metropolitan Area. Precise locality details are contained on Departmental files and a computerised database.

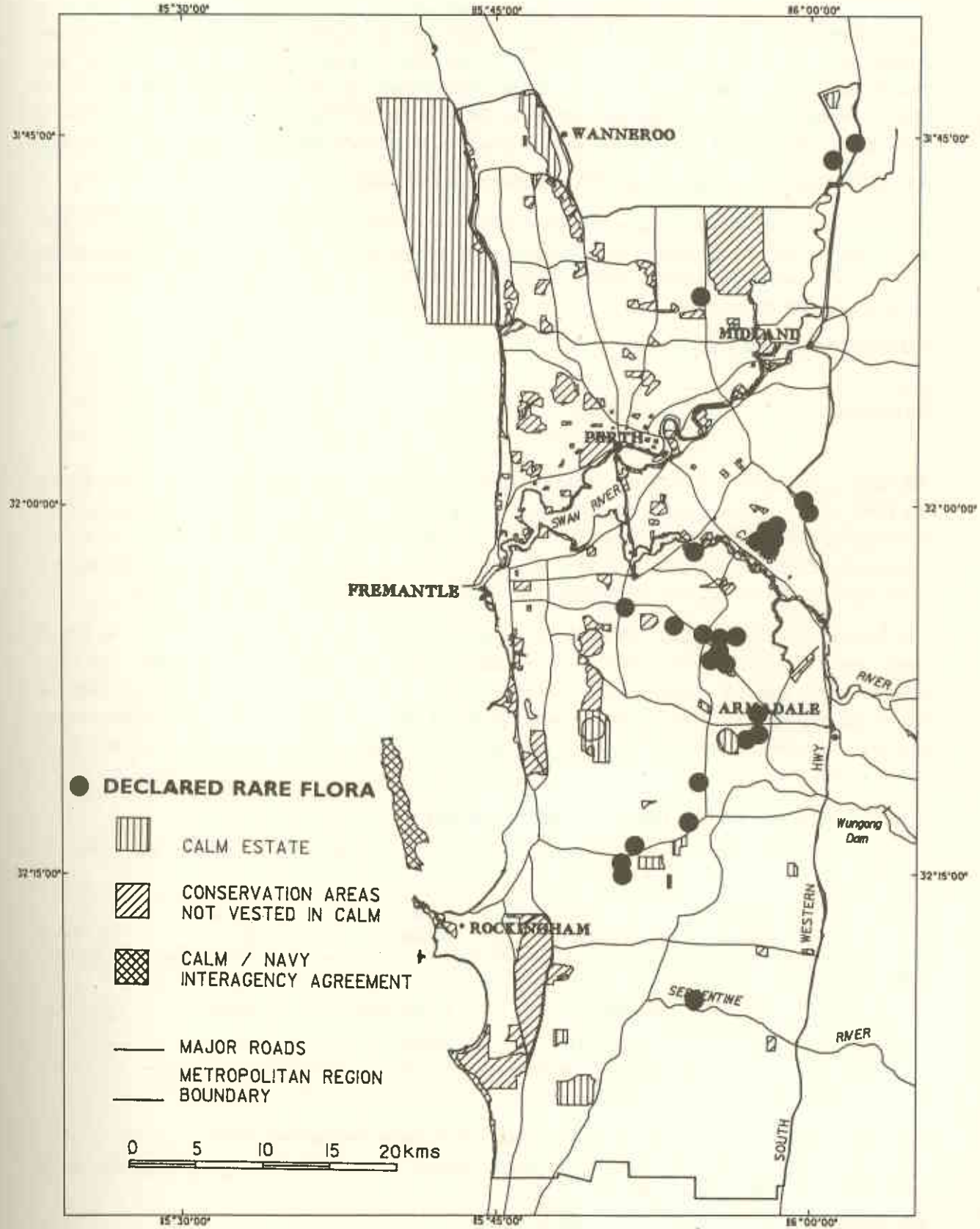
Impact of fire, soil disturbance, weed invasion and dieback was noted (where known) from observations made in the field during routine monitoring and from discussion with research personnel. Management and research requirements were determined on the basis of conservation status and from general location data on the Rare Flora files.

Of the nine extant taxa treated in the Program, three (*Calytrix breviseta* subsp. *breviseta, Epiblema grandiflorum* var. *'cyanea'* and *Diuris micrantha*) are endemic to the Metropolitan Area. Each of these is known from a single locality.

Figure 3 maps the distribution of all Declared Rare Flora populations in the Metropolitan Area. Over half (61.3 per cent) of the 31 populations occur on private land and only one is from a nature reserve. Two populations occur in a proposed nature reserve, one in a private reserve and another in a proposed Regional Park. The City of Gosnells contains 38.7 per cent of the total populations. The remaining populations are evenly distributed through the Cities of Armadale, Canning and Melville, Shires of Kalamunda, Serpentine-Jarrahdale and Swan and the Town of Kwinana.

The presumed extinct species, *Schoenus natans* and *Tetraria australiensis*, are known only from old herbarium collections with poor locality details. They are likely to have occurred in areas that are now cleared, although *S. natans* may have escaped attention because of its small size and inconspicuous habit.

Figure 3. Distribution of Declared Rare Flora populations in the Metropolitan Area.



APONOGETON HEXATEPALUS van Bruggen

Stalked Water Ribbons

Aponogeton hexatepalus is a perennial, aquatic herb dying back to an underground tuber over the summer months. It grows rooted in the mud, with erect leaf stalks supporting floating, linear leaves. The leaf blade may be up to 20 cm long x 0.6 cm wide and has several parallel, longitudinal veins. The slender flower stalk branches into two spikes that protrude above the water surface. Small, green, stalkless flowers are in loose groups. The beaked fruits are also green. Flowers in August-September.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

A coastal plain endemic occurring in ephemeral freshwater swamps in the Metropolitan Area at Kenwick and in the Central Forest Region from Eaton to Nannup. At the Kenwick sites it grows in inundated claypans surrounded by *Melaleuca lateritia* heath. Old collections record *A. hexatepalus* from Pinjarra and thirty miles south of Busselton.

CONSERVATION STATUS

Endangered	Rare	In Need of Special Protection	✓

An often prolific species known from 10 000+ plants in more than 20 populations, two on private land in the Perth suburb of Kenwick and the remainder in the Eaton-Nannup area. There are no records from conservation reserves throughout its range, with the majority of southern populations occurring on private land, road and railway reserves. A number of these sites have been degraded by grazing, clearing and weed invasion, with no apparent detriment to this species. One population is from State Forest.

The Kenwick populations occur 145 km north of the nearest known site and include one of the largest single populations on record (several thousand plants). They are largely undisturbed but with some off-road-vehicle use and rubbish dumping in the area. One of the sites is proposed for development. No further populations in the Metropolitan Area are likely and protection of at least one of the Kenwick sites, to conserve diversity within this species, is a priority. *A. hexatepalus* has been successfully translocated and can be readily propagated.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
11/ 10/ 90	G	Kenwick (I)	Homeswest	4000+	good
11/ 10/ 90	G	Kenwick (II)	private	1000+	good

G - City of Gosnells

Response to Fire - not affected by summer fire due to its dormant underground tuber.

Response to Soil Disturbance - tolerates extensive habitat disturbance (clearing, grazing) due to its persistence as an underground tuber.

Susceptibility to Weed Invasion - not applicable.

Susceptibility to Phytophthora *species* - not applicable.

MANAGEMENT REQUIREMENTS

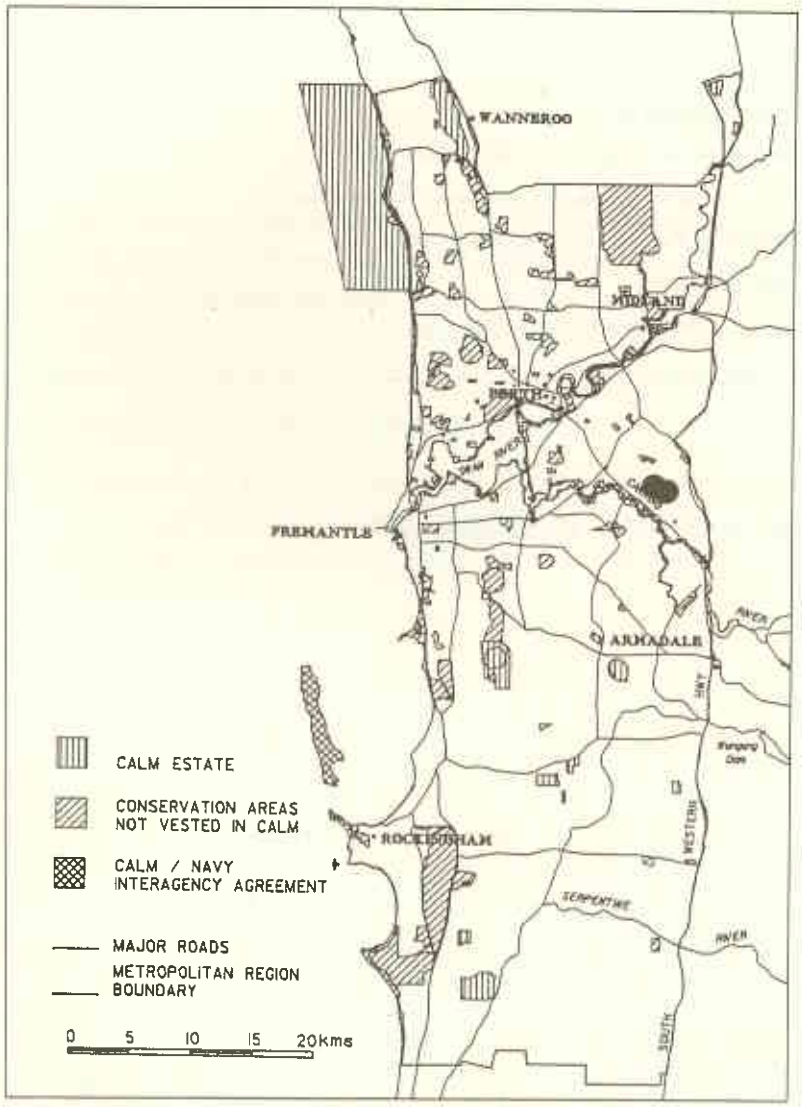
- acquire land in the Kenwick area as a conservation reserve;
- close liaison with landowners/ managers and local authorities;
- exclude rubbish dumping and off-road-vehicle access;
- monitor populations regularly;
- summer burn at no less than seven yearly intervals.

RESEARCH REQUIREMENTS

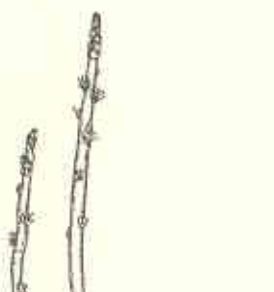
- none required.

REFERENCES

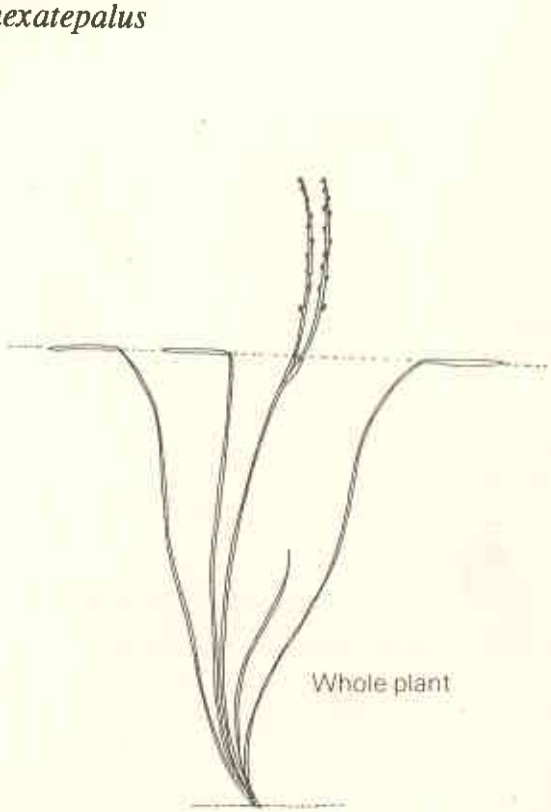
Aston (1973); Rye and Hopper (1981); van Bruggen (1969).



● *Aponogeton hexatepalus*



Flower stalk



Whole plant

Flower (side view)

CALADENIA HUEGELII H.G. Reichb.

Grand Spider Orchid

Caladenia huegelii is a slender orchid, usually growing to 30-70 cm high but occasionally up to 1 m. It has one or two striking flowers characterised by a greenish-cream labellum with a recurved, maroon tip and a long, often terminally branched fringe that extends well above the column. The sepals and petals are cream with red or pink suffusions. The sepals narrow to slender, brown, terminal 'clubs'. The hairy, linear leaf may be up to 40 cm long. It differs from other members of the *C. huegelii* complex in its generally larger flowers with a comparatively large labellum and long fringe. The most magnificent examples of this species occur in the Perth area. Flowering is from September-October with above-ground portions of the plant dying back to underground tubers over summer.

The name *C. huegelii* has been misapplied to a closely related species (*C. 'arenicola'* Hopper and A.P. Brown, *ined.*) for some time due to confusion resulting from a mixed collection on the type sheet.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

C. huegelii occurs from the Upper Swan and Gnangara areas, through suburban Perth and southwards to Gracetown and the Scott River. In the north of its range, habitat is well-drained, sandy soils in low woodlands of *Banksia attenuata, B. menziesii, Allocasuarina fraseriana* and *Eucalyptus marginata*. It tends to favour areas of lush undergrowth. At Upper Swan it was recorded from a flooded gum (*Eucalyptus rudis*) community. It has been collected from the Yarloop-Pinjarra area but there are no recent records as little suitable habitat remains.

CONSERVATION STATUS

Endangered	Rare	In Need of Special Protection ✓

A widespread species occurring as scattered plants in usually small populations (10+ plants each). It is not known from any conservation reserves in the Metropolitan Area, although two populations are from a proposed nature reserve and a proposed flora and fauna reserve (Regional Park). A recently recorded population in the Upper Swan area occurs on land that is subject to recommendation by the Environmental Protection Authority to be protected. Outside the Metropolitan Area it has been recorded from at least thirteen sites which include national park, state forest and a flora and fauna reserve. In the Metropolitan Area, much of its favoured habitat has been cleared or is under threat from development. It is likely to be more common than currently indicated and large areas of land still require survey so that adequate protection in the north of its range can be achieved.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
9/10/86	G	Canning Vale (I)	prison reserve	10	good
6/10/89	G	Canning Vale (II)	private	2	proposed development
13/10/88	M	Leeming (I)	road reserve	1	threatened

POPULATIONS KNOWN IN THE METROPOLITAN AREA (*continued*)

23/ 9/ 90	M	Leeming (II)	shire reserve	10	healthy, recently burnt
10/ 88	K	Casuarina	VCL (proposed nature reserve)	6	some weed invasion
23/ 9/ 90	C	Wilson	road reserve (proposed regional park)	2	good
21/ 9/ 88	A	Forrestdale (I)	private	1	part disturbed
9/ 10/ 89	A	Forrestdale (II)	private	10	good
11/ 91	S	Upper Swan	private	37	good

A - City of Armadale
C - City of Canning
G - City of Gosnells
Kw - Town of Kwinana
M - City of Melville
S - Shire of Swan

Response to Fire - killed if burnt when above-ground parts (flowers and leaves) are present (July-November).

Response to Soil Disturbance - not known.

Susceptibility to Weed Invasion - growth suppressed.

Susceptibility to Phytophthora *species* - not known.

MANAGEMENT REQUIREMENTS

- close liaison with landowners/ managers and local authorities;
- acquisition of land supporting large populations;
- do not burn during flowering/ vegetative stage (July-November);
- monitor populations regularly, particularly with regard to weed invasion.

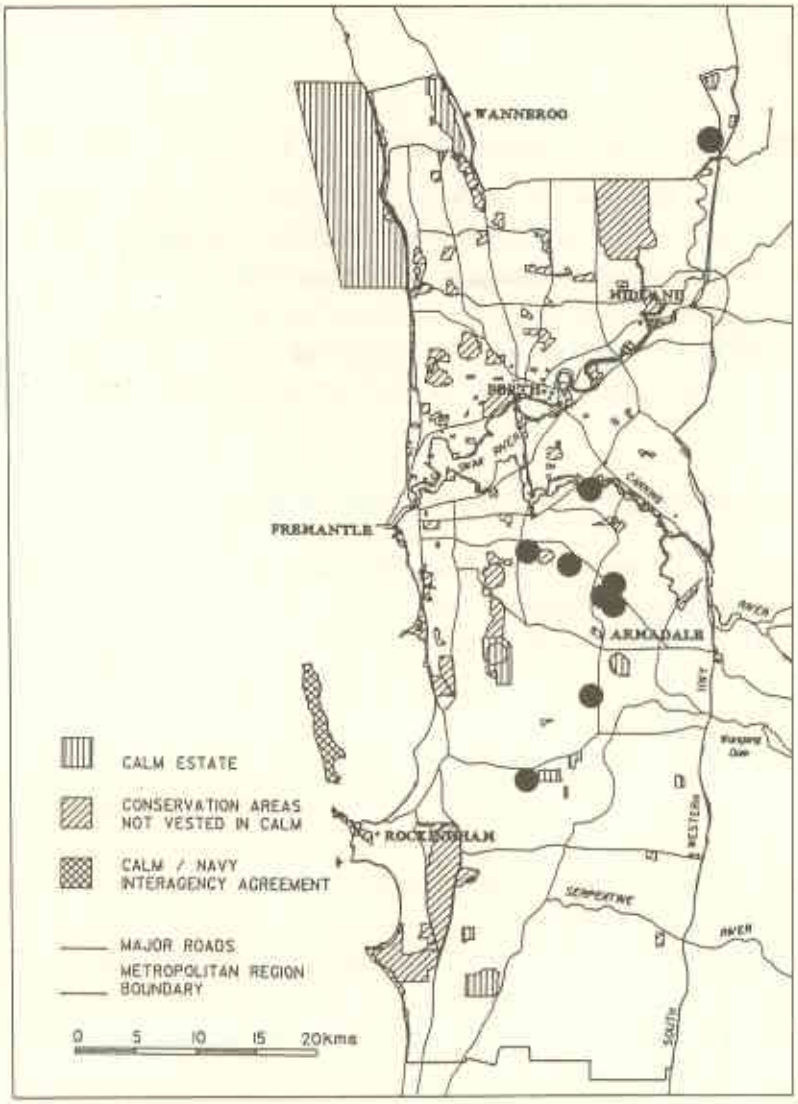
RESEARCH REQUIREMENTS

- conduct surveys of likely habitats in the Metropolitan Area with view to acquiring land supporting large populations.

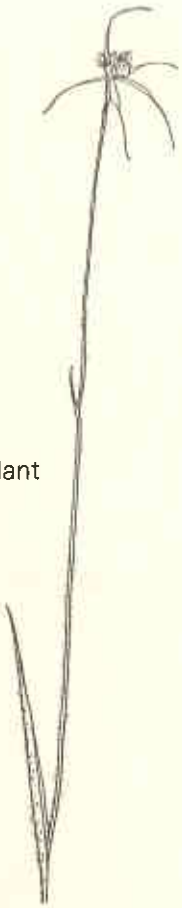
REFERENCES

A.P. Brown[1] (personal communication); Marchant *et al.* (1987).

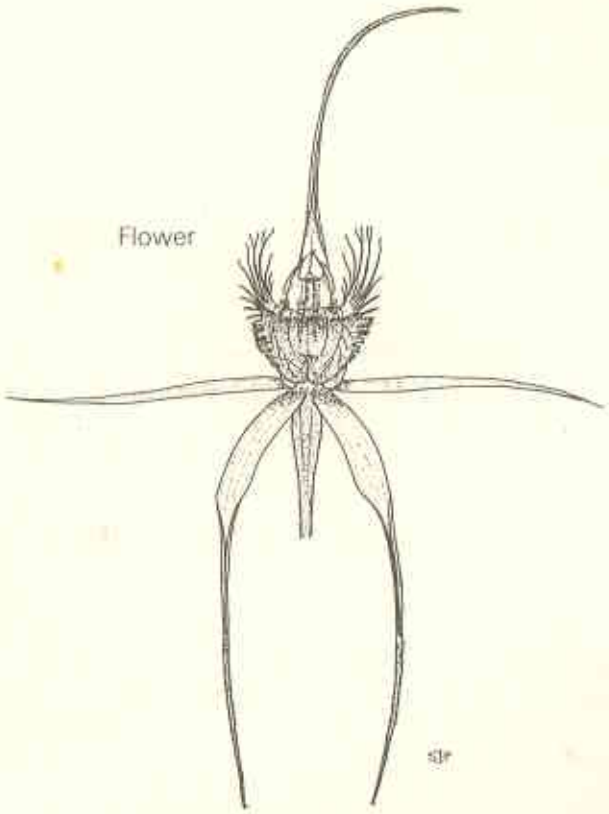
1 A.P. Brown, Department of Conservation and Land Management, Wildlife Research Centre



● ***Caladenia huegelii***



Whole plant



Flower

CALYTRIX BREVISETA Lindl. subsp. BREVISETA

An erect or spreading shrub to 40 cm tall with widely spaced, linear to narrowly elliptic leaves up to 9 mm long x 1.25 mm wide. The leaves are semi-terete, very shortly petiolate and terminating in a slender point. The purple flowers with numerous stamens are in scattered inflorescences. The apex of each sepal is produced into an awn up to 11 mm long. The bracteoles are brown and free almost to the base. This subspecies differs from subsp. *stipulosa*, which is widespread east of the Darling Range, in its longer, usually linear leaves, longer petals, greater number of stamens and equal bracteoles. Flowers in September-October.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Endemic to the Metropolitan Area where it is known from a single site in Kenwick. Habitat is a low-lying, sandy clay flat with low heath of *Verticordia acerosa* and *V. plumosa*. It was collected from Gosnells and Bellevue earlier this century but is unlikely to remain in these areas as they have been largely cleared.

CONSERVATION STATUS

Endangered	✓	Rare	✓	In Need of Special Protection

Calytrix breviseta subsp. *breviseta* was presumed extinct until its rediscovery in November 1990. The population, of several hundred plants, occurs on private land adjoining a private reserve in Kenwick. The population is in good condition but careful management is essential to ensure its long term survival. There are no immediate intentions to develop the site and its acquisition as a conservation reserve would be desirable. Alternatively, propagation and introduction to suitable habitats in conservation areas may be required.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
1/ 11/ 90	G	Kenwick	private	several 100	good

G - City of Gosnells

Response to Fire - not known.

Response to Soil Disturbance - not known.

Susceptibility to Weed Invasion - not known.

Susceptibility to Phytophthora *species* - not known.

MANAGEMENT REQUIREMENTS

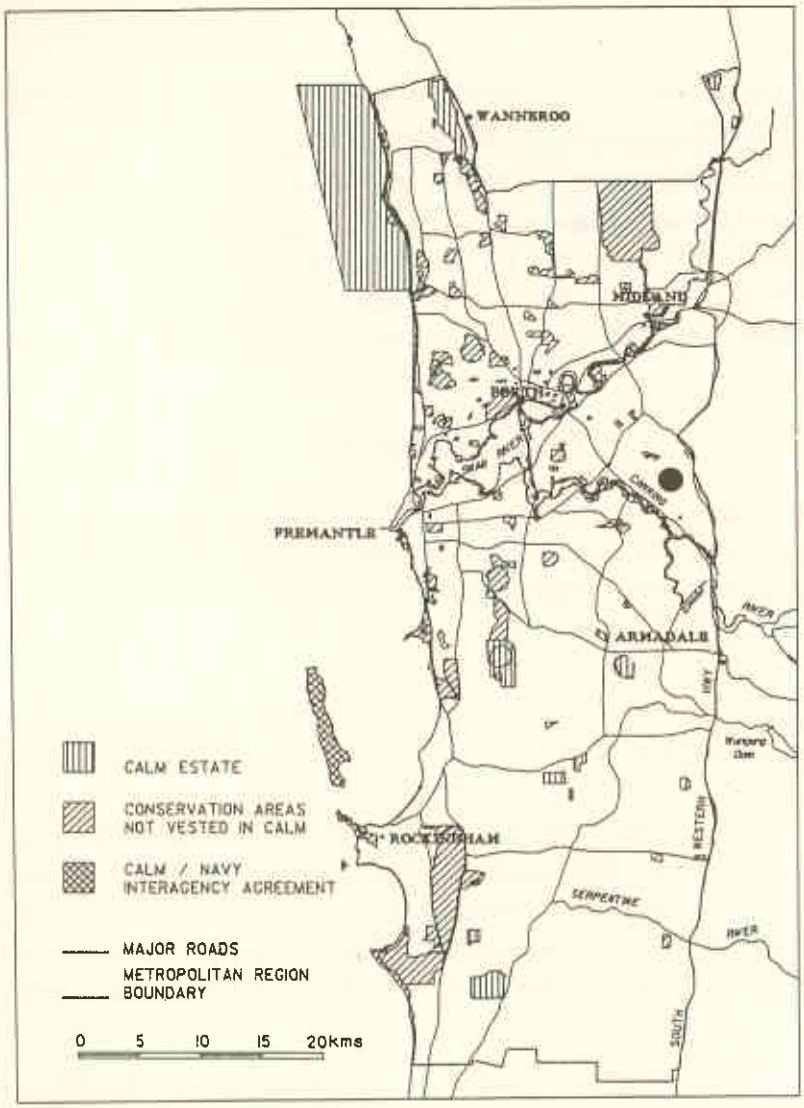
- close liaison with landowners regarding management and protection of the population;
- monitor site annually;
- exclude fire;
- collect seed for long-term storage;
- acquisition of the site as a conservation reserve.

RESEARCH REQUIREMENTS

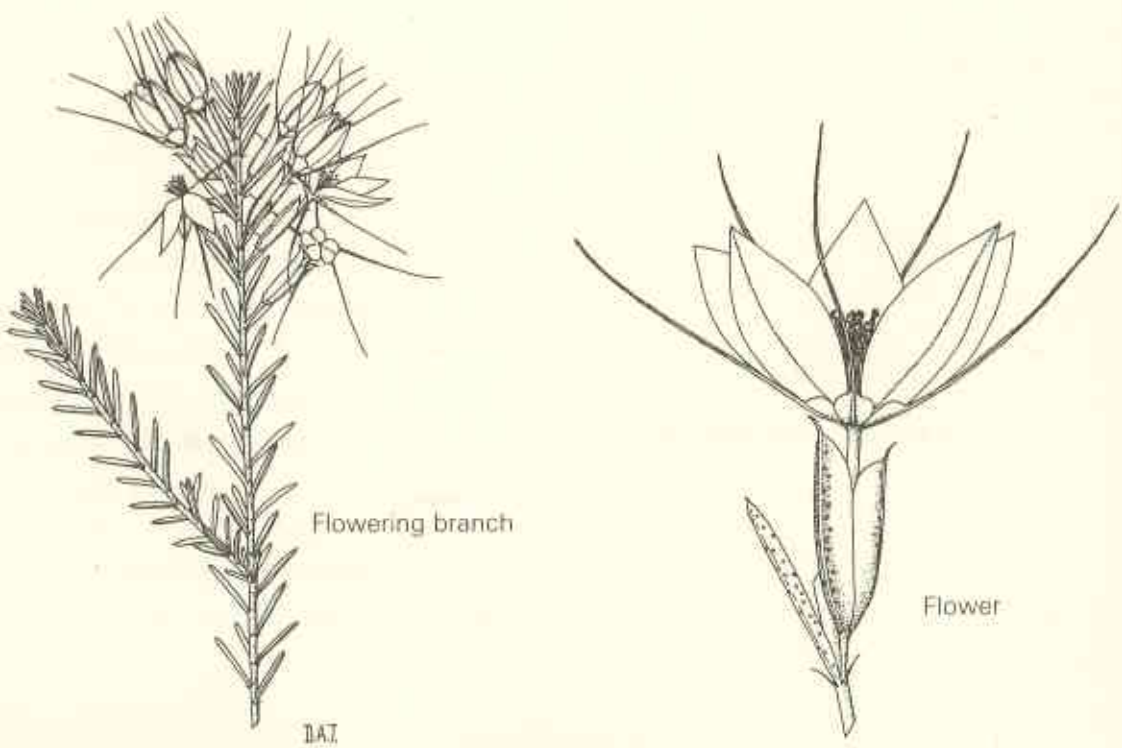
- further survey of suitable habitat in the Metropolitan Area;
- develop propagation techniques and establish in cultivation;
- conduct research on fire and life history.

REFERENCES

Craven (1987); Marchant *et al.* (1987).



● *Calytrix breviseta* subsp. *breviseta*



DIURIS MICRANTHA D. Jones

Swamp Donkey Orchid

Diuris micrantha is an erect herb with a basal tuft of linear leaves and a loose, slender inflorescence up to 60 cm high. The flowers are yellow with red-brown markings and are the smallest in the genus, measuring up to 13 mm across. This newly described species is closely related to the widespread *D. laxiflora*, differing in its smaller, paler yellow flowers, more rounded petals and blunter labellum with short, broad lateral lobes. It flowers in August-September and dies back to a dormant tuber over summer.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Endemic to the Metropolitan Area where it is known from a single population east of Kwinana. It grows in a sandy clay, winter-wet swamp amongst dense native sedges and scattered *Melaleuca* shrubs and paperbarks. The similar *D. laxiflora* is associated.

CONSERVATION STATUS

Endangered	✓	Rare	✓	In Need of Special Protection

A rare species known from a single population of 200+ plants on VCL near Kwinana. The site has been considerably degraded in the past by heavy weed infestation caused by frequent burning, and by intense rabbit activity, illegal trail-bike riding and rubbish dumping. The population size appears to fluctuate between seasons, probably in response to environmental conditions. Negotiations are underway to acquire the site as a nature reserve and it has been recently fenced to prevent vehicle access. Research on the breeding systems and population ecology of this species is underway and a detailed management program will be prepared.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
9/91	Kw	Casuarina	VCL (proposed nature reserve)	200+	partly disturbed

Kw - Town of Kwinana

Response to Fire - killed if burnt when in vegetative or flowering state (April-September).

Response to Soil Disturbance - not known.

Susceptibility to Weed Invasion - growth suppressed.

Susceptibility to Phytophthora *species* - not known.

MANAGEMENT REQUIREMENTS

- continue negotiations to acquire land as a nature reserve;
- control invasive weeds and undertake rehabilitation of degraded areas;
- exclude fire;
- collect seed for long term storage and establish in cultivation;

MANAGEMENT REQUIREMENTS (*continued*)

- survey population annually;
- monitor water-table levels regularly.

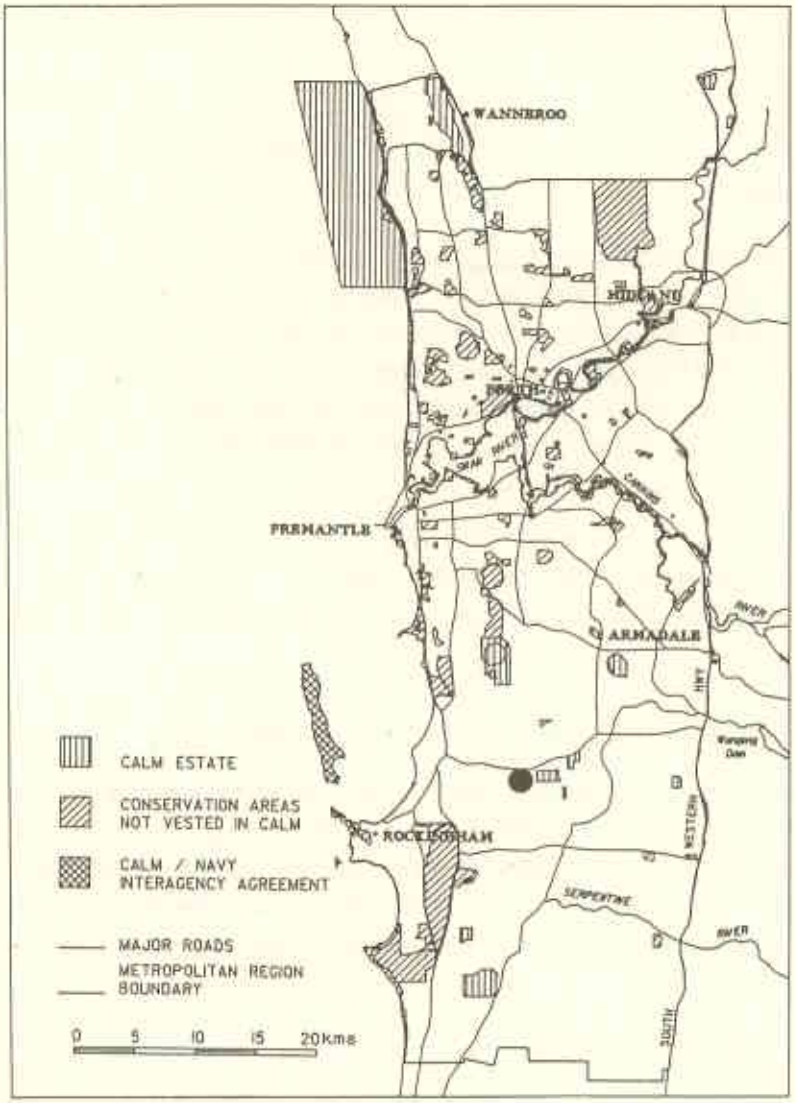
RESEARCH REQUIREMENTS

- further survey of suitable habitats in the Metropolitan Area.

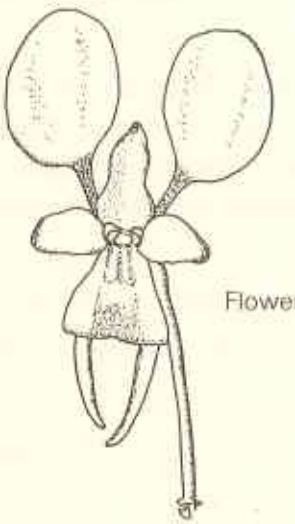
REFERENCES

A.P. Brown[2] (personal communication); S. Carstairs[3] (personal communication); Jones (1991).

2 A.P. Brown, Department of Conservation and Land Management, Wildlife Research Centre
3 S. Carstairs, University of Western Australia, Botany Department



● ***Diuris micrantha***



Flower

Whole plant

DIURIS PURDIEI Diels.

Purdie's Donkey Orchid

Diuris purdiei is a slender orchid with 5-10 narrow, spirally twisted leaves arising from the base and enclosed in two prominent sheaths. It has up to 10 distinctive flowers on a single spike to 45 cm high. The flowers are pale yellow with magenta-brown markings at the base of the labellum and on the underside of the petals. The conspicuous labellum has a broad, ridged middle lobe and smaller, fringed lateral lobes. It partially conceals the long, narrow, lateral sepals which are greenish is colour. Spreading petals are elliptical on long claws. The small dorsal sepal stands erect. The fruit is a small, urn-shaped capsule with many fine seeds.

D. purdiei is believed to be pollinated by small beetles and native bees. Flowering occurs in September-October, only after a summer or early autumn burn. Non-flowering plants in unburnt habitats consist of a single narrow leaf. The above-ground portion of the plant dies back to cylindrical tubers over summer.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Occurs on sandy clay soils in low-lying, winter-wet areas between Kenwick and the Harvey Estuary (85 km). It grows in dense heath with scattered emergent *Melaleuca preissiana* and *Nuytsia floribunda*. In the Metropolitan Area, commonly associated shrub species include *Adenanthos obovatus, Astartea fascicularis, Calothamnus lateralis, Hypocalymma angustifolium* and *Pericalymma ellipticum*. Sedges and herbaceous species are prominent in the years following fire. Unverified reports of this species have been made further south near Yarloop.

CONSERVATION STATUS

Endangered	Rare	In Need of Special Protection ✓

A species under extreme pressure in the Metropolitan Area due to continuing destruction of its habitat through urban and industrial developments. It is not known from any conservation reserves in the Metropolitan Area, with 6 of the 7 recorded populations on private land. The largest concentration of plants occurs at Canning Vale on land proposed for development. Fortunately, over half (52.5 per cent) of the total 2000+ plants are secure in two nature reserves south of Mandurah. Protection of large, heathy populations in the Metropolitan Area is a priority.

Although extensive clearing throughout its range has reduced the available habitat, its sporadic observation is due in part to its requirement for a summer-early autumn burn to induce flowering. It is almost impossible to recognise in the vegetative state and may occur in areas long unburnt. A detailed study of the biology of this species has been conducted and a management program is in preparation. It has been successfully propagated but is not in general cultivation.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
1989-90	C	Canning Vale (a) (sub-populations)	private	640	good/ endangered
6/ 10/ 84	C	(b)	private	16	endangered
1986	G	(c)	private	80	endangered
16/ 10/ 84	G	Southern River (I)	private	22	
1986	G	Southern River (II)	private	100	
1967	G	Kenwick	private reserve	*	
9/ 10/ 89	A	Forrestdale (I)	private	30+	good
1982	A	Forrestdale (II)	recreation reserve	30	
15/ 10/ 87	S/ J	Oakford	private	30	good

* population not recently surveyed

A - City of Armadale
C - City of Canning
G - City of Gosnells
S/ J - Shire of Serpentine-Jarrahdale

Response to Fire - requires a summer-early autumn (January to April) burn to initiate flowering. Fires at any other time of the year may be detrimental.

Response to Soil Disturbance - not known.

Susceptibility to Weed Invasion - suppresses growth.

Susceptibility to Phytophthora *species* - not known.

MANAGEMENT REQUIREMENTS

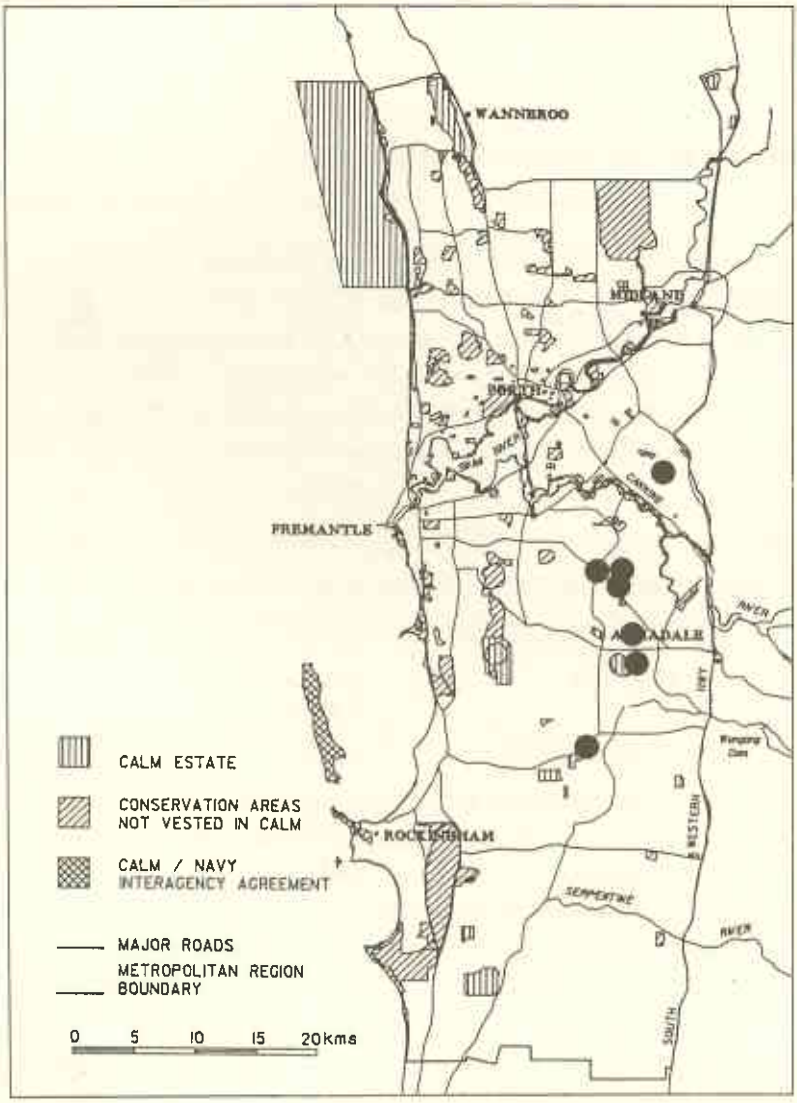
- close liaison with landowners/ managers and local authorities;
- acquisition of land as a conservation reserve;
- maintain in cultivation;
- translocate plants endangered by developments to suitable habitats in conservation reserves;
- do not burn during vegetative/ flowering phase (July-November).

RESEARCH REQUIREMENTS

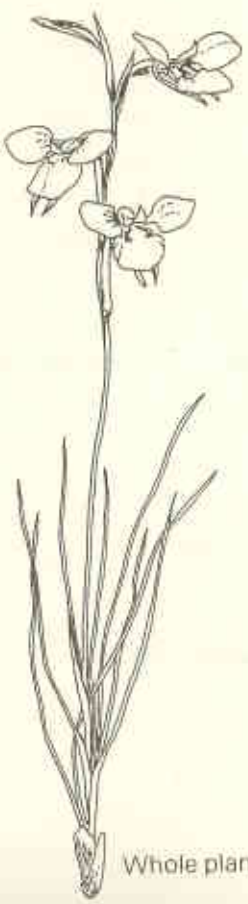
- further survey of suitable summer-burnt habitats in the Metropolitan Area;
- continue research on ecology, breeding systems and pollination biology.

