INTERIM RECOVERY PLAN NO. 159

MATTED CENTROLEPIS (*CENTROLEPIS CAESPITOSA*)

INTERIM RECOVERY PLAN

2004-2008

[1]Sandra Gilfillan and [2]Sarah Barrett

[1] Conservation Officer, CALM Albany District, 120 Albany Hwy, Albany 6330.
[2] Flora Conservation Officer, CALM Albany District, 120 Albany Hwy, Albany 6330.

Photograph: Diana Papenfus

January 2004

Department of Conservation and Land Management
South Coast Regional Office, 120 Albany Hwy, Albany WA 6330

Natural Heritage Trust
Helping Communities Helping Australia

Government of Western Australia

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50.

IRPs outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

CALM is committed to ensuring that Critically Endangered taxa are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and by ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

This Interim Recovery Plan will operate from January 2004 to December 2008 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be reviewed after five years and the need for a full Recovery Plan will be assessed.

This IRP was given regional approval on 14 June 2004 and was approved by the Director of Nature Conservation on 22 July 2004. The allocation of staff time and provision of funds identified in this IRP is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

Information in this IRP was accurate at January 2004.

ACKNOWLEDGMENTS

The following people have provided assistance and advice in the preparation of this Interim Recovery Plan:

Kate Brunt	Conservation Officer, CALM's Merredin District
Rebecca Evans	Conservation Officer, CALM's Swan Region
Bethea Loudon	Conservation Officer, CALM's Katanning District
Robyn Luu	Project Officer, WATSCU
Andrew Webb	Nature Conservation Officer, CALM's Blackwood District
Rosemarie Rees	Project Officer (TECs) WATSCU
Andrew Brown	Coordinator (Threatened Flora) WATSCU

Thanks also to staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and the Department's Wildlife Branch for their assistance.

SUMMARY

Scientific Name:	*Centrolepis caespitosa*	**Common Name:**	Matted centrolepis
Family:	Centrolepidaceae	**Flowering Period:**	September to November
CALM Regions:	South Coast, Swan, Wheatbelt, South West	**CALM Districts:**	Albany, Merredin, Katanning, Swan Coastal, Perth Hills,.Blackwood
Shires:	Albany (City), Murray, Swan, Cunderdin, Woodanilling, Busselton	**Recovery Teams:**	Swan Region and Merredin District Threatened Flora and Communities Recovery Teams, South West Region, Katanning District and Albany District Threatened Flora Recovery Teams

Illustrations and/or further information: Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia; Western Australian Herbarium (1998) FloraBase - Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. http://www.calm.wa.gov.au/science/.

Current status: *Centrolepis caespitosa* was declared as Rare Flora in 1991 (as presumed extinct). However, some three years later (1994) it was placed on the extant list after it was found that Greg Keighery had collected it at the South Stirling town site in 1976. It is currently ranked as Endangered (EN) under World Conservation Union (IUCN 2000) Red List criterion D. However, as one population contains more than 250 mature individuals it no longer meets EN. The species now meets VU under criterion D due to population sizes numbering less than 1000 mature individuals.

There are currently eight known populations of *Centrolepis caespitosa*, three of which occur in CALM's Swan Region, two in the South Coast Region, two in the Wheatbelt Region and one in the South West Region. It is thought that further intensive survey will result in more populations being found. The main threats are weed invasion, changed hydrology/salinity, road maintenance and trampling and/or grazing by stock or rabbits.

Habitat requirements: *Centrolepis caespitosa* occurs in winter-wet clay pans dominated by low shrubs and sedges (Brown *et al.* 1998).

Critical habitat: The critical habitat for *Centrolepis caespitosa* comprises the area of occupancy of the known population; similar habitat within 200 metres of the known population; remnant vegetation that links subpopulations; and additional nearby occurrences of similar habitat that do not currently contain the species but may have done so in the past and may be suitable for translocations.

Habitat critical to the survival of the species, and important populations: Given that this species is listed as Endangered it is considered that all known habitat for wild and translocated populations is habitat critical, and all populations are important ones.

Benefits to other species/ecological communities: *Centrolepis caespitosa* occurs within three Threatened Ecological Communities (TEC's). The Merredin District population (Population 3) is part of the *Mortlock River Salt Flats* TEC, the Blackwood District population (Population 8) occurs within *the Shrublands on southern Swan Coastal Plain Ironstones* TEC. Population 2 occurs within *Herb rich shrublands in clay pans* (site = Meelon01 and Meelon02) TEC, which corresponds to community type 8 of Gibson *et al.* (1994). There is a current IRP for the *Shrublands on southern Swan Coastal Plain Ironstones* TEC (English 1999) and an IRP is planned for the *Mortlock River Salt Flats* TEC [1]. Recovery actions included in these IRP's will benefit *Centorolepis caespitosa*, and recovery actions for *C. caespitosa* will improve the condition of the above TEC's.