REFERENCES

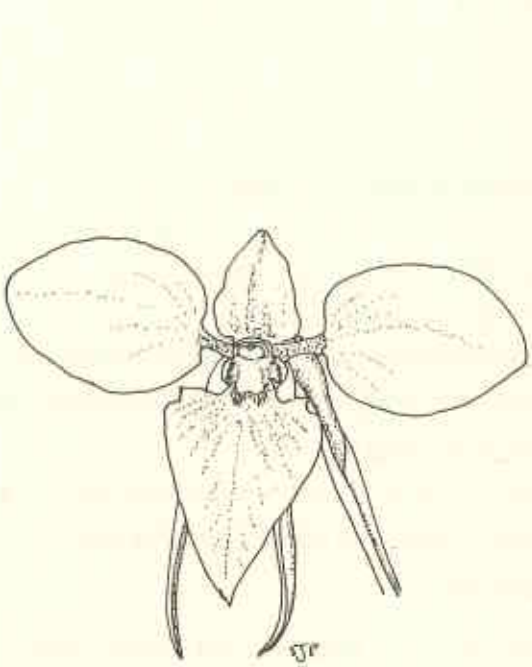
Goble-Garratt (1991); Maddocks and Lamont (1984); Patrick and Hopper (1982).



● *Diuris purdiei*



Whole plant



Flower

DRAKAEA ELASTICA Lindl.

Glossy-leaved Hammer Orchid

Drakaea elastica is a slender orchid with a distinctive bright green, glossy leaf that is orbicular to cordate in shape and up to 2 cm in diameter. Its highly modified flower is solitary on an erect stem up to 30 cm high. The hinged labellum has a swollen 'hammer-like' end that is constricted into two lobes. The larger lower lobe is glabrous while the short upper lobe is densely covered with purple glands and hairs. The perianth segments are narrowly linear and yellowish-green in colour. The leaf is usually withered by the time of flowering and the stems die back to an underground tuber over summer. Flowering occurs in October-November but *D. elastica* is most easily located in July-August when the leaves are conspicuous.

This species was described by Lindley in 1840. However, the name became misapplied to the more common *D. livida*. It was redescribed as *D. jeanensis* by Rogers in 1920 and recognised under this name until the late 1980s when closer inspection of the type collection and description revealed the error.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Confined to the coastal plain where it occurs from Southern River in the Metropolitan Area, south to near Ruabon. It has been collected from north-west of Bindoon but is believed to be extinct at this site. In the Metropolitan Area it grows in sandy soils, often beneath *Kunzea ericifolia* scrub, in *Banksia attenuata/B. menziesii/Allocasuarina fraseriana* woodlands. Sites are usually low lying, bordering ephemeral swamps.

CONSERVATION STATUS

Endangered	Rare ✓	In Need of Special Protection

An uncommon species occurring in habitats that have been largely cleared for agricultural and urban development. It is known from only 1000+ plants at nine sites throughout its range, only one of which is in a conservation reserve. The populations in the Metropolitan Area are from small remnants of vegetation on shire and private land. At Forrestdale the population has not been seen in over ten years and may be extinct. The Anketell population has also been unsurveyed for some time. Thorough surveys to locate and protect this species in suitable habitats in the north of its range are required.

Observations indicate that *D. elastica* favours open sites and that the decline of some populations may be due to increased shading and competition by other species. Disturbances such as fire may be essential to its survival. Research on the breeding systems and population ecology of this species is underway and a detailed management program will be prepared.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
10/78	A	Forrestdale	shire reserve	2	possibly extinct
28/10/82	Kw	Anketell	private	30+	
28/11/88	G	Southern River	private	8	good
10/90	S/J	Peel Estate	private	10+	good

POPULATIONS KNOWN IN THE METROPOLITAN REGION (*continued*)

A - City of Armadale
G - City of Gosnells
Kw - Town of Kwinana
S/J - Shire of Serpentine-Jarrahdale

Response to Fire - killed if burnt when in vegetative or flowering state (April-November).

Response to Soil Disturbance - favours open or cleared ground.

Susceptibility to Weed Invasion - growth suppressed by competition and shading.

Susceptibility to Phytophthora *species* - not known.

MANAGEMENT REQUIREMENTS

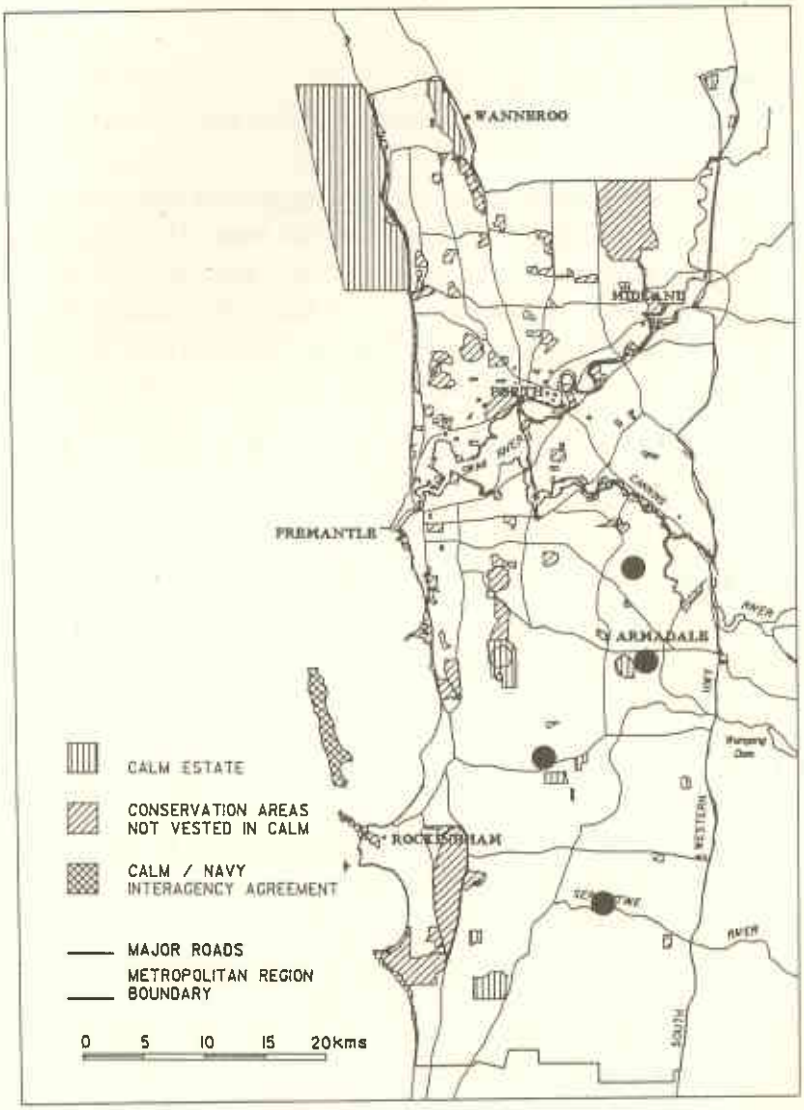
- close liaison with landowners/ managers;
- do not burn during vegetative/ flowering phase (April-November);
- conduct surveys at the Forrestdale and Anketell sites to relocate populations;
- monitor regularly, particularly with regard to invasive weeds.

RESEARCH REQUIREMENTS

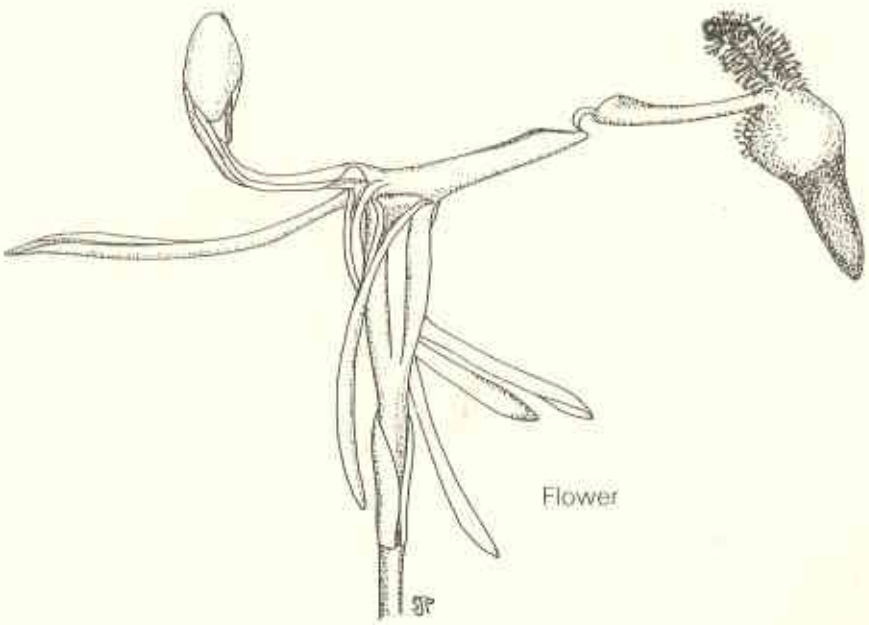
- further survey of suitable habitats with view to acquiring land as a conservation reserve.

REFERENCES

Clements (1989); Hoffman and Brown (1984); Marchant *et al.* (1987); Rogers (1920).



● *Drakaea elastica*



DRYANDRA MIMICA A.S. George

Summer Honeypot

Dryandra mimica is a low prostrate shrub with a woody lignotuber and underground stems. The leaves are linear, up to 35 cm long, with rounded sinuses between the lobes. The under-surface of the leaves is densely hairy and has a prominent midrib. The upper surface is hairy in the juvenile leaves but becoming glabrous as they mature. Flowers are yellow with a tuft of long, white hairs at the apex, and are in erect flowerheads borne at ground level. The few densely hairy fruits are up to 2 cm long and 1 cm wide. It is similar in overall appearance to *D. nivea* but is most closely related to *D. vestita*. Flowers in December.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

A widespread species occurring at three sites over a 310 km range, from west of Mogumber to the Whicher Range south-east of Busselton. In the Perth area it is known only from Wattle Grove where it grows on grey-white sand in mixed low heath with a *Banksia attenuata/B. menziesii* open low woodland overstorey.

CONSERVATION STATUS

Endangered	✓	Rare	✓	In Need of Special Protection

A rare species known from four populations at three disjunct localities. In the Whicher Range, the largest population of 70+ plants is in State Forest proposed as a conservation reserve. The population near Mogumber consists of only 6 plants on a small patch of vegetation grazed and trampled by stock. The two Wattle Grove populations are in remnant vegetation on developed private lots near the cleared type locality. The long-term survival of these small isolated populations is further threatened by their proximity to buildings, firebreaks and a shire road. Seed set is low and may be due to reduced pollinator activity (M. Pieroni[4], personal communication). *D. mimica* has been well surveyed in the Metropolitan Area and further populations are unlikely. It is rare in cultivation but not difficult to grow.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
17/1/91	K	Wattle Grove (I)	private	6	partly burnt
17/1/91	K	Wattle Grove (II)	private	22	good

K - Shire of Kalamunda

Response to Fire - regenerates vigorously from lignotuber after fire.

Response to Soil Disturbance - responds well, regenerating from lignotuber after clearing.

Susceptibility to Weed Invasion - not known.

Susceptibility to Phytophthora *species* - like other *Dryandra* species it may be susceptible, but unlikely to be a problem due to its preference for sandy soils.

4 M. Pieroni, Dryandra Study Group

MANAGEMENT REQUIREMENTS

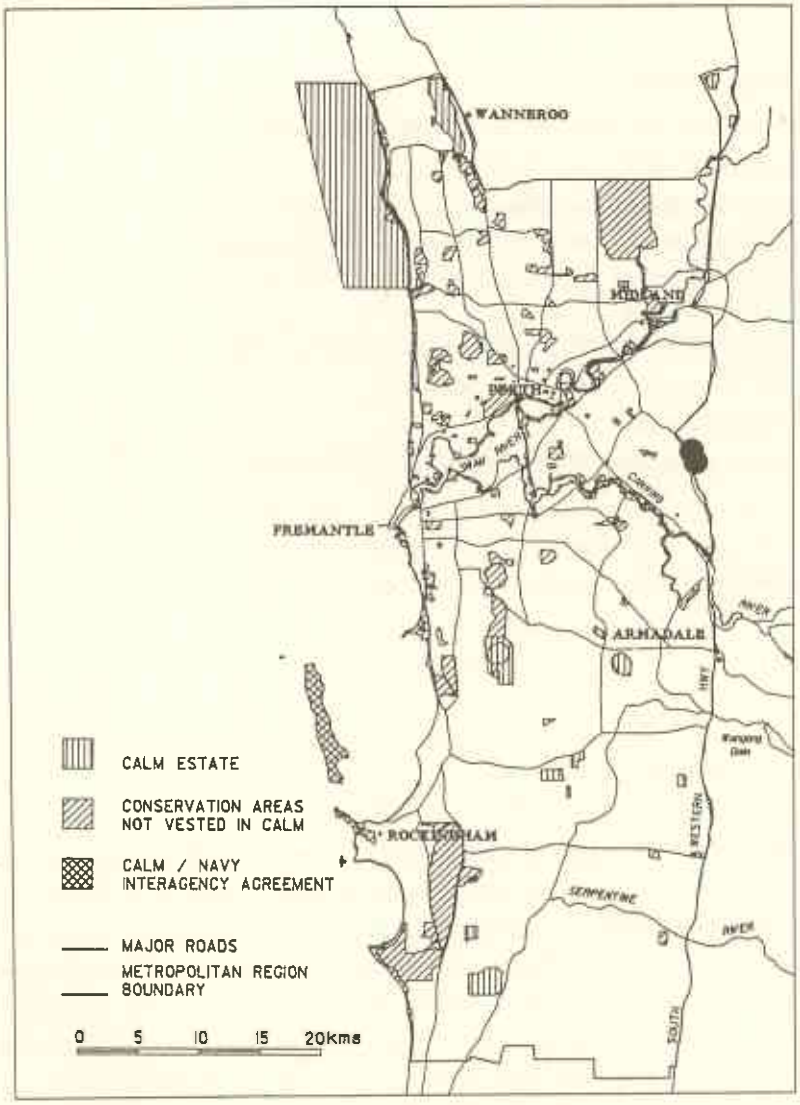
- close liaison with landowners and careful management of the sites;
- monitor populations annually;
- autumn burn at no less than seven yearly intervals;
- control invasive weeds;
- collect seed for long-term storage;
- translocation of plants or propagation and introduction to suitable sites in conservation reserves should be considered.

RESEARCH REQUIREMENTS

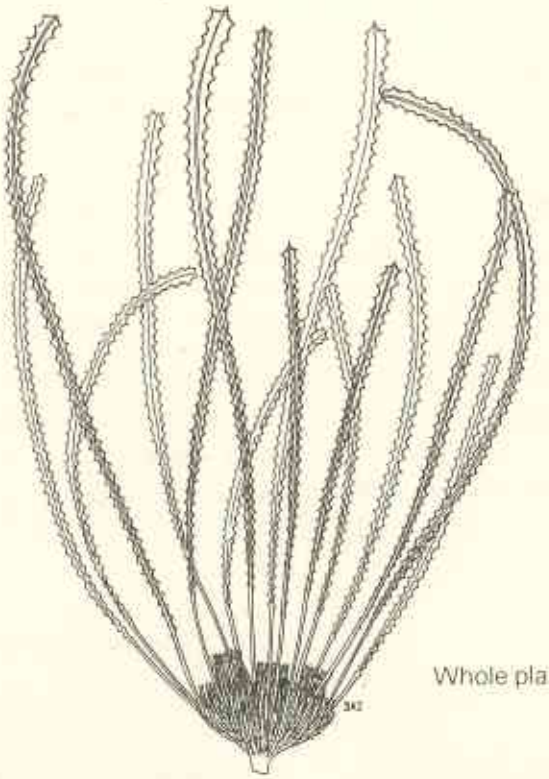
- conduct research on pollination biology and population ecology.

REFERENCES

George (1984); Sainsbury (1985).



● *Dryandra mimica*



Whole plant

Flower

EPIBLEMA GRANDIFLORUM R.Br. var. 'CYANEA' ms

A variety of the widespread 'Babe in the Cradle', *Epiblema grandiflorum*, differing in its blue rather than purple-mauve flowers. It has a slender, erect stem with a basal, linear leaf and two shorter, erect stem bracts. The flowers are pedicellate, usually up to six in a loose inflorescence. The sepals and lateral petals are spreading, broadly oblong-lanceolate and almost equal in size. The labellum is ovate with a distinct claw and a tuft of linear calli at the base. The column is short with thin, erect lobes. Flowers November-December.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Known only from Malaga in the Metropolitan Area where it grows amongst sedges bordering a seasonal swamp. It usually grows in shallow water and flowers as the soil begins to dry out.

CONSERVATION STATUS

Endangered	✓	Rare	✓	In Need of Special Protection

An extremely rare taxon known from a single population on private land at Malaga. A total of 29 plants have been recorded but the population may contain in excess of 100 plants as a number of unflowered seedlings of unknown status occur nearby. The entire swamp has been fenced by the landowner to protect the population from accidental damage, particularly by earthworks in the vicinity. Widespread surveys by orchid enthusiasts have not located any other populations of this variant. It was recently gazetted (May 1991) and is proposed to be described as a distinct variety.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
5/11/90	S	Malaga	private	29	good

S - Shire of Swan

Response to Fire - site not likely to support a fire during spring. A summer fire (Dec-Jan) may destroy flowering/ fruiting plants.

Response to Soil Disturbance - not known.

Susceptibility to Weed Invasion - not known.

Susceptibility to Phytophthora *species* - not known.

MANAGEMENT REQUIREMENTS

- close liaison with landowners regarding protection and management of the population;
- inspect population annually;
- monitor water table regularly;
- exclude fire during vegetative-flowering stage (July-December);
- collect seed for long-term storage and maintain in cultivation.

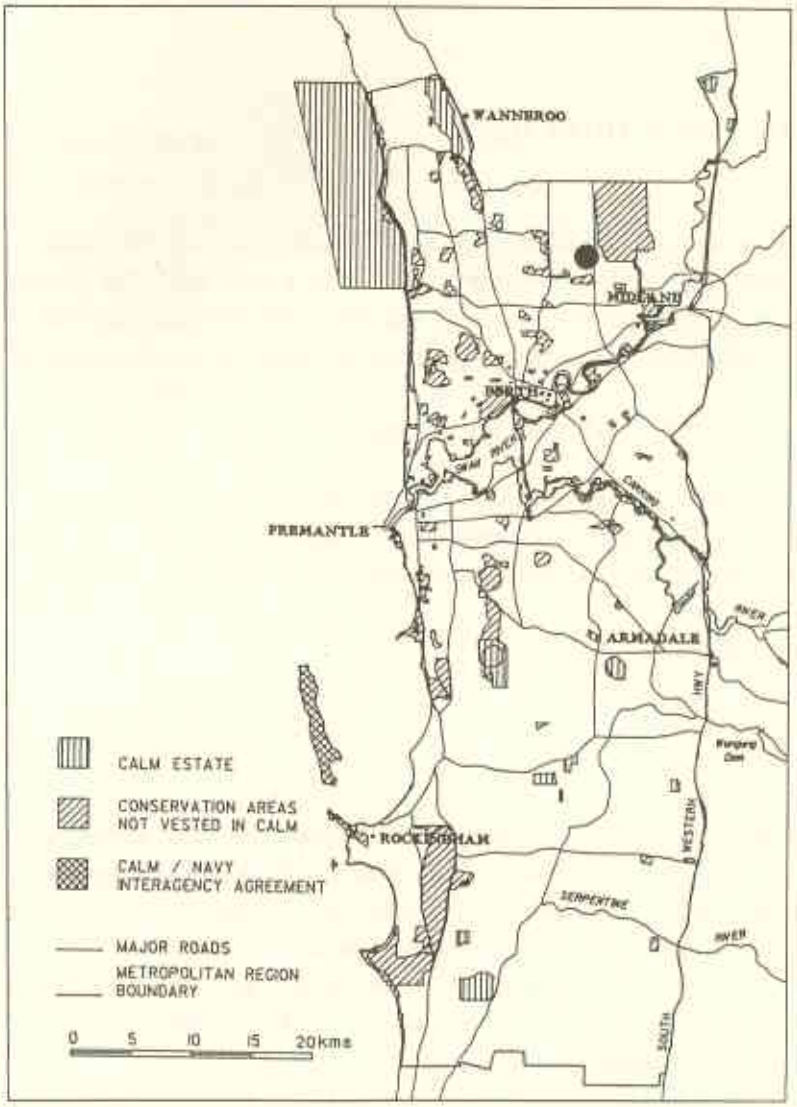
RESEARCH REQUIREMENTS

- conduct research on population ecology and pollination biology.

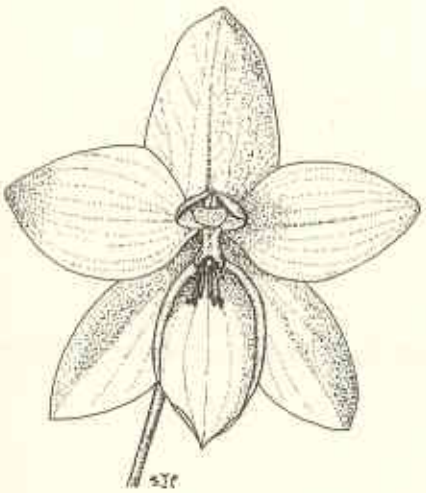
REFERENCES

K. Dixon[5] (personal communication); Marchant *et al.* (1987).

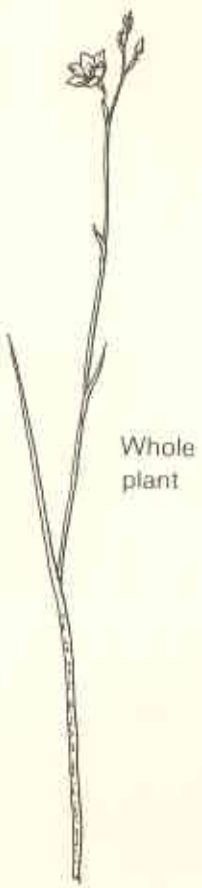
5 K. Dixon, Kings Park and Botanic Gardens



● ***Epiblema grandiflorum*** **var. '*cyanea*' m.s.**



Flower



Whole plant

HYDROCOTYLE LEMNOIDES Benth.

Aquatic Pennywort

Hydrocotyle lemnoides is a small annual herb and the only truly aquatic species in its genus. It has thread-like stems and more or less rounded leaves up to 5 mm wide. The shortly-stalked, apparently unisexual flowers, are in umbels of 3-6. Petals are mauve and up to 1 mm long. The fruits are circular and flattened, on distinct individual stalks and a larger common stalk. Flowers in September-October.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

H. lemnoides occurs over a range of almost 100 km, from Bolgart north-east of Perth south to near Brookton. It grows in shallow ephemeral freshwater swamps with its leaves floating and stems rooted in the clay. At the metropolitan sites the surrounding vegetation is *Melaleuca lateritia* heath.

CONSERVATION STATUS

Endangered	Rare	In Need of Special Protection ✓

An uncommon species known in the Metropolitan Area from three large populations at Ellen Brook and Kenwick. The Ellen Brook population is not threatened but the Kenwick populations are under pressure from rubbish dumping, weed incursion and trail-bike riding. One of the sites is a proposed housing development. Outside the Metropolitan Area, four populations of several thousand plants each occur in state forest, nature reserve and private property. *H. lemnoides* was probably more widely distributed on lands that have been cleared and further populations in the Metropolitan Area are unlikely. It may still exist in unsurveyed swamps elsewhere in its range.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Conservation Reserves					
2/ 11/ 90	S	Ellen Brook	nature reserve	several 1000	good
Other Lands					
12/ 9/ 90	G	Kenwick (I)	Homeswest	several 1000	good
12/ 9/ 90	G	Kenwick (II)	private	1000+	good

G - City of Gosnells
S - Shire of Swan

Response to Fire - regenerates each year from small seeds. Summer fires at several of the sites have had no apparent effect on population size.

Response to Soil Disturbance - not applicable.

Susceptibility to Weed Invasion - not applicable.

Susceptibility to Phytophthora *species* - not applicable.

MANAGEMENT REQUIREMENTS

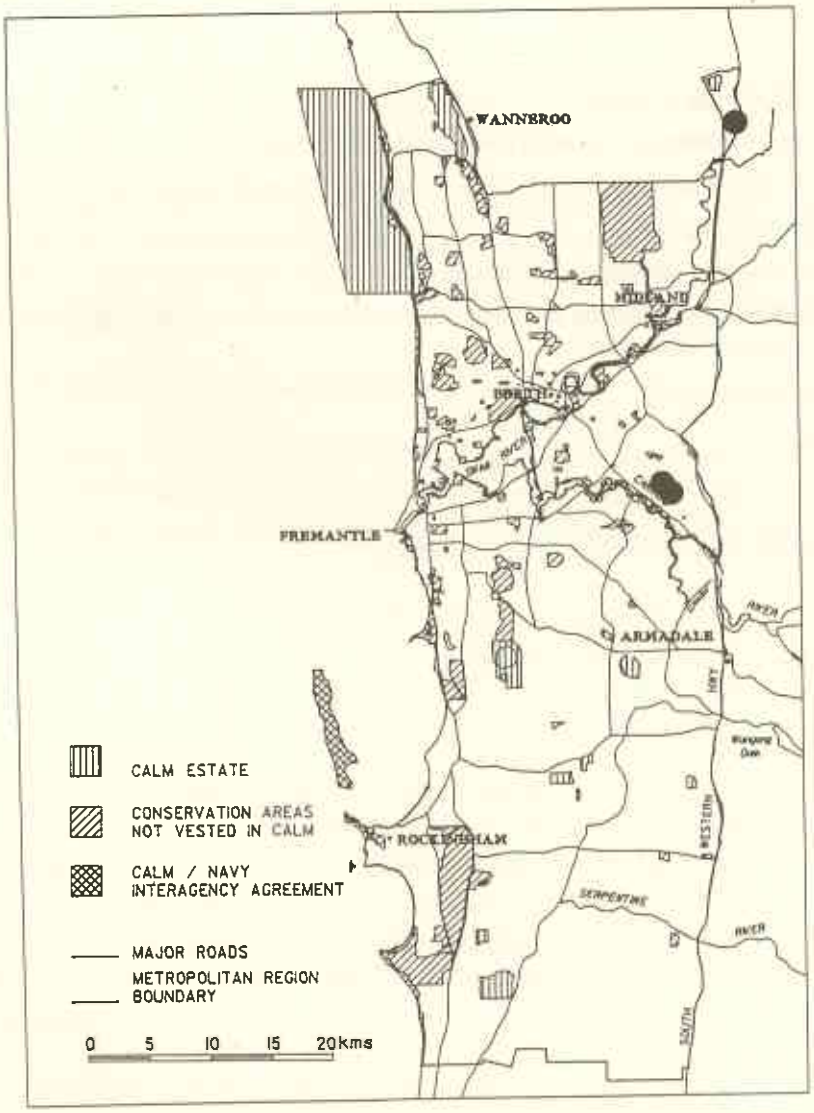
- close liaison with landowners/ managers and local authorities;
- exclude rubbish dumping and off-road-vehicle access at Kenwick sites;
- monitor populations regularly;
- summer burn at no less than seven yearly intervals;
- acquisition of land in the Kenwick area as a conservation reserve would greatly enhance the conservation status of this species.

RESEARCH REQUIREMENTS

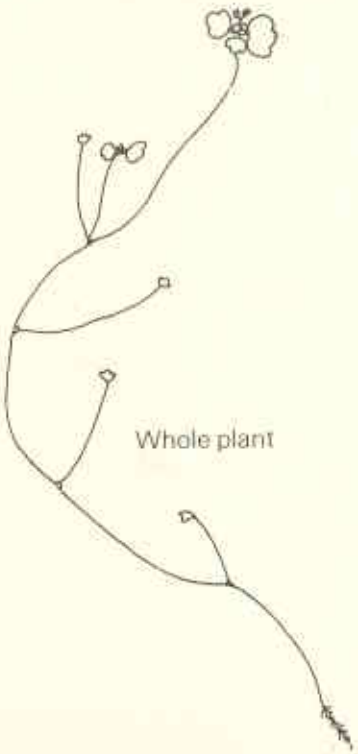
- none required.

REFERENCES

Aston (1973); Bentham (1867); Marchant *et al.* (1987).



● *Hydrocotyle lemnoides*



Umbel with buds, flowers and young fruits

SCHOENUS NATANS (F. Muell.) Benth.

Floating Bog-rush

A glabrous, aquatic annual with thread-like stems that form a floating mass over 30 cm long. The leaves are also thread-like, up to 8 cm long. The inflorescence has one terminal spikelet, sometimes with another spikelet below. The spikelets are light brown and 2-flowered. The perianth segments are longer than the nut and fringed with hairs. The nut is ovoid, with three prominent ribs, smooth but sometimes with a small, hairy point at the apex. Flowering period is probably October.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

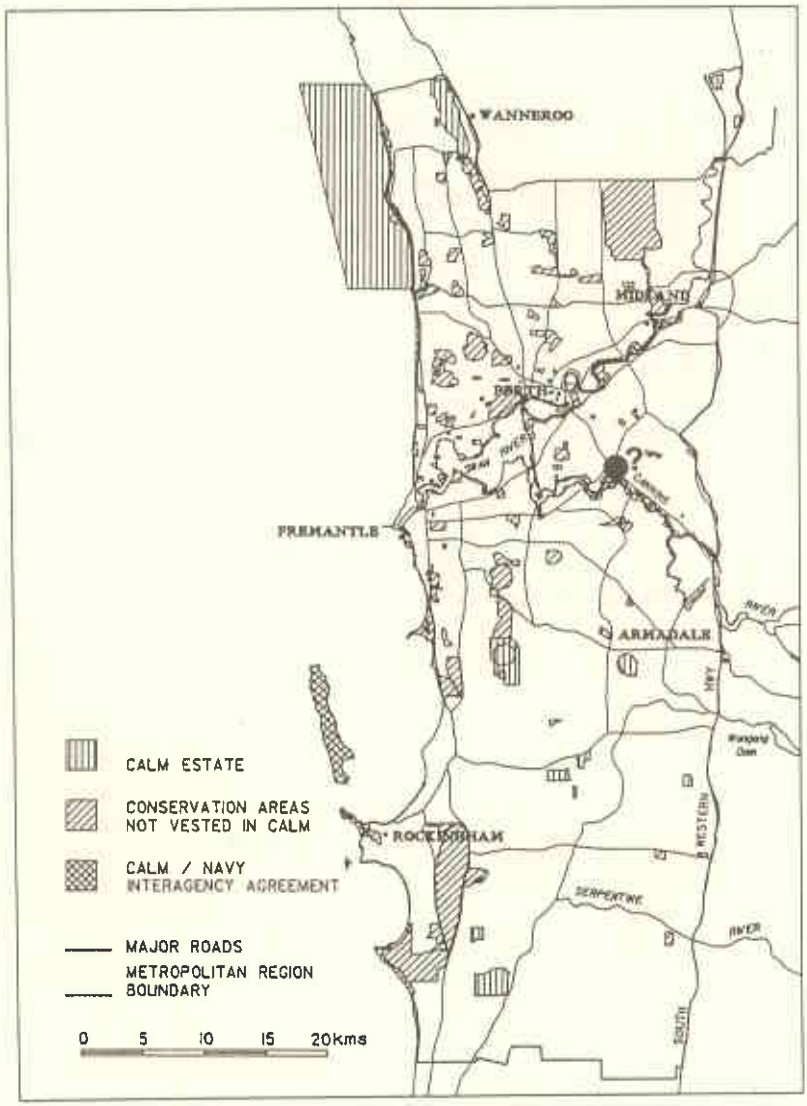
Apparently endemic to the Metropolitan Area where it was recorded from winter-wet depressions in the Cannington area.

CONSERVATION STATUS - presumed extinct.

Schoenus natans has been collected on only two occasions, once by Drummond from an unknown locality and then from Cannington in 1911. It is now possibly extinct, but being a small plant may have been overlooked. Agricultural and urban development is likely to have destroyed much of the suitable habitat for this species.

REFERENCES

Bentham (1878); Leigh *et al.* (1984); Marchant *et al.* (1987).



● *Schoenus natans*

TETRARIA AUSTRALIENSIS C.B. Clarke

A perennial herb with a woody rhizome and terete stems up to 1 m high. The leaves are cylindrical, to 18 cm long x 6 mm wide, with many fine, longitudinal lines. The basal leaves are numerous, becoming shorter further up the stem. The base of the leaf encloses the stem in a blackish-brown sheath. The inflorescence is slender, dull pinkish-brown, up to 30 cm long. Laterally flattened spikelets are densely clustered on numerous short, erect branches of the inflorescence. Each spikelet is about 1 cm long, containing two flowers and usually three empty basal glumes. The fruit is a smooth, round to elliptical nut.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

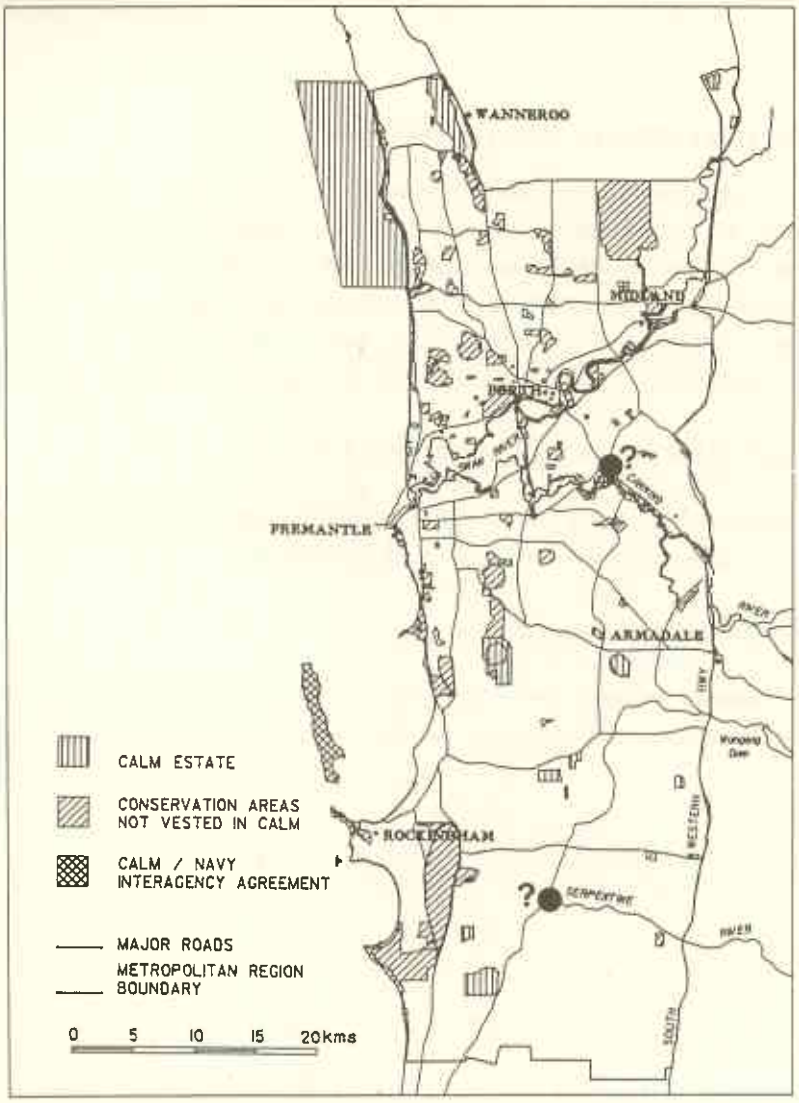
Occurring in the Metropolitan Area where it has been recorded from Cannington and the Serpentine River. The Serpentine collection was from open forest on sandy soil.

CONSERVATION STATUS - presumed extinct.

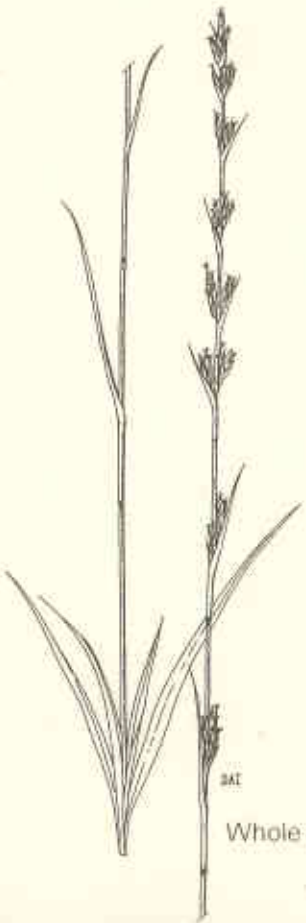
A presumed extinct species collected from the Serpentine River in 1872 and Cannington in 1898. Precise locality information was not recorded and it has probably been destroyed at these sites by clearing.

REFERENCES

Leigh *et al.* (1984); Marchant *et al.* (1987).



● *Tetraria australiensis*



Whole plant

Style and anthers

Spikelet

PART THREE: PRIORITY FLORA IN THE METROPOLITAN AREA

The taxa treated in this section are those listed on CALM's priority flora list (November 1991) for the Metropolitan Area. The priority categories are outlined in Part 1.4. The treatments follow the format in Part 2 but do not include detailed recommendations for management and research actions. For some taxa, populations were recorded just east of the Metropolitan Area boundary and these have been included in the treatments.

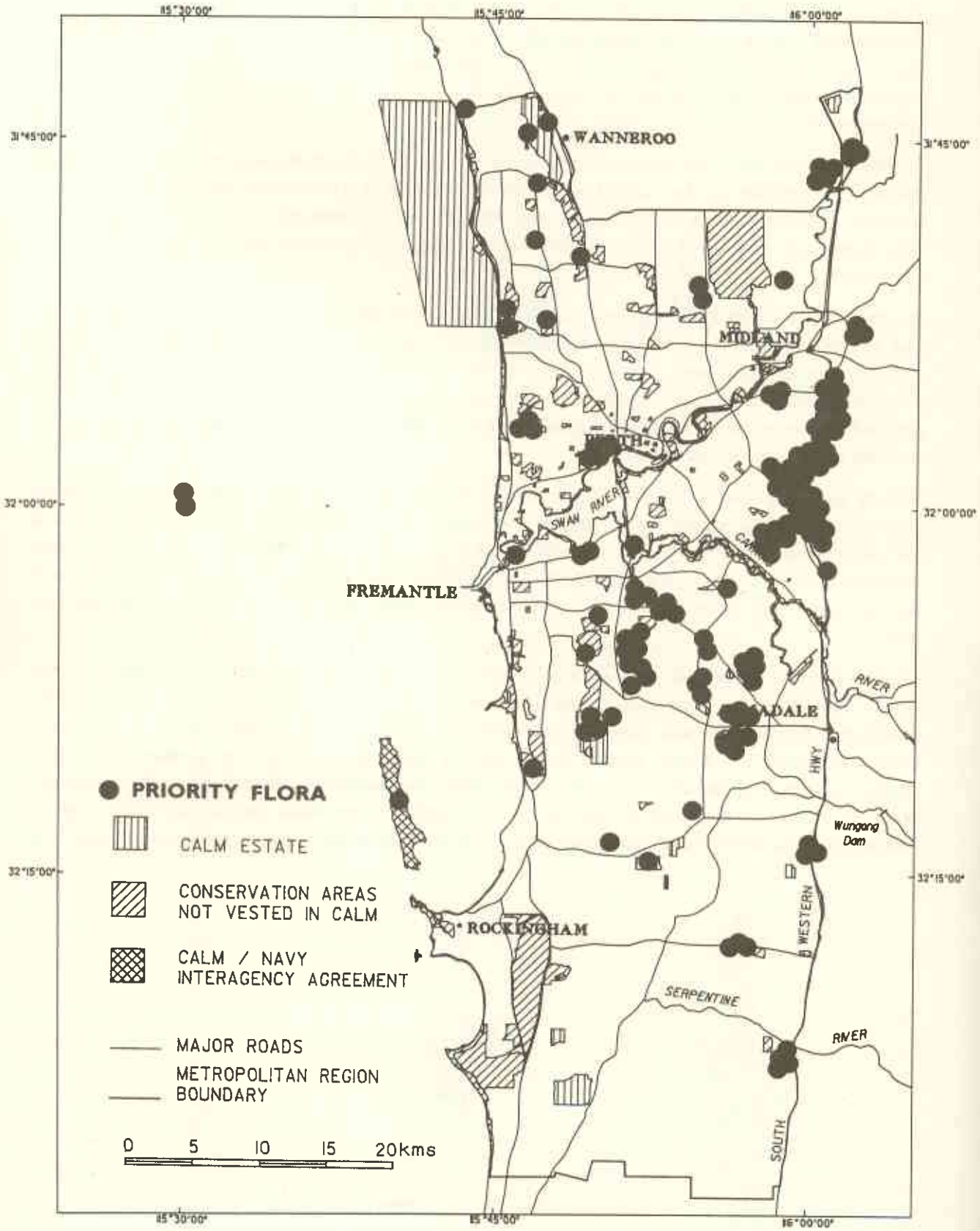
Priority One, Two and Three taxa require further surveys to determine their conservation status as they do not meet the requirements for gazettal as Rare Flora (Appendix 3). They may be added to the Rare Flora schedule if they prove to be truly rare, endangered or in need of special protection. Populations of these taxa, particularly those listed as priority one and two, should be protected from accidental damage or destruction.

Priority Four taxa have been adequately surveyed. They are usually represented on conservation reserves and are not presently endangered or in need of special protection. Their status may change if present circumstances alter (e.g. land clearing, dieback infection) and they may go onto (or back onto) the Rare Flora Schedule. These species should be monitored during routine operations. Priority taxa that are presumed to be extinct in the Metropolitan Area but are known from extant populations elsewhere are included under their current status.