A population of the threatened plant taxon, *Diuris micranthera*, occurs with *Centrolepis caespitosa* in one location and two Priority species (*Triglochin stowardii* and *Wurmbea drummondii*) occur in the vicinity of *C. caespitosa* at Woodanilling. Recovery actions put in place for *C. caespitosa* will also benefit these species.

International Obligations: This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that convention. The taxon is not listed under any specific international treaty, however, and therefore this IRP does not affect Australia's obligations under any other international agreements.

Role and interests of indigenous people: According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, no sites have been discovered near the *Centrolepis caespitosa* populations. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *C. caespitosa*, and this is discussed in the recovery actions.

[1] Rosemarie Rees, WATSCU.

Social and economic impacts: The implementation of this recovery plan has the potential to have some minimal social and economic impact as some populations are located on private property. However, recovery actions refer to continued negotiations between stakeholders with regard to these areas.

Evaluation of the Plans Performance: The Department of Conservation and Land Management, in conjunction with relevant Recovery Teams, will evaluate the performance of this IRP. In addition to annual reporting on progress of listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented –

1. Staff at CALM's Perth District are liaising with managers at Pearce Airbase to ensure that populations of DRF on their land are not accidentally destroyed or damaged.
2. Science Division staff, whilst completing a floristic survey of the southern Swan Coastal Plain, investigated many of the typical habitats for the species, locating Population 2 (Gibson, *et al.*, 1994).
3. An attempt was made by Albany District to relocate the original Pfeiffer Road population (population 1). This has been unsuccessful to date.
4. A population was located on private property north-east of Woodanilling by Bronwen Keighery during the Wildflower Society of Western Australia's bushland plant survey project in 1997. This population has been fenced and stock excluded since 1978.
5. A new population of *Centrolepis caespitosa* containing over 500 plants was located in the Albany District in 2001 and is protected from grazing.
6. Rare Flora Markers have been installed at the South Coast Region population (population 6) and the Department of Main Roads has been informed of its location.

IRP Objective: The objective of this Interim Recovery Plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the species in the wild.

Recovery criteria:

Criterion for success: The number of individuals within populations and/or the number of populations have increased by 10% or more over the period of the plan's adoption under the EPBC Act.
Criterion for failure: The number of individuals within populations and/or the number of populations have decreased by 10% or more over the period of the plan's adoption under the EPBC Act.

Recovery actions

1. Coordinate recovery actions
2. Urgent resurvey of selected populations
3. Investigate and implement restrictions to vehicle access at Population 5
4. Conduct further surveys
5. Monitor populations
6. Develop and implement a fire management strategy
7. Undertake weed control
8. Install fencing at population 3
9. Collect seed
10. Seek improved security for populations
11. Promote awareness
12. Obtain biological and ecological information
13. Review the need for a full Recovery Plan and seek funds for its preparation if required.

1. BACKGROUND

History

D.A. Cooke described *Centrolepis caespitosa* in 1980 (Cooke 1980) from a collection made by Alexander Morrison in 1904 from Beenup [Beenyup] in the Byford area. At the time of description the species was known only from the holotype and in 1991 was declared as Rare Flora and ranked as Presumed Extinct. In 1992 Cooke (Cooke 1992) reported that he had identified a collection of the species made from south of the South Stirling town site by Greg Keighery in 1976. The species was transferred from extinct to extant on CALM's Declared Rare and Priority Flora List in 1994 (Atkins 1994).

Two new populations of the species were recorded during the Floristic Survey of the southern Swan Coastal Plain in 1994 (Gibson *et al.* 1994).

Currently, the species is known from eight populations over a wide area between the South Coast, Perth and Meckering.

Description

Centrolepis caespitosa is a diminutive, densely tufted, glabrous annual herb. The leaves are red or green, slender and 5-10 mm long. These form a dense clump or cushion up to 2 cm in diameter. The inflorescences, which are cylindrical and held on the ends of the branchlets, do not extend beyond the leaves and are enclosed by two red/brown bracts, of which the outer has a long leaf like extension 2 to 4 mm long. Typically, the inflorescence contains a single flower consisting of a stamen, ovary, and style. The single flowered inflorescence distinguish this species from dwarf centrolepis (*Centrolepis humillima),* which has 2-5 flowers in each head (Brown *et al*. 1998).

Distribution and habitat

Very little is known about *Centrolepis caespitosa* as it is very small and inconspicuous and, being an annual herb, dies over summer (Evans *et al*. 2003). Eight populations are known over a large geographical range from the South Coast near Denmark, north to the Swan Coastal Plain and east to Meckering. Due to its inconspicuous nature, the taxon is difficult to locate and the possibility of finding more populations is highly unlikely unless the species is specifically targeted for survey (Evans *et al*. 2003).

The species generally occurs on swampy loam in low-lying winter depressions that are occasionally inundated with fresh (not saline) water and are dominated by low shrubs and sedges (Brown *et al*. 1998, Evans *et al*. 2003). It was recorded in the Floristic Survey of the southern Swan Coastal Plain in 1994 from two community types; herb rich shrubland in clay pans (Type 8) and shrubland on southern ironstone (Type 10b) (Gibson *et al.* 1994).

Habitat is *Cyathochaeta avenacea, Pericalymma ellipticum, Astartea* sp, *Meeboldina* sp. *Schoenus* sp. *Centrolepis glabra, C. mutica* (Population 6) (Barrett 2001), *Melaleuca viminea,* shrub over *Calothamnus lateralis,* open Low Shrub A on mixed herbs and *Leptocarpus* species and low sedges (Population 5) (Evans *et al*. 2003).

The two communities in which the species was recorded during the Floristic Survey of the southern Swan Coastal Plain (Gibson *et al.* 1994) contain the associated species *Centrolepis aristata, Chorizandra enodis, Drosera menziesii* subsp. *menziesii, Drosera rosulata, Goodenia micrantha, Haemodorum simplex, Hyalosperma cotula* and *Schoenus odontocarpus* (community type 8) and *Aphelia cyperoides, Centrolepis aristata, C. drummondiana, Borya scirpoidea, Caladenia marginata, Caustis dioica, Dampiera linearis, Drosera glanduligera, D. rosulata, Loxocarya magna ms, Mitrasacme paradoxa, Opercularia vaginata, Philydrella pygmaea, Polypompholyx multifida, Schoenus odontocarpus, Stylidium calcaratum, Thelymitra antennifera, Thysanotus thyrsoides,* and the shrubs *Acacia stenoptera, Hakea varia (*Yellow flowered ironstone form*), Hemiandra pungens and Viminaria juncea* (community type 10b)

Biology and ecology

The family Centrolepidaceae has its centre of diversity in Australia. *Centrolepis* is one of three genera within the family and consists of small tufted annual or cushion-forming perennial monocots. There are 22 species of *Centrolepis* in Australia (Cooke 1992). The following is known of the biology and ecology of *C. caespitosa:*

Fire - Being an annual the species is dead during the most vulnerable fire risk season but some seed remains held in the old inflorescences. It is not known however, if fire kills the seed (Evans *et al*. 2003). Fire in spring may result in local extinction depending on the presence and longevity of any soil-stored seed bank.
Disturbance - Unknown, but high levels of disturbance to the habitat may influence the species ability to flower and set seed (Evans *et al*. 2003).
Disease - Unknown
Grazing - Grazing of flowering plants would reduce the species reproductive capacity, but the species is small and occurs in wet areas when flowering, therefore reducing the likelihood of high grazing impact (Evans *et al*. 2003).
Propagation - Unknown and not known in cultivation (Evans *et al*. 2003).
Other - The seed is held in the inflorescence on dead adult plants over summer, to be released in the first rains. It is thought that this protects the seed from high temperatures and predation (Brown *et al.*, 1998).

Threats

Centrolepis caespitosa was declared as Rare Flora in 1991 as presumed extinct. However, some three years later (1994) it was placed on the extant list after it was found that Greg Keighery had collected it at the South Stirling town site in 1976. It is currently ranked as Endangered (EN) under World Conservation Union (IUCN 2000) Red List criterion D. However, as one population contains more than 250 mature individuals it no longer meets EN. The species now meets VU under criterion D due to population sizes numbering less than 1000 mature individuals. The main threats are weed invasion, changed hydrology, road maintenance and trampling and/or grazing by stock or rabbits.

- **Weed invasion** is a threat to populations that occur in degraded habitat. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many weed species.