Surveys for the priority taxa were conducted over the March 1990-January 1991 period, with survey priority given to those in the Priority One and Two categories. New populations were recorded for 21 taxa and many were found to be more abundant than previously thought. Several species (e.g. *Stylidium utricularioides, Gonocarpus pithyoides* and *Phlebocarya filifolia*) can be deleted from the list on the basis of these surveys. Table 3 lists the current and recommended status for all priority taxa in the Metropolitan Area.

Figure 4 maps the distribution of all priority flora populations in the Metropolitan Area. Of the total taxa, six are endemic to the Metropolitan Area and four (*Amanita cameiphylla, Calandrinia* sp. (Kenwick), *Eryngium 'subdecumbens'* and *Verticordia plumosa* var. *pleiobotrya*) are known from a single locality. Several taxa were not located despite specific surveys. Some species (e.g. *Conospermum undulatum, Isopogon drummondii* and *Grevillea thelemanniana* subsp. *thelemanniana*), although found to be frequent, cannot be considered secure as they are poorly represented in conservation reserves and often occur on land proposed for development. Further surveys outside the Metropolitan Area are required for most taxa.

Figure 4. Distribution of Priority Flora populations in the Metropolitan Area.



A. PRIORITY ONE TAXA

AMANITA CARNEIPHYLLA O.K. Miller

Pink-gilled Amanita

A robust species characterised by its clay-pink gills with pale, entire or slightly toothed margins. It has a fleshy white cap, to 12 cm in diameter, with large conical warts covering the surface. The cap is convex when young, becoming flattened as it matures. The stem is fusiform, white to slightly pink in colour, and up to 20 cm long. It is smooth below the cap and scaly in the lower part. The membranous ring is persistent. The basidiospores are white. Mature fruiting bodies emerge through sand in April-June.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Restricted to the Metropolitan Area where it is known from a single site in the suburb of Murdoch. It grows on a deep, yellow-white sandy flat in *Banksia* woodland. *Eucalyptus marginata* and *Pinus pinaster* occur nearby.

CONSERVATION STATUS - poorly known (priority 1).

Discovered in 1988, *Amanita carneiphylla* is known from a single population on a regularly maintained firebreak on private land. The population has been resurveyed each year with up to 36 fruiting bodies recorded in one season. Specific searches for this species have been limited but no other sightings have been made during fungal survey work in the south-west. Its conservation status is difficult to assess given the poor knowledge of the biology of Western Australian fungi. Survey and management of such species may be complicated by their often irregular life histories. Monitoring of the site and close liaison with landowners is essential. Further survey and research on the biology of this species is required.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

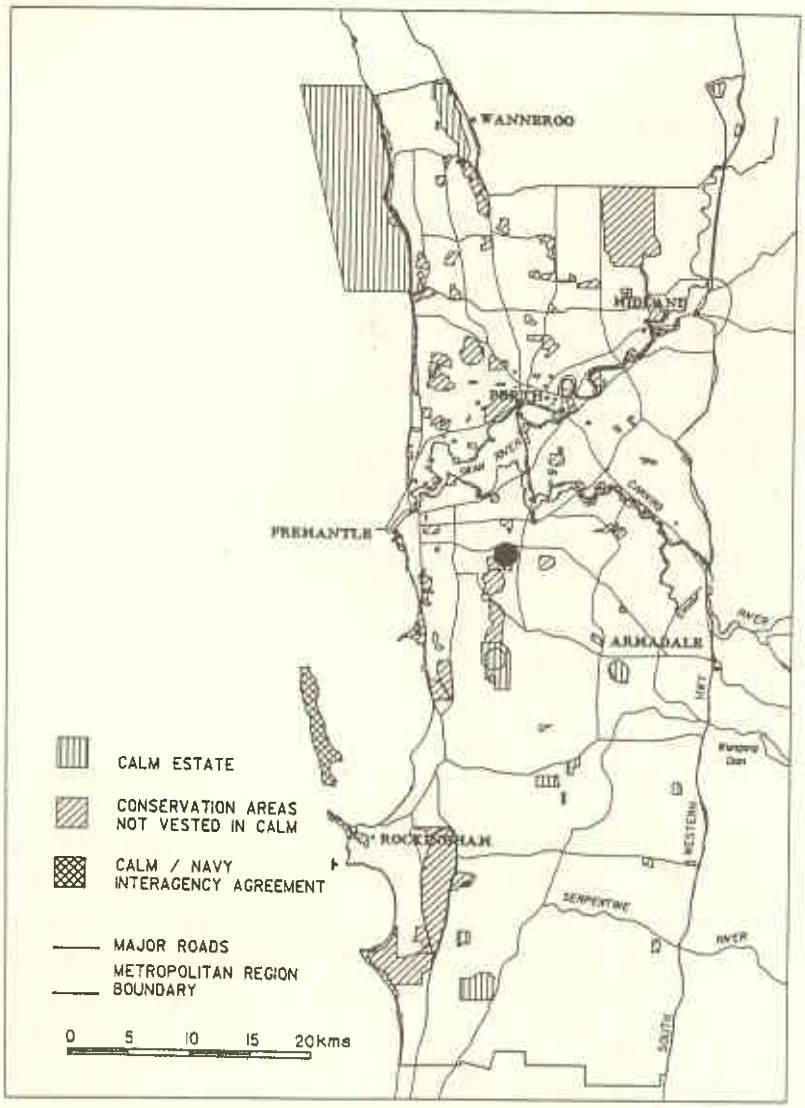
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
19/ 5/ 90	M	Murdoch	private	n/ a	n/ a

M - City of Melville

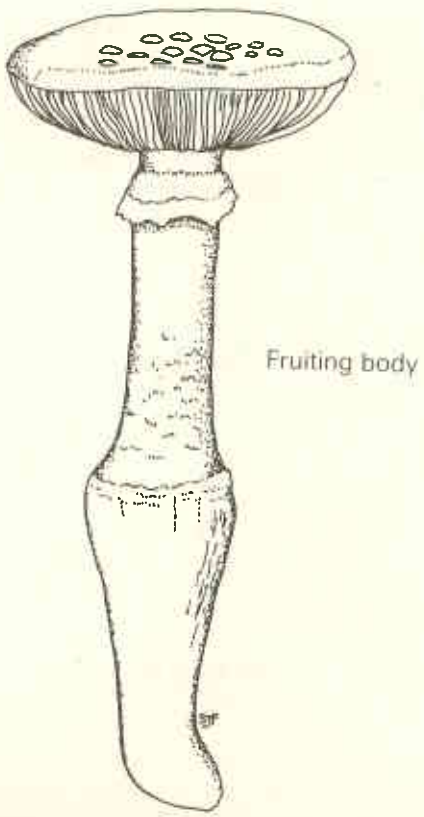
REFERENCES

E.M. Davison[6] (personal communication); Miller (1992).

6 E.M. Davison, Department of Conservation and Land Management



● *Amanita carneiphylla*



AMPEREA PROTENSA Nees (priority 1)

A small shrub to about 30 cm tall, with a woody rootstock and numerous, slender, diffuse stems. It has alternating, oblong-lanceolate leaves that are contracted into a petiole. The leaves are flat or almost so. Stipules are broad and deeply fringed. The flowers are in small, axillary clusters with usually one female flower surrounded by a few male flowers. The female flowers are sessile with the perianth divided to the base into five segments. The male flowers are pedicellate and divided almost to the middle into three lobes. The fruit is a capsule with erect appendages at the apex.

Amperea protensa was collected near Lake Monger in 1840, but is considered to be extinct in the Metropolitan Area as all native vegetation has been cleared from this site. It is otherwise known from the Central Forest, Southern Forest and South Coast Regions where it has been collected from the Scott River, Bow River, Walpole and Albany. It apparently occurs in small localised populations and may be found to be more frequent after thorough survey. It occupies swampy sites on sand or loam soils. *A. protensa* has only recently been recognised as a Metropolitan Area priority species so little survey has been conducted.

REFERENCES

Bentham (1873).

BEYERIA CYGNORUM (Muell. Arg.) Benth.

Beyeria cygnorum is a much-branched shrub covered with short hairs. It has narrow, alternating leaves with closely revolute margins and small, unisexual flowers borne in the leaf axils. The male flowers are single or in small groups on short thick pedicels, while the female flowers are solitary on longer pedicels. The sepals are concave, about 2 mm long, hairy at the base in the male flowers but glabrous in the female. The petals are shorter than the sepals and glabrous. Stamens are numerous. Flowering has been recorded in November-December.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Currently known from only two populations, one in the Metropolitan Area at City Beach and the other north of Yanchep. The City Beach population was recorded from *Acacia xanthina* shrubland, high in the landscape on sand over limestone. The type collection was made in 1854 by James Drummond from 'between the Moore and Murchison Rivers'. No other collections have been made.

CONSERVATION STATUS - poorly known (priority 1).

The only recorded Metropolitan population occurs on a Shire reserve where it may be endangered by prescribed burning and maintenance operations. The northern population is from State forest proposed for addition to Yanchep National Park. This species is poorly known at present and there is some doubt regarding its taxonomic status. It may prove to be more closely related to *B. cinerea*. Further survey and taxonomic research is required before its conservation status can be assessed. Protection of the populations in the interim is essential. In the Metropolitan Area suitable habitat is limited and further populations are unlikely.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

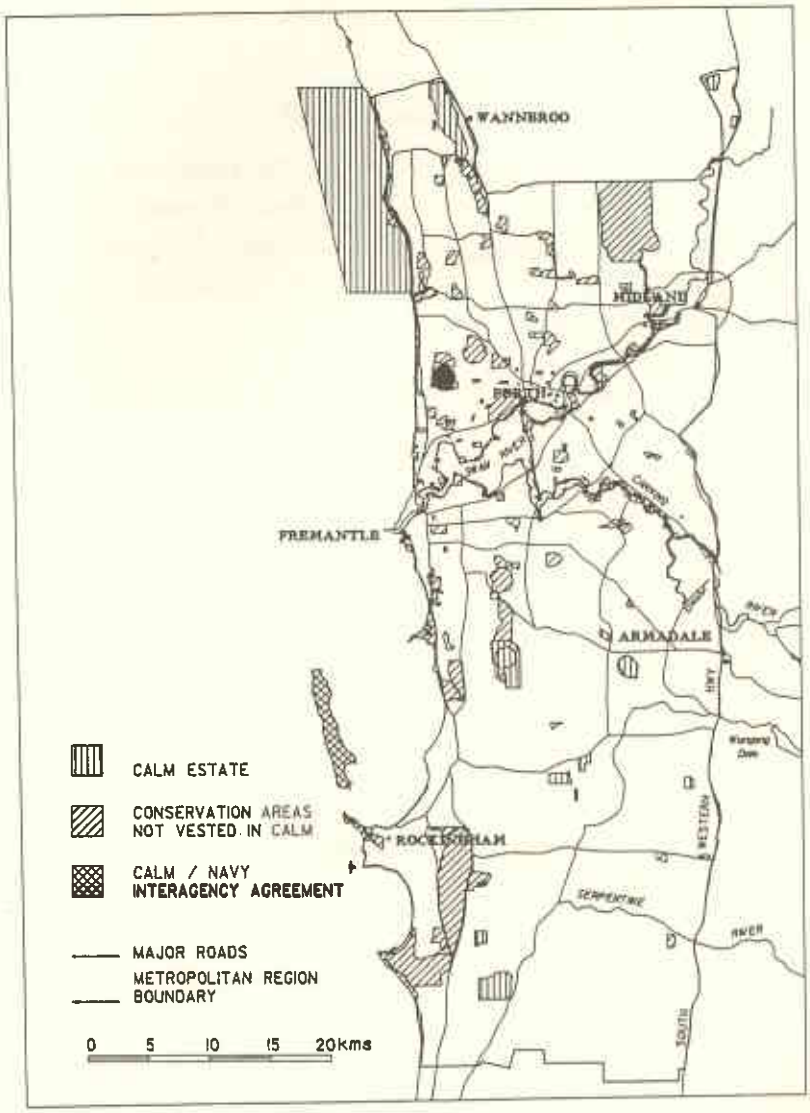
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
29/ 11/ 88	P	City Beach	shire recreation reserve	50+	good

P - City of Perth

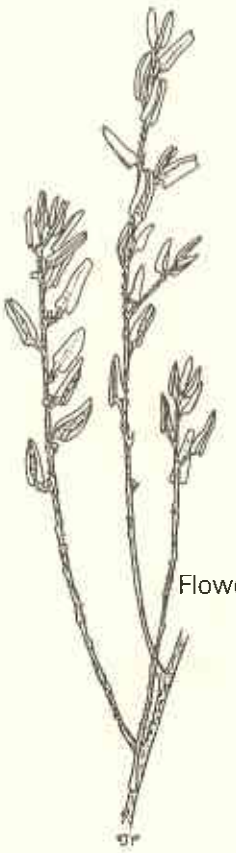
REFERENCES

Bentham (1873); G.J. Keighery[7] (personal communication).

7 G.J. Keighery, Department of Conservation and Land Management, Wildlife Research Centre



● *Beyeria cygnorum*



Flowering stem

Female flower

Underside of leaf

CALANDRINIA SP. (Kenwick) G.J. Keighery 10905

A small, succulent annual with horizontally spreading stems. The flowers are cup-shaped, very pale pink, with fused sepals. They are numerous, on erect pedicels in short inflorescences. The alternate leaves are basal and on the lower part of the flowering stems. They are glabrous, mostly linear, largest at the base and decreasing in size along the stem. This taxon is similar to *Calandrinia composita* and is distinguished by its pale pink flowers, fused sepals and claypan habitat.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Collected only from Kenwick in the Metropolitan Area where it was growing amongst herbs in a winter-wet claypan.

CONSERVATION STATUS - poorly known (priority 1).

Known from a single population in Kenwick where it was reported as 'common'. The site is proposed for development and is subject to some rubbish dumping and off-road-vehicle use. It has not been recorded at any other localities but specific surveys have not been conducted. It may occur in claypans at Ellen Brook and is possibly more common after fire. Further surveys are required before its conservation status can be assessed.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

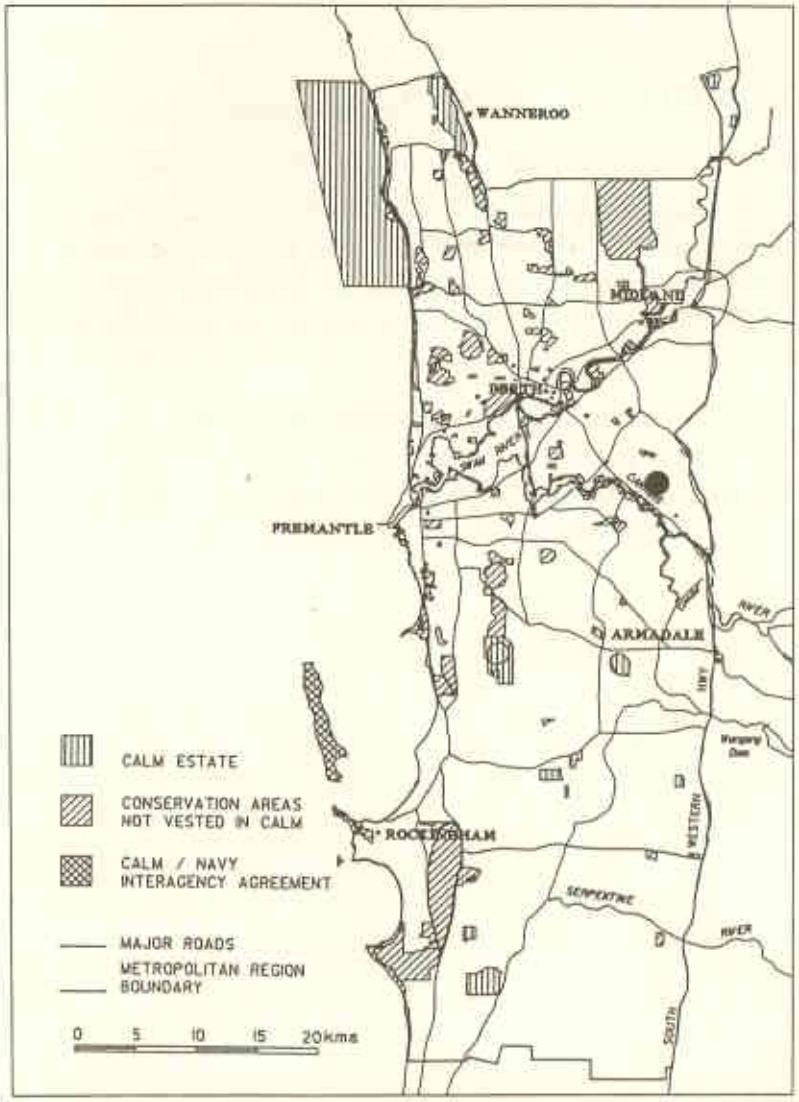
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
21/ 10/ 89	G	Kenwick	Homeswest	common	good

G - City of Gosnells

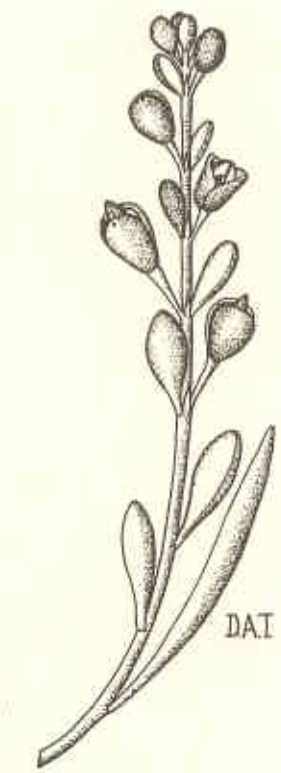
REFERENCES

G.J. Keighery[8] (personal communication).

8 G.J. Keighery, Department of Conservation and Land Management, Wildlife Research Centre

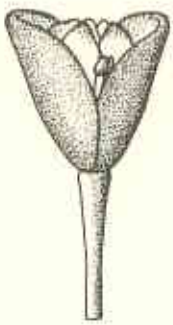


● *Calandrinia* sp. (Kenwick) G.J. Keighery 10905



Flowering stem

Flower



Capsule and Seed

CHORIZEMA VARIUM Benth. (priority 1)

Various-leaved Chorizema

A shrubby species with strong, hairy branches and greenish-grey, roundly cordate to ovate leaves. The leaves are nearly sessile, undulated, with regularly serrated margins. They are glabrous or slightly hairy above, coarsely venated and hairy beneath. The inflorescences are erect and terminal, with many densely-clustered, reddish-yellow flowers. The calyx is covered with brown hairs. The fruit is a pod with smooth, shiny seeds. Flowers in September-October.

Chorizema varium has been recorded from a few sites in the Fremantle area where it was last collected in 1902. It was presumed extinct until its recent rediscovery on coastal limestone near Seabird. Suitable habitats in the Metropolitan Area have been well surveyed and it is unlikely to be refound here.

REFERENCES

Bentham (1864).

COMESPERMA RHADINOCARPUM F. Muell.

A glabrous, perennial herb with well-spaced leaves along several erect stems up to 45 cm high. The leaves are flat, linear-lanceolate, to 6-10 mm long. Blue, 'pea-like' flowers are on short pedicels in long, 'spike-like' infloresences at the end of the stems. Each flower has two long inner sepals, three smaller outer sepals and three oblong petals joined to above their midpoints. The middle petal is yellow with a blunt, recurved tip. The fruit is a linear-lanceolate, pointed capsule to 9 mm long and 1.5 mm wide, containing two dark brown, hairy seeds. Flowers in September-October.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Recorded on white sand in the Metropolitan Area at Kenwick, otherwise known from three sites in the Greenough Region between Mullewa and Cataby. The type collection made in 1877 was from the "Greenough and Irwin Rivers".

CONSERVATION STATUS - poorly known (priority 1)

In the Metropolitan Region, *Comesperma rhadinocarpum* is known from only one herbarium collection made from a private reserve in Kenwick. Size or condition of the population is not known and survey of the site is required to determine if the population still exists. In the Greenough Region collections have been made from a proposed nature reserve, private and vacant Crown land. Further survey, particularly in the north of its range, is likely to locate additional populations. *C. rhadinocarpum* has only recently been recognised as a Metropolitan Area species so little survey has been conducted.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
4/ 11/ 82	G	Kenwick	private reserve		*

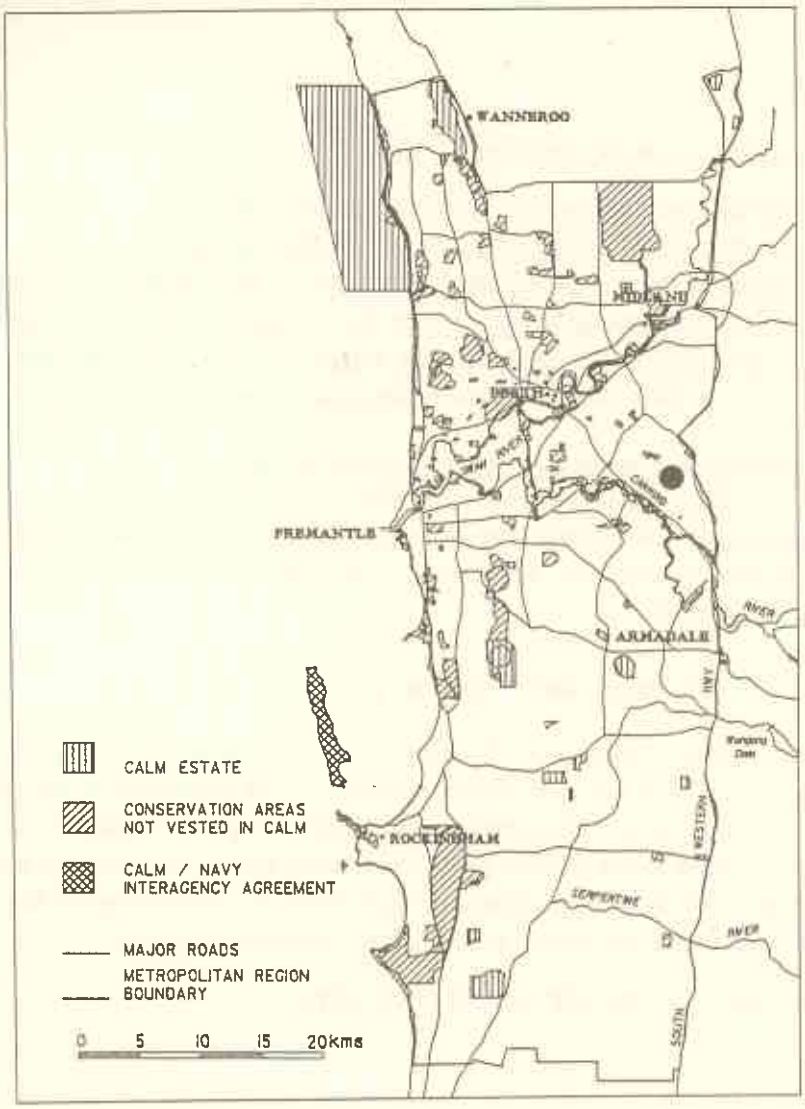
* Herbarium collection, not recently surveyed.

G - City of Gosnells

REFERENCES

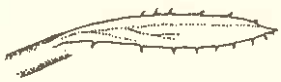
G.J. Keighery[9] (personal communication); Leigh *et al.* (1984).

9 G.J. Keighery, Department of Conservation and Land Management, Wildlife Research Centre



● *Comesperma rhadinocarpum*


Flowering stem


Leaf


Capsule


Seed


Flower

CONOSPERMUM UNDULATUM Lindl.

An erect, compact shrub to 1.5 m tall with fibrous, longitudinally fissured stems. The leaves are glabrous, to 12 cm long x 3.8 cm wide, tapering to the base. They have three distinct, parallel veins and characteristic undulate margins. The flowers are woolly with long, white hairs, in infloresences emergent well above the leaves. The fruit is a nut covered with tan-orange hairs. Flowers in August-October with occasional flowering at other times.

Conospermum undulatum was reduced to a synonym of the Tree Smokebush, *C. triplinervium* but is being reinstated to species status. It differs from *C. triplinervium* in its undulate leaves, emergent inflorescences and smaller habit. It has longer hairs on the flowers and never develops a thick trunk.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

C. undulatum is a very restricted species occurring over a 14 km range between High Wycombe and Martin. It grows on flat or gently sloping sites in the foothills of the Darling Scarp, on sand and clayey sand soils, often over laterite. The vegetation is usually *Banksia* and *Eucalyptus* woodlands over heath. *Isopogon drummondii, Hakea conchifolia* and *Lambertia multiflora* are often associated. A few records were from slightly swampy habitat.

CONSERVATION STATUS - poorly known (priority 1). Recommended status - priority three, with consideration for gazettal as Declared Rare Flora.

C. undulatum is abundant within its restricted range, with over 8000 plants recorded mostly on private and shire land. It is not represented in any conservation reserves and several of the larger populations are on land proposed for development. Long-term survival of populations is threatened by future clearing, uncontrolled fires and invasive weeds. Regular monitoring of the sites and close liaison with landowners and local authorities is essential. Acquisition of land supporting large populations would be desirable. Surveys in the Metropolitan Area have been comprehensive and further populations are unlikely. Plants have been recorded resprouting from the lignotuber after fire.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
9/90	K	Maida Vale (I)	shire recreation reserve and road reserve	2000+	good, proposed development
9/90	K	Maida Vale/ Gooseberry Hill	shire reserve & DPUD	500+	partly disturbed
14/10/90	K	Maida Vale (II)	shire recreation reserve	50	recently burnt
14/10/90	K	High Wycombe (I)	school site	< 10	
14/10/90	K	High Wycombe (II)	private	< 10	
14/10/90	K	High Wycombe (III)	private	300	undisturbed
14/10/90	K	High Wycombe (IV)	several private lots	100+	good
9/90	K	High Wycombe (V)	private	?	

POPULATIONS KNOWN IN THE METROPOLITAN AREA (*continued*)

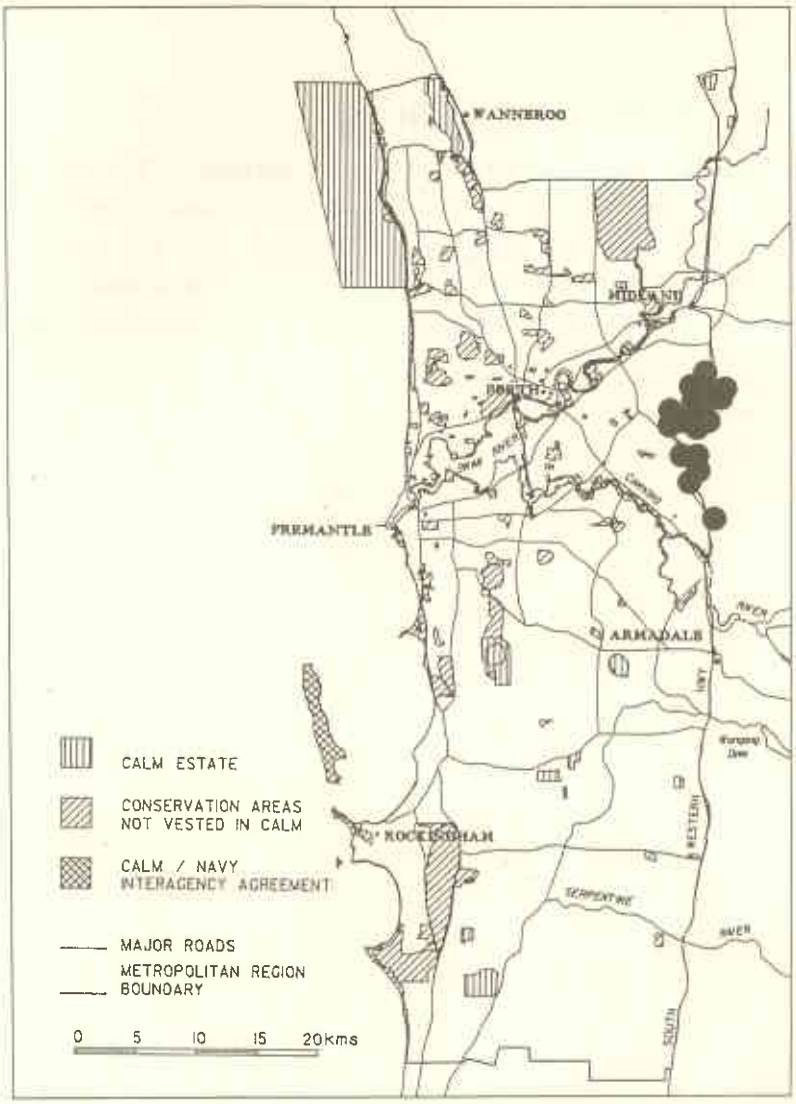
14/ 10/ 90	K	High Wycombe (VI)	private and road reserve	400+	part disturbed
14/ 10/ 90	K	High Wycombe (VII)	private	50	good
7/ 10/ 90	K	High Wycombe (VIII)	shire reserve	15	weed invaded
10/ 90	K	High Wycombe (IX)	private	100+	good
9/ 90	K	Forrestfield (I)	SEC reserve	< 10	disturbed
9/ 90	K	Forrestfield (II)	private	< 10	good
16/ 10/ 90	K	Forrestfield (III)	shire reserve	50	proposed development
20/ 10/ 90	K	Forrestfield (IV)	private & shire water, road & Fire Brigade reserves	2000+	good, proposed development
5/ 10/ 90	K	Forrestfield (V)	APB reserve	150	good
9/ 90	K	Forrestfield (VI)	shire reserve	20	disturbed
24/ 10/ 90	B	Newburn	Federal Airports	21	good
12/ 11/ 90	K	Forrestfield & Wattlegrove	shire recreation reserve	300+	good
9/ 90	K	Wattle Grove (I)	private lots	50+	
9/ 90	K	Wattle Grove (II)	road reserve	10	weed invaded
9/ 90	K	Wattle Grove (III)	private	40	disturbed
6/ 10/ 90	K	Wattle Grove (IV)	private	500	lightly grazed
9/ 90	K	Wattle Grove (V)	private	50	
6/ 10/ 90	K	Wattle Grove (VI)	private	500	good
9/ 90	G	Orange Grove (I)	shire reserve & private lots	600+	good
9/ 90	G	Orange Grove (II)	?private	200+	partly disturbed
10/ 90	G	Martin	road reserve	1	

B - City of Belmont
G - City of Gosnells
K - Shire of Kalamunda

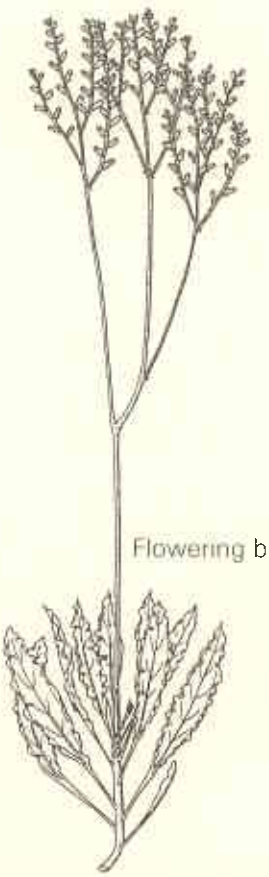
REFERENCES

E. Bennett[10] (personal communication).

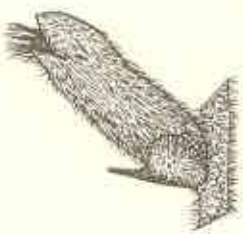
10 E. Bennett, Kings Park and Botanic Gardens



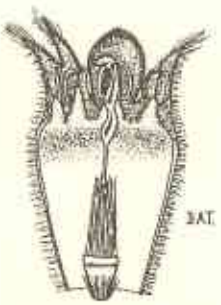
● *Conospermum undulatum*



Flowering branch



Flower



Flower (cross-section)

CRYPTANDRA GLABRATA Steud. (priority one)

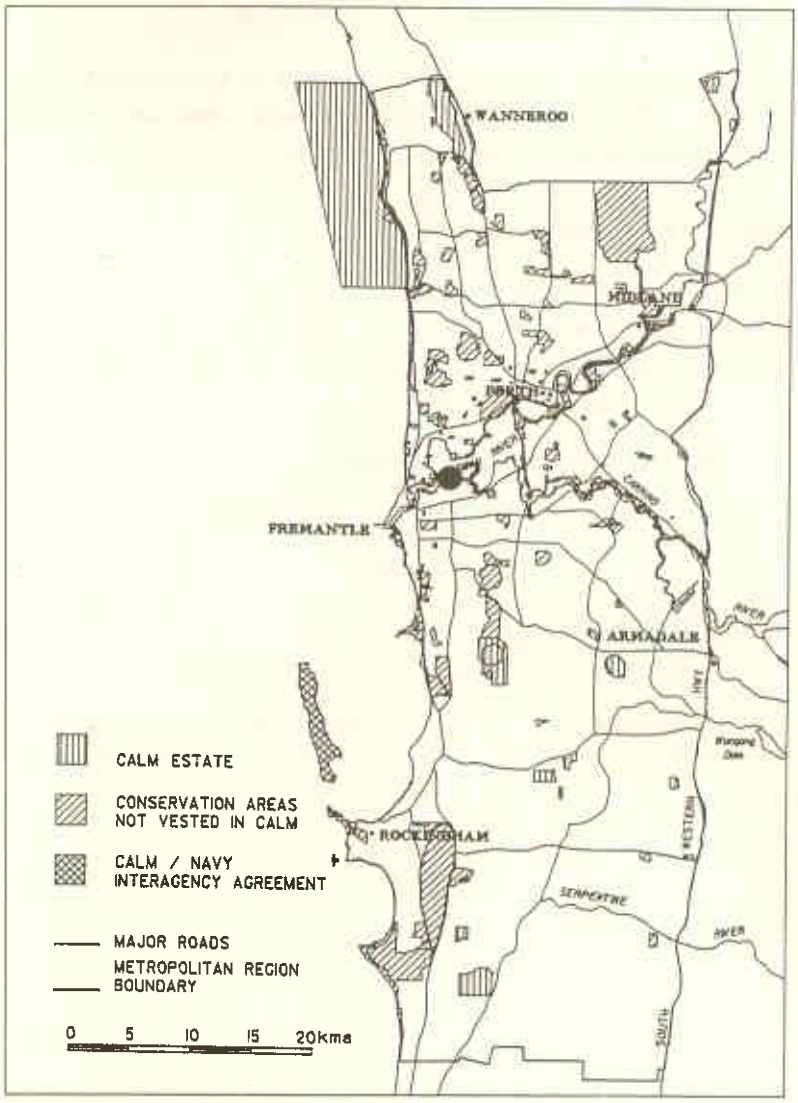
A shrub with long branches and numerous short, spinous branchlets. The leaves are narrow-linear, glabrous or pubescent, with revolute margins. The flowers are very small, almost sessile, forming loose inflorescences on the side branches. The calyx is bell-shaped and divided to the middle into five lobes. Obtuse, brown, overlapping bracts surround the base of the flower. The summit of the ovary is hairy and the disc is glabrous. Described from an immature specimen. Flowering period and fruits not known.

Cryptandra glabrata is possibly extinct as it has not been seen since the original collection made at Point Walter in 1839. It is unlikely to be extant at this largely cleared locality, but may occur in remnants of native vegetation occurring along the river foreshore. It has only recently been recognised as a priority species and specific surveys have not been conducted. Habitat was recorded as "sandy woods".

REFERENCES

Bentham (1863); B. Rye[11] (personal communication).

11 B. Rye, Western Australian Herbarium



● *Cryptandra glabrata*

ELEOCHARIS SP. (Kenwick) G.J. Keighery 5180

A rhizomatous, perennial herb forming colonies. The stems are up to 30 cm high, terete to slightly flattened, with longitudinal ribs. The leaves are basal, flattened and also ribbed. The spikelets are narrowly ovate, terminal and solitary, to *ca.* 2 cm long. Closely related to *Eleocharis acuta*, differing in its pale brown rather than very dark brown bracts. Flowering recorded in September.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Known from Kenwick in the Metropolitan Area where it grows in an open, winter-wet claypan surrounded by *Melaleuca lateritia* heath. It occurs in association with *Eleocharis acuta* and *Aponogeton hexatepalus*, in an area of the claypan that retains its water longest.

CONSERVATION STATUS - poorly known (priority 1).

Recorded from the Kenwick area on land that is proposed for development and subject to some rubbish dumping and off-road-vehicle use. The population consists of a large 'clump' which may be only one or two plants. It may occur near Boyanup at the site of other *A. hexatepalus* populations. Further survey and adequate protection of the Kenwick population is required.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

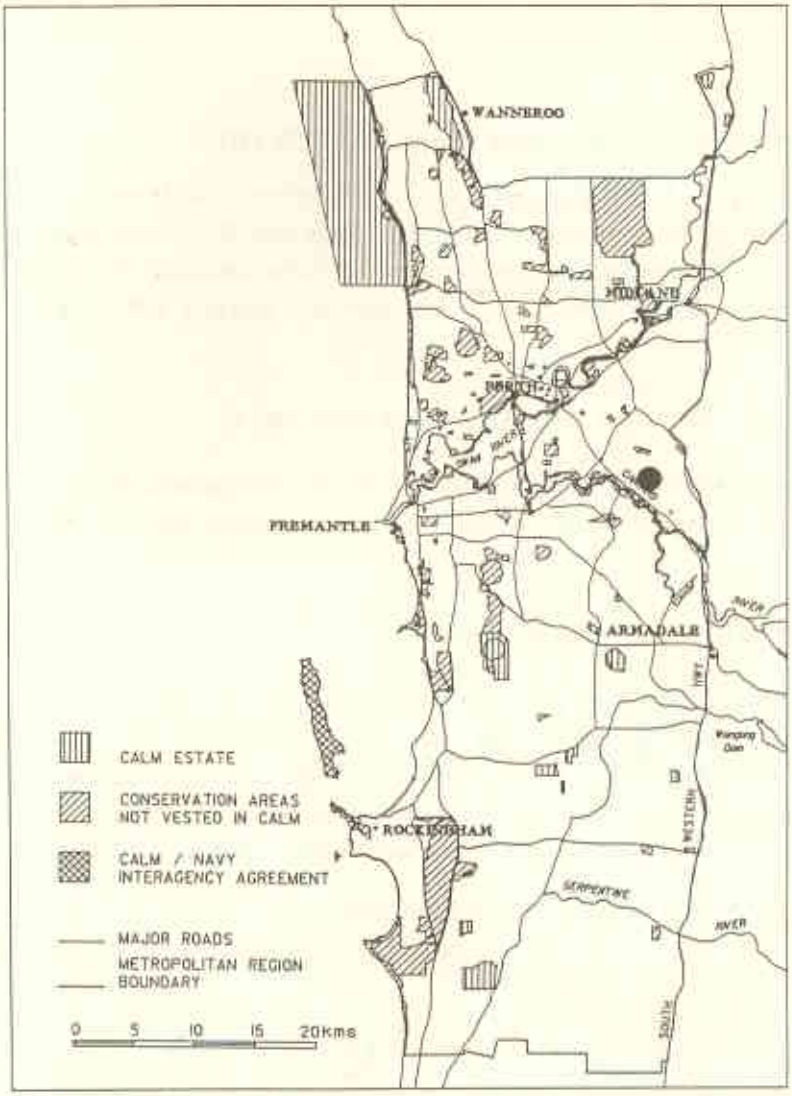
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
11/90	G	Kenwick	Homeswest	see above	good

G - City of Gosnells

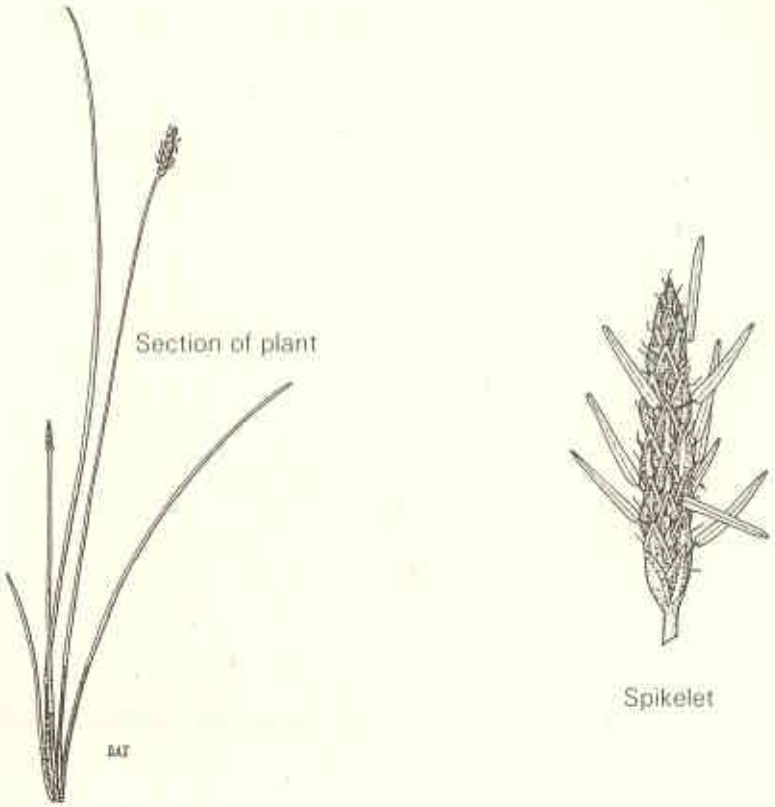
REFERENCES

G.J. Keighery[12] (personal communication).

12 G.J. Keighery, Department of Conservation and Land Management, Wildlife Research Centre



● *Eleocharis* sp. (Kenwick) G.J. Keighery 5180



ERYNGIUM PINNATIFIDUM Bunge subsp. 'PALUSTRIS'

An erect, perennial herb to 45 cm high, with one or two tubers. The leaves are long, cylindrical and hollow. They are mostly entire, sometimes divided into lobes. The flowers are white, in several pungent, ovoid flower-heads. The flower-heads are pedunculate, on stems exceeding the leaves. Differs from the typical subspecies in its white flowers, cylindrical leaves and swampy habitat. Flowering recorded in October.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Recorded at five sites between Serpentine and Gingin. At the metropolitan sites it grows on the edge of winter-wet claypans surrounded by *Melaleuca* heath. It occurs in association with *Eryngium 'subdecumbens'* at Kenwick.