  Winter-wet habitats are readily invaded by weeds, particularly after disturbance (Brown *et al.* 1998). Several weed species have been recorded in association with *Centrolepis caespitosa*. These include *Briza minor, Cicendia filiformis, Gladiolus* or *Watsonia* sp. and *Ehrharta calycina* (Gibson *et al.* 1994, Barrett 2001).

  The TEC that *Centrolepis caespitosa* population 2 occurs in (Meelon01, Meelon02) is under threat from weeds, and weed control is considered a priority. The Mortlock River Salt Flats TEC of which population 3 is a part is also threatened by weed invasion.

- **Changed hydrology / salinity.** The immediate impact of changed hydrology on *Centrolepis caespitosa* is not known. However, as this species occurs in winter-wet habitats any significant changes in hydrology will impact on populations over time by potentially limiting the amount of suitable habitat or changing the conditions required for its growth, flowering and seed germination.

  The Mortlock River Salt Flats TEC, in which population 3 occurs, is under threat from changed hydrology. An interim recovery plan (IRP) is currently being written, and will include actions to monitor groundwater depth and quality within this TEC and to improve the protection of areas of high conservation value. The implementation of this plan will benefit *Centrolepis caespitosa* habitat.

  As this species favours fresh (at least some of the time), not saline, seasonally moist soils and clay flats (Gunness, 1999), it is likely that increasing salinity may impact on its survival.

- **Inappropriate fire regimes.** As this species is an annual, spring fires may result in local extinction if they occur before plants have reached maturity and have replenished the soil seed bank. The longevity of the soil seed bank is unknown in this species.

- **Road maintenance** threatens populations on road reserves. Threats include; grading, construction of drainage channels, and the mowing of roadside vegetation. Some of these actions also encourage weed invasion.

- **Trampling and/or grazing by stock and rabbits.** The Merredin population (Population 3) is at present located within an unfenced remnant on private property. It likely that the species is grazed by both stock and rabbits, and trampling by stock is likely to have a major impact on the species.

Summary of population information and threats

Pop. No. & Location (District)	District	Land Status	Year/No. plants	Condition	Threats
1. S of South Stirling townsite	Albany	Shire Road Reserve	1976 Not recorded 1999 0	Unknown	Weeds, road maintenance, changed hydrology / salinity, inappropriate fire regimes.
2. Meelon NR	Pemberton	Nature Reserve	1993 7	Good	Weeds, changed hydrology/salinity, inappropriate fire regimes.
3. E of Meckering	Merredin	Private	1991 Not recorded	Unknown	Trampling and/or grazing by stock or rabbits, weeds, changed hydrology/salinity, inappropriate fire regimes.
4. Pearce	Pemberton	Aerodrome	1994 200	Poor	Weeds, clearing, inappropriate fire regimes.
5. Pinjarra	Blackwood	Shire Recreational Reserve	1995 Not recorded	Good	Weeds, clearing, inappropriate fire regimes.
6. South Coast Highway	Albany	Shire Road Reserve	2001 500+	Moderate	Weeds, road maintenance, inappropriate fire regimes.
7. NE of Woodanilling	Katanning	Private property	1997 Not recorded	Unknown	Trampling and/or grazing by stock or rabbits, weeds, changed hydrology/salinity, inappropriate fire regimes.
8. E of Busselton	Southwest	Shire Road Reserve and Rail Reserve	1994 Not recorded	Unknown	Weeds, changed hydrology/salinity, inappropriate fire regimes.

Districts: Swan Region: SC = Swan Coastal; **South Coast Region:** Al = Albany, **Wheatbelt Region:** Mer = Merredin, Kat = Katanning; **South West Region**: Bla = Blackwood, Swc = South West Capes, **Swan Region**: Pe = Perth

International Obligations

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that convention. The taxon is not listed under any specific international treaty, however, and therefore this IRP does not affect Australia's obligations under any other international agreements.

Role and interests of indigenous people

According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, no sites have been discovered near the *Centrolepis caespitosa* populations. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *C. caespitosa*, and this is discussed in the recovery actions.

Habitat critical to the survival of the species, and important populations

Given that this species is listed as Endangered it is considered that all known habitat is critical. In addition all populations, including any translocated populations, are considered important to the survival of the species.