CONSERVATION STATUS - poorly known (priority 1).

In the Metropolitan Area, known from populations at Forrestdale, Kenwick and Serpentine. The Kenwick population is on land proposed for development while the Serpentine population occurs on a degraded rail reserve. The population at Forrestdale is only recently recorded and its size or extent is not fully known. Outside the Metropolitan Area it has been collected from north of Bullsbrook and near Gingin. It apparently flowers more profusely after fire. Further surveys are required.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

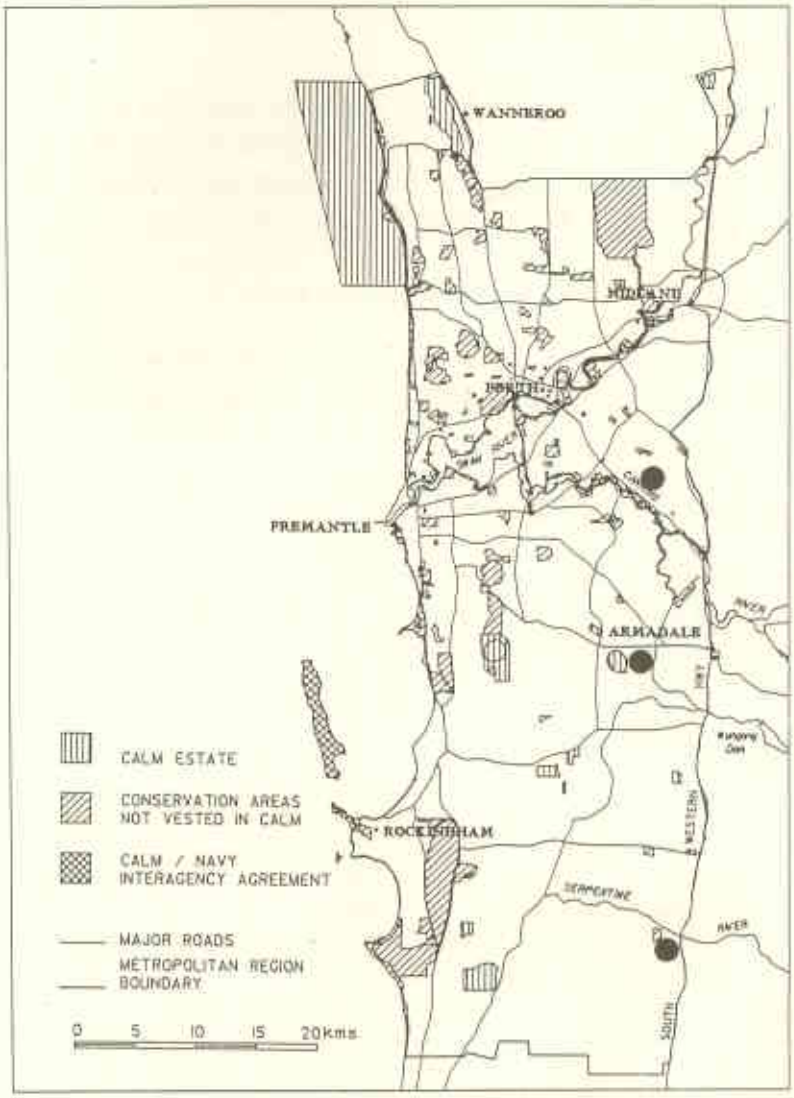
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
11/90	G	Kenwick	Homeswest	100+	good
28/10/83	S/J	Serpentine	rail reserve	common	area degraded
7/1991	A	Forrestdale	shire reserve	200+	good

A - City of Armadale
G - City of Gosnells
S/J - Shire of Serpentine/Jarrahdale

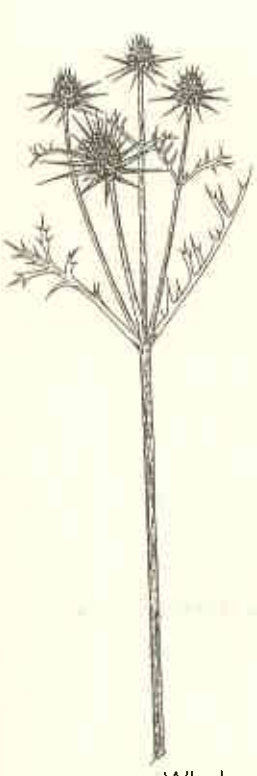
REFERENCES

G.J. Keighery[13] (personal communication); Marchant *et al.* (1987).

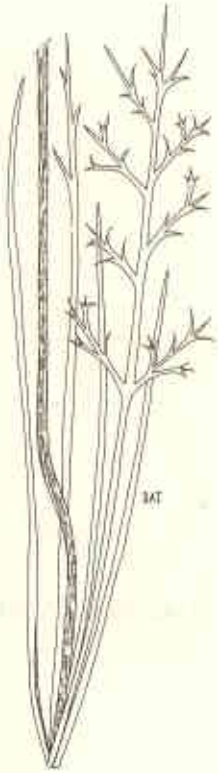
13 G.J. Keighery, Department of Conservation and Land Management, Wildlife Research Centre

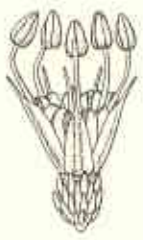


● *Eryngium pinnatifidum* subsp. '*palustris*' m.s.

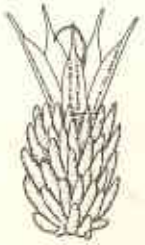


Whole plant





Flower



Fruit

ERYNGIUM 'SUBDECUMBENS' ms

A densely-tufted, perennial herb with numerous tubers and short, sometimes spreading stems. The leaves are basal, linear and flattened, to 35 cm long x 5 mm wide. They are horizontally ridged, almost entire or with a few linear lobes. The flowers are greenish, in small flower-heads. The flower-heads are grouped on short stems hidden amongst the leaves. Flowers from November into summer.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Recorded at Kenwick in the Metropolitan Area, in an open, winter-wet claypan with scattered shrubs. It was collected from Midland in 1905 but is presumed extinct at this locality. Grows in association with *Eryngium pinnatifidum* subsp. *'palustris'*.

CONSERVATION STATUS - poorly known (priority 1).

Currently known from a single population of 100+ plants at Kenwick. The locality is under consideration for development and there is some rubbish dumping and off-road-vehicle use on the site. It is unlikely to be extant in the Midland area as it has been largely cleared. Further survey of swampy areas on the coastal plain is required, particularly south of the Metropolitan Area.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

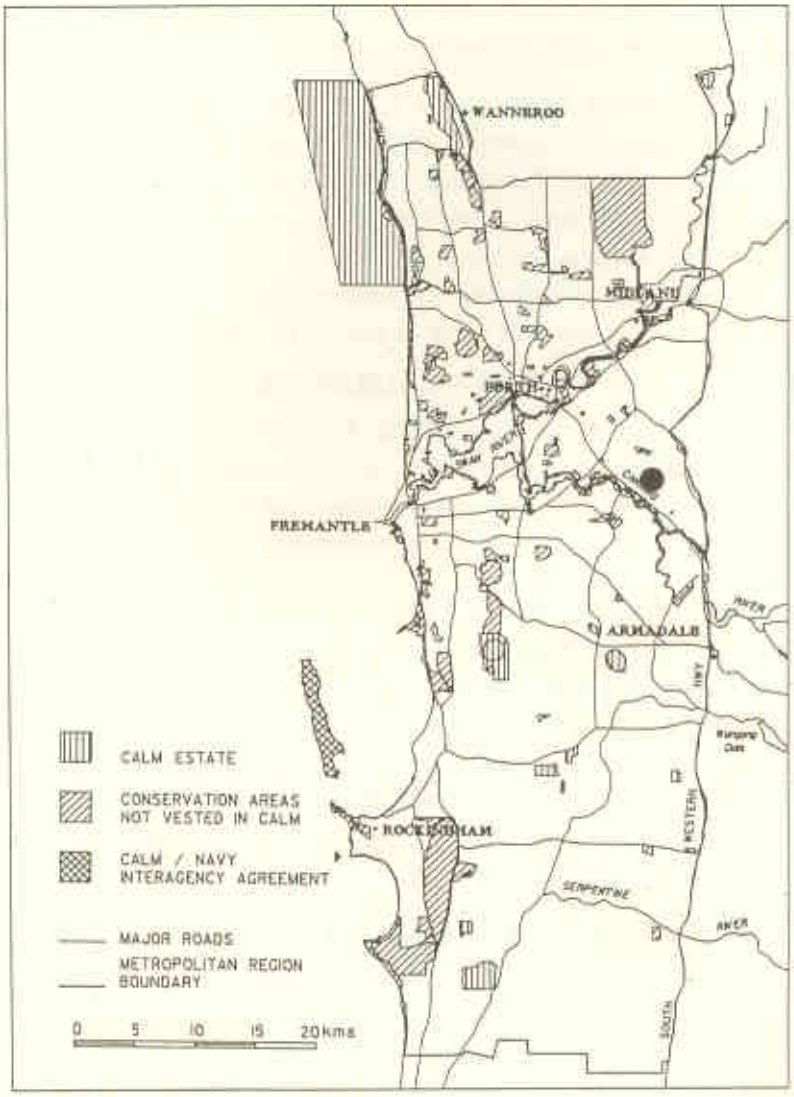
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
11/90	G	Kenwick	Homeswest	100+	good

G - City of Gosnells

REFERENCES

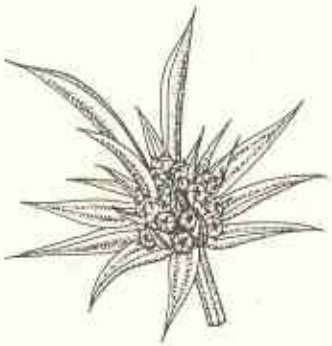
G.J. Keighery[14] (personal communication); Marchant *et al.* (1987).

14 G.J. Keighery, Department of Conservation and Land Management, Wildlife Research Centre



● *Eryngium 'subdecumbens'* m.s.

Whole plant



Flower head

GREVILLEA THELEMANNIANA Huegel ex Endl. subsp. THELEMANNIANA

A lignotuberous, erect to spreading shrub up to 1.5 m high. The leaves are green, divided into narrow-linear lobes, with the lower lobes sometimes divided again. Simple leaves may also be present. Pale to deep red flowers are in loose, pendulous, one-sided inflorescences up to 7 cm long. The perianth is about 7 mm long, slightly hairy inside and out, splitting along one side to release the long, smooth style. The branchlets, peduncles and pedicels are hairy. The fruit is a follicle containing two seeds. Flowers sporadically from May to November. *Grevillea thelemanniana* subsp. *thelemanniana* belongs to a complex group with seven subspecies. Four of these are listed as priority one taxa.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Occurs at Kenwick and Forrestdale in the Metropolitan Area, on sandy, usually moist soils of low-lying flats. It grows in mid-dense heath, most commonly in association with *Actinostrobus pyramidalis, Banksia telmatiaea, Calothamnus hirsutus, Hypocalymma angustifolium* and *Leptocarpus* spp. Two collections from north-west of Cataby in the Greenough Region require verification.

CONSERVATION STATUS - poorly known (priority 1). Recommended status - priority 3.

Possibly endemic to the Metropolitan Area, where it occurs at a single site in Forrestdale and in large numbers on private land in Kenwick. It has not been recorded from any conservation reserves but is well represented in a private reserve. It has been well surveyed on unfenced blocks in the Kenwick area but probably extends into remnant vegetation on fenced lots. Surveys are required in the area of the Greenough Region collections and further research may be necessary to determine their taxonomic status. It has been reported regenerating from the lignotuber. Protection of *G. thelemanniana* subsp. *thelemanniana* on conservation lands would be desirable.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

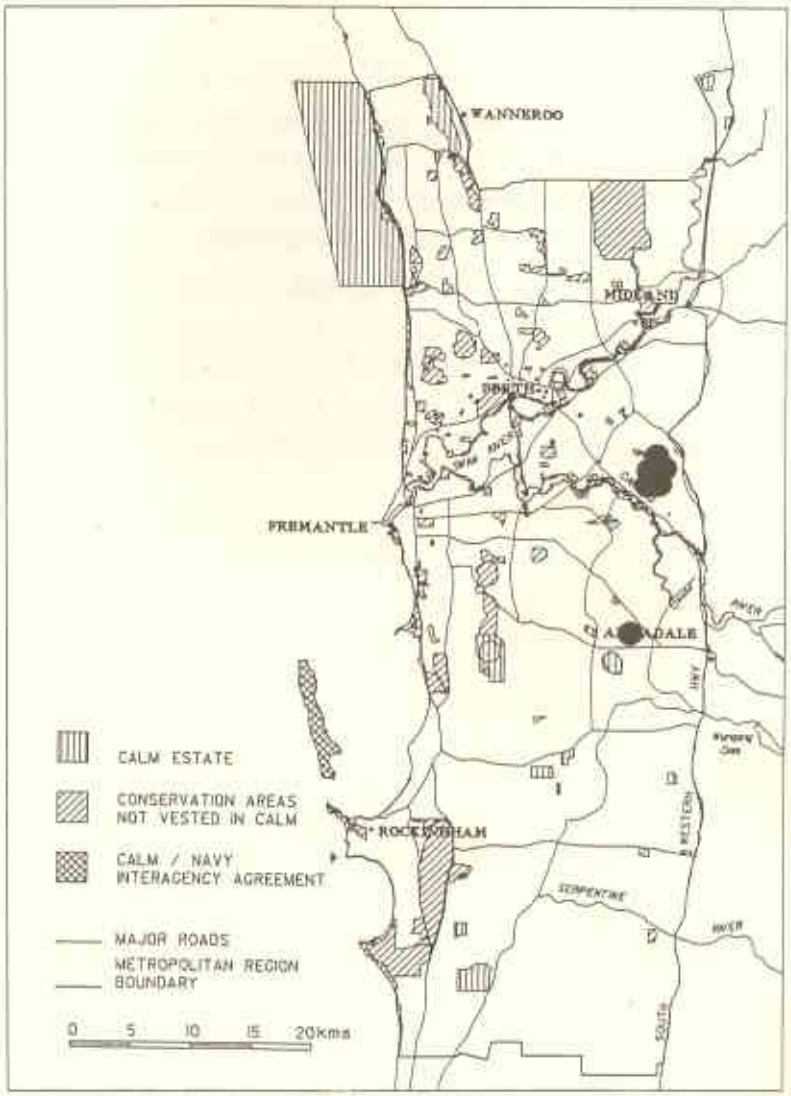
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
12/ 9/ 90	G	Kenwick (I)	private	300+	good
18/ 10/ 90	G	Kenwick (II)	private	200+	
18/ 10/ 90	G	Kenwick (III)	private	1000+	degraded in parts
18/ 10/ 90	G	Kenwick (IV)	private	30+	
31/ 10/ 90	G	Kenwick (V)	private	50+	good
1/ 11/ 90	G	Kenwick (VI)	private	100+	
1/ 11/ 90	G	Kenwick (VII)	private	20+	weed invaded
1/ 11/ 90	G	Kenwick (VIII)	private	46	
1/ 11/ 90	G	Kenwick (IX)	private reserve	360+	good
1990	A	Forrestdale	private		

NB: Some of the populations listed above may be contiguous.

G - City of Gosnells
A - City of Armadale

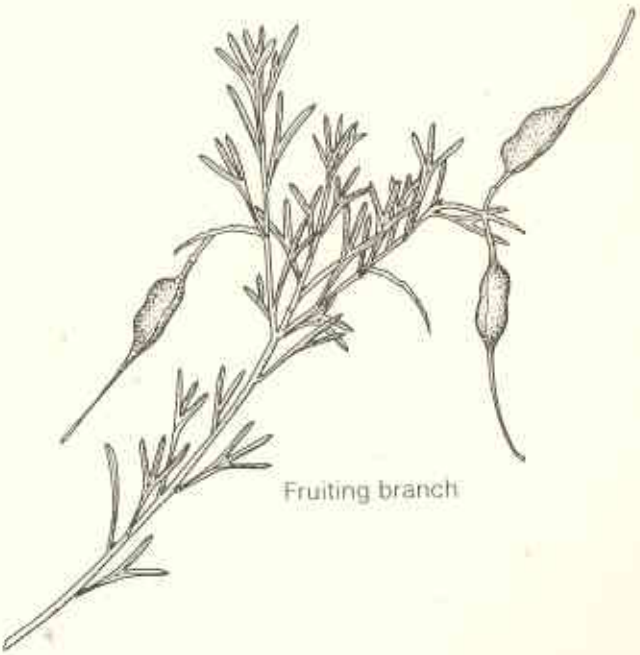
REFERENCES

Marchant *et al.* (1987); Wrigley (1989).



● *Grevillea thelemanniana* subsp. *thelemanniana*

Flowering branch



Fruiting branch

HALORAGIS TENUIFOLIA Benth. (priority 1)

A glabrous, annual herb with erect or spreading, weakly ribbed stems to 50 cm long. The leaves are alternate and sessile, to 5 cm long, the larger ones divided into narrow, linear lobes. The inflorescence is an indeterminate spike of small, shortly pedicellate flowers in clusters of 1-5. The fruit is ovoid to trigonous, smooth or slightly wrinkled. Flowers in November-December.

In the Metropolitan Area, *Haloragis tenuifolia* has been recorded from Midland Junction (1930) and Maddington (1963), but no extant populations are known. It has been collected recently (1977, 1987) from the Ruabon area, in the Central Forest Region, where it was 'common'. Otherwise known only from collections at Byfields Mill (1900) and Wooroloo (1907). It occurs in swampy, winter-wet areas but was not found during recent surveys of suitable habitat in the Metropolitan Area.

REFERENCES

Bentham (1864); Leigh *et al.* (1984); Marchant *et al.* (1987).

HYDROCOTYLE HISPIDULA Bunge

Hydrocotyle hispidula is a slender, erect or spreading herb to 20 cm high. Its leaves are stalked, circular in outline, with stout, erect hairs on both surfaces. They are deeply divided into five broad lobes that are toothed or further divided. The flowers are small, white, in simple heads of 5-12 flowers. The fruits are laterally compressed, to 1 mm x 1.5 mm, with two distinct lobes which separate at maturity. The lobes are ribbed, with numerous tubercles between. Flowers September-November.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

A widespread but sporadic species occurring on the mainland and offshore islands near Perth, at Northcliffe and Esperance. In the Metropolitan Area habitat was recorded as sandy soils and limestone.

CONSERVATION STATUS - poorly known (priority 1). Recommended status - priority 3.

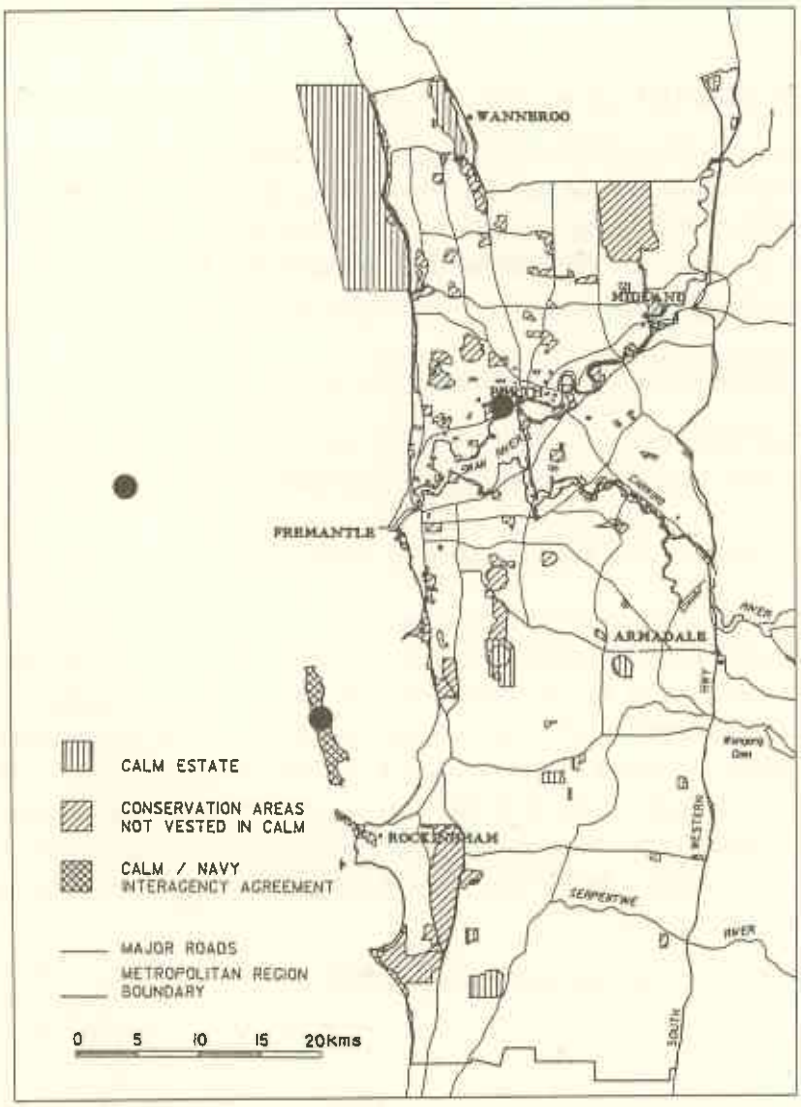
H. hispidula is known from a few scattered collections over a wide geographic range. In the Metropolitan Area it was recorded early this century from Mosman Park and Rottnest Island and more recently from Garden Island and Kings Park. It has not been resurveyed at any of these localities but is apparently common on the limestone escarpment at Kings Park (Bennett 1988). Outside the Metropolitan Area it has been recorded from south of Pinjarra (1962), south of Northcliffe (1986), north-east of Esperance (1975) and the Recherche Archipelago (1974). It is likely to be more frequent throughout its range but is probably overlooked because of its small, inconspicuous habit. Specific surveys for this species have not been conducted and much suitable habitat still exists. Resurvey of the previous herbarium collections in the Metropolitan Area are required.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

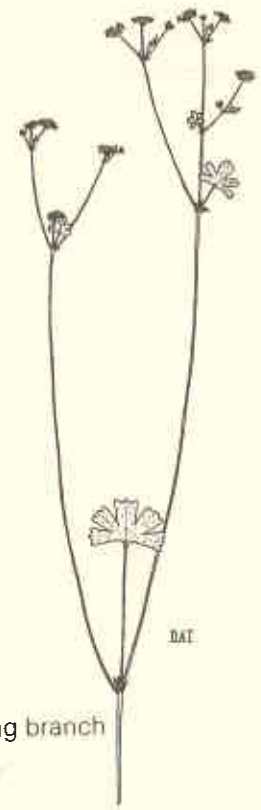
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
20/ 10/ 78	-	Garden Island	Navy/ CALM		
1988	-	Kings Park	public park	abundant	good

REFERENCES

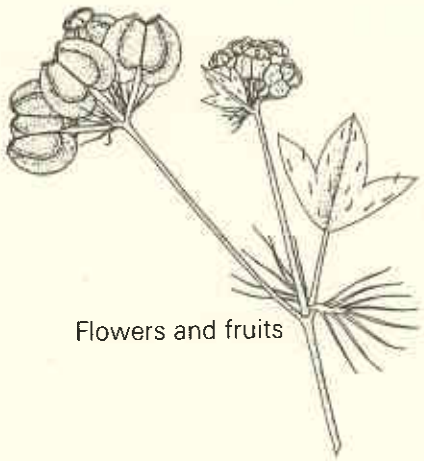
Bentham (1867); Bennett (1988); Marchant *et al.* (1987).



● *Hydrocotyle hispidula*



Flowering branch



Flowers and fruits

ISOPOGON DRUMMONDII Benth.

Isopogon drummondii is a lignotuberous shrub with several openly-branched stems up to 1 m high. The leaves are terete, to 5 cm long, ending in a sharp point. The mature foliage is glabrous but the stems and young shoots are densely hairy. The flowers are creamy yellow, in globular, terminal cones. The cones measure up to 2.5 cm across and are surrounded by numerous floral leaves and a few lanceolate bracts. The cone scales are narrow and densely hairy. The fruiting-heads are grey-woolly and persistent on the plant for some time. Flowers February-April, sometimes extending through to June.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

I. drummondii has been recorded from east of Perth north to Cockleshell Gully. In the Perth area, it is restricted to the foothills of the Darling Scarp between Orange Grove and Stratton. It typically occurs on sandy soils, often with some laterite, in low *Banksia menziesii-B. attenuata* woodland over dense heath. *Conospermum undulatum, Lambertia multiflora, Hakea conchifolia* and *Banksia incana* are commonly associated shrub species.

CONSERVATION STATUS - poorly known (priority 1). Recommended status - priority 3.

Recent surveys in the foothills east of Perth have recorded *I. drummondii* at twenty sites between Orange Grove and Stratton. The total number of plants is estimated at 4500, almost half of these occurring on private land. Few of the sites can be regarded as secure, with at least five populations on land proposed for development. *I. drummondii* is not known from any conservation reserves, although there is an old collection from "Cockleshell Gully" (1965), part of which occurs in the Lesueur National Park. The recent discovery of populations near Moora, Dandaragan and Mogumber suggest that it may be more common in the north of its range. Further surveys in these areas are required before its status can be assessed. Acquisition of land as conservation reserves would be desirable to enable adequate protection of this species at the southern extent of its range.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
4/ 4/ 90	K	Forrestfield (I)	shire reserve	180+	good, proposed development
11/ 4/ 90	K	Forrestfield (II)	Fire Brigade reserve	40	proposed development
23/ 4/ 90	K	Forrestfield (III)	water reserve & private	326	undisturbed
6/ 4/ 90	K	Forrestfield (IV)	APB reserve	300+	
12/ 11/ 90	K	Forrestfield (V)	shire reserve	131	good
12/ 11/ 90	K	Forrestfield (VI)	shire reserve	75+	undisturbed
4/ 4/ 90	K	Wattle Grove (I)	private	250+	undisturbed
4/ 4/ 90	K	Wattle Grove (II)	private	19	disturbed
6/ 10/ 90	K	Wattle Grove (III)	private	200+	
14/ 10/ 90	K	High Wycombe (I)	?shire reserve	50	

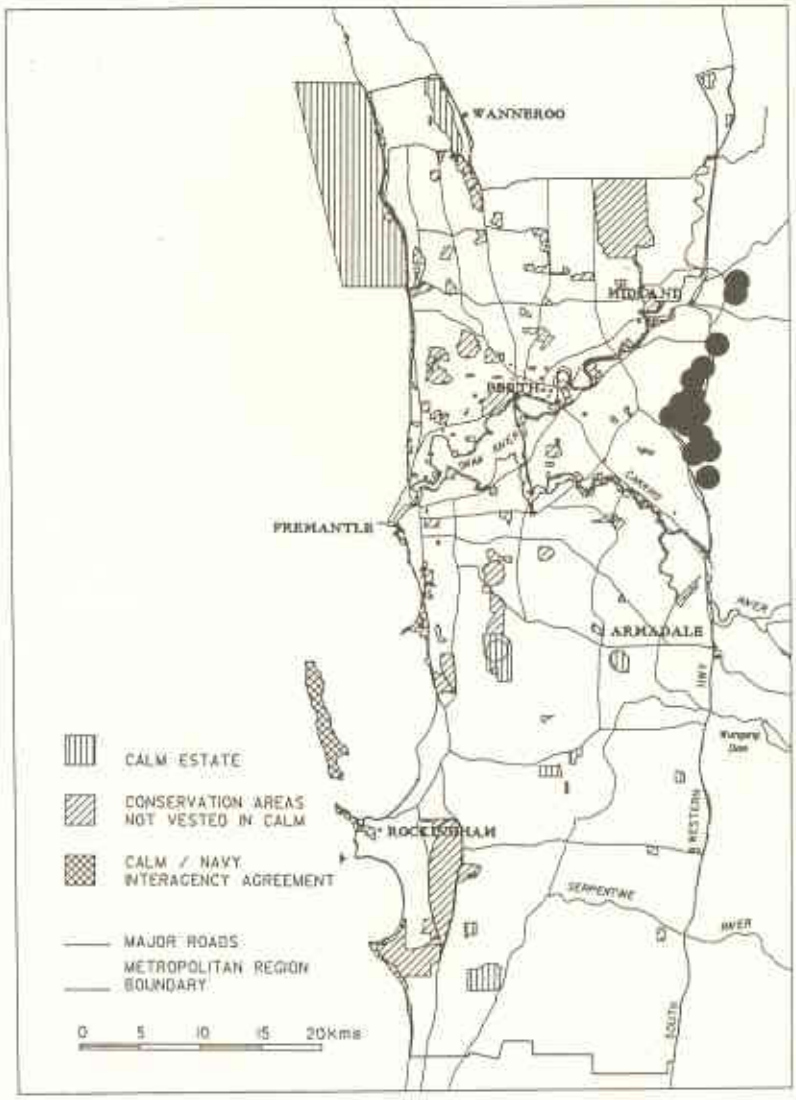
POPULATIONS KNOWN IN THE METROPOLITAN AREA (*continued*)

14/ 10/ 90	K	High Wycombe (II)	private	700+	
14/ 10/ 90	K	High Wycombe (III)	private	40	undisturbed
14/ 10/ 90	K	High Wycombe (IV)	private	75	good
7/ 10/ 90	K	High Wycombe (V)	private	500+	good
7/ 10/ 90	K	High Wycombe (VI)	shire reserve	50	recently burnt
27/ 11/ 90	K	Helena Valley	Dept. of Defence	150+	proposed development
4/ 4/ 90	G	Orange Grove	shire reserve & private	260+	undisturbed
15/ 11/ 90	S	Stratton	recreation reserve	1000+	good
15/ 11/ 90	S	Swan View (I)	shire reserve	30+	good, proposed development
15/ 11/ 90	S	Swan View (II)	cemetery reserve	27	disturbed, proposed development

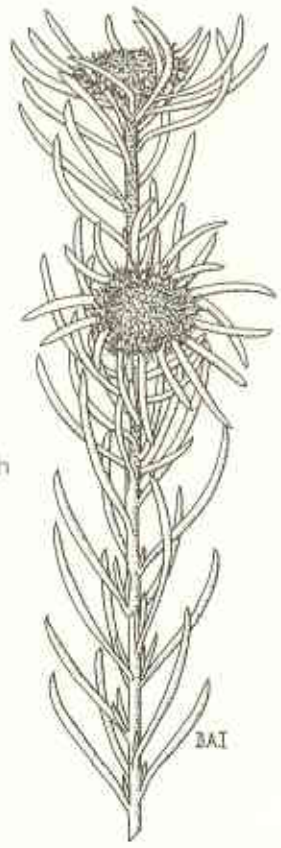
G - City of Gosnells
K - Shire of Kalamunda
S - Shire of Swan

REFERENCES

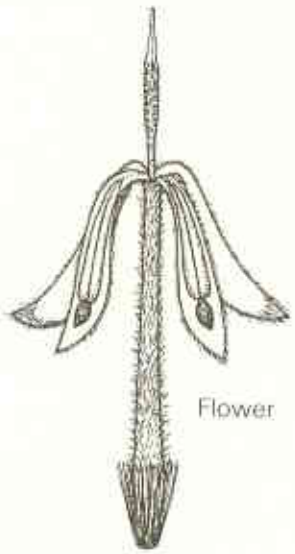
Bentham (1870); Marchant *et al.* (1987); Sainsbury (1987).



● *Isopogon drummondii*



Flowering branch



Flower

LEPIDOSPERMA ROSTRATUM S.T. Blake

A perennial herb to 30 cm high, with stems terete and distinctly ribbed in the upper part, somewhat compressed in the lower part. The leaves are stem-like but much shorter and narrower. Leaf sheaths are pale brown or whitish with almost translucent margins. The narrow, spike-like inflorescence is up to 4 cm long, with few spikelets. The spikelets are 2-flowered, erect and alternate. The fruit is pear-shaped, 3 mm long, beaked toward the style base, with a transverse ridge and six longitudinal ribs. Fruits recorded in August.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Recorded only from the Metropolitan Area on sand in swampy heath at Cannington.

CONSERVATION STATUS - poorly known (priority 1).

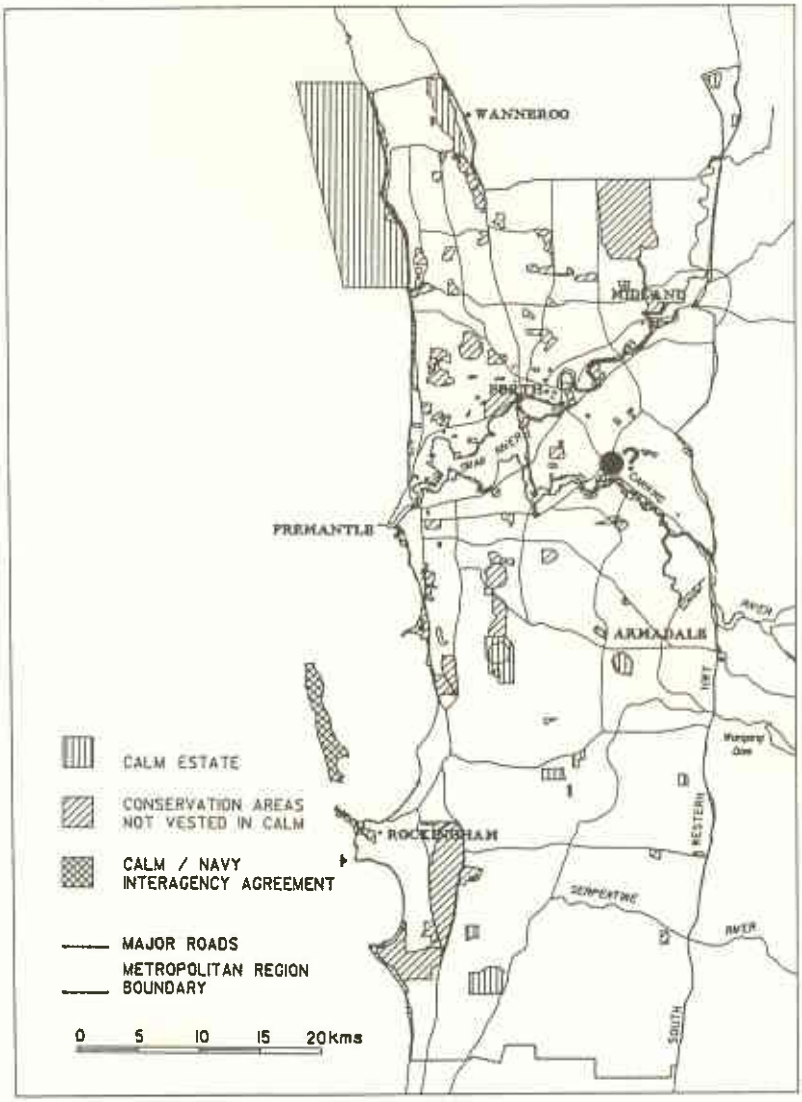
Lepidosperma rostratum is known from a single collection made in Cannington in 1947. It is likely to be extinct in this well developed area but may occur in other ephemeral habitats on the coastal plain. It may require consideration for gazettal as Declared Rare Flora if further surveys fail to locate any populations.

This species was recorded as *Tetraria* sp. A in Marchant *et al.* (1987) but further study has found it to be a *Lepidosperma* as originally described .

REFERENCES

K. Wilson[15], personal communication; Marchant *et al.* (1987).

15 K. Wilson, National Herbarium of New South Wales



● *Lepidosperma rostratum*

MITRASACME PALUSTRIS W. Fitzg. (priority 1)

Marsh Mitrasacme

A glabrous annual, to 5 cm across and 1.5 cm high, with a fleshy, white taproot and a basal rosette of 2 or 3 leaves. The leaves are narrowly spathulate, to 2 cm long, rather thick and succulent. Small, white flowers enclosed by the calyx lobes are on thin ascending pedicels. The inflorescence is a terminal, umbel-like cluster of numerous flowers. Flowers in October-November.

Mitrasacme palustris was collected from Midland Junction in 1901 and presumed extinct until its rediscovery north of Kojonup in 1983. At this site, some 100-200 plants were found in herbfields on winter-wet claypans. This species may easily be overlooked and is expected to be more abundant than current records indicate. Requires further survey.

REFERENCES

Hopper *et al.* (1990); Marchant *et al.* (1987).

SCHOENUS ANDREWSII W. Fitzg.

Schoenus andrewsii is a tufted, perennial herb characterised by its strongly ribbed, resinous-scabrous stems. The stems are terete, yellow-green, up to 0.1 cm wide and 35 cm long. Small leaves arise from the base and are enclosed in shiny, red-black sheaths. The inflorescence is a narrow panicle to 6 cm long, with up to two pale brown spikelets enclosed in each sheathing bract. There are usually two flowers per spikelet. The glumes are ciliate. The 3-ribbed nut is up to 1.5 mm long. Flowers December-February.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

A species of sporadic and widespread occurrence from Kenwick in the Metropolitan Area north to Badgingarra and Kalbarri in the Greenough Region. In the Kenwick area, *S. andrewsii* is found bordering winter-wet depressions on sand over clay. Vegetation is low heath with emergent *Viminaria juncea*. Several old collections have been made from Cannington and Maylands-Bayswater.

CONSERVATION STATUS - poorly known (priority 1). Recommended status - priority 2.

In the Metropolitan Area, *S. andrewsii* is currently known from a single population on Homeswest land in Kenwick. It may be extinct at the other Kenwick sites (see table below) as no populations were found despite intensive surveys. The extant population is a priority for protection as it occurs at the southern extent of the species' range. The site is under considerable pressure from a proposed housing development, rubbish dumping, weed incursion and trail-bike riding.

Outside the Metropolitan Area, *S. andrewsii* has been collected from Kalbarri National Park, Badgingarra National Park and Carnamah. Poor collection of this species, particularly in the north of its range, may be due to its late flowering period and somewhat inconspicuous habit. Further survey is required before its conservation status can be assessed.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

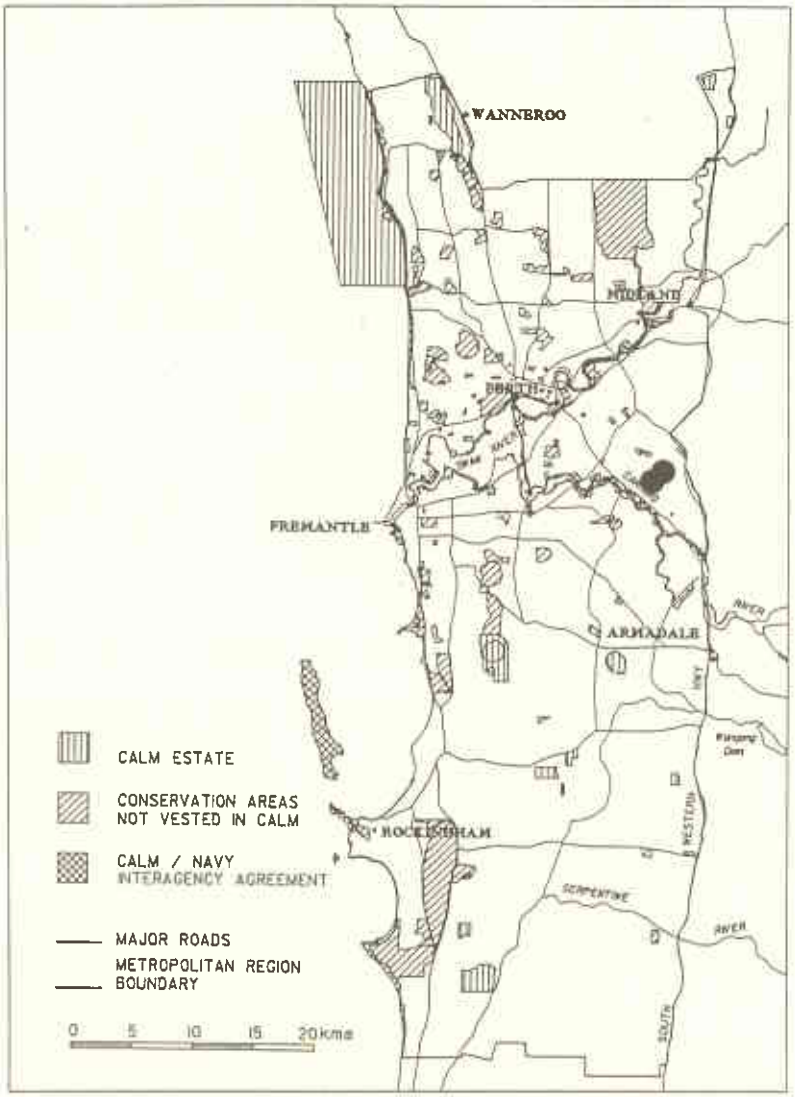
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other lands					
16/ 10/ 90	G	Kenwick (I)	Homeswest	8	good
1978	G	Kenwick (II)		'common'	*
< 1980	G	Kenwick (III)	private reserve		*

* not relocated during recent surveys

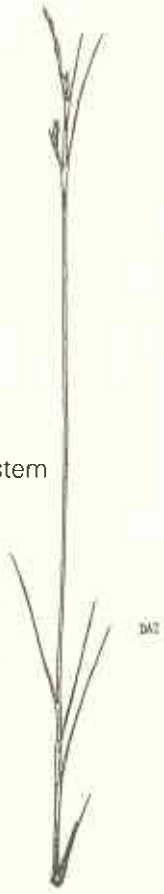
G - City of Gosnells

REFERENCES

Fitzgerald (1903); Marchant *et al.* (1987).