Benefits to other species/ecological communities

Centrolepis caespitosa occurs in three Threatened Ecological Communities (TEC's). The Merredin District population (population 3) is part of the Mortlock River Salt Flats TEC, the Blackwood District population (population 8) occurs within the Shrublands on southern Swan Coastal Plain Ironstones TEC. Population 2 occurs within Herb rich shrublands in clay pans (sites = Meelon01 and Meelon02) TEC, which corresponds to community type 8 of Gibson *et al.* (1994). There is an IRP for the Shrublands on southern Swan Coastal Plain Ironstones TEC (English 1999) and an IRP is planned for the Mortlock River Salt Flats TEC [2]. Recovery actions included in these IRP will benefit *C. caespitosa*, and recovery actions for *C. caespitosa* will improve the condition of the above TEC's.

A population of the threatened plant taxon, *Diuris micrantha*, also occurs at one location and two Priority species (*Triglochin stowardii* and *Wurmbea drummondii*) occur in the vicinity of *Centrolepis caespitosa* at Woodanilling. Recovery actions will also benefit these species.

Social and economic impacts

The implementation of this recovery plan has the potential to have some minimal social and economic impact, as one population is located on private property. However, the landholder is amenable to managing the habitat of the species for conservation. Recovery actions will include continued liaison between stakeholders with regard to the conservation of this species on private property. Future actions that could minimise potential impact may include fencing, land acquisition, covenants and management agreements.

Evaluation of the Plan's Performance

The Department of Conservation and Land Management in conjunction with the Swan and South West Regions Threatened Flora and Communities Recovery Teams and Merredin, Katanning and Albany Districts Threatened Flora Recovery Teams will evaluate the performance of this recovery plan. In addition to annual reporting on progress against the criteria for success and failure, the plan is to be reviewed within five years of its implementation. Any changes to management / recovery actions made in response to monitoring results will be documented accordingly.

Critical habitat

Critical habitat is habitat identified as being critical to the survival of a listed threatened species or listed threatened ecological community. Habitat is defined as the biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms or once occupied (continuously, periodically or occasionally) by an organism, or group of organisms, and into which organisms of that kind have the potential to be reintroduced (*Environment Protection and Biodiversity Conservation Act 1999*).

The critical habitat for *Centrolepis caespitosa* comprises:

- the area of occupancy of known populations;
- areas of similar habitat within 200 metres of known populations (swampy loam in occasionally inundated low-lying winter depressions that are dominated by low shrubs and sedges) that provide potential habitat for natural recruitment;
- remnant vegetation that surrounds and links populations (this is necessary to allow pollinators to move between populations);
- additional occurrences of similar habitat that do not currently contain the species but may have done so in the past (these represent possible translocation sites); and

[2] Rosemarie Rees, WATSCU.

- the local catchment for the surface and ground waters that provide the ephemeral winter-wet habitat required by the species (the species occurs in areas that are seasonally inundated and depend on the local hydrology).

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of the population or within the defined critical habitat of *Centrolepis caespitosa* require assessment. No developments should be approved unless the proponents can demonstrate that they will not have a deleterious impact on the species, its habitat, or potential habitat, or the local surface and ground water hydrology.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

The objective of this Interim Recovery Plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the species in the wild.

Criteria for success: The number of individuals within populations and/or the number of populations has increased by ten percent or more over the period of the plan's adoption under the EPBC Act.
Criteria for failure: The number of individuals within populations and/or the number of populations has decreased by ten percent or more over the period of the plan's adoption under the EPBC Act.

3. RECOVERY ACTIONS

Existing recovery actions

The following recovery actions have been or are currently being implemented: -

1. Staff at CALM's Perth District continue to liaise with the managers at Pearce Airbase to ensure the populations of DRF on their land are not accidentally destroyed or damaged.
2. Science Division staff whilst completing a floristic survey of the southern Swan Coastal Plain investigated many of the typical habitats for the species, locating Population 2 (Gibson, *et al.*, 1994).
3. An attempt was made by Albany District to relocate the original Pfeiffer Road population (Population 1). This has been unsuccessful to date.
4. A population was located north-east of Woodanilling on private property by Bronwen Keighery during the Wildflower Society of Western Australia's 'Volunteers of the Bushland Plant Survey Project' in 1997. This population has been fenced, and grazing by stock excluded, since 1998.
5. A new population of *Centrolepis caespitosa* was located in 2001 in the Albany District. This population consists of over 500 plants and protective actions have been put in place.
6. Rare Flora Markers have been installed at the Albany District population, South Coast Hwy (population 6) and the Department of Main Roads have been informed of the location of this population.

Future recovery actions

Where populations occur on lands other than those managed by the Department, permission has been or will be sought from the appropriate land managers prior to recovery actions being undertaken. The following recovery actions are roughly in order of descending priority; however this should not constrain addressing any of the priorities if funding is available for 'lower' priorities and other opportunities arise.

1. Coordinate recovery actions

The Swan and South West Region Threatened Flora and Communities Recovery Teams (SRTFCRT and SWRTFCRT)) and the Merredin, Albany and Katanning District Threatened Flora Recovery Teams, (MDTFCRT, ADTFRT, and KDTFRT) are coordinating recovery actions for *Centrolepis caespitosa* and will include information on progress in their annual report to the Department's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: CALM (Swan Coastal, Perth Hills, Albany, Merredin, Katanning and Blackwood Districts) through the (SRTFCRT, SWTFRT, ADTFRT, MDTFCRT and KDTFRT**)**
Cost: $3,000 per year.

2. Urgent Resurvey

Staff from Swan Coastal District will resurvey Populations 2, 4 and 5 in 2004 as they have not been monitored for quite some time. Staff from the Merredin, Katanning and Blackwood District will survey Population 3, 7 and 8 respectively in the next flowering season. Rare Flora Report Forms (RFRFs) will be completed and an accurate GPS reading taken to indicate an exact location. Special attention is needed to assess immediate threats to the populations including weed burden, track formation, and firebreak maintenance. These threats will be carefully noted in the RFRFs. Population numbers will also be assessed.

Action: Urgent resurvey
Responsibility: CALM (Merredin, Katanning and Blackwood Districts) through the (MDTFCRT, KDTFRT and SWTFRT**)**
Cost: $6,700 per year

3. Investigate and implement restrictions to vehicle access at Population 5

Population 5 has experienced severe disturbance due to vehicles utilising tracks. CALM will, in consultation with Shire of Murray, investigate and implement means to restrict this damage.

Action: Investigate and implement restrictions to vehicle access at Population 5
Responsibility: CALM (Swan Coastal District, Science Division) through the SRTFCRT
Cost: $2,800 once

4. Conduct further survey

Further surveys will be conducted during the species' flowering period (October to December). Members of community groups such as local Naturalists Clubs and Wildflower Societies will be encouraged to be involved in surveys supervised by CALM staff.

An old herbarium specimen of 1904 indicates that the species occurred near Byford (Beenup) and future surveys will focus initially on suitable habitats within this area.

Action: Conduct further survey
Responsibility: CALM (Swan Coastal, Perth Hills , Albany District, Merredin, Katanning and Blackwood Districts) through the (SRTFCRT, SWTFRT, ADTFRT, MDTFCRT and KDTFRT**)**
Cost: $6,700 per year

5. Monitor populations

Monitoring of factors such as weed invasion, habitat degradation, hydrology and population stability (expansion or decline), pollinator activity, seed production and recruitment is essential. The populations will be inspected every 2 years and Rare Flora Report Forms completed, with a full resurvey every five years or before, on evidence of disturbance.

Action: Monitor populations
Responsibility: CALM (Swan Coastal, Perth Hills, Albany, Merredin, Katanning and Blackwood District) through the (SRTFCRT, SWTFRT, ADTFRT, MDTFCRT and KDTFRT**)**
Cost: $3,400 per year

6. Develop and implement a fire management strategy

The response of *Centrolepis caespitosa* and its habitat to fire has not been documented. Until its affect is better understood, fire will if possible be prevented from occurring in the area of populations, except where it is being used experimentally or as a recovery tool. A fire management strategy will be developed to determine fire control measures and fire frequency.

Action: Develop and implement a fire management strategy
Responsibility: CALM (Swan Coastal, Perth Hills, Albany, Merredin, Katanning and Blackwood District) through the (SRTFCRT, SWTFRT, ADTFRT, MDTFCRT and KDTFRT**)**
Cost: $4,200 in first year and $2,000 in subsequent years.

7. Undertake weed control

Weeds are beginning to threaten all known populations and will be assessed during Recovery Action 2. Control of weeds may then be necessary and the following actions implemented:

1 Determine which weeds are present.
2 Choose and implement appropriate method/s;
   a) Select and spray appropriate herbicides,
   b) Hand weed,
   c) Wick or sponge application of herbicide, and
   d) Mowing
3 Control invasive weeds by hand removal with minimal disturbance and/or spot spraying around the *Centrolepis caespitosa* plants when weeds first emerge.
4 Monitor the success of the treatment on weed death, and the tolerance of *C. caespitosa* and associated native plant species to the treatment.
5 Report on the method, timing, and success of the treatment, and effect on *C. caespitosa* and associated native plants species.