● *Schoenus andrewsii*



Single stem

Cross-section of stem

Spikelet

SCHOENUS PENNISETIS S.T. Blake

An annual herb to 13 cm high, with slender, almost terete stems and a loose, paniculate inflorescence of several small spikelets. Leaves are basal, shorter than the stems but of similar breadth. The spikelets are black to dark purple, 1- or 2-flowered, up to 6.5 mm long. The perianth segments are longer than the nut and densely hairy in the lower part. The nut is *ca.* 1.25 mm long with three ribs raised uniformly to the base of the style. This species closely resembles *S. odontocarpus,* differing in its well developed perianth segments and finely reticulate nuts. Flowers in August-September.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

In the Metropolitan Area, *S. pennisetis* occurs in sandy winter-wet depressions at Byford and Kenwick. It has also been recorded from near Dongara (1980) and Wongan Hills (1949) in the Greenough and Wheatbelt Regions.

CONSERVATION STATUS - poorly known (priority 1).

S. pennisetis is known in the Metropolitan Area from two recently discovered populations on Shire land at Byford. It has been collected, on at least two occasions, from a private reserve in Kenwick but was not seen there during recent surveys. The Greenough and Wheatbelt sites have not been resurveyed. This species is likely to be more common throughout its range and further survey is required. It may easily be overlooked during routine work owing to its inconspicuous habit and similarity to the more common *S. odontocarpus.* Both Byford collections and the old Kenwick collection were from cleared ground (e.g. tracks), suggesting that this species favours open sites. Until its true conservation status is known, protection of the metropolitan populations is important.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

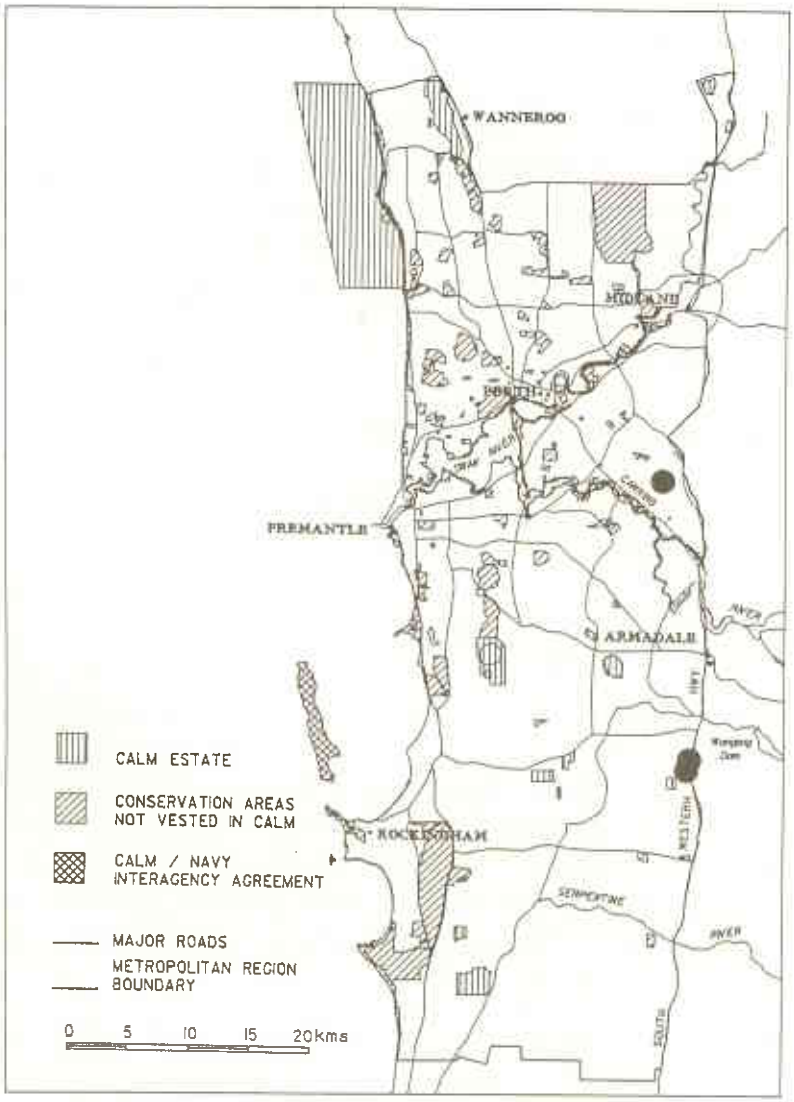
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
27/11/90	S/J	Byford (I)	shire reserve	10+	good
27/11/90	S/J	Byford (II)	shire reserve	20+	good
9/9/76*	G	Kenwick	private reserve		*

* herbarium collection, not relocated during recent surveys.

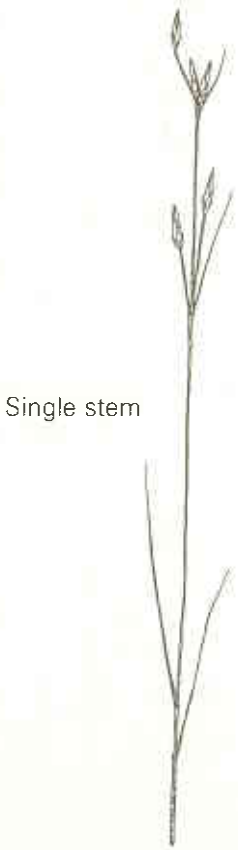
G - City of Gosnells
S/J - Shire of Serpentine-Jarrahdale

REFERENCES

Marchant *et al.* (1987).



● *Schoenus pennisetis*



Single stem

DAT

Spikelet

Nut

TRIPTEROCOCCUS SP. (Cannington) A.S. George 16201

A glabrous, perennial herb with erect, yellow-green stems to about 80 cm high. Leaves are linear and sparsely scattered. The flowers are pedicellate, with several to many arranged in branched clusters off the main axis. The corolla is yellow to sometimes almost black, with a slender tube and narrow lobes. The fruits have broad, papery, conspicuously venated wings. Flowers in November-December.

This taxon is very closely related to *Tripterococcus 'paniculatus'* which has branched inflorescences and occurs in the Margaret River-Walpole area. It differs in its more slender corolla lobes. Further research is required to determine its taxonomic status.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Known only in the Metropolitan Area over a 10 km range from Willeton south to Forrestdale. It grows on sandy, seasonally damp flats in low heath and sedgeland, usually with scattered emergent *Melaleuca preissiana* and *Nuytsia floribunda*. Commonly associated heath species are *Adenanthos obovatus, Pericalymma ellipticum, Hakea varia, Hypocalymma angustifolium* and *Regelia ciliata*.

CONSERVATION STATUS - poorly known (priority 1).

Restricted to the Metropolitan Area where it is known from several hundred plants at four localities. It has not been recorded from any conservation reserves and the largest known population is on land proposed for development. Flowering in this taxon appears to be enhanced by fire but is not a requirement. It favours open and sometimes cleared sites (e.g. firebreaks) and may be shaded out by dense vegetation. This may be the case with the Canning Vale population recorded in 1980 and not relocated during recent surveys. *Tripterococcus* sp. (A.S. George 16201) may be more abundant in the Metropolitan Area, with populations occurring in suitable habitat where the vegetation is dense and long unburnt.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

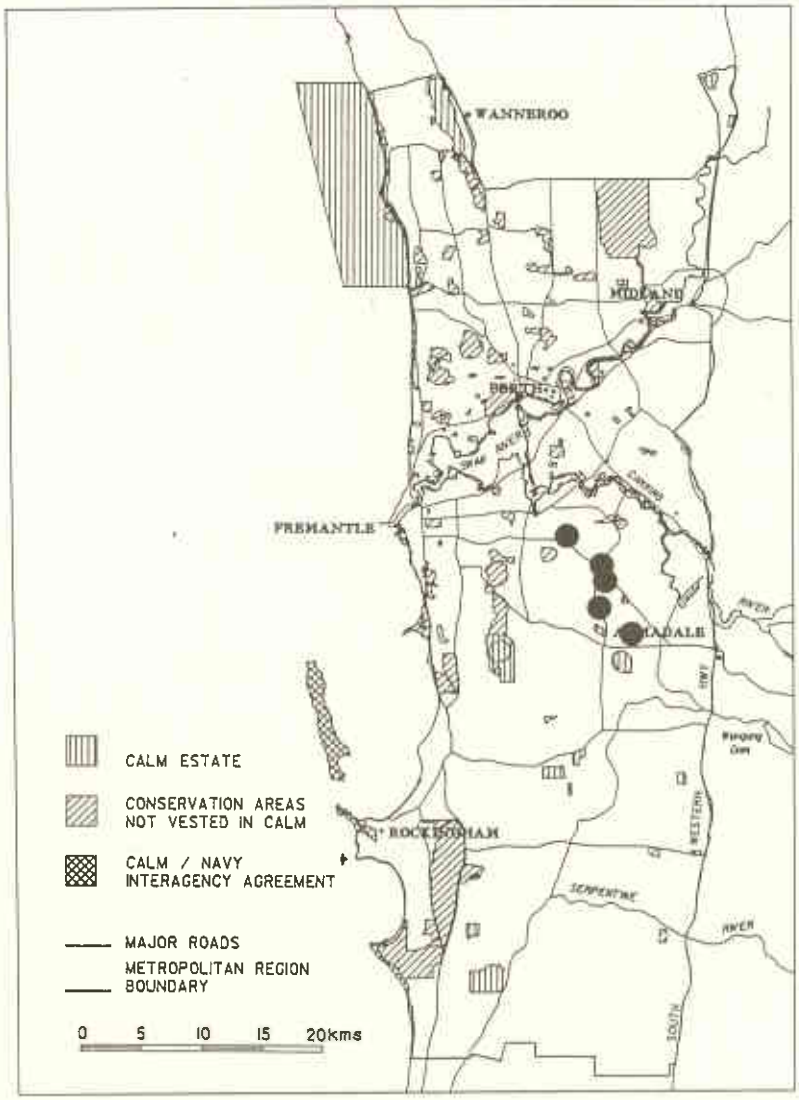
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
11/ 12/ 90	A	Forrestdale	private	80	recently burnt, good
18/ 12/ 90	C	Canning Vale (I) a	private	500+	recently burnt, good
	C	b	private	10	good
	G	c	private	16	good
24/ 11/ 80	C	Canning Vale (II)			*vegetation intact
18/ 12/ 90	C	Willeton	water reserve	2	good

* not relocated during survey in December 1990

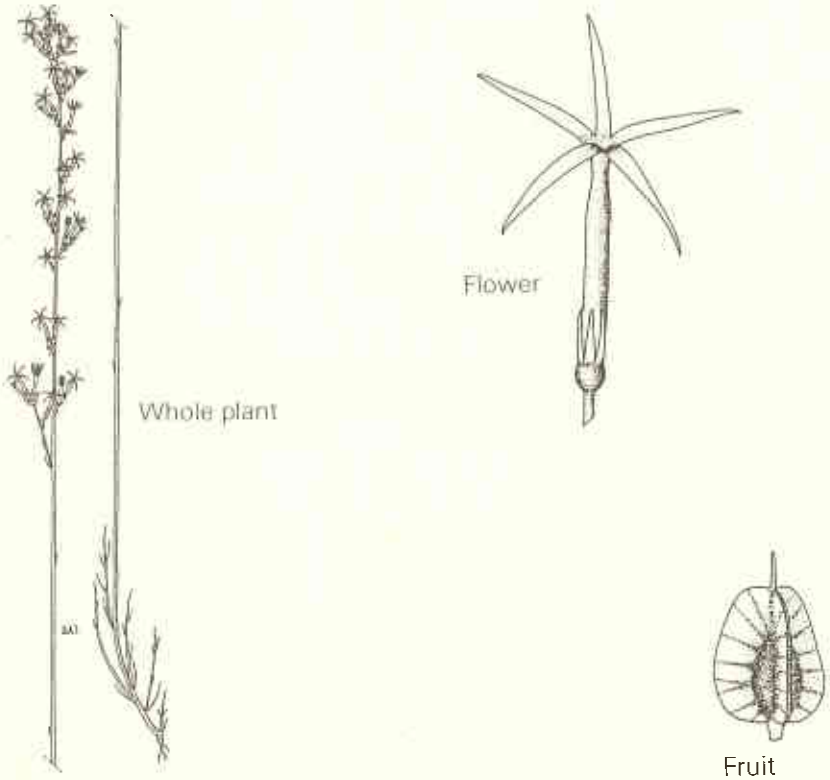
A - City of Armadale
C - City of Canning
G - City of Gosnells

REFERENCES

Barker (1984); Marchant *et al.* (1987).



● *Tripterococcus* sp. (Cannington) A.S. George 16201



VERTICORDIA PLUMOSA (Desf.) Druce var. PLEIOBOTRYA A.S. George

An erect shrub with crowded leaves and pink or mauve flowers in many small, lateral groups. The leaves are slightly glaucous, semi-terete, mostly 4-8 mm long. The flowers have ovate, slightly hairy petals and a smooth hypanthium densely covered with long, soft hairs. The sepals are divided almost to the base into 5-7 ciliate lobes. The peduncles are usually to 3 mm long but may be up to 8 mm. It is distinguished from the other varieties of *Verticordia plumosa* by its small flowers, narrow sepal lobes and narrow petals. Flowers October-November.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Recorded west and south-west of Mundijong on low-lying, clay and sandy loam flats amongst low shrublands.

CONSERVATION STATUS - poorly known (priority 1)

V. plumosa var. *pleiobotrya* is known from only a few small populations on road verges in a heavily cleared area. Size or extent of the populations is not known as it has only recently been recognised as a rare and distinct taxon and no field surveys have been conducted. It may prove to be more frequent after specific surveys in suitable habitat.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

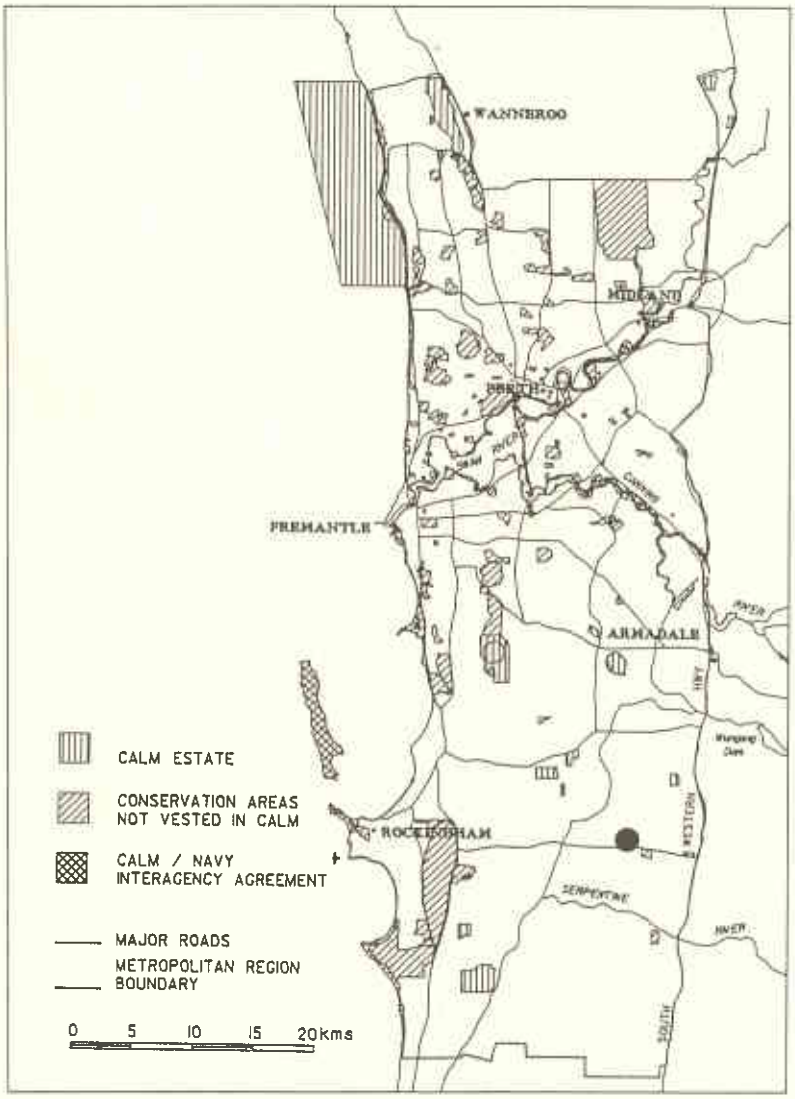
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
7/11/86	S/J	Mundijong/ Peel Estate	road reserve		*

* herbarium collection, not recently surveyed

S/J - Shire of Serpentine/Jarrahdale

REFERENCES

George (1991).



● *Verticordia plumosa* var. *pleiobotrya*

B. PRIORITY TWO TAXA

HALORAGIS ACULEOLATA Benth. (priority 2)

Haloragis aculeolata is a slender, perennial herb to 40 cm tall. Its stems are weakly ribbed, glabrous or sparsely scabrous with simple hairs. The leaves are linear, alternate and sessile, to 25 mm long x 4 mm wide. They are usually divided, with 6-8 linear teeth up to 2 mm long. The flowers are shortly-pedicellate, in clusters of up to three, forming indeterminate spikes. Fruits are ovoid to pear-shaped and finely ribbed. Flowers in December-January.

H. aculeolata is known in the Metropolitan Area from a single collection made in the Cannington area in 1901. The exact site of this collection is unknown and it is unlikely to be extant in this well developed area. It has also been found in the Stirling Range National Park (1929) and more recently in Yalgorup National Park (1989). Habitat was not recorded for the Cannington collection but the others were from sandy heath and tall tuart (*Eucalyptus gomphocephala*) woodland on coarse sand over limestone.

REFERENCES

Marchant *et al.* (1987); Orchard (1990).

HYDATELLA DIOICA D.A. Cooke

Swan Hydatella

A minute, semi-aquatic annual with male and female flowers borne on separate plants. It has short stems and many flattened, linear leaves tufted at the base. The leaves are glabrous, up to 2.5 cm long x 1 mm wide, sometimes becoming red-tinted. The male plant has several terminal, 8-10-flowered clusters on terete flowering stalks up to 3 cm long. Two lanceolate bracts closely enclose the base of the flower. There are up to ten exserted stamens with persistent, flexuose filaments and pale yellow anthers. Female plant not described. Flowers in October-November.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Hydatella dioica grows partly submerged on the edge of shallow, winter-wet claypans at Ellen Brook and Kenwick. At both sites surrounding vegetation is *Melaleuca lateritia* low heath.

CONSERVATION STATUS - poorly known (priority 2).

H. dioica was collected on several occasions from Midland Junction between 1898 and 1903, and was considered extinct until its rediscovery in the early 1980s. It is known only from the Metropolitan Area, in a nature reserve at Ellen Brook and a proposed housing development at Kenwick. It is a small plant that is easily overlooked and although much of its habitat has been destroyed, its conservation status cannot be accurately assessed until specific surveys of ephemeral wetlands of the coastal plain have been conducted.

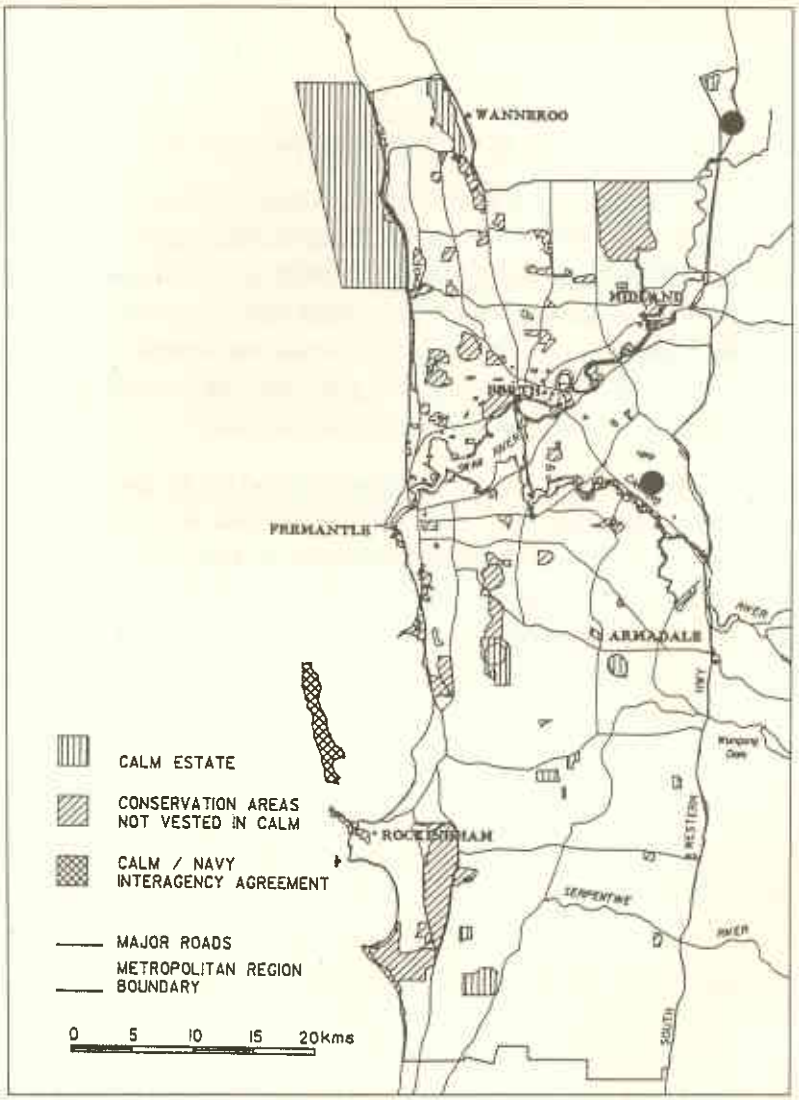
POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Conservation Reserves					
1988	S	Ellen Brook	nature reserve	1000	good
Other Lands					
11/90	G	Kenwick	Homeswest	several 100	good

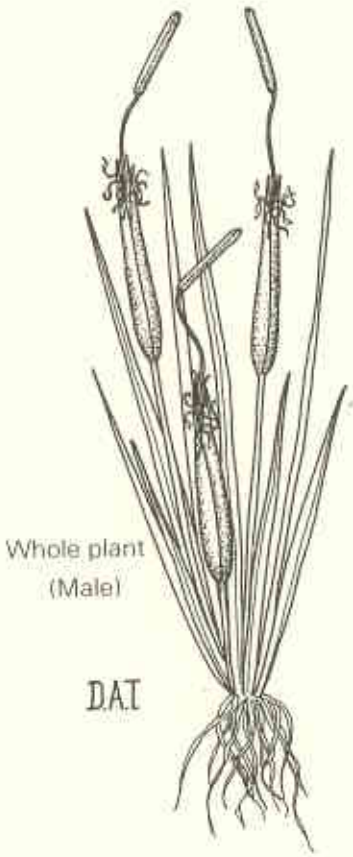
S - Shire of Swan
G - City of Gosnells

REFERENCES

Cooke (1983); Marchant *et al.* (1987).



● *Hydatella dioica*



LEUCOPOGON GLAUCIFOLIUS W. Fitgz. (priority 2)

An erect or spreading shrub to 30 cm, with finely hairy branches and erect, narrowly oblong to narrowly obovate leaves. The leaves are glabrous, shiny on the upper surface, finely veined and glaucous below. They are convex, to 12 mm long x 2 mm wide, ending in a sharp point and usually with recurved margins. Flowers are in erect, 1-3-flowered, axillary spikes. The bracts and bracteoles are pale, with a prominent mucro. The sepals are pale, glabrous to minutely hairy. The corolla is white, up to 5 mm long, with the tube shorter than the sepals. The lobes are revolute, glabrous and pointed at the apex. The fruit is globular, flattened at the top, with 5 ribs. Flowers in October-November.

Leucopogon glaucifolius is presumed extinct in the Metropolitan Area as it has not been recorded since 1902 when the type collection was made from "Midland Junction and vicinity in sandy heathy spots". The exact location of this collection is not known but is likely to be cleared. Outside the Metropolitan Area it has been recorded from north-west of Cataby (1988), South Stirlings (1959) and near Kendenup (1963). Further survey throughout its range is required.

REFERENCES

Fitzgerald (1903); Marchant *et al.* (1987).

LYSINEMA ELEGANS Sonder

An erect shrub to 60 cm high, with slender, shortly hairy branches and oblong to ovate leaves that are appressed against the stems. The leaves are glabrous except for the minutely hairy margins, up to 4 mm long on the main branches and usually smaller on the side branches. The flowers are in compact, terminal heads that sometimes extend into cylindrical spikes. The creamy white corolla has a narrow tube up to 16 mm long and five lobes to 6 mm long. Dark brown, glabrous or minutely ciliate bracts form a cylindric whorl around the corolla. The anthers and style are exserted. The fruit is a narrow capsule. Flowers in October-November.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Lysinema elegans occurs over a range of less than 6 km in the Jandakot-Canning Vale district of the Metropolitan Area, and south of Regans Ford in the Northern Forest Region. At Jandakot it grows on sandy flats and slopes, in *Banksia attenuata-B. menziesii* woodland/forest over heath. Most commonly associated shrub species are *Allocasuarina humilis, Kunzea micrantha, Stirlingia latifolia* and *Eremaea pauciflora.*

CONSERVATION STATUS - poorly known (priority 2). Recommended status - priority 3.

In the Metropolitan Area, *L. elegans* is known from several hundred plants at a number of sites between Jandakot and Canning Vale. It occurs largely on privately owned land, in small remnants of vegetation or in areas proposed for development.

It was collected from west of Byford in 1961 but the exact locality is unknown. Surveys were conducted in the area without success. There are no populations recorded from conservation reserves in the Metropolitan Area although it may occur in the Thomsons Lake Nature Reserve where suitable habitat exists. Outside the Metropolitan Area, it is known from a large population (1000+ plants) in the Moore River National Park. It was not relocated in 1990 at the site of a 1969 collection north of Regans Ford, but may still occur there as the vegetation is intact.

L. elegans favours open sites and is often found growing on firebreaks or cleared embankments. It has considerable horticultural potential and should be introduced into general cultivation. Further survey is required in the north of its range. Adequate protection of at least some of the southern populations is essential.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
16/ 12/ 90	Co	Jandakot (I)	private	20+	proposed development
6/ 12/ 90	Co	Jandakot (II)	private & Federal Airports	100+	remnant vegetation
10/ 12/ 90	Co	Jandakot (III)	private	115	good
10/ 12/ 90	Co	Jandakot (IV)	private	38	good
13/ 12/ 90	Co	Jandakot (V)	private	210	good
13/ 12/ 90	Co	Jandakot (VI)	private	7	remnant vegetation

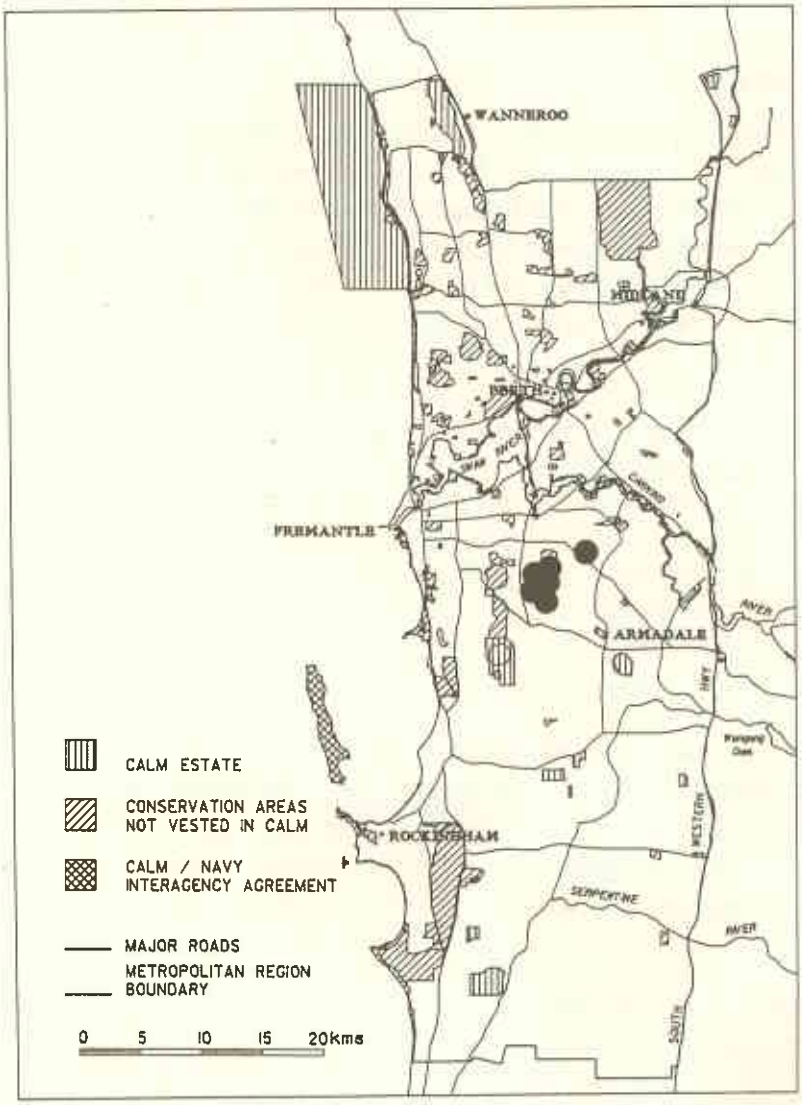
POPULATIONS KNOWN IN THE METROPOLITAN AREA (*continued*)

13/ 12/ 90	Co	Jandakot (VII)	private	6	good
13/ 12/ 90	Co	Jandakot (VIII)	private	13	good
23/ 12/ 90	Co/ M	Leeming	recreation reserve	500+	good
1990	C	Canning Vale	private	20+	proposed development

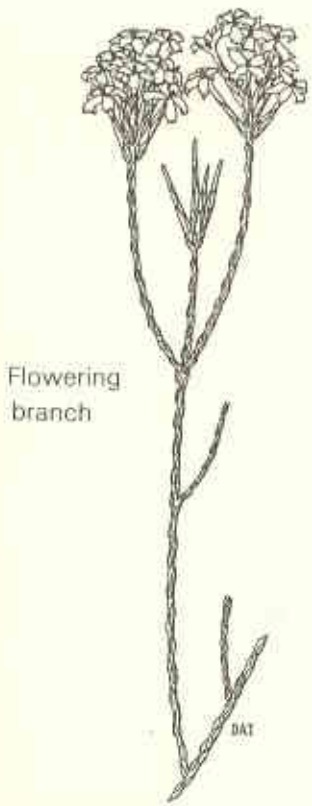
C - City of Canning
Co - City of Cockburn
M - City of Melville

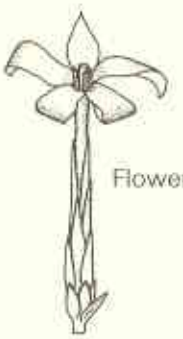
REFERENCES

Leigh *et al.* (1984); Marchant *et al.* (1987).



● *Lysinema elegans*






Section of stem

SCHOENUS CAPILLIFOLIUS D.A. Cooke

A glabrous, semi-aquatic annual with short stems repeatedly branching to form dense tufts at the soil surface. The basal leaves are thread-like, up to 10 cm long and supported by the water. The spikelets are one-flowered, solitary, sessile in the leaf tufts or terminating the stem branches. Two closely sheathing bracts form a tube around the flower and support the stigmas and anther above water level. There are six perianth segments with white, silky hairs. The fruit is a fragile, ovoid nut to 1.3 mm long. Flowers in spring when the water level has fallen to about 1 cm above the mud in which the plant is rooted (Keighery, personal communication).

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Schoenus capillifolius occurs in clayey, winter-wet depressions at Ellen Brook and Kenwick in the Metropolitan Area and at Waterloo in the Central Forest Region. At the Metropolitan localities surrounding vegetation is *Melaleuca lateritia* low heath. It grows submerged in shallow water or on the drying claypan edges.

CONSERVATION STATUS - poorly known (priority 2).

An uncommon species occurring in habitats that have been largely cleared for urban and agricultural development. It is abundant at the known locations, with one population well protected in a nature reserve. At least one of the Kenwick sites is proposed for development. Surveys for this species have been conducted in typical habitats throughout its range but being a small, inconspicuous species it may be more frequent than records indicate. Further survey on the coastal plain south of the Metropolitan Area is required.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

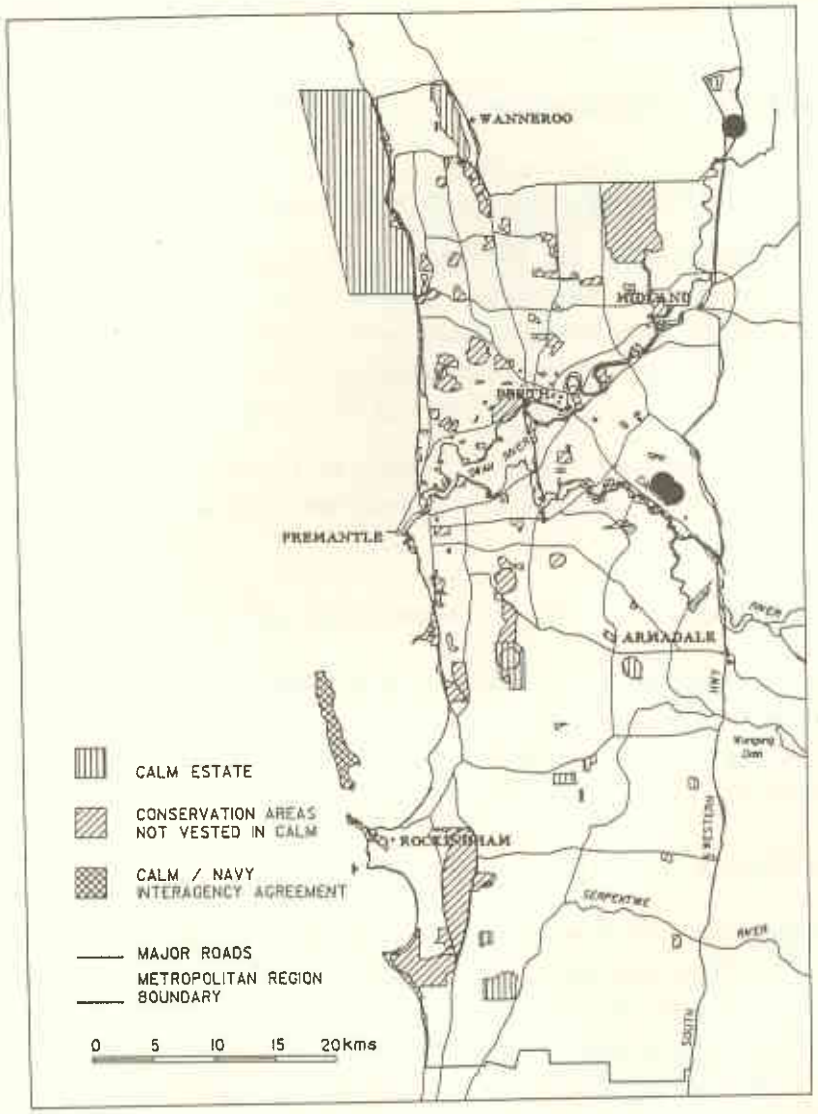
Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Conservation Reserves					
2/ 11/ 90	S	Ellen Brook	nature reserve	100+	good
Other Lands					
16/ 10/ 90	G	Kenwick (I)	Homeswest	100+	proposed development
31/ 10/ 90	G	Kenwick (II)	private	100+	good

G - City of Gosnells
S - Shire of Swan

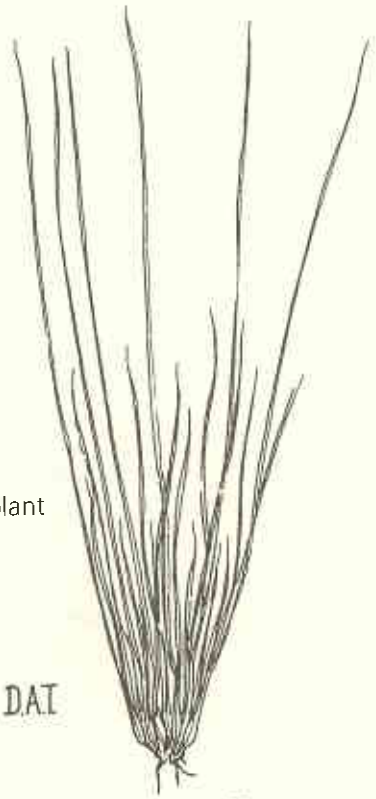
REFERENCES

Cooke (1981); G.J. Keighery[16] (personal communication); Marchant *et al.* (1987).

16 G.J. Keighery, Department of Conservation and Land Management, Wildlife Research Centre



● *Schoenus capillifolius*



Whole plant

D.A.T

C. PRIORITY THREE TAXA

ANTHOTIUM JUNCIFORME (Vriese) D.A. Morrison

A glabrous, perennial herb to 40 cm high forming a solitary, erect or spreading clump from the rootstock. The leaves are tufted at the base, linear to terete, up to 15 cm long x 1 mm wide. Light blue to purple flowers are in loose clusters terminating the branches of the flowering stalk. The calyx tube is narrowly cylindric and ribbed. The corolla is glabrous throughout, with the upper lobes usually exceeding the calyx. The fruit is a narrowly cylindric capsule up to 1 cm long. Flowers in December-February.

Anthotium junciforme was previously treated as a variety of *A. humile* but has recently been elevated to specific status. It differs from *A. humile* in its much taller habit and larger flowers in an elongated, loose inflorescence.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

A. junciforme occurs along the coastal plain on clayey, winter-wet flats from Upper Swan in the Metropolitan Area south to Yallingup in the Central Forest Region. In the Metropolitan Area it is most commonly found growing amongst *Leptocarpus* sedges surrounded by heath of *Melaleuca lateritia, Astartea fascicularis, Viminaria juncea* and *Pericalymma ellipticum*.

CONSERVATION STATUS - poorly known (priority 3).

A. junciforme was apparently quite frequent in the Metropolitan Area, with early collections from Midland Junction, lower Canning River, Bayswater, Cannington, Kelmscott, Maida Vale and Upper Swan River. It has been poorly collected in this century, with the only confirmed Metropolitan populations from Kenwick, Upper Swan and the Mundijong-Serpentine area. One of the Kenwick sites is threatened by development while the southern metropolitan populations occur on narrow remnants of vegetation that are weed invaded and subject to regular disturbances. The Upper Swan population occurs on land that is subject to recommendations by the Environmental Protection Authority to be protected.

Its range of *ca.* 200 km extends through intensively settled areas and much of its habitat has been cleared. It does not occur on any conservation reserves in the Metropolitan Area and is poorly represented in conservation reserves elsewhere. A collection from a private reserve in Kenwick was not confirmed during recent surveys. Its late flowering period may account for its poor collection. It appears to favour open, somewhat disturbed sites. Further survey, particularly in the south of its range, is required.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
22/ 12/ 90	G	Kenwick (I)	Homeswest	162	good
22/ 12/ 90	G	Kenwick (II)	private	32	good
4/ 12/ 90	S/ J	Peel Estate	road reserve	299	weed invaded
4/ 12/ 90	S/ J	Mundijong	road reserve	44	part disturbed

POPULATIONS KNOWN IN THE METROPOLITAN AREA (*continued*)

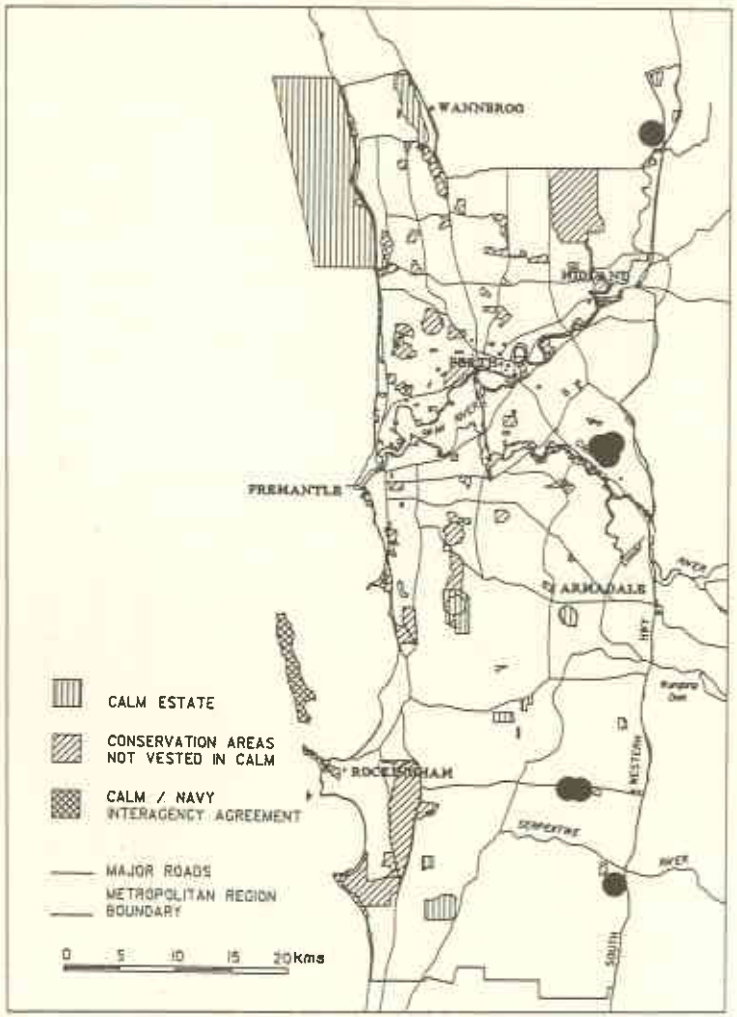
4/ 12/ 90	S/ J	Serpentine	road/ rail reserve	221	good
1984	G	Kenwick	private reserve		*
11/ 91	S	Upper Swan	private		

* not relocated during surveys in December 1990

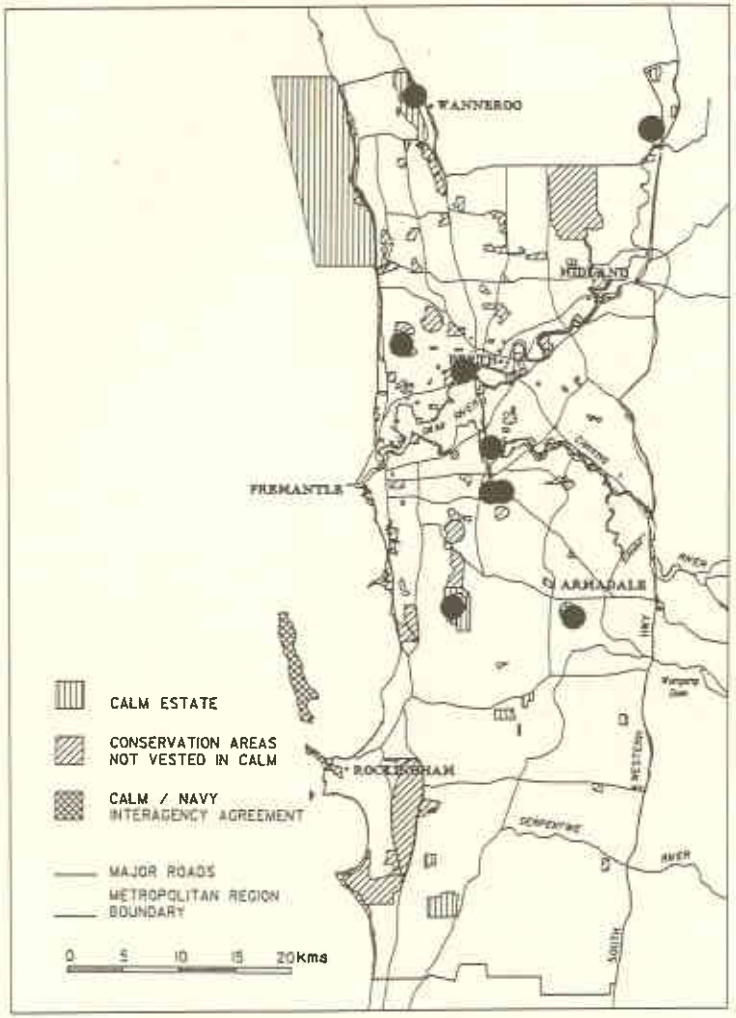
G - City of Gosnells
S/ J - Shire of Serpentine-Jarrahdale
S - Shire of Swan

REFERENCES

Marchant *et al.* (1987); Morrison (1989).