Depending on the scale of weed control, rehabilitation of the site with local provenance species may be required. Careful monitoring of the treated sites will be required in order to determine the extent to which this will be required.

Action: Undertake weed control
Responsibility: CALM (Swan Coastal, Perth Hills, Albany, Merredin, Katanning and Blackwood Districts) through the (SRTFCRT, SWTFRT, ADTFRT, MDTFCRT and KDTFRT**)**
Cost: $4,500 per year

8. Install fencing

To prevent possible stock damage, a fence will be erected around population 3 (Merredin District). Fencing will include a buffer of surrounding habitat. Funding will be sought from various sources.

Action: Install fencing
Responsibility: CALM (Merredin Districts) through the MDTFCRT
Cost: To be determined

9. Collect seed

Preservation of germplasm is essential to guard against the possible extinction of wild populations. Seed and cuttings can be used to propagate plants for future translocations. Seed is required from all populations to maximise the genetic diversity of *ex situ* material.

Action: Collect seed
Responsibility: CALM (Swan Coastal, Perth Hills, Albany and Merredin Districts, Science Division) through the SRTFCRT, ADTFRT and MDTFCRT
Cost: $4,300 per year.

10. Seek improved security for populations

Populations exist on various land tenures, the most secure being in Meelon Nature Reserve (Swan Coastal District) (Evans *et al*. 2003). The South Coast Highway population (Population 6) contains over 500 mature plants, however, it, together with the Pfeiffer Rd population (population 1, if it still exists), are not entirely secure due their location adjacent to main roads and the threat from weeds and roadworks. Other populations are also not secure as they occur on private land and a Shire Recreation Reserve.

Staff from CALM's Swan Coastal, Perth Hills, Albany, Merredin, Katanning and Blackwood Districts are liaising with land managers and landowners to ensure that populations are not accidentally damaged or destroyed. In addition, ways and means of improving the security of populations and their habitat will be investigated. For the populations that occur on private property (Population 3 and 7) this may include land purchase, conservation covenants or using the Land for Wildlife scheme. Input and involvement will also be sought from any indigenous groups that have an active interest in areas that are habitat for *Centrolepis caespitosa*.

Action: Seek improved security for populations
Responsibility: CALM (Swan Coastal District, Perth Hills , Albany, Merredin, Katanning and Blackwood Districts) through the (SRTFCRT, SWTFRT, ADTFRT, MDTFCRT and KDTFRT**)**
Cost: $500 per year for liaison; Cost of purchasing to be determined if appropriate.

11. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of this species will be promoted to the community through poster displays and the local print and electronic media. Formal links with local naturalist groups and interested individuals will also be encouraged. An information sheet, which includes a description of the plant, its habitat, threats, recovery actions and photos has been produced and distributed.

Action: Promote awareness
Responsibility: CALM (Swan Coastal, Perth Hills, Albany, Merredin, Katanning and Blackwood District) through the (SRTFCRT, SWTFRT, ADTFRT, MDTFCRT and KDTFRT**)**
Cost: $1,400 in first year and, $600 per year thereafter

12. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Centrolepis caespitosa* will provide a better scientific basis for management of the wild populations. An understanding of the following is particularly necessary for effective management:

1. Soil seed bank dynamics and the role of various disturbances (including fire), competition, rainfall and grazing in germination and recruitment.
2. The pollination biology of the species.
3. The reproductive strategies, phenology and seasonal growth of the species.
4. The population genetic structure, levels of genetic diversity and minimum viable population size.
5. The impact of changed hydrology on *Centrolepis caespitosa* and its habitat.

Action: Obtain biological and ecological information
Responsibility: CALM (Swan Coastal, Perth Hills, Albany, Merredin , Katanning and Blackwood Districts) through the (SRTFCRT, SWTFRT, ADTFRT, MDTFCRT and KDTFRT**)**
Cost: $20,200 per year for first 3 years

13. Review the need for a full Recovery Plan and prepare if necessary

At the end of the fourth year of the five-year term of this Interim Recovery Plan, if the taxon is still ranked as Endangered, the need for a full Recovery Plan or a review of this IRP will be assessed and funds sought for the preparation of a full plan if necessary.

Action:	Review the need for a full Recovery Plan and seek funds to prepare it if necessary
Responsibility:	CALM (Western Australian Threatened Species and Communities Unit (WATSCU), Swan Coastal, Perth Hills, Albany, Merredin, Katanning and Blackwood Districts) through the (SRTFCRT, SWTFRT, ADTFRT, MDTFCRT and KDTFRT**)**
Cost:	$15,700 in the fifth year (if required).