● *Anthotium junciforme*



● *Cartonema philydroides*

CARTONEMA PHILYDROIDES F. Muell.

A perennial herb to 30 cm high, with glandular hairs covering the stems, leaves, bracts and outer surface of the sepals. The leaves are sheathing at the base, to 20 cm long x 0.5 cm wide, becoming progressively shorter up the stem. The flowers are shortly pedicellate, in dense, spike-like racemes up to 12 cm long. Each flower consists of three green outer perianth segments and three bright yellow inner segments. The fruit is a capsule with sparse hairs. Flowers October-November.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Cartonema philydroides occurs on the coastal plain from Wanneroo and Upper Swan south to Capel, a range of approximately 200 km. It grows on deep, sandy soils, sometimes near winter-wet or permanently wet areas. In the Metropolitan Area, the vegetation is open *Banksia* woodland (*B. attenuata, B. menziesii, B. littoralis*) or low open scrub. *Jacksonia furcellata, Nuytsia floribunda* and *Pelargonium* sp. are often associated. A Kalbarri collection differs from the southern specimens and may be a distinct taxon (Marchant *et al.* 1987).

CONSERVATION STATUS - poorly known (priority 3). Recommended status - priority 4.

Known from nine sites in the Metropolitan Area, including large populations from two nature reserves and several shire reserves. There has been an unconfirmed record from Padbury that requires verification. *C. philydroides* has been collected from Midland Junction (1901), Cannington (1923), Guildford (1899), Maida Vale (1925) and Bayswater (1923) and may still occur in some of these areas. In the Central Forest Region it has been recently recorded from four sites between Australind and Capel. Herbarium collections from Bullsbrook and Wanneroo require investigation. It is not known from any conservation reserves outside the Metropolitan Area.

C. philydroides favours disturbed or open sites, and is often found growing on firebreaks or in areas of high rabbit activity. Many of these suffer from heavy weed infestation. It is fairly inconspicuous when not in flower and is probably more abundant throughout its range. Recommend status change to priority 4.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Conservation Reserves					
23/ 10/ 90	A	Forrestdale	nature reserve	547	good
6/ 11/ 90	Co	Success	nature reserve	296 (3 pops)	good
Other Lands					
22/ 5/ 90	W	Wanneroo	shire reserve (proposed regional park)	613	good
4/ 11/ 90	M	Bull Creek (I)	shire recreation reserve	48	
4/ 4/ 90	M	Bull Creek (II)	shire recreation reserve	200+	good
13/ 11/ 90	SP	Manning	road reserve	1	
< 1988	-	Kings Park	public park		*

POPULATIONS KNOWN IN THE METROPOLITAN AREA (*continued*)

< 1990	P	City Beach	shire recreation reserve	*
11/91	S	Upper Swan	private	

* population not recently surveyed

POPULATIONS KNOWN IN THE METROPOLITAN AREA (*continued*)

A - City of Armadale
Co - City of Cockburn
M - City of Melville
P - City of Perth
SP - City of South Perth
W - City of Wanneroo
S - Shire of Swan

REFERENCES

Bentham (1878); Marchant *et al.* (1987).

CONOSTEPHIUM MINUS Lindl.

Pink-tipped Pearl Flower

Conostephium minus is an erect, much-branched shrub growing to 30-60 cm high. The leaves are linear, to 2 cm long, with a small point and closely revolute margins. The flowers are solitary and clustered in the axils of the upper leaves. The pedicels are less than 2 mm long, erect at first but usually becoming recurved. The corolla is a pinkish-red tube, broadest in the middle, usually sparsely hairy outside and hairy inside. The bracts are shiny or minutely puberulous. Bracteoles and sepals are puberulous and have minutely ciliate margins. Flowers in July-September.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

C. minus has a distribution extending from east of Perth north to near Cataby. It grows on sandy soils of the coastal plain, usually in *Banksia menziesii-B. attenuata* woodland.

CONSERVATION STATUS - poorly known (priority 3). Recommended status - priority 4.

In the Metropolitan Area, *C. minus* is known from recently discovered populations at Newburn, Upper Swan and Beechboro. It has been collected at Guildford (1901), Welshpool (1928) and Victoria Park (1948) but may no longer be extant in these areas. Outside the Metropolitan Area 15+ collections have been made north to near Cataby. It has been recorded from Moore River National Park, Melaleuca Park, Namming Nature Reserve and several State forest sites in the Yanchep-Wanneroo area. It may prove to be more abundant with thorough surveys in the north of its range.

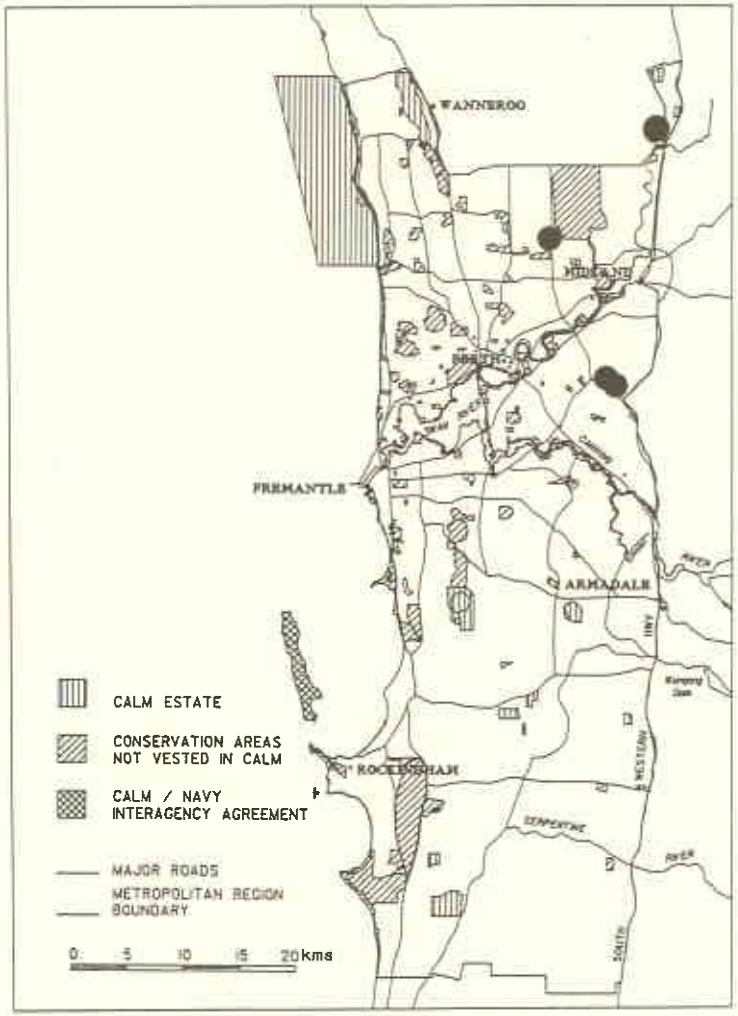
POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
24/ 10/ 90	B	Newburn	Federal Airports	44 (2 pops)	good
8/ 10/ 90	S	Beechboro/ Malaga	private and SEC reserve	5	good
11/ 91	S	Upper Swan	private		

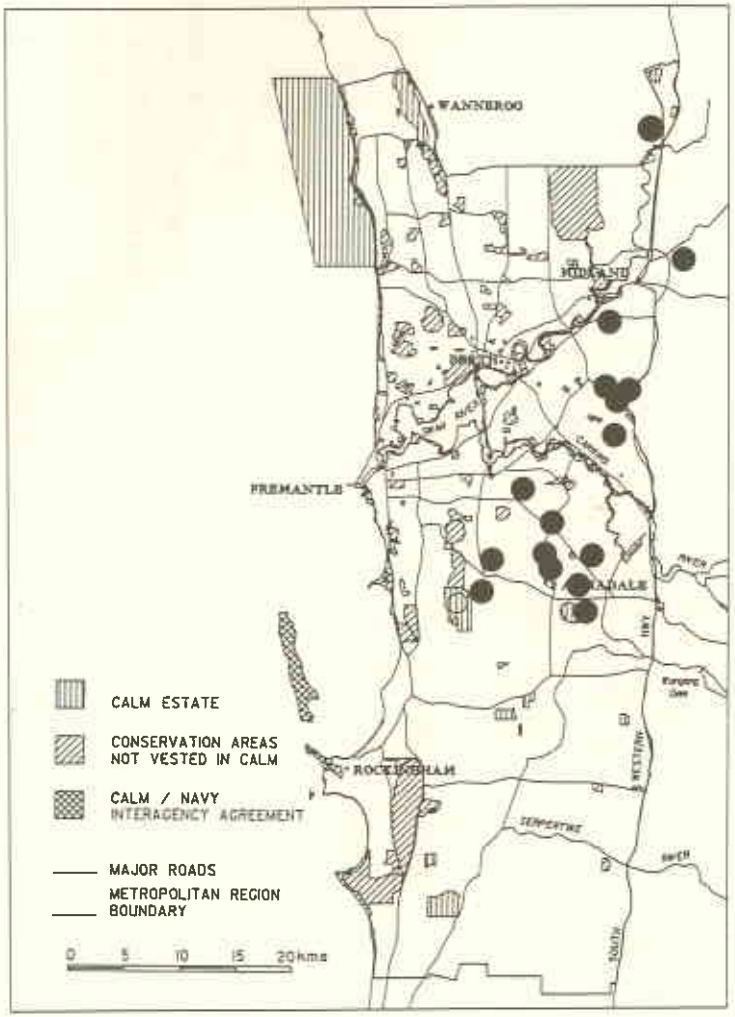
B - City of Belmont
S - Shire of Swan

REFERENCES

Marchant *et al.* (1987).



● *Conostephium minus*



● *Gonocarpus pithyoides*

GONOCARPUS PITHYOIDES Nees

Gonocarpus pithyoides is an erect, perennial herb to 40 cm high, with slender, smooth or weakly ribbed stems branching at the base. Its leaves are alternate, terete or slightly flattened, glabrous or sparsely scabrous, to 1.5 cm long. The flowers are small, pendent, in axillary spikes extending well beyond the leaves. The petals are yellow to reddish, *ca.* 2 mm long, glabrous or scabrous. The sepals are reddish, broadly ovate to triangular, notched at the base. The ovary is grey, top-shaped, 8-ribbed but otherwise smooth. It is glabrous or scabrous, often with a tuft of hairs at the base. Fruits are drooping, dark grey, also 8-ribbed. Closely related to *G. cordiger* with which it may hybridise. Flowers October-November.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Occurs on the coastal plain where it has been recorded over a 280 km range from Forrestdale and Jandakot north to the Arrowsmith River. In the Metropolitan Area it grows mostly on sandy soils in *Banksia attenuata-B. menziesii* woodland or forest. It is occasionally found in slightly swampy sites.

CONSERVATION STATUS - poorly known (priority 3). Recommend deletion from priority list.

A widespread species found frequently during opportunistic surveys in the Metropolitan Area. While it has not been recorded from any existing conservation reserves, several populations occur on sites proposed for addition to the conservation estate. A large population is known from a private reserve in Kenwick, and it has been recorded from Kings Park, although not seen here recently (Bennett 1988). It is likely to be more abundant in the Metropolitan Area and in the north of its range and is recommended for deletion from the priority list.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
1/ 11/ 90	G	Kenwick	private reserve	400+	good
19/ 11/ 90	G	Southern River		50+	good
20/ 11/ 90	S	South Guildford	regional reserve	abundant	
11/ 91	S	Upper Swan	private		
8/ 11/ 90	A	Forrestdale (I)	private	50+	good
20/ 11/ 90	A	Forrestdale (II)	recreation reserve	100+	good
20/ 11/ 90	B	Newburn	Federal Airports	frequent	undisturbed
19/ 11/ 90	Co	Banjup		abundant	
6/ 12/ 90	Co	Jandakot (I)	private	50+	undisturbed
6/ 12/ 90	Co	Jandakot (II)	private	30+	
19/ 11/ 90	C	Canning Vale (I)		abundant	
14/ 11/ 90	C	Canning Vale (II)	private	20+	good
14/ 11/ 90	C	Willeton	water reserve	30+	good
21/ 11/ 90	K	Forrestfield	road reserve	20+	undisturbed
7/ 11/ 90	K	Wattle Grove	road reserve	4	

A - City of Armadale
B - City of Belmont
C - City of Canning
Co - City of Cockburn
G - City of Gosnells
S - Shire of Swan
K - Shire of Kalamunda

REFERENCES

Marchant *et al.* (1987); Orchard (1990).

HELIPTERUM PYRETHRUM (Steetz) Benth.

Helipterum pyrethrum is an erect, glabrous annual to 20 cm tall with basally thickened stems that are simple or little-branched. The leaves are linear at the base, becoming narrowly ovate and almost scale-like toward the apex. The flower-heads are solitary and terminal on the branches. The involucral bracts are pure white or tinged with pink. Florets are bright yellow, the marginal ones bisexual, the inner ones male. The compressed-ovoid fruits are silky hairy and contain one seed. Flowers in October-November.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Found in shallow, seasonally-wet claypans in the Metropolitan Area at Ellen Brook, Kenwick and Southern River, and in the Central Forest Region from Harvey to Capel. It grows on the wet claypan edges or with its stems submerged in water. In the Metropolitan Area, surrounding vegetation is heath of *Melaleuca lateritia* or *M. viminea*.

CONSERVATION STATUS - poorly known (priority 3).

In the Metropolitan Area, *H. pyrethrum* is known from large populations, of several hundred plants each, at Ellen Brook, Kenwick and Southern River. The Ellen Brook population is well protected on a nature reserve, and is the only occurrence on conservation land. The other Metropolitan populations are less secure and their long-term survival is at risk. A collection was made from Bellevue in 1902 but it is unlikely to be extant in this area. In the Central Forest Region, *H. pyrethrum* is known from four sites between Harvey and Capel, on private land, road, rail and water treatment reserves. It is probably more frequent than records indicate as it is easily overlooked due to its similarity to other *Helipterum* species. More adequate reservation of this species throughout its range is required. It has been well surveyed in the Metropolitan Area.

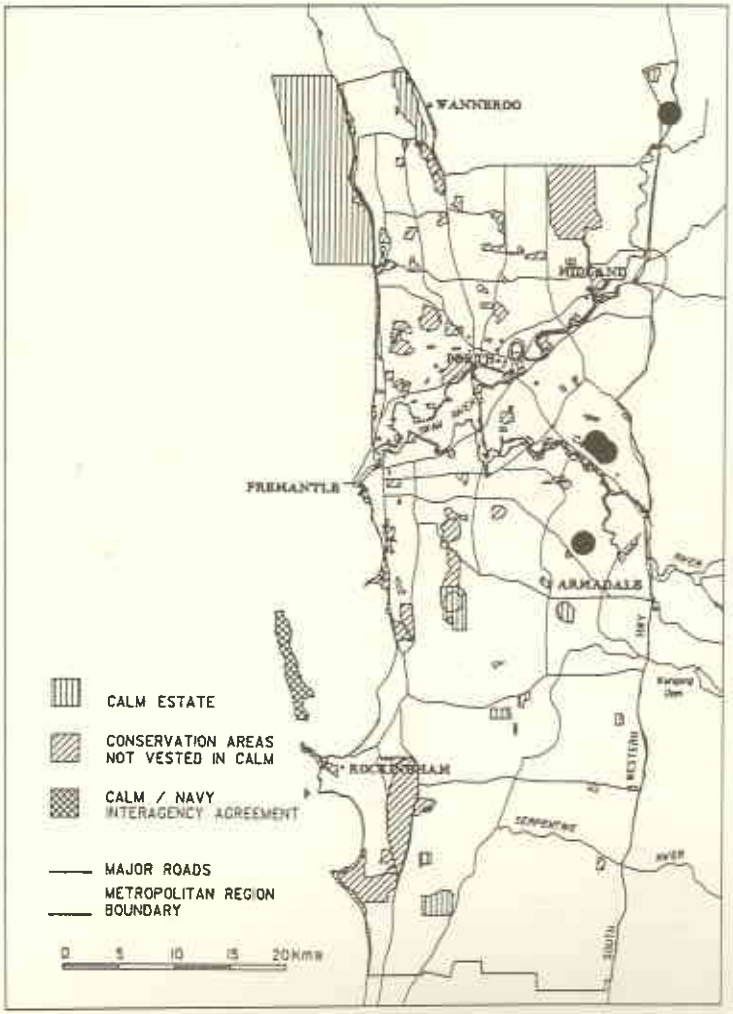
POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Conservation Reserves					
2/11/90	S	Ellen Brook	nature reserve	several 100	good
Other Lands					
16/10/90	G	Kenwick (I)	Homeswest	several 100	good
31/10/90	G	Kenwick (II)	private	several 100	
19/11/90	G	Southern River	private	several 100	good

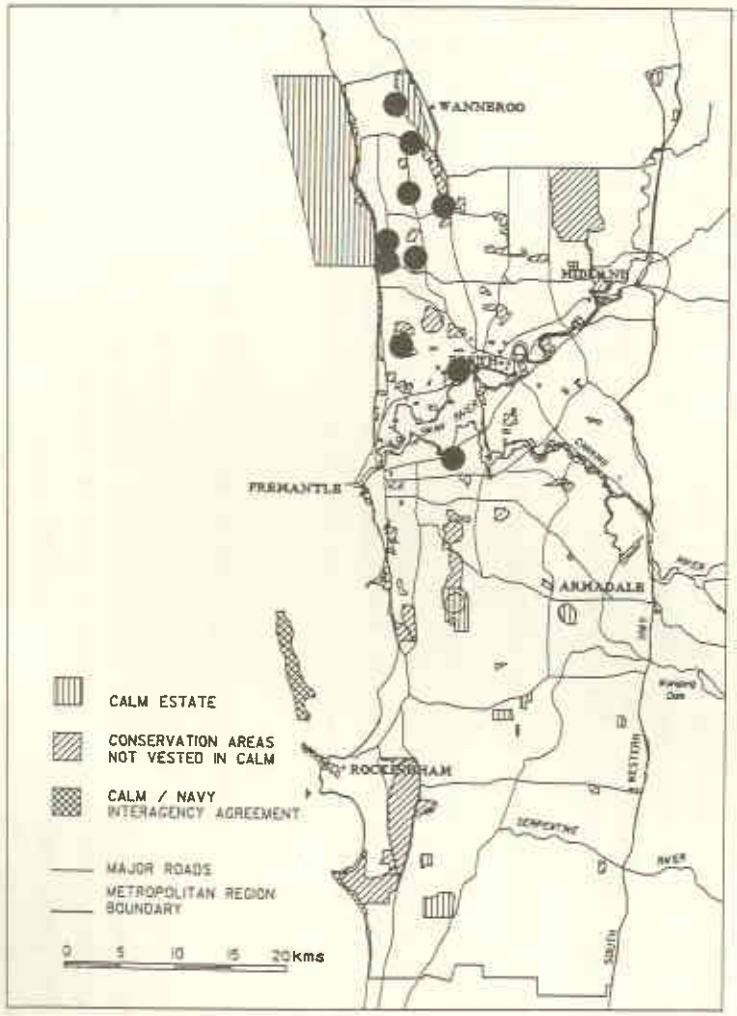
G - City of Gosnells
S - Shire of Swan

REFERENCES

Bentham (1867); Marchant *et al.* (1987).



● *Helipterum pyrethrum*



● *Jacksonia sericea*

JACKSONIA SERICEA Benth.

Jacksonia sericea is a bluish-green shrub to 60 cm high with spreading, angular to flattened stems and branchlets. The branchlets are usually simple, linear, with a sharp point and spreading hairs. The orange flowers are pedicellate, in loose terminal inflorescences or rarely solitary. The calyx is silky hairy, with linear lobes that are usually longer than the petals. The pods are ovoid, on short stalks, densely covered with long, soft hairs. Flowers usually in December-February, but may be seen throughout the year.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Occurs on the coastal plain from Neerabup National Park, through suburban Perth to the Mandurah-Pinjarra area. It grows on sandy or calcareous soils, often overlying limestone, in *Banksia menziesii-B. attenuata* open woodland or low heath. Jarrah (*Eucalyptus marginata*) and tuart (*E. gomphocephala*) are sometimes associated. It favours cleared or open ground and is not found in areas of dense vegetation.

CONSERVATION STATUS - poorly known (priority 3). Recommended status - priority 4.

Apparently once common in the Perth area with old collections from Subiaco, West Perth, Shenton Park, Fremantle and Claremont. It is currently known from ten localities in the Metropolitan Area, largely on shire and recreation reserves. It is abundant at many of these sites with some populations containing several hundred plants each. Outside the Metropolitan Area it has been recorded in large numbers at Neerabup National Park (G.J. Keighery[17], personal communication) and may occur in Yalgorup and Yanchep National Parks. *J. sericea* is a disturbance opportunist often found growing on road verges and firebreaks.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
27/ 12/ 89	W	Joondalup	private, road and rail reserves	size not specified	
15/ 5/ 90	W	Edgewater	private and road reserve	500+	proposed development
26/ 3/ 90	W	Padbury	proposed housing development	1000+	good
17/ 10/ 90	W	Warwick	recreation reserve	1000+	good
4/ 4/ 90	St	Karrinyup	shire reserve	100+	weed invaded
< 1979	St	North Beach/ Waterman	recreation reserve		*
5/ 12/ 87	St	Trigg	dune and townsite reserves		*

17 G.J. Keighery, Department of Conservation and Land Management, Wildlife Research Centre

POPULATIONS KNOWN IN THE METROPOLITAN AREA (*continued*)

4/ 4/ 90	-	Kings Park	public park	500+ (several sites)	good
< 1990	P	City Beach	recreation reserve		*
13/ 11/ 90	M	Ardross	shire reserve	1300+	good

* populations not recently surveyed

M - City of Melville
P - City of Perth
St - City of Stirling
W - City of Wanneroo

REFERENCES

Bentham (1864); Marchant *et al.* (1987).

MYRIOCEPHALUS APPENDICULATUS Benth.

White-tip Myriocephalus

Myriocephalus appendiculatus is an erect annual up to 20 cm tall, with few branches and a loose, woolly covering of short hairs. Its leaves are linear or narrowly ovate, to 35 mm long x 5 mm wide, pointed at the apex and slightly dilated at the base. The compound flower-heads are terminal and solitary, up to 1.5 cm in diameter. Numerous involucral bracts in several rows form a white ray around the cluster of pale yellow florets. The fruits are minutely hairy, dry and with one seed. Flowers in November-December in the Metropolitan Region, elsewhere as early as September.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Currently known from a few widely scattered localities over a range of almost 900 km - near Eneabba in the Greenough Region, north-east of Perth in the Metropolitan Area and east of Mt Ragged in the South Coast Region. It has also apparently been recorded from Bullsbrook. The metropolitan population grows in a herbfield surrounded by *Melaleuca lateritia* heath, on drying clay of a winter swamp. Outside the Metropolitan Area it has been recorded from coarse sand and granite.

CONSERVATION STATUS - poorly known (priority 3). Recommended status - priority 2.

M. appendiculatus has been reasonably well surveyed in the Metropolitan Area, with the only known population occurring on a nature reserve at Ellen Brook. Old herbarium collections have recorded it from Upper Swan (1959) and Midland Junction (1899), the Upper Swan collection probably referring to the Ellen Brook site. Outside the Metropolitan Area it has not been thoroughly surveyed and its conservation status cannot be accurately assessed. It is likely to be found elsewhere throughout its range and further survey is required.

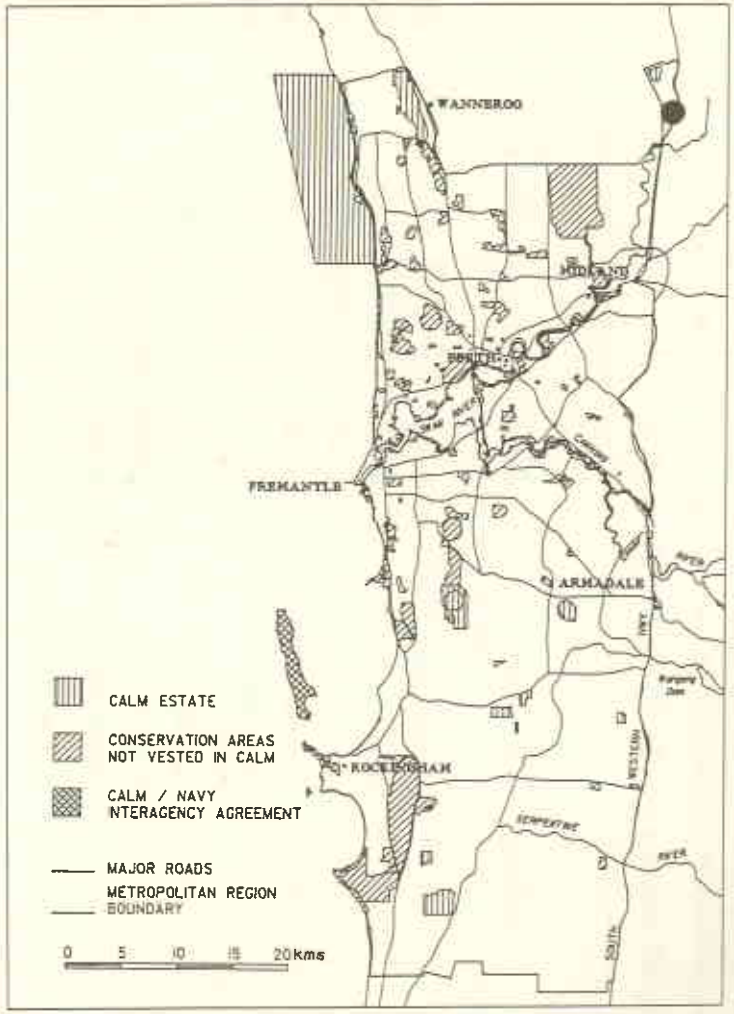
POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Conservation Reserves					
2/ 11/ 90	S	Ellen Brook	nature reserve	50+	good

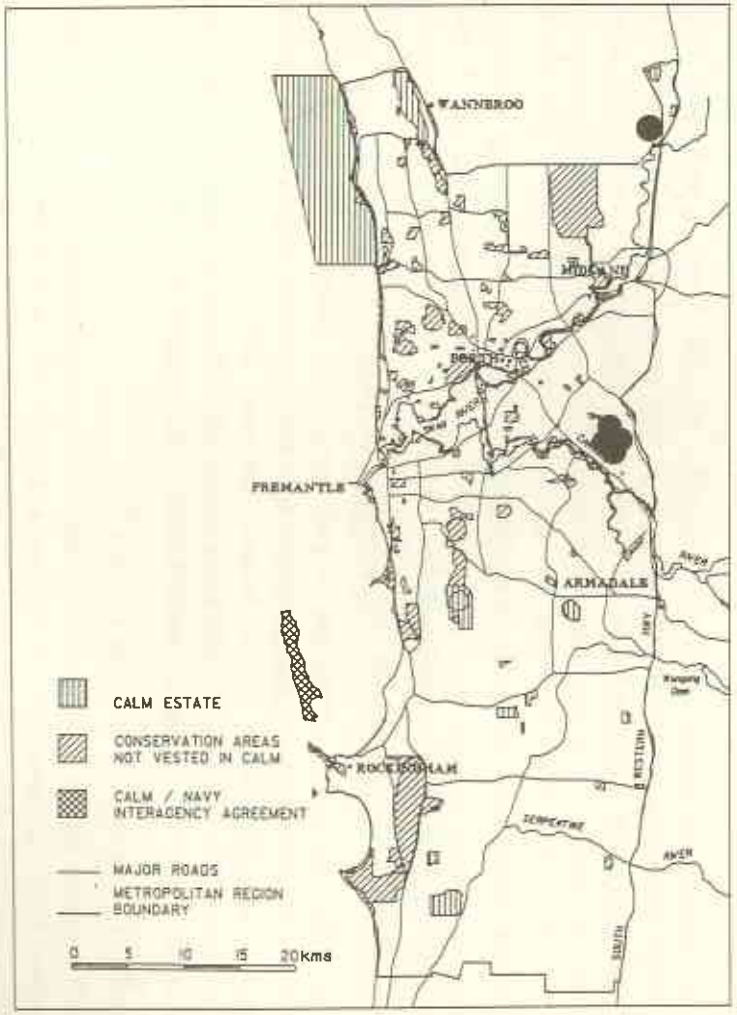
S - Shire of Swan

REFERENCES

Bentham (1867), Marchant *et al.* (1987).



● *Myriocephalus appendiculatus*



● *Philydrella drummondii*

PHILYDRELLA DRUMMONDII L. Adams

Greater Butterfly Flower

Philydrella drummondii is a glabrous, perennial herb with a stem-like flowering stalk up to 25 cm high. There are usually two leaves, one above the centre of the stem and a larger, narrowly linear one at the base. The flowers are bright yellow, in a terminal 3-9-flowered spike, opening from the base upward. The bracts are erect and overlapping in bud, becoming strongly reflexed at anthesis. The perianth segments are broad, the outer segments free and spreading, the inner segments joined in the lower part. The fruit is a capsule containing reddish-brown seeds. Flowers in October-November.

It differs from *P. pygmaea*, the only other species in the genus, in its generally larger size, broader inner perianth segments and prominently hooked anthers.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Occurs in low-lying, ephemeral swamps and seepage areas from Gingin south to Manjimup. In the Metropolitan Area it grows on sandy clay amongst sedges and other herbs in open patches of low heath. Most commonly associated heath species include *Melaleuca lateritia, M. bracteosa, Hypocalymma angustifolium, Actinostrobus pyramidalis, Viminaria juncea* and *Calothamnus hirsutus. P. drummondii* is often found in association with *P. pygmaea* which flowers earlier when the swamps are quite wet.

CONSERVATION STATUS - poorly known (priority 3).

A sporadically observed species in need of further survey before its conservation status can be assessed. In the Metropolitan Area it is known from Upper Swan and several sites at Kenwick, mostly on private land. Old collections have been made from Bayswater (1904) and Guildford (1902) where it may no longer be extant. It has been collected more recently (1977) from the Lower Helena Valley but was not found there during surveys in 1990. Outside the Metropolitan Area it has been recorded from Chidlow (1943), Pinjarra (1897), Gingin (1990) and Manjimup (1981). There are no confirmed occurrences of *P. drummondii* on conservation reserves anywhere in its range. While much of its suitable habitat has been cleared, intensive surveys are likely to find it to be more abundant than records indicate. Its poor collection may be due to its similarity to the more common *P. pygmaea* with which it is often associated.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
18/ 10/ 90	G	Kenwick (I)	private	abundant	part degraded
18/ 10/ 90	G	Kenwick (II)	private	20+	good
31/ 10/ 90	G	Kenwick (III)	private	occasional	
31/ 10/ 90	G	Kenwick (IV)	private	20+	good
31/ 10/ 90	G	Beckenham/ Kenwick	road reserve and Homeswest	30+	part disturbed
1/ 11/ 90	G	Kenwick (V)	private	frequent	
1/ 11/ 90	G	Kenwick (VI)	private reserve	20+	good
11/ 91	S	Upper Swan	private		

G - City of Gosnells
S - Shire of Swan

REFERENCES

Adams (1987).

PHLEBOCARYA FILIFOLIA (F. Muell.) Benth.

Phlebocarya filifolia is a tufted perennial herb with basal, flattened to terete leaves that are sheathing at the base. The leaves are up to 40 cm long x 1.8 mm wide, sparsely hairy at least near the apex or base. The margins of flattened leaves are fringed with hairs while terete leaves have hairs in two rows. Leaf sheaths are hairy, including the midline. The membranous margins may be glabrous or hairy. Flowers are white to creamish-blue, in inflorescences slightly shorter to markedly longer than the leaves. The anther connective is prolonged beyond the cells. The fruit is nut-like with one seed.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Recorded from Eneabba in the north to Yelverton south of Busselton. In the Metropolitan Area it grows in mixed heath in *Banksia attenuata-B. menziesii* woodland or forest, sometimes with a *Eucalyptus calophylla-E. marginata* overstorey. Soils are grey-white sands on flats and slopes.

CONSERVATION STATUS - poorly known (priority 3). Recommend deletion from priority list.

A widespread species found frequently during rare flora surveys in the Metropolitan Area. Outside this area it has been collected from many sites including a national park, State forest and vacant Crown land proposed as conservation reserves. In the Metropolitan Area it occurs on a private reserve and several shire and recreation reserves. Further surveys are likely to find it in nature reserves and other areas proposed for acquisition as conservation land.

Prior to the recent surveys *P. filifolia* was known from only four collections in the Metropolitan Area made between 1900 and 1985. It is often overlooked due to its similarity to other *Phlebocarya* species and is probably well represented throughout its range. It is recommended for deletion from the priority species list.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
21/ 11/ 90	K	Forrestfield (I)	road reserve & private	30+	good
12/ 11/ 90	K	Forrestfield (II)	shire reserve	50+	good
19/ 11/ 90	C	Canning Vale (I)		50+	good
15/ 10/ 79	C/ G	Canning Vale (II)			*
14/ 11/ 90	M	Bull Creek	shire reserve	250+	
13/ 11/ 90	M	Ardross	shire reserve	14	good
20/ 11/ 90	B	Newburn	Federal Airports	frequent	
20/ 11/ 90	S	South Guildford	cemetery reserve	50+	good
15/ 11/ 90	S	Stratton	recreation reserve		
29/ 11/ 90	G	Kenwick	private reserve	frequent	good
19/ 11/ 90	G	Southern River		20+	
13/ 12/ 90	Co	Jandakot (I)		50+	
10/ 12/ 90	Co	Jandakot (II)	private	20+	

POPULATIONS KNOWN IN THE METROPOLITAN AREA (*continued*)

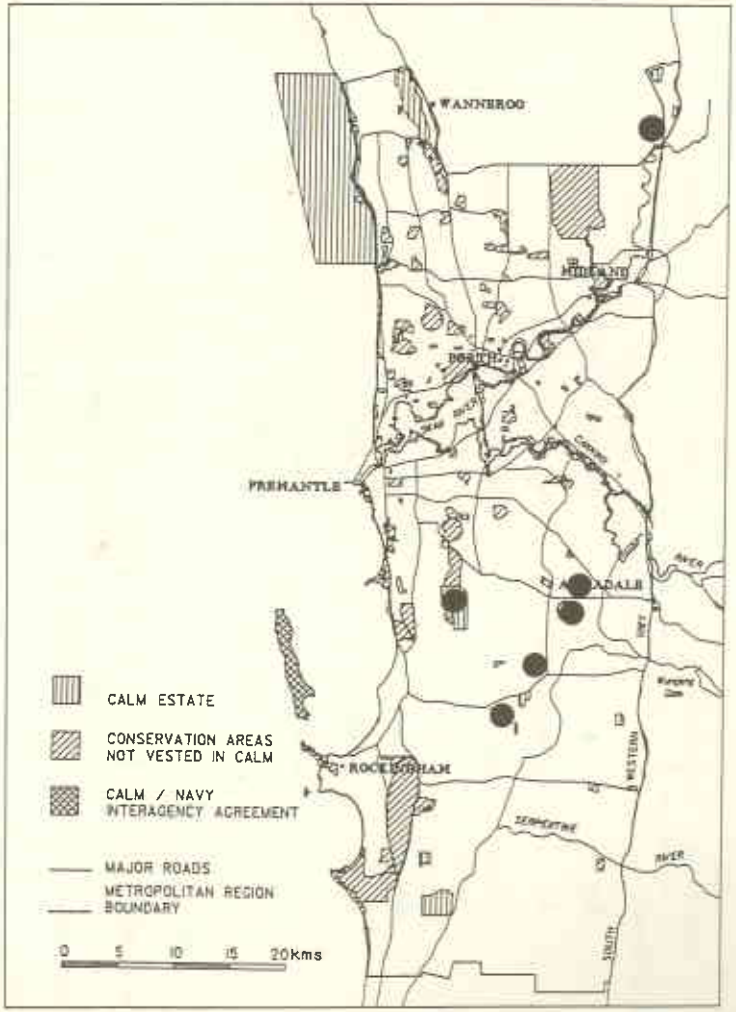
6/ 12/ 90	Co	Jandakot (III)	private	600+	good
6/ 12/ 90	Co	Jandakot (IV)	private	50+	good
10/ 12/ 90	Co	Jandakot (V)	Federal Airports	100+	good
9/ 12/ 85	Co	Banjup			*

* population not recently surveyed

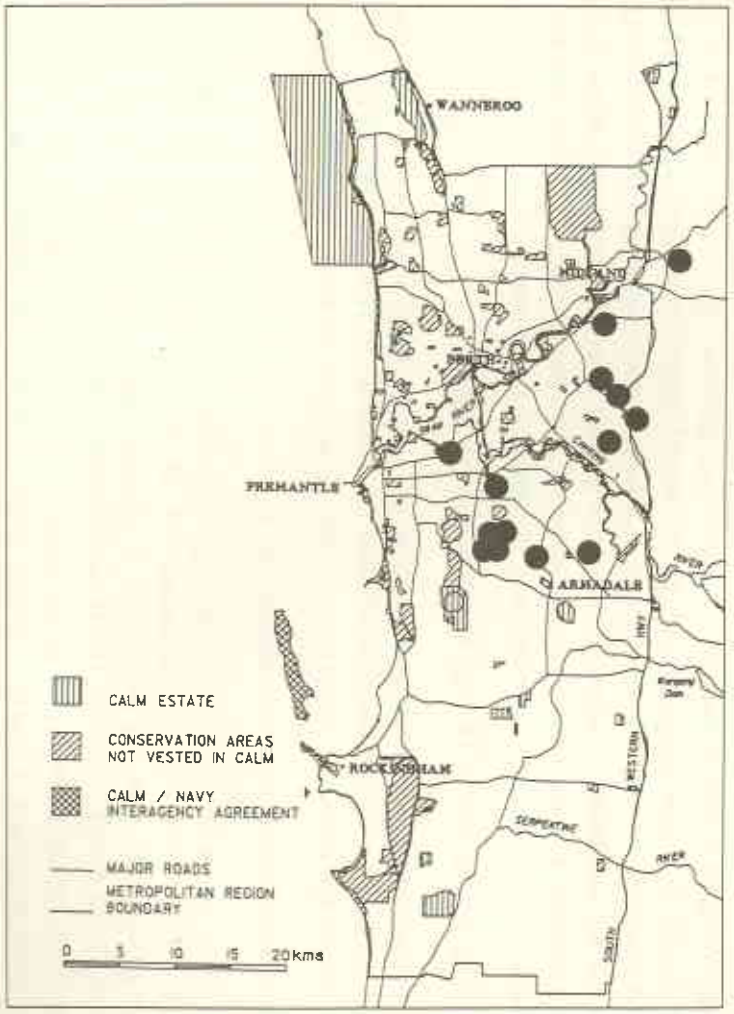
B - City of Belmont
C - City of Canning
Co - City of Cockburn
G - City of Gosnells
K - Shire of Kalamunda
M - City of Melville
S - Shire of Swan

REFERENCES

MacFarlane (1987); Marchant *et al.* (1987).



● *Restio stenostachyus*



● *Phlebocarya filifolia*

RESTIO STENOSTACHYUS W. Fitzg.

A rhizomatous herb with straight or sometimes flexuose stems forming dense mats. The rhizome is creeping and covered by reddish-brown wool. The stems are glabrous, up to 2 mm wide x 60 cm tall, with several longitudinal ribs. The leaves are reduced to closely appressed, sheathing scales. Spikelets are bronze, many-flowered, solitary and terminal or with several other sessile spikelets below. Male and female spikelets are on separate plants. The perianth is flat, the outer segments with reddish wool on the back, the inner segments almost translucent. The anthers are red and much exserted. The style is exserted and divided into three recurved stigmatic branches. Flowers in February-March.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Restio stenostachyus occurs from Badgingarra south to Casuarina, a range of approximately 200 km. In the Metropolitan Area it occurs on sandy, moist flats or bordering permanently wet areas. Associated vegetation is usually low heath and sedges below *Melaleuca preissiana* or *M. rhaphiophylla* low forest.

CONSERVATION STATUS - poorly known (priority 3).

R. stenostachyus is known from several localities in the Metropolitan Area, including populations in three nature reserves. One of the reserved populations has not been surveyed in recent years and requires confirmation of population size and abundance. *R. stenostachyus* has been collected from Maida Vale (1939), Canning River (1962), Bayswater (1901) and Burswood (1901) and may still occur in some of these areas. Outside the Metropolitan Area it has been collected on a number of occasions from the Gingin-Bullsbrook area where it may be frequent. It is likely to be more abundant than records indicate and further surveys, particularly on conservation lands in the north of its range, are required.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Conservation Reserves					
6/2/91	Kw	Casuarina	nature reserve	several 100	good
31/12/85	A	Forrestdale (I)	nature reserve		*
6/3/91	Co	Success	nature reserve	several 100	undisturbed
Other Lands					
28/3/90	S/J	Oakford	private		
4/11/90	A	Forrestdale (II)	private	< 10	good
19/3/91	K	Wattle Grove	road reserve		endangered
11/91	S	Upper Swan	private		

* population not recently surveyed

A - City of Armadale
Co - City of Cockburn
K - Shire of Kalamunda
Kw - Town of Kwinana
S/J - Shire of Serpentine-Jarrahdale
S - Shire of Swan

REFERENCES

Fitzgerald (1903); Marchant *et al.* (1987).

STYLIDIUM UTRICULARIOIDES Benth.

Pink Fan Triggerplant

A slender, ephemeral herb with fleshy, simple or branched stems to 15 cm high. Its leaves are scattered, ovate near the base and becoming linear higher up the stem. Flowers are pink and white with a yellow throat, solitary or loosely arranged in many-flowered clusters at the ends of the branches. The upper petals are smaller and usually with an enlarged apex, while the lower petals are larger, spreading and spathulate. There are 4-6 linear throat appendages. The pedicels, calyx and outside of the petals are minutely glandular-hairy. The fruit is a narrowly cylindric capsule to 1 cm long. Flowers in October-November.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Stylidium utricularioides has a distribution extending from Bolgart to Albany, where it grows amongst other herbs and sedges in ephemeral wetlands or on the edges of creeks. In the Metropolitan Area it occurs in clay or sandy clay depressions on the eastern side of the coastal plain. It is usually found in open patches of heath dominated by *Astartea fascicularis, Pericalymma ellipticum* and *Melaleuca* species.

CONSERVATION STATUS - poorly known (priority 3). Recommend deletion from priority list.

A widespread and frequent species if searched for in appropriate habitats. In the Metropolitan Area, recent surveys have recorded several thousand plants in seventeen populations. Outside the Metropolitan Area it has been recorded from more than ten sites between Bolgart and Lowden. It is apparently abundant around Albany (A. Lowrie[1], personal communication) although no collections are currently represented in the W.A. Herbarium. Development is a threat to a number of the Metropolitan sites but several populations are protected in a nature reserve, private reserve and shire reserves. Although much of its favoured habitat has been cleared, intensiye surveys throughout its range are likely to find more populations. Given its wide distribution and abundance, it is recommended that *S. utricularioides* be deleted from the priority list.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Conservation Reserves					
< 1990	S	Ellen Brook	nature reserve		*
Other Lands					
9/ 11/ 90	Mg	Helena Valley	private	50	
23/ 11/ 90	G	Kenwick (I)	Homeswest	1000+	good
29/ 11/ 90	G	Kenwick (II)	private reserve	154	good
1/ 11/ 90	G	Kenwick (III)	private	1000+	good
31/ 10/ 90	G	Kenwick (IV)	?private	150	
19/ 11/ 90	G	Southern River	private	18	good
7/ 11/ 90	K	Wattle Grove (I)	road reserve	50+	

POPULATIONS KNOWN IN THE METROPOLITAN AREA (*continued*)

7/ 11/ 90	K	Wattle Grove (II)	shire & SEC reserves	90+	good
21/ 11/ 90	K	Wattle Grove (III)	road reserve	35	area degraded
5/ 11/ 90	A	Forrestdale (I)	shire reserve	200+ (2 pops)	good
8/ 11/ 90	A	Forrestdale (II)	shire reserve	20+	good
8/ 11/ 90	A	Forrestdale (III)	private	400+	good
27/ 11/ 90	S/ J	Byford	shire reserve	350+	good
4/ 12/ 90	S/ J	Mundijong	road reserve	1000+	good
4/ 12/ 90	S/ J	Serpentine (I)	road/ rail reserve	700+	good
4/ 12/ 90	S/ J	Serpentine (II)		88	good
11/ 91	S	Upper Swan	private		

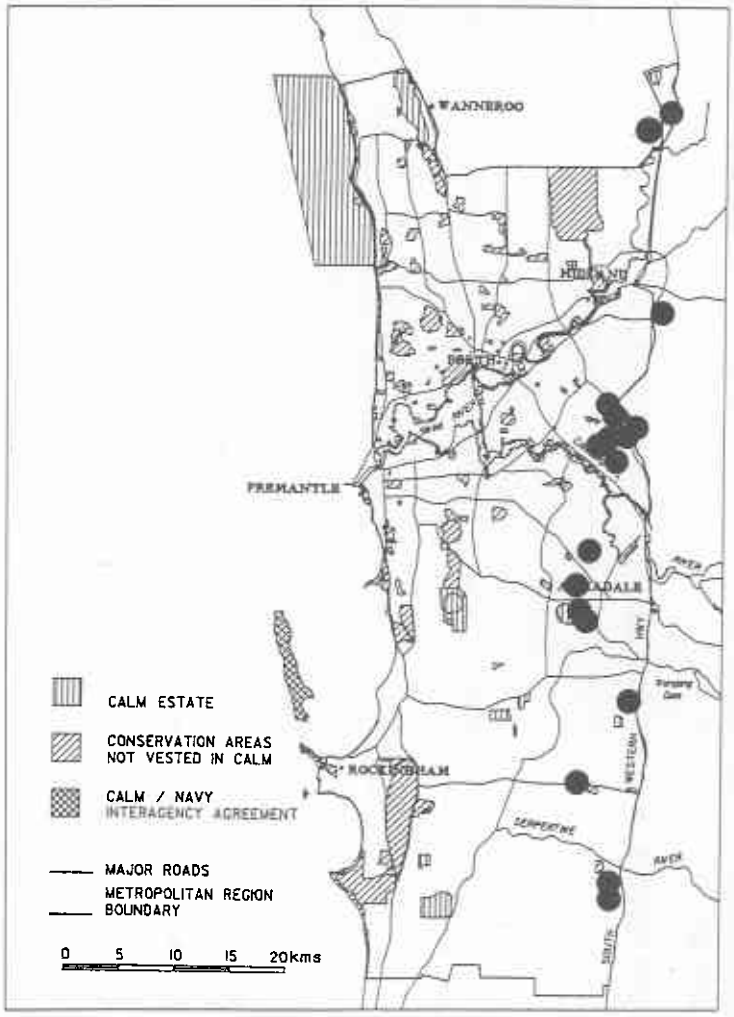
* population not recently surveyed

A - City of Armadale
G - City of Gosnells
K - Shire of Kalamunda
S/ J - Shire of Serpentine-Jarrahdale
Mg - Shire of Mundaring
S - Shire of Swan

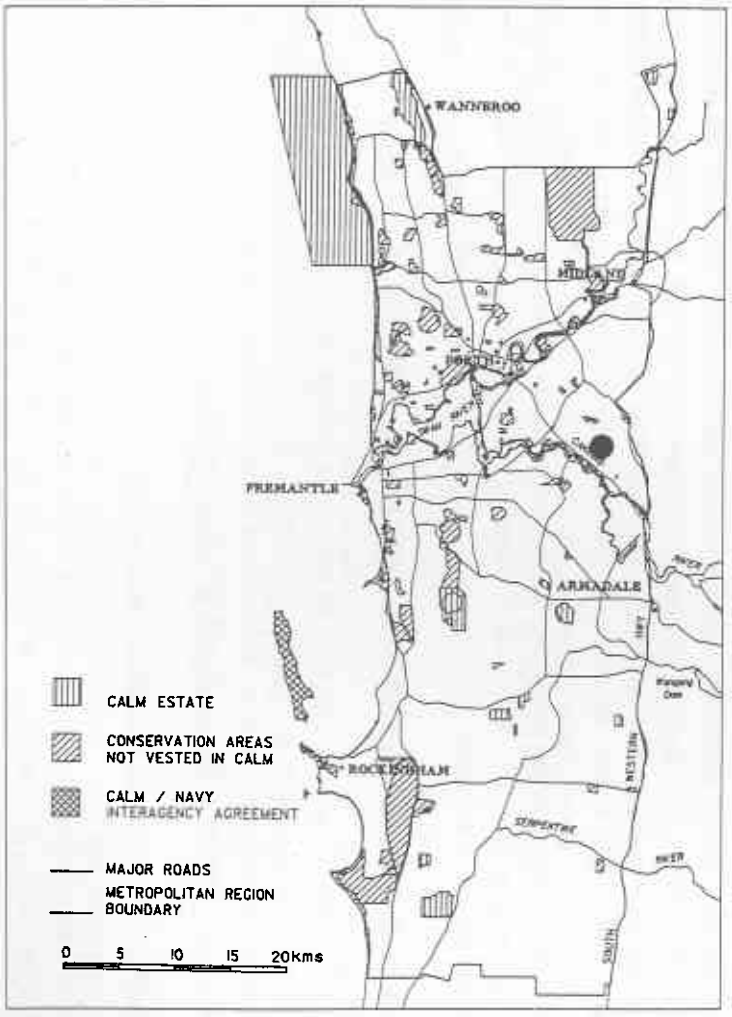
REFERENCES

Bentham (1869); Leigh *et al.* (1984); A. Lowrie[18] (personal communication); Marchant *et al.* (1987).

18 A. Lowrie, Duncraig



● *Stylidium utricularioides*



● *Synaphea acutiloba*

SYNAPHEA ACUTILOBA Meissner

An undershrub with short or spreading stems bearing erect leaves and flowering spikes. The leaves are on petioles to 20 cm long, deeply divided into three lobes and further divided into short, pungent lobes. The yellow flowers are glabrous, 3-4 mm long, on spikes to at least 10 cm long. The peduncle is up to 40 cm long, usually branched several times, glabrous except for short hairs at the base and apex. Flowers in July-September.

There is some doubt regarding the taxonomic status of this species. Marchant *et al.* (1987) states that it is very similar to *Synaphea petiolaris*, with which it should possibly be combined. *S. petiolaris* is distinguished by its larger flowers to 5-6 mm long.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

S. acutiloba occurs over a range of less than 40 km, on the Darling Scarp and eastern side of the coastal plain, from north-west of Gidgegannup to east of Gosnells. In the Metropolitan Area at Kenwick it grows on shallow loams and clays over laterite, in *Viminaria juncea* shrubland. On the scarp it is associated with granite, or less often laterite, in low heath and *Eucalyptus* woodland.

CONSERVATION STATUS - poorly known (priority 3).

A restricted species usually found on the Darling Scarp and recorded occasionally on the heavier soils of the coastal plain. The only confirmed occurrence in the Metropolitan Area is at Kenwick on land proposed for development. It may occur in other isolated pockets of heavy scarp soils that extend into the area. It has been collected from Bellevue (1939), Cannington (1909) and Midland Junction (1897), these areas now being largely cleared. It has been recorded from Helena River, Susannah Brook, Gidgegannup and Ellis Brook on the Darling Scarp and in the foothills at Stratton. It is protected in State forest, Kalamunda National Park and a shire recreation reserve. It is very similar to *S. petiolaris* in appearance, which may account for its poor observation. Intensive specific surveys are required to determine its conservation status.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
24/ 7/ 86	G	Kenwick	Homeswest	'abundant'	good

G - City of Gosnells

REFERENCES

Bentham (1870); Marchant *et al.* (1987).

THYSANOTUS ARBUSCULA Baker

A rhizomatous perennial with erect, dichotomously branching stems up to 95 cm high. The stems are terete, longitudinally ridged and densely covered with short hairs. A few linear, somewhat dry and membranous leaves are occasionally produced. The flowers are mauve, erect, in terminal 4-6-flowered inflorescences. The petals are elliptic, to 10 mm long x 6 mm wide, with a wide fringe. The sepals are linear, to 10 mm long x 2 mm wide. There are six stamens with straight anthers of equal length. Flowers November-January but occasional flowers may be produced as early as September.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Known from scattered localities between Mt Lesueur and the Blackwood River and extending eastward to Brookton and Nannup. In the Metropolitan Area recently recorded from the lower Helena Valley, South Guildford, West Swan and Jandakot areas where it favours deep sand or sandy clay soils, often with some laterite. Associated vegetation is *Banksia attenuata-B. menziesii* woodland or forest over dense heath.

CONSERVATION STATUS - poorly known (priority 3). Recommended status - priority 4.

A widespread species found at several sites in the Metropolitan Area during recent surveys. Observations of this species have been sporadic owing to its summer flowering period and scattered occurrence at any given site. When not in flower it is inconspicuous and difficult to locate. It is probably more frequent in suitable habitats throughout its range and is recommended to be downgraded to priority four status.

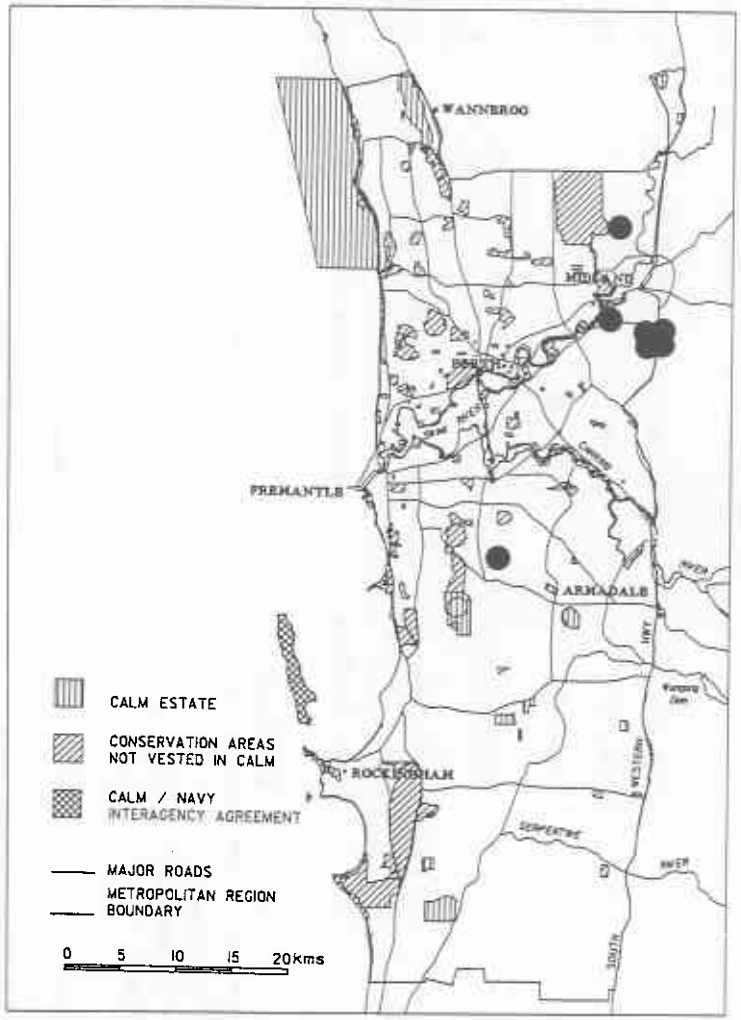
POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
27/ 11/ 90	K	High Wycombe	private	30+	good
6/ 12/ 90	Co	Jandakot	private	2	good
27/ 11/ 90	S	Hazelmere (I)	private & road reserve	165	
27/ 11/ 90	S	Hazelmere (II)	private	26	recently burnt
28/ 11/ 90	S	Helena Valley	Dept. of Defence	650+	proposed development
8/ 12/ 90	S	South Guildford	cemetery reserve & Federal Airports	70+	recently burnt
9/ 12/ 90	S	West Swan	RAAF	9+	

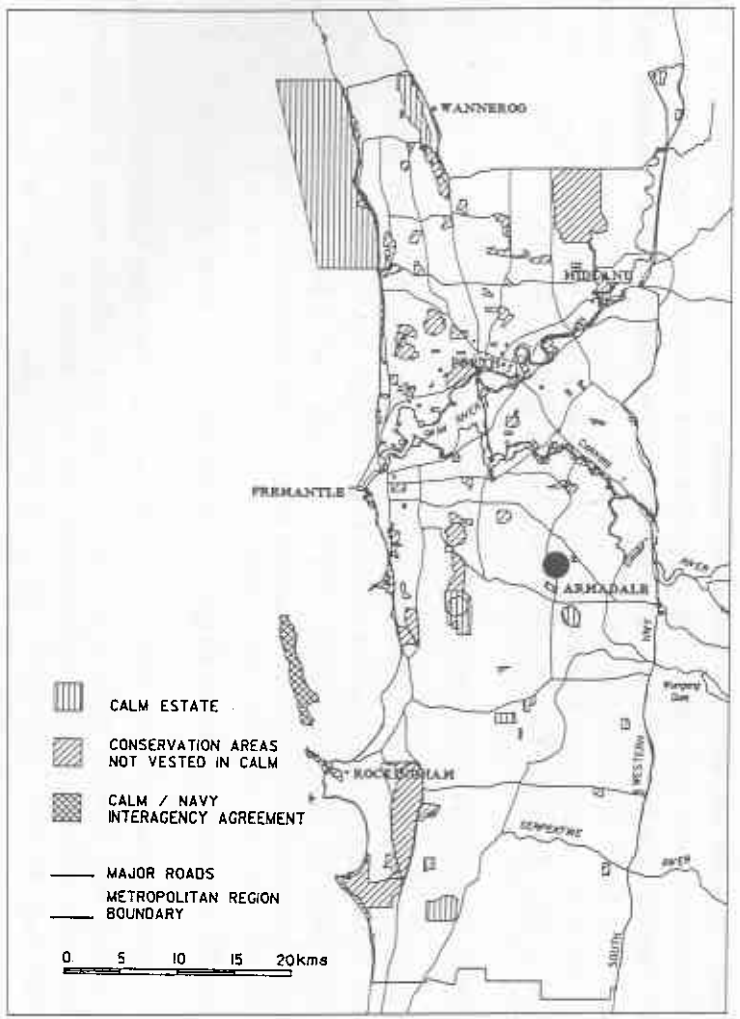
Co - City of Cockburn
K - Shire of Kalamunda
S - Shire of Swan

REFERENCES

Brittain (1981); Marchant *et al.* (1987).



● *Thysanotus arbuscula*



● *Thysanotus glaucus*

THYSANOTUS GLAUCUS Endl.

Thysanotus glaucus is a small, perennial herb with dense clusters of up to 30 leaves arising from a common fibrous rootstock. The leaves are terete, 5-10 mm long, glaucous-blue at the base and sometimes red towards the apex. The mauve flowers are in paniculate inflorescences to 21 cm tall. The flowering stalk extends well above the level of the leaves, and branches in the upper 4-5 cm. There is usually one inflorescence per leaf cluster. The petals are elliptic, to 7 mm wide and 13 mm long, bordered by a fringe to 6 mm wide. There are three stamens per flower, with one filament longer than the others. Anthers are dark purple with yellow bases. *T. glaucus* is distinguished from *T. glaucifolius* by its paniculate inflorescence and unequal staminal filaments. In the Metropolitan Area, flowering occurs in February-March.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

A widely distributed species occurring from the Lesueur National Park to south of Busselton. In the Metropolitan Area, *T. glaucus* has been collected from Bull Creek (1841, type locality) and Canning Vale (1960). The Canning Vale collection was from disturbed sandy soil in open heath. Outside the Metropolitan Area it grows in heath and open *Banksia* woodland, usually on sandy soils.

CONSERVATION STATUS - poorly known (priority 3).

T. glaucus is a widespread species recorded recently from Yelverton State Forest south of Busselton, the Lesueur National Park, north of Lancelin and the foothills east of Perth. At the Canning Vale site in the Metropolitan Area, the vegetation is intact but no plants were located during surveys in March 1991 and 1992. The 1960 collections from this site were made after partial clearing of the area in 1958. It is unlikely to be found at the type locality in Bull Creek. The localities of old herbarium collections east of Jurien, north of Regans Ford and around Busselton require survey. Its late flowering period (December-March) may contribute to its sporadic observation and it is probably more abundant throughout its range.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other lands					
5/ 3/ 60	G	Canning Vale	Prisons Dept.		*

* Site surveyed March 1991 and 1992 - no plants located

G - City of Gosnells

REFERENCES

Brittain (1981); Leigh *et al.* (1984).

VERTICORDIA LINDLEYI Schauer subsp. LINDLEYI

An erect shrub up to 70 cm high, with opposite, narrowly obovate to elliptic leaves that are often fringed with tiny hairs. The leaves are concave, up to 5 mm long, dense to widely-spaced along the stems. Flowers are purplish-pink, about 8-9 mm broad, in fairly dense, spike-like inflorescences. The flowers have a rounded, ribbed hypanthium with reflexed appendages. Petals are ovate, entire or toothed across the upper margin. Each sepal is deeply divided into several lobes fringed with hairs. The subsp. *purpurea* occurs in scattered localities from Brookton to Cranbrook and differs in its darker flowers with petals broad at the apex and deeply toothed. There is some variation within the typical subspecies and further study may be required. Flowers in November-March, sometimes as late as May.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Occurs on low-lying, swampy flats from Gillingarra south to near Forrestdale, with one disjunct collection from the Murray River. In the Metropolitan Area it is found on sand to clayey sand soils, in heath or low scrub characterised by *Pericalymma ellipticum, Verticordia densiflora, Hypocalymma angustifolium* and emergent *Actinostrobus pyramidalis* and *Viminaria juncea.*

CONSERVATION STATUS - poorly known (priority 3).

Known from a number of sites in the Metropolitan Area where it is under increasing threat from development. It has not been recorded from conservation reserves anywhere in its range but is well represented (200+ plants) in a private reserve at Kenwick. It is probably more abundant than records indicate but is often overlooked because of its inconspicuous habit and late flowering period. In the Metropolitan Area, further survey is required at the sites of previous herbarium collections from Maida Vale (1979), Oakford (1981) and Forrestdale (1969). Surveys elsewhere in its range are required to determine its abundance, distribution and representation in conservation reserves.

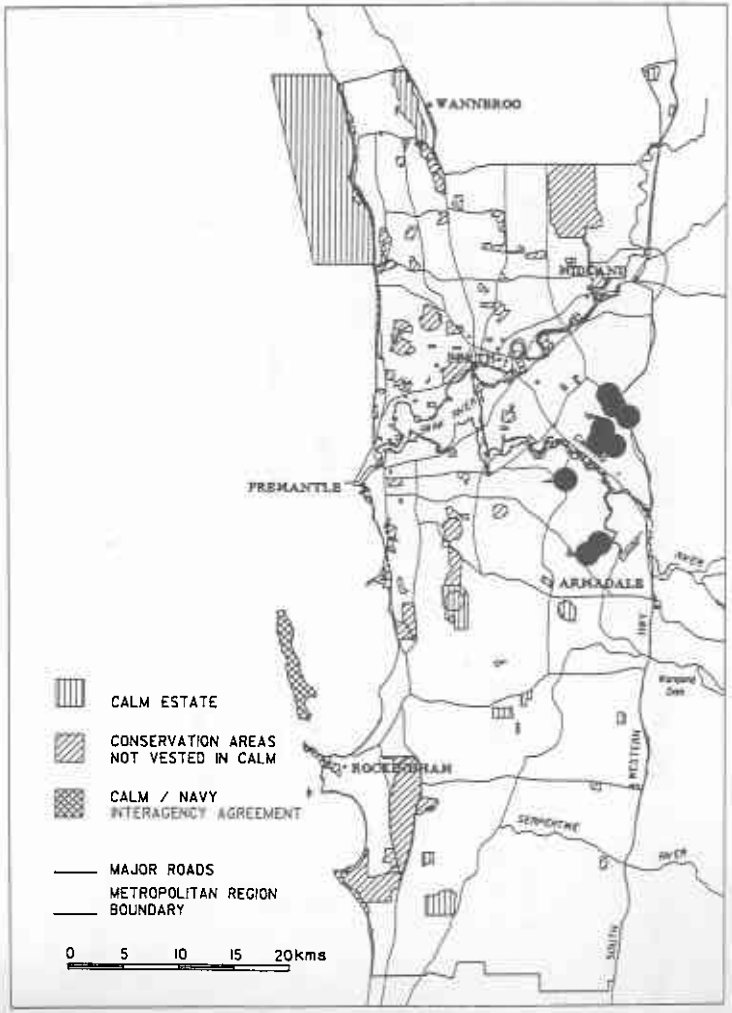
POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
13/3/90	G	Kenwick (I)	private reserve	210+	good
25/5/90	G	Kenwick (II)	private	30+	good
31/3/90	G	Kenwick (III)	private	30+	good
13/1/90	K	Wattle Grove (I)	road reserve	80+	part disturbed
21/3/90	K	Wattle Grove (II)	shire reserve	50+	good
4/4/90	K	Forrestfield	private & road reserve	100+	good
13/3/90	G	Langford	parks & recreation reserve	100+	good
11/5/90	G	Southern River (I)	private	40	disturbed
11/5/90	G	Southern River (II)	private	10+	grazed

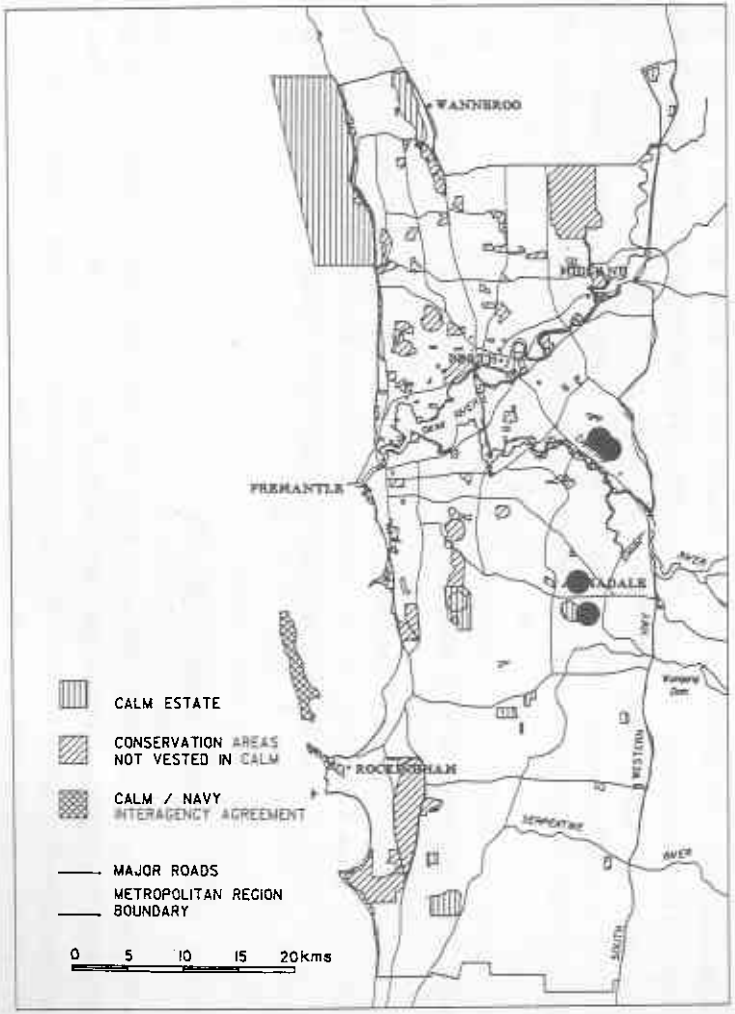
G - City of Gosnells
K - Shire of Kalamunda

REFERENCES

George (1991); Marchant *et al.* (1987).



● *Verticordia lindleyi* subsp. *lindleyi*



● *Villarsia submersa*

VILLARSIA SUBMERSA H.I. Aston

An aquatic, perennial herb with floating leaves and flowers on fine stems up to 60 cm long. The leaf blades are elliptic to lanceolate-ovate, to 6 cm long x 3 cm wide. The upper surface is smooth while the lower surface is paler and finely dotted. The flowers are white, woolly on the inner surface, borne on slender pedicels in a much-branched inflorescence. Fruits are thinly membranous, ellipsoid capsules containing smooth, shiny seeds. Flowers in August-October. Pollination by small native flies has been observed.

DISTRIBUTION AND HABITAT IN THE METROPOLITAN AREA

Villarsia submersa grows in ephemeral, freshwater pools in clay or sandy clay depressions, often in association with *Aponogeton hexatepalus*. Its distribution extends over *ca.* 370 km from Kenwick south to near Albany. At the Metropolitan sites, surrounding vegetation is dominated by *Melaleuca lateritia- M. viminea* heath.

CONSERVATION STATUS - poorly known (priority 3).

Known from four sites in the Metropolitan Area, three of which are under pressure from proposed developments, off-road-vehicle use, rubbish dumping and weed invasion. Outside the Metropolitan Area, it occurs at nine sites including nature reserves, State forest, private property and road and rail reserves. It has proved to be more frequent than originally thought, with many of the records made in the past five years. Its distribution appears to be concentrated in the Busselton-Boyanup area but this may be a result of more intensive surveys.

V. submersa has been reasonably well surveyed in the Metropolitan Area but further searching, particularly in the south of its range near Manjimup and Albany, is required. Protection of at least some of the Metropolitan populations would be desirable. Monitoring of water level and quality may be needed at some sites.

POPULATIONS KNOWN IN THE METROPOLITAN AREA

Date of most recent survey	Local Authority	Population	Land Status	No. of plants	Condition
Other Lands					
11/ 10/ 90	G	Kenwick (I)	Homeswest	50+	part disturbed
11/ 10/ 90	G	Kenwick (II)	private	50+	good
19/ 10/ 89	A	Forrestdale (I)	shire recreation reserve	6	good
5/ 11/ 90	A	Forrestdale (II)	private	100+	part disturbed

A - City of Armadale
G - City of Gosnells

REFERENCES

Leigh *et al.* (1984); Marchant *et al.* (1987).

D. PRIORITY FOUR TAXA

DODONAEA HACKETTIANA W. Fitzg.

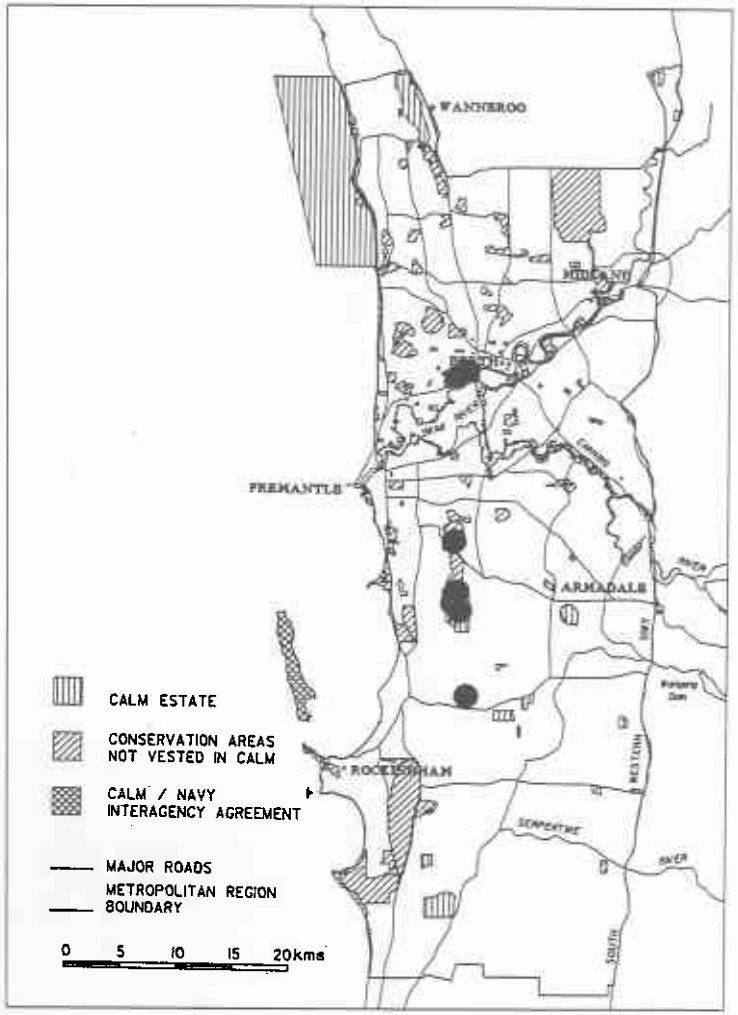
Hackett's Hop Bush

An erect or spreading shrub to 4.5 m high, with male and female flowers borne on separate plants. The leaves are bright green, narrowly elliptic and tapering towards the stems, to 6 cm long x 0.8 cm wide. There are 2 or 3 rows of white or brown hairs on the branchlets. The flowers are small, greenish-yellow, in few- or many-flowered terminal inflorescences that are shorter than the leaves. The fruits are orange-red with three large, membranous wings. Flowers in July-October. Fruits usually mature by December-January.

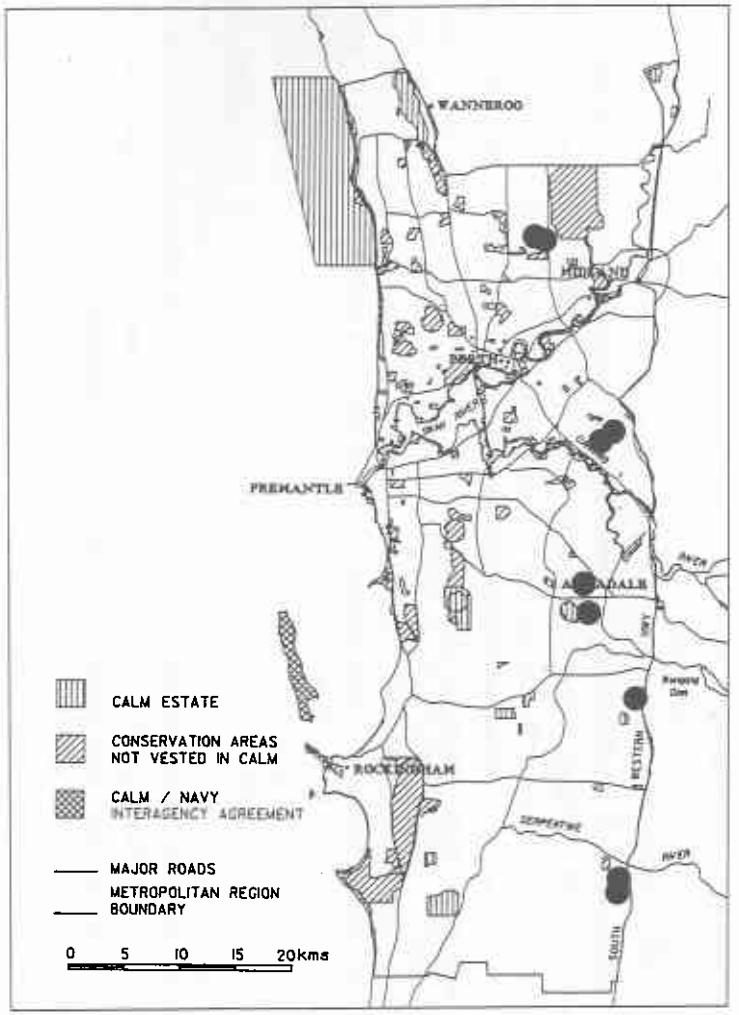
A restricted species occurring in the Metropolitan Area at Kings Park and at several sites between Bibra Lake and The Spectacles. It is abundant at many of these localities, with an estimated total of approximately 4000 plants. It is well protected in a nature reserve, fauna reserve and A Class Public Reserve. Outside the Metropolitan Area, several populations have been recorded from private land and road reserve in the Gingin Shire. The populations at Kings Park occur on limestone in tuart (*Eucalyptus gomphocephala*), jarrah (*E. marginata*) and marri (*E. calophylla*) woodland. The southern populations are often associated with wetlands, growing on sand in flooded gum (*E. rudis*) or jarrah-*Banksia* woodlands. It has been well surveyed in the Metropolitan Area and few further populations are likely.

REFERENCES

Rye (1980); Rye and Hopper (1981).



● *Dodonaea hackettiana*



● *Drosera occidentalis*

DROSERA OCCIDENTALIS Morrison

Minute Pygmy Sundew

A small, insectivorous herb with as many as twenty glandular leaves arranged in a basal rosette up to 1.5 m in diameter. The leaves are round and deeply cupped, to about 1 mm across, on slender stalks to 4 mm long. They are often partially concealed by sand. Small, pinkish-white flowers are solitary and terminal on flower stalks up to 1 cm tall. There is usually one, but may be up to four, flowering stalks per plant. Flowering occurs in October-December and it dies back to ground level during summer.

Drosera occidentalis occurs in moist depressions on the coastal plain and Darling Range from Gingin south to the Murray River. In the Metropolitan Area, it grows amongst native sedges on sandy clay soils at Kenwick, Wattle Grove, Beechboro and Forrestdale. It was gazetted as Declared Rare Flora but deleted from the Schedule in June 1991 because recent surveys found it to be abundant. A total of more than twenty-thousand plants have been recorded from at least twenty sites throughout its range, including State forest, shire reserves and a private reserve. It is a disturbance opportunist that is often found growing in large numbers on cleared firebreaks.

REFERENCES

Erickson (1968).

EUCALYPTUS FOECUNDA Schauer

Coastal Dune Mallee, Fremantle Mallee

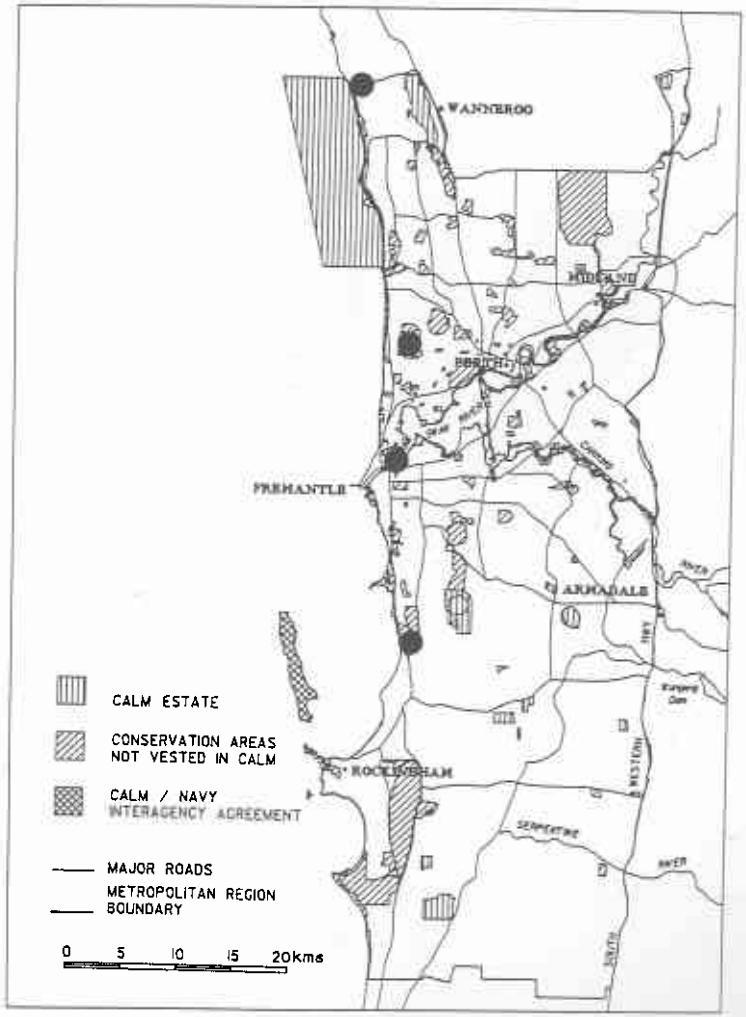
Eucalyptus foecunda is a mallee to 5 m with thin, rough, grey bark and narrow, glossy green adult leaves to 10 cm long x 1.2 cm wide. The flowers are creamy white, in axillary inflorescences often clustered toward the ends of the branchlets. The buds are spindle-shaped and quite red when mature. The fruits are barrel-shaped with a thick rim.

E. foecunda is restricted to coastal areas from Yalgorup north to Arrowsmith, growing on shallow, sandy soils usually over limestone. In the Metropolitan Area, populations are known from Fremantle, Burns Beach, Mt Brown and Perry Lakes. It has been collected at Sorrento but is probably no longer extant there.

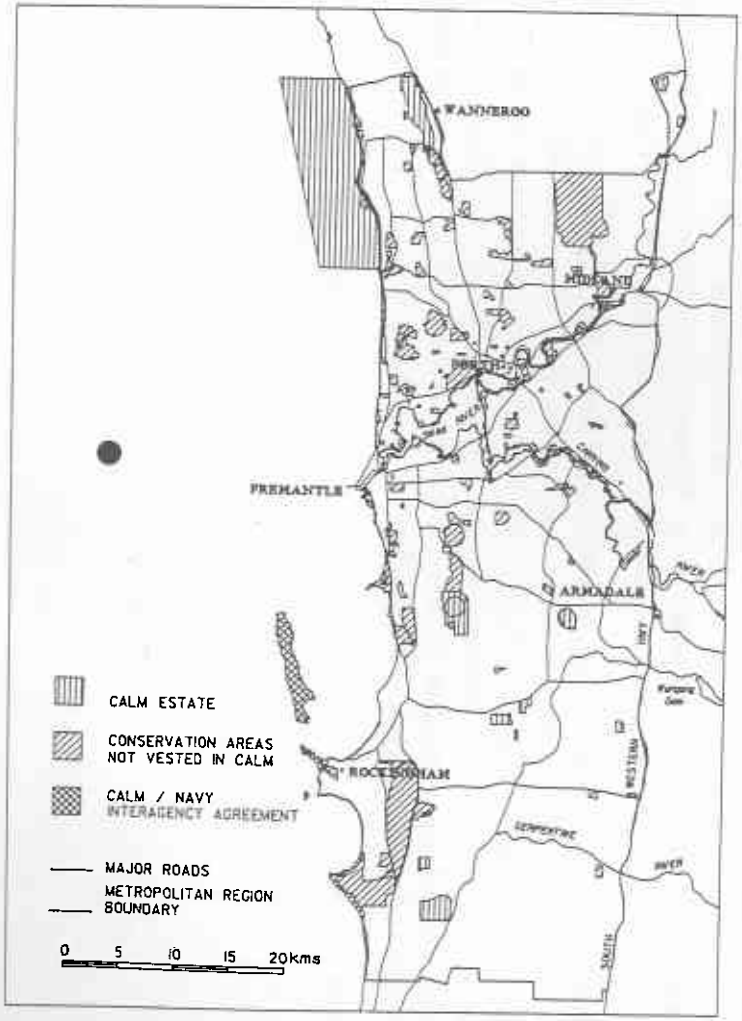
Outside the Metropolitan Area it is known from more than 20 sites, including Yalgorup National Park, Yanchep State Forest and Neerabup National Park. It has been well surveyed in the Metropolitan Area and through most of its range as part of the Survey of Rare and Poorly Known Eucalypts of Western Australia (Kelly *et al.*, in preparation).

REFERENCES

Brooker and Kleinig (1990); Napier *et al.* (1988).



● *Eucalyptus foecunda*



● *Lepidium puberulum*

LEPIDIUM PUBERULUM Bunge

An annual, many-branched herb to 40 cm tall with short hairs covering the leaves and stems. The leaves are petiolate, toothed or divided, up to 3 cm long at the base and becoming smaller further up the stems. There are numerous small flowers to < 1 mm long, in elongated, terminal inflorescences. The fruits are greenish-yellow, circular, to 2.5 mm x 2 mm, on pedicels to 3 mm long. Flowers in July-August.

In the Metropolitan Area, *Lepidium puberulum* has been recorded from Rottnest Island where it was collected by Preiss in 1839. It is otherwise known from several island nature reserves including Dorre Island at Shark Bay, Boullanger Island near Jurien and several of the Abrolhos Islands west of Geraldton. It may occur on other islands of the Metropolitan Area (e.g. Carnac, Penguin and Garden Islands) but specific surveys have not been conducted. Resurvey of Rottnest Island would be desirable as there have been considerable changes to the native vegetation since the original collection.

REFERENCES

Marchant *et al.* (1987).

Table 1. DECLARED RARE FLORA IN THE METROPOLITAN AREA SCORED (1-3) ACCORDING TO THE DEGREE OF THREAT OR URGENCY FOR MANAGEMENT AND RESEARCH ACTION

	Liaison	Monitoring populations	Land acquisition	Vulnerability - small population size	Fire exclusion	Re-establishment	Location of other populations	Seed collection	Propagation	Monitoring water-table	Recreational damage	Weed control	Research	Firebreak/road construction	Fencing	TOTAL
Calytrix breviseta subsp. *breviseta*	3	3	3	3	3	3	2	3	3	1	-	-	2	3	1	33
Epiblema grandiflorum var. *`cyanea'* m.s.	3	3	3	3	3	2	1	3	3	3	-	1	3	-	-	31
Dryandra mimica	3	3	-	3	2	3	1	2	2	-	-	2	3	3	-	27
Diuris micrantha	-	3	-	2	3	-	1	2	2	2	1	3	-	-	-	19
Diuris purdiei	3	2	3	1	1	2	2	-	-	2	1	1	-	-	1	19
Drakaea elastica	3	2	2	2	1	2	2	1	1	-	1	1	-	-	-	18
Caladenia huegelii	3	2	2	2	1	-	3	-	-	-	-	1	1	1	-	16
Aponogeton hexatepalus	3	2	3	-	-	1	-	-	-	1	3	-	-	-	2	15
Hydrocotyle lemnoides	1	1	1	-	-	-	-	-	-	1	3	-	-	-	1	8
TOTAL	22	21	17	16	14	13	12	11	11	10	9	9	9	7	5	

PART FOUR - THE PLAN FOR MANAGEMENT

The objective of the program is:

to ensure and enhance, by appropriate management, the continued survival in the wild of populations of Declared Rare Flora and other plants in need of special protection.

1. Determining Priorities

Part Two assesses the abundance and conservation status of each Declared Rare Flora within the Metropolitan Area and makes recommendations for protection, research and management. On the basis of these recommendations, each taxon was ranked on a scale of 1 to 3 under 15 categories (Table 1) recognised as potential threats for protection and management requirements. Taxa with a low degree of threat or urgency for management and research action were given a score of 1. Those with a high degree of threat were allocated a score of 3. Taxa not threatened or in need of action were marked -. The scores were summed for each of the 9 taxa and for each threat/ requirement category. Table 1 summarises the perceived threats, and management and research requirements for each Declared Rare Flora in the Metropolitan Area.

Table 2 lists the 9 Declared Rare Flora in priority order according to the urgency of their requirement for protection and management action. Taxa with a high ranking score are most threatened and/ or most in need of action. It is intended that all requirements for each taxon, as outlined in the previous species treatments, will be implemented. Work will be conducted, programmed or deferred according to priority, available funds and existing resources and workloads. Attention is directed to Table 2 to determine with which taxon action should commence. This will enable resources and staff within the Metropolitan Area to be allocated where most urgently required.

Taxa most in need of attention for a particular management or research requirement can be determined from Table 1.

Ranking the categories illustrates which are the most critical threats/ requirements in the Metropolitan Area. The Table indicates those taxa that are (or may be) threatened by particular activities, in addition to providing for continued research and management once requirements listed for the priority taxa are fulfilled.

Table 2. METROPOLITAN AREA DECLARED RARE FLORA (AS AT JUNE 1991) RANKED IN ORDER OF PRIORITY FOR PROTECTION AND MANAGEMENT ACTION.

1.	*Calytrix breviseta* subsp. *breviseta*
2.	*Epiblema grandiflorum* var. *'cyanea'* m.s.
3.	*Dryandra mimica*
4.	*Diuris micrantha*
5.	*Diuris purdiei*
6.	*Drakaea elastica*
7.	*Caladenia huegelii*
8.	*Aponogeton hexatepalus*
9.	*Hydrocotyle lemnoides*

2. Management and Research Actions

A confidential Rare Flora database, with precise locality details of known populations, is maintained in the Wildlife Branch. The database is updated regularly as required.

(i) Liaison

Close association and cooperation with private landowners, local authorities, land managers and government agencies (e.g. EPA, DPUD, DOLA, SEC and Main Roads) is essential to ensure the continued survival of the majority of Declared Rare Flora in the Metropolitan Area. Survival of some taxa currently relies entirely on the goodwill of local Shires and private landowners. Departmental staff are required to provide advice and assistance, regarding conservation and management, to landholders and other agencies with Rare Flora populations on land under their control. Landowners are requested to arrange their operations so that the area of Rare Flora will not be destroyed or damaged in any way. Priority taxa for staff liaison with landowners are:

Calytrix breviseta subsp. *breviseta*
Epiblema grandiflorum var. *'cyanea'* m.s.
Dryandra mimica
Diuris purdiei
Drakaea elastica
Aponogeton hexatepalus

(ii) Monitoring of Populations

Where possible, all populations in the Metropolitan Area are to be inspected annually to observe fluctuations in population numbers and to monitor changes in the habitat which may threaten survival. The following species are the highest priority for annual inspection:

Diuris micrantha
Calytrix breviseta subsp. *breviseta*
Epiblema grandiflorum var. *'cyanea'* m.s.
Dryandra mimica

(iii) Land Acquisition

Acquisition of land by the Department, either by donation, exchange or purchase, is required for those taxa without representative populations on conservation reserves throughout their range. Acquisition would enable appropriate management and protection practices to be implemented on land maintained, as much as possible, in a natural state. Plants occurring on land reserved for nature conservation are generally considered to be less endangered 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, like other areas, are subject to threats such as weed invasion, disease infection, drought and uncontrolled fires.

Negotiations are currently underway for acquisition of some sites within the Metropolitan Area. Where land is not available for this purpose, other alternatives (e.g. establishment in suitable habitats in reserves) need to be considered. The following are priority species for land acquisition:

Calytrix breviseta subsp. *breviseta*
Epiblema grandiflorum var. *'cyanea'* m.s.
Diuris purdiei
Aponogeton hexatepalus

Drakaea elastica
Caladenia huegelii

A few sites within the Metropolitan Area support large numbers of Declared Rare and Priority Flora and would be valuable conservation reserves. Acquisition of a single site in Kenwick would protect two Declared Rare flora, as well as five priority one, two priority two, five priority three and one priority four taxa. Likewise an area in Forrestdale would protect one Declared Rare species, two priority one, two priority three and one priority four taxa. Several sites in the Forrestdale, High Wycombe and Wattle Grove areas support large populations of two priority one taxa and would also be desirable for acquisition as conservation reserves.

(iv) Protection from Accidental Destruction

Many taxa within the Metropolitan Area are vulnerable to damage or destruction owing to their extremely small population size or the small area occupied by the known populations. Bulldozing, off-road-vehicles, rubbish dumping and weed control are potential threats to such taxa. Protection is to be achieved by alerting Departmental officers and private landowners of the location of Rare Flora populations, and ensuring that populations and surrounding habitats are excluded from operations and activities conducted in the vicinity. Taxa requiring protection from accidental destruction are:

Dryandra mimica
Calytrix breviseta subsp. *breviseta*
Epiblema grandiflorum var. *'cyanea'* m.s.
Diuris micrantha
Drakaea elastica
Caladenia huegelii

(v) Protection from Fire

A number of taxa, particularly those known from only one or a few localities, require exclusion or protection from fire or specially tailored fire regimes. These taxa should be excluded from prescribed burns on CALM and other lands or be burnt in accordance with specifically developed fire regimes. Such regimes will need to be developed by both research and regional staff. These taxa will also need to be protected (by construction of protective breaks or by reduction of fuels in surrounding areas) where possible from potential uncontrolled fires unless such fires fit the conditions determined for the particular fire regime developed for that taxon. Taxa requiring protection/exclusion from fire until specific fire regimes are developed are:

Diuris micrantha
Epiblema grandiflorum var. *'cyanea'* m.s.
Calytrix breviseta subsp. *breviseta*
Dryandra mimica

NB: In the suppression of uncontrolled fires, the protection of human life and major property assets takes precedence over the protection of endangered flora, but conservation considerations should be taken into account when developing fire control strategies.

(vi) Re-establishment in Suitable Habitats in the Wild

Taxa poorly represented on conservation reserves should be propagated and re-established in suitable, less vulnerable habitats on land designated for nature conservation. Taxa requiring re-establishment into the wild by CALM staff under approved management programs are:

Dryandra mimica
Calytrix breviseta subsp. *breviseta*
Epiblema grandiflorum var. *'cyanea'* m.s.
Diuris purdiei

(vii) Location of Other Populations

Further survey of suitable habitats in the wild is a requirement for almost all of the Declared Rare Flora in the Metropolitan Area. Some taxa are in need of urgent attention, either because of the small number or size of known populations, or their poor representation in conservation reserves. Taxa most urgently in need of intensive field surveys are:

Caladenia huegelii
Drakaea elastica
Diuris purdiei
Calytrix breviseta subsp. *breviseta*

viii) Seed Collection and Storage

Collection and long term storage of seed from wild populations of Declared Rare Flora provides a source of propagation material for future cultivation, in addition to ensuring protection of populations, or more importantly taxa, from extinction. Seed should be collected from the following taxa for storage:

Calytrix breviseta subsp. *breviseta*
Epiblema grandiflorum var. *'cyanea'* m.s.
Diuris micrantha
Dryandra mimica

(ix) Propagation

Although conservation of the Declared Rare Flora in their natural habitats is the priority, all taxa should ideally be established in cultivation. This would eliminate any need for harvesting wild populations and provide insurance against extinction, particularly for those taxa known in the wild from only a few individuals. It will also provide a source of material for re-establishment of populations into suitable conservation areas. Kings Park and Botanic Gardens have an active propagation research program and CALM is commencing work in this area.

Stock plants of the following taxa should be propagated and maintained in cultivation in Departmental nurseries. Any taxa with horticultural potential should be established in general cultivation.

Calytrix breviseta subsp. *breviseta*
Epiblema grandiflorum var. *'cyanea'* m.s.
Diuris micrantha
Dryandra mimica

(x) Water-table Monitoring

A number of taxa in the Metropolitan Area occur in ephemeral, winter-wet habitats. Changes in the drainage patterns and water levels may affect growth and reproduction of these taxa. Monitoring of the sites to ensure that there are no significant changes to the hydrology is required for the following taxa:

Epiblema grandiflorum var. *'cyanea'* m.s.
Diuris micrantha

Diuris purdiei
Calytrix breviseta subsp. *breviseta*
Aponogeton hexatepalus
Hydrocotyle lemnoides

(xi) Protection from Recreational Damage and Provision of Fencing

A few taxa are located at sites where they are actually or potentially at risk from recreational activities. In the Metropolitan Area, off-road vehicle use and horse riding are the major threats. Recreation should be controlled or excluded from sensitive sites depending on the degree of threat. Provision of fencing may be necessary. The following species are in need of protection from recreational damage:

Aponogeton hexatepalus
Hydrocotyle lemnoides
Diuris micrantha
Diuris purdiei
Drakaea elastica

(xii) Control of Competitive Weeds

Control of weeds in and near Rare Flora populations on CALM land is to be conducted by Regional staff. Officers of the Department should liaise closely with the Agriculture Protection Board, Main Roads Department and private landowners when weed control is required near Rare Flora populations on other lands. Weeds are to be removed by hand where a herbicide may destroy or damage Declared Rare Flora. The following taxa require weed control or eradication at their population localities:

Diuris micrantha
Dryandra mimica

(xiii) Research

Only a few of the Declared Rare Flora within the Metropolitan Area have been subject to detailed studies. Research into the taxonomy, genetic systems, population biology and ecology of the other taxa is needed to determine the best means of protecting and managing populations. Response to fire regimes, susceptibility to *Phytophthora* species and other introduced pathogens and impact of exotic bees on native pollinators (particularly of members of the Orchidaceae) require special attention. The following species are most urgently in need of research:

Epiblema grandiflorum var. *'cyanea'* m.s.
Dryandra mimica
Calytrix breviseta subsp. *breviseta*
Caladenia huegelii

(xiv) Protection from firebreak/ road maintenance and construction

Populations located near roads and firebreaks are vulnerable to damage or destruction by maintenance operations. Such activities in the vicinity of Rare Flora populations require careful monitoring. The following taxa are most threatened:

Dryandra mimica
Calytrix breviseta subsp. *breviseta*

(xv) Possible Future Threats

A number of operations are potential threats to the survival of Declared Rare Flora in the Metropolitan Area, where these operations are not properly planned and supervised. The most important of these are:

- construction and maintenance of roads and firebreaks;
- development.

Inspection of sites for Declared Rare Flora should be conducted prior to any operations that could either temporarily or permanently destroy the vegetation. It is important to ensure that areas zoned for such activities have been surveyed for Declared Rare Flora. Where populations have been located, operations may require re-alignment (roads, fire-breaks) or re-location (development).

(xvi) *Phytophthora* Species (Dieback) Hygiene

Insufficient research information is available to assess the impact of the soil-borne pathogens, *Phytophthora* species, on Declared Rare Flora in the Metropolitan Area. Plants not destroyed by direct infection may be affected indirectly by structural and ecological changes in the community caused by dieback. Disturbances such as road construction are known to promote the spread of the disease, particularly in moist, relatively low-lying sites unless carried out under strictly controlled hygiene conditions. Any operations in localities likely to support the pathogen should be conducted under strict hygiene conditions. Urgent research on the impact of dieback on Declared Rare Flora is required.

3. Priority Flora in the Metropolitan Area

The conservation status of the priority flora in the Metropolitan Area was assessed in Part Three. Recommended status, based on recent surveys, is listed in Table 3. The priority for conservation action in the Metropolitan Area is:

Poorly known taxa in need of further survey

- Priority One
- Priority Two
- Priority Three

Taxa requiring monitoring

- Priority Four

4. Term of the Management Program

A recovery team will be appointed which will oversee and report annually to the Corporate Executive on the implementation of this Management Program.

This program shall run for a 10-year period, unless subsequent research or changes to the schedule of Declared Rare Flora cause it to be superseded earlier. During this period, the Department of CALM may institute any changes to the provisions outlined in this program as are found, through further research, to be necessary for conservation of the Declared Rare Flora and priority taxa in the Metropolitan Area.

Table 3 CURRENT AND RECOMMENDED STATUS FOR PRIORITY TAXA IN THE METROPOLITAN AREA

Priority One	**Recommended Status**
Amanita cameiphylla	P1
Amperea protensa	*
Beyeria cygnorum	P1
Calandrinia sp. (Kenwick) G.J. Keighery 10905	P1
Chorizema varium	*
Comesperma rhadinocarpum	P1
Conospermum undulatum	P3
Cryptandra glabrata	P3
Eleocharis sp. (Kenwick) G.J. Keighery 5180	P1
Eryngium 'subdecumbens' m.s.	P1
Eryngium pinnatifidum subsp. *'palustris'* m.s.	P1
Grevillea thelemanniana subsp. *thelemanniana*	P3
Haloragis tenuifolia	*
Hydrocotyle hispidula	P3
Isopogon drummondii	P3
Lepidosperma rostratum	P1
Mitrasacme palustris	*
Schoenus andrewsii	P2
Schoenus pennisetis	P1
Tripterococcus sp. (Cannington) A.S. George 16201	P1
Verticordia plumosa var. *pleiobotrya*	P1
Priority Two	
Haloragis aculeolata	*
Hydatella dioica	P2
Leucopogon glaucifolius	*
Lysinema elegans	P3
Schoenus capillifolius	P2
Priority Three	
Anthotium junciforme	P3
Cartonema philydroides	P4
Conostephium minus	P4
Gonocarpus pithyoides	delete
Helipterum pyrethrum	P3
Jacksonia sericea	P4
Myriocephalus appendiculatus	P2
Philydrella drummondii	P3
Phlebocarya filifolia	delete
Restio stenostachyus	P3
Stylidium utricularioides	delete
Synaphea acutiloba	P3
Thysanotus arbuscula	P4
Thysanotus glaucus	P3
Verticordia lindleyi subsp. *lindleyi*	P3
Villarsia submersa	P3
Priority Four	
Dodonaea hackettiana	P4
Drosera occidentalis	P4
Eucalyptus foecunda	P4
Lepidium puberulum	P4

*Taxa presumed extinct in the Metropolitan Area but known from populations elsewhere.
No recommendations made on priority status.

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GLOSSARY

alternate an arrangement of leaves or other parts which are not opposite or whorled but are placed singly on the axis or stem at different heights

annual plant that completes its full life cycle within a single year

anther part of the stamen where pollen is produced

anthesis the period of flowering i.e. between opening of the bud and onset of withering

appressed pressed closely to another organ but not united

awn a slender, bristle-like appendage

axil the upper angle formed by the junction of the stem with a leaf or similar organ

axillary in the axils

basidiospore a sexual spore produced on the basidium of Basidiomycete fungi

bisexual having male and female reproductive structures in the one flower

bract a leaf-like structure occurring between the normal leaves and the flower or inflorescence

bracteole a small structure, similar in form to a bract and occurring singly or paired on the stalk or calyx of a flower

calli glandular, wart-like structures occurring on the labellum of some orchids

calyx the outermost whorl of a flower, usually consisting of sepals or a calyx tube and calyx lobes. The calyx tube is formed by fusion of the individual sepals. A calyx lobe is one of the free upper parts of the calyx when it is partially fused to form a tube.

cap the head of a mushroom

capsule a dry fruit formed from two or more fused compartments and splitting at maturity to release the seeds

ciliate fringed with hairs

claw the conspicuously narrowed base of a petal or labellum

column a structure formed by fusion of the style, stigma and stamen(s), as in the Orchidaceae

cone an inflorescence or fruit with a central axis bearing overlapping scales

cordate heart-shaped in outline

corolla the inner whorl of a flower, usually consisting of petals or a corolla tube and corolla lobes. A corolla tube is formed when the individual petals are completely or partially fused.

dichotomous divided almost equally into two parts

disc fleshy structure developed usually between the stamens and ovary

dorsal the lower or under surface of a leaf or flower

elliptic oval in outline

ephemeral short-lived

endemic having a distribution confined to a particular geographical region

entire smooth undivided margin without any incisions or teeth

filament the stalk of a stamen which supports the anther

fissured divided or broken into parts

flexuose zig-zagging; wavy

floret one of the small individual flowers that make up a dense inflorescence of a composite flower or the reduced flower of the grasses

foliage a collective term for the leaves of a plant

follicle a dry fruit derived from one carpel and splitting along one line

fusiform spindle-shaped

gills the plate-like structure on the underside of the cap

glabrous without hairs

glaucous blue-green in colour with a whitish bloom

glume one or two bracts at the base of a grass spikelet, or the very small bracts on the spikelet of the Cyperaceae

habit form of a plant including the size, shape, texture and stem orientation

herb a plant which is non-woody or woody at the base only, the above-ground stems usually not persistent

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

indeterminate not terminated absolutely, e.g. an inflorescence in which no flower ends the axis

indigenous native to the area in which it occurs; not introduced

inflorescence an arrangement of more than one flower, usually comprising individual flowers, bracts, pedicels and peduncles

involucre a whorl of bracts surrounding or beneath an inflorescence, resembling and performing the function of a calyx of a single flower

labellum (lip) the usually modified lower petal/ perianth segment of the orchid flower, often differing in morphology and patterning from the two lateral petals

lanceolate narrow and tapering at both ends

lignotuber a woody, usually underground rootstock, often giving rise to numerous above-ground stems

linear long, narrow, straight-sided

lobe partial division of any part

mallee growth form, typical of certain eucalypt species, in which a few to many woody stems arise separately from a lignotuber

mucro a sharp spiny tip

nut a dry indehiscent 1-seeded fruit with a hard woody wall

oblong longer than broad with more or less straight sides

obovate shape resembling an egg with the narrowest end near the point of attachment

obtuse blunt or rounded at the apex

orbicular almost circular and flattened

ovate roughly egg-shaped with the broader end towards the point of attachment

ovoid a solid object that is oval in outline

panicle inflorescence in which the flowers are borne on branches of the main axis or on further branches of these - adjective: paniculate

pedicel the stalk of an individual flower

peduncle the stalk of an inflorescence

perennial a plant continuing its growth from year to year. In herbaceous perennials, leaves and flowers die back to an underground storage or perennating organ. Woody perennials have persistent above-ground parts.

perianth a collective term for the petals and sepals, applied when the petals and sepals are similar in appearance or when either is missing

petal the usually brightly coloured and conspicuous individual segments of the corolla

petiole the stalk of a leaf - adjective: petiolate

pod a dry, usually many-seeded fruit which splits down both sides on ripening to release the seeds

prostrate describing a plant that grows closely along the ground

pubescent covered with fine, short hairs

pungent sharp-pointed

raceme an indeterminate inflorescence with the individually stalked (pedicellate) flowers arising from a simple elongated main axis (peduncle)

recurved bent or curved backwards

resinous sticky with an exudate of resin

reticulate forming a network pattern

revolute with the margins inrolled on the lower surface

rhizome a usually underground stem, bearing buds in axils of reduced scale-like leaves and serving as a means of perennation and vegetative propagation - adjective: rhizomatous

ring (annulus) in mushrooms, the remnant of the inner membrane left as a ring around the stork

rosette	a tuft of leaves radiating outwards from the stem at ground level. Ranging in form from a hemispherical tuft to a flat whorl.
scabrous	rough to touch
sepal	the usually green and leaf-like individual segment of the calyx. In some species, the sepals may be brightly coloured and assume the function of petals.
serrate	having a saw-toothed margin with teeth pointing forward
sessile	without a stalk
sheath	enclosing, covering or surrounding
sheathing	enclosing, covering or surrounding
shrub	a perennial woody plant usually with several stems arising from near ground level
spathulate	spoon shaped; a structure broad at the apex and narrowed towards the base
spike	an unbranched inflorescence in which sessile flowers are borne on an elongated axis
spikelet	a small or secondary spike; the characteristic inflorescence of the grasses (Poaceae) and sedges (Cyperaceae)
spinous	spinelike or with spines
stamen	male reproductive organ of a flowering plant, bearing pollen and typically consisting of a stalk (filament) and pollen bearing portion (anther)
stigma	the usually papillate or glandular receptive tip of the style which receives the pollen at pollination
stipule	one of a pair of leaf-life, scale-like or bristle-like structures inserted at the leaf base or along a petiole
style	the stigma and its stalk, attached to the summit of the ovary
succulent	fleshy, juicy in texture and appearance
terete	cylindrical in cross-section
terminal	at the apex or end furthest away from the organs point of attachment
toothed	with minor projections along the margins
trigonous	three-angled
tuber	the usually underground, swollen part of a stem or root, modified for storage and lasting for one year only
tubercles	a wart-like protuberance
umbel	an inflorescence in which the flowers are borne on individual pedicels of equal length originating from a common point on top of the peduncle
undulate	with a wavy margin
unisexual	having stamens and carpels in separate flowers
whorl	a set of organs arranged in a circle around the axis

(2) A person who makes or obtains a record pursuant to paragraph (b) of subsection (1) of this section shall retain the record for not less than twelve months and produce it on demand to a wildlife officer.

Rare or endangered species of flora.
Added by No. 86 of 1976, s. 17 (As amended by No. 28 of 1979, s. 7.).

23F. (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) of this section 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 license issued under this Act to take protected flora;

(b) the owner or occupier of private land on which rare flora exists; or

(c) authorised by the owner or occupier of land on which rare flora exists,

take any rare flora unless—

(d) where he is not the holder of a license issued under this Act, he first obtains the consent thereto in writing of the Minister;

(e) where he is the holder of a license issued under this Act, he first obtains the further consent thereto in writing of the Minister.

(5) [*This subsection was in section 23F. as added by No. 86 of 1976, however it was repealed by No. 28 of 1979 at the time section 23F. came into operation.*]

(6) A person who takes any rare flora contrary to the provisions of this section is liable on conviction to a penalty not exceeding one thousand dollars. *

(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 five years, as the loss continues.

(8) Where compensation has been paid under subsection (7) of this section for a period of five 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) of this section, whether for a period of five 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 Governor under and subject to the Public Works Act, 1902 for any of the purposes of this Act.

* *Amended to ten thousand dollars on the 28 October 1985 Amendment Act No 58.*

APPENDIX II

[Extract from Government Gazette (No. 70) of 17 May 1991]

WILDLIFE CONSERVATION ACT 1950
WILDLIFE CONSERVATION (RARE FLORA) NOTICE 1991

Made by the Minister under section 23F (2).

Citation

1. This notice may be cited as the *Wildlife Conservation (Rare Flora) Notice 1991*.

Interpretation

2. In this notice—

"extant" means still existing in its original state;

"protected flora" means the classes of flora declared to be protected flora in the notice made by the Minister under section 6 (6) of the Act and published in the *Gazette* on 9 October 1987 at p. 3855;

"rare flora" has the meaning given at section 23F (1) of the Act;

"taxa" includes protected flora that is described by a genus name and any other name or description.

Rare Flora

3. Subject to clause 4 all taxa of protected flora described in items 1 and 2 of the Schedule growing in an original state are declared to be rare flora throughout the whole of the State.

Certain protected flora excluded

4. Clause 3 shall not apply to the taxa of protected flora described in the Schedule when that protected flora is growing in a domesticated or cultivated state.

Revocation

5. The notice made by the Minister under section 23F (2) of the *Wildlife Conservation Act 1950* and published in the *Gazette* on 1 June 1990 at pp. 2486-89 is revoked.

Schedule

(Clause 3)

Protected Flora Declared as Rare Flora

Item 1. Taxa Known to be Extant.

Item 2. Taxa Presumed to be Extinct.

BOB PEARCE, Minister for the Environment.

ITEM 1—TAXA KNOWN TO BE EXTANT

Acacia anomala
Acacia aphylla
Acacia argutifolia
Acacia denticulosa
Acacia depressa
Acacia forrestiana
Acacia 'lanuginophylla' m.s.
Acacia lobulata
Acacia merrickiae
Acacia pharangites
Acacia 'pygmaea' m.s.
Acacia semicircinalis
Acacia simulans
Acacia vassalii
Acacia sp. (Dandaragan) S. van Leeuwen 269
Adenanthos cunninghamii
Adenanthos dobagii
Adenanthos ellipticus
Adenanthos eyrei
Adenanthos ileticos
Adenanthos pungens subsp. effusa
Adenanthos pungens subsp. pungens
Adenanthos velutinus
Allocasuarina fibrosa
Allocasuarina tortiramula
Andersonia sp. (Two Peoples Bay) G. Keighery 8229
Anigozanthos bicolor subsp. *minor*
Anigozanthos humilis subsp. *chrysanthus*
Anigozanthos viridis subsp. *terraspectans*
Anthocercis gracilis
Apium prostratum subsp. *'phillipii'* m.s.
Aponogeton hexatepalus
Asplenium obtusatum
Asterolasia drummondii
Asterolasia grandiflora
Asterolasia nivea
Baeckea arbuscula
Banksia brownii
Banksia cuneata
Banksia goodii

Banksia oligantha
Banksia sphaerocarpa var. *dolichostyla*
Banksia tricuspis
Banksia verticillata
Bentleya spinescens
Billardiera mollis
Boronia adamsiana
Boronia revoluta
Caladenia bryceana subsp. *bryceana*
Caladenia bryceana subsp. *'uncinata'* m.s.
Caladenia 'caesarea' subsp. *'maritima'* m.s.
Caladenia 'christineae' m.s.
Caladenia cristata
Caladenia dorrienii
Caladenia 'elegans' m.s.
Caladenia 'excelsa' m.s.
Caladenia 'exstans' m.s.
Caladenia 'harringtoniae' m.s.
Caladenia 'hoffmanii' m.s.
Caladenia huegelii
Caladenia integra
Caladenia 'viridescens' m.s.
Caladenia 'voigtii' m.s.
Caladenia wanosa
Calectasia sp. (central wheatbelt) K. Dixon 861
Calytrix breviseta subsp. *breviseta*
Chamelaucium 'erythrochlora' m.s.
Chamelaucium 'griffinii' m.s.
Chamelaucium 'roycei' m.s.
Conospermum toddii
Conostylis drummondii
Conostylis lepidospermoides
Conostylis micrantha
Conostylis misera
Conostylis rogeri
Conostylis seorsiflora subsp. *trichophylla*
Conostylis setigera subsp. *dasys*
Conostylis wonganensis
Coopernookia georgei
Corybas 'limpidus' m.s.
Darwinia acerosa
Darwinia apiculata
Darwinia carnea
Darwinia collina
Darwinia 'ferricola' m.s.
Darwinia macrostegia
Darwinia masonii
Darwinia meeboldii
Darwinia oxylepis
Darwinia squarrosa
Darwinia wittwerorum
Darwinia sp. (Stirling Range) G.J. Keighery 5732
Daviesia 'bursarioides' m.s.
Daviesia euphorbioides
Daviesia 'megacalyx' m.s.
Daviesia 'microcarpa' m.s.
Daviesia 'oxylobium' m.s.
Daviesia 'pseudaphylla' m.s.
Daviesia purpurascens
Daviesia 'speciosa' m.s.
Daviesia spiralis
Diuris drummondii
Diuris purdiei
Diuris sp. (Kwinana) A.P. Brown 10.9.84
Diuris sp. (Northampton) A.P. Brown 203
Drakaea 'confluens' subsp. *'confluens'* m.s.
Drakaea 'confluens' subsp. *'isolata'* m.s.
Drakaea 'concolor' m.s.
Drakaea elastica
Drakaea 'micrantha' m.s.
'Drakonorchis barbarella' m.s.
'Drakonorchis drakeoides' m.s.
Drosera fimbriata
Drummondita ericoides
Drummondita hassellii var. *longifolia*
Dryandra mimica
Dryandra serratuloides
Dryandra sp. (Kamballup) M. Pieroni 20.9.88
Dryandra sp. (Stirling Range) F. Lullfitz 3379
Epiblema grandiflorum var. *'caeruleum'* m.s.
Eremophila caerulea subsp. *'merrallii'* m.s.
Eremophila denticulata subsp. *denticulata*
Eremophila denticulata subsp. *'trisulcata'* m.s.
Eremophila inflata
Eremophila microtheca
Eremophila nivea
Eremophila racemosa
Eremophila resinosa
Eremophila 'subteretifolia' m.s.
Eremophila ternifolia
Eremophila 'veneta' m.s.
Eremophila verticillata
Eremophila virens
Eremophila viscida
Eriostemon wonganensis
Eucalyptus 'absita' m.s.
Eucalyptus 'argutifolia' m.s.
Eucalyptus 'articulata' m.s.
Eucalyptus 'balanites' m.s.
Eucalyptus beardiana
Eucalyptus bennettiae
Eucalyptus brevipes
Eucalyptus burdettiana
Eucalyptus ceracea
Eucalyptus cerasiformis
Eucalyptus coronata
Eucalyptus 'crispata' m.s.
Eucalyptus crucis subsp. *crucis*
Eucalyptus crucis subsp. *'praecipua'* m.s.
Eucalyptus 'cuprea' m.s.
Eucalyptus 'dolorosa' m.s.
Eucalyptus erectifolia
Eucalyptus goniantha subsp. *goniantha*
Eucalyptus 'graniticola' m.s.
Eucalyptus 'impensa' m.s.
Eucalyptus insularis
Eucalyptus johnsoniana
Eucalyptus lateritica
Eucalyptus 'leprophloia' m.s.
Eucalyptus merrickiae
Eucalyptus mooreana
Eucalyptus 'olivacea' m.s.
Eucalyptus rhodantha var. *petiolaris*
Eucalyptus rhodantha var. *rhodantha*
Eucalyptus steedmanii
Eucalyptus suberea
Eucalyptus synandra s.s.
Eucalyptus sp. (Cape Naturaliste) K.H. Rechinger 58888
Eucalyptus sp. (Midlands Highway) M.I.H. Brooker 8734
Eucalyptus sp. (Moresby Range) S.D. Hopper 2759
Eucalyptus sp. (Norseman) S.D. Hopper 2736
Gastrolobium appressum
Gastrolobium callistachys
Gastrolobium glaucum
Gastrolobium graniticum
Gastrolobium hamulosum
Gastrolobium tomentosum
Grevillea calliantha
Grevillea cirsiifolia
Grevillea dryandroides
Grevillea inconspicua
Grevillea infundibularis
Grevillea involucrata
Grevillea prostrata
Grevillea saccata
Grevillea scapigera
Hakea aculeata
Hakea megalosperma
Halosarcia bulbosa
Hemiandra gardneri

Hemiandra rutilans
Hemigenia viscida
Hensmania chapmanii
Hibbertia sp. (Porongurups) R.D. Hoogland 12186
Hydrocotyle lemnoides
Isopogon uncinatus
Kennedia beckxiana
Kennedia glabrata
Kennedia macrophylla
Lambertia echinata subsp. *echinata*
Lambertia fairallii
Lambertia orbifolia
Laxmannia jamesii
Lechenaultia chlorantha
Lechenaultia laricina
Lechenaultia pulvinaris
Lechenaultia superba
Lepidium catapycnon
Leucopogon obtectus
Melaleuca sciotostyla
Microcorys eremophiloides
Microtis globula
Myoporum cordifolium
Myoporum turbinatum
Myriophyllum petraeum
Pandanus spiralis var. *flammeus*
Pimelea rara
Pittosporum moluccanum
Pityrodia augustensis
Pityrodia scabra
Pleurophascum occidentale
Prostanthera carrickiana
Prostanthera magnifica
Pterostylis sp. (Northampton) S. D. Hopper 3349
Ptychosema pusillum
Pultenaea pauciflora
Restio abortivus
Rhagodia acicularis
Rhizanthella gardneri
Ricinocarpos trichophorus
Roycea pycnophylloides
Sowerbaea multicaulis
Spirogardnera rubescens
Stawellia dimorphantha
Stylidium coroniforme
Stylidium galioides
Stylidium plantagineum
Stylidium scabridum
Tetratheca aphylla
Tetratheca harperi
Tetratheca 'paynteri' m.s.
Thelymitra benthamiana
Thelymitra psammophila
Thelymitra stellata
Thomasia montana
Thomasia sp. (York) A.S. George 8075
Thryptomene wittweri
Tribonanthes purpurea
Verreauxia verreauxii
Verticordia fimbrilepis
Verticordia harveyi
Verticordia helichrysantha
Verticordia hughanii
Verticordia staminosa
Verticordia sp. (Fitzgerald) C.A. Gardner 9148
Villarsia calthifolia
Wurmbea drummondii
Wurmbea tubulosa
Wurmbea sp. (Cape Naturaliste) S.D. Hopper 5871
Xyris sp. (Stirling Range) G.J. Keighery 7951

ITEM 2—TAXA PRESUMED TO BE EXTINCT

Acacia prismifolia
Acacia volubilis
Beyeria lepidopetala
Calothamnus accedens
Centrolepis caespitosa
Coleanthera virgata
Cryptandra nudiflora
Cryptandra tubulosa
Deyeuxia drummondii
Dicrastylis morrisonii
Eriostemon falcatus
Eucalyptus rameliana
Frankenia conferta
Frankenia decurrens
Frankenia parvula
Glyceria drummondii
Gonocarpus intricatus
Grevillea batrachioides
Gyrostemon reticulatus
Haloragis platycarpa
Hemigenia exilis
Hemigenia obtusa
Hydatella leptogyne
Hypocalymma longifolium
Lasiopetalum rotundifolium
Lepidium drummondii
Leptomeria dielsiana
Leptomeria laxa
Leucopogon cryptanthus
Leucopogon marginatus
Menkea draboides
Meziella trifida
Nemcia lehmannii
Opercularia acolytantha
Phlegmatospermum drummondii
Platysace dissecta
Plectrachne bromoides
Pseudanthus nematophorus
Ptilotus fasciculatus
Ptilotus pyramidatus
Scaevola attenuata
Scaevola macrophylla
Schoenus natans
Spyridium kalganense
Spyridium microcephalum
Stylidium merrallii
Stylidium neglectum
Taraxacum cygnorum
Tetraria australiensis
Tetratheca elliptica
Tetratheca fasciculata
Thomasia gardneri
Verticordia plumosa var. (Serpentine) L. Preiss 174

APPENDIX III

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

POLICY STATEMENT NO. 9

CONSERVATION OF THREATENED FLORA IN THE WILD

MAY 1991

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 endangered 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 landowners 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 (not including hybrids) which are protected flora declared under the Wildlife Conservation Act may be recommended for gazettal as declared rare (threatened) flora if they satisfy the following criteria:

i) the taxon (species, subspecies, variety) is well-defined, readily identifiable and represented by a voucher specimen in a State or National Herbarium. It need not necessarily be formally described under conventions of 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).

(Plants which occur on land reserved for nature conservation may be considered less in need of special protection that 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:

i) 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;

ii) the taxon is shown to be a hybrid;

or

iii) 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" Endangered 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 to 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:

3.1 Identify, locate and seek to conserve threatened flora.

3.2 Undertake research into the taxonomy, population biology, ecology, protection and propagation of threatened flora.

3.3 Implement management practices to conserve threatened flora and its habitat.

3.4 Publicise the need for conservation of threatened flora, and encourage involvement in conservation from all sectors of the community.

3.5 Liaise with other land management and research agencies and private landowners to enhance the study and conservation of threatened flora.

3.6 Develop and manage a geographic database for threatened flora at its headquarters and at regional and district officers.

5. STRATEGIES

To accomplish the Departmental 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 co-ordinated.

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 of Endangered (Threatened) Flora in Departmental Operations".

5.10 Monitor known populations of threatened flora.

5.11 Maintain a geographic and biological database 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 approved management programmes 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

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 "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."

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 (e.g. granite outcrops) will require less time to survey than those more catholic in habitat preference.

3. Plant size

   Large conspicuous perennial plants (e.g. 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.

Geographical Range	Area of available habitat	Recommended period of full time field survey	
		*Taxon easily identifiable any time	# Taxon identifiable with difficulty over short flowering period in certain years
< 50 km	small	0.5-1 month	1-2 months over several years
	large	1-2 months	3-6 months over a decade
> 50 km	small	3-6 months	6-12 months over a decade
	large	6-12 months	not possible

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

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.