4. TERM OF PLAN

This Interim Recovery Plan will operate from January 2004 to December 2008 but will remain in force until withdrawn or replaced. If the taxon is still ranked Endangered after five years, the need to review this IRP or to replace it with a full Recovery Plan will be determined.

5. REFERENCES

Atkins, K., (1994) *Declared Rare and Priority Flora List for Western Australia.* Department of Conservation and Land Management, Western Australia.

Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia.

Barrett, S. (2001), *Rare Flora Report Form - Centrolepis caespitosa*, Department of Conservation and Land Management.

Cooke, D. A. (1980). Studies in Australian Centrolepidaceae. 1. The scapeless species of *Centrolepis*. *Muelleria* 4 (3). 265-272.

Cooke, D. (1992). A taxonomic revision of *Centrolepis* (Centrolepidacaeae) in Australia. *J. Adelaide Bot. Gard*. 15 (1): 1-63.

English, V. (1999). INTERIM RECOVERY PLAN NO. 44. Shrubland Association on Southern Swan Coastal Plain Ironstone(Busselton Area) (Southern Ironstone Association) Department of Conservation and Land Management. Western Australian Threatened Species and Communities Unit.

Evans, R., Willers, N, and Mitchell D. (2003) Threatened flora of Swan Region. Unpublished report to the Department of Conservation and Land Management, and Environment Australia.

Gibson N., Keighery B. J., Burbidge A.H.; Lyons M. N. (1994). A Floristic survey of the Southern Swan Coastal Plain. Department of Conservation and Land Management, Unpublished.

Gunness, A.G. (1999). The vegetation and flora of remnant bushland on the Bessell-Browne's and Crossley's properties at Woodanilling, Cartmeticup sub-catchment, Shire of Woodanilling. Volunteers of the Bushland Plant Survey Project and the Wildflower Society of Western Australia (Inc.).

Western Australian Herbarium (1998) FloraBase – Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. http://www.calm.wa.gov.au/science/

World Conservation Union (2000) *IUCN red list categories prepared by the IUCN Species Survival Commission*, as approved by the 51st meeting of the IUCN Council. Gland, Switzerland.

6. TAXONOMIC DESCRIPTION

Cooke, 1980

Centrolepis caespitosa is a small densely tufted glabrous herb, forming rounded cushions up to 25mm diameter. Stem repeatedly branched from the axils of the lower leaves, forming internodes 0.5-2mm long. Leaves with marrow scarious basal sheaths to 2 mm long passing into filiform laminae dark-pigmented in dried material, up to 9 mm long and 0.2 mm wide. Leaf tips are acute, and lacking a mucro. Uppermost foliar leaf on each branch reduced to an acute scarious cataphyll 1-2 mm long. Head cylindric, c. 0.5mm wide, terminal in an internode 1-2 mm long. Primary bracts 2, sub-opposite, enclosing the head. Outer bracts with a hyaline sheath 1.5 -3mm long, lacking a keel but with several prominent nerves, grading into a leaf lamina 2.5 -4 mm long. Inner bract keeled, hyaline, narrow, 1.5 - 2 mm long terminating in a recurved foliar tip up to 0.6 mm long. Secondary bracts are absent. Pseudanthium 1 per head, bi sexual. Stamen 1, not adnate to the gynophore, filament 3-4 mm, anther ovate- elliptic c. 0.5 mm long. Gynoecium of 3-6 carpels superposed alternately biseriate on a gynophore. Styles 1-2 mm long, becoming connate for up to half their total length. Seed are brown smooth, and ovoid, c. 0.4 mm long.

SUMMARY OF RECOVERY ACTIONS AND COSTS

Recovery Action	Year 1			Year 2			Year 3			Year 4			Year 5		
	Dept	**Other**	**Ext**	**Dept**	**Other**	**Ext**	**Dept**	**Other**	**Ext**	**Dept**	**Other**	**Ext**	**Dept**	**Other**	**Ext**
Coordinate recovery actions	1800	600	600	1800	600	600	1800	600	600	1800	600	600	1800	600	600
Urgent re survey	4500	1000	1200	4500	1000	1200	4500	1000	1200	4500	1000	1200	4500	1000	1200
Investigate and implement restrictions to vehicle access at population 5	700		2100												
Conduct further survey	4500	1000	1200	4500	1000	1200	4500	1000	1200	4500	1000	1200	4500	1000	1200
Monitor populations	2200	500	700	2200	500	700	2200	500	700	2200	500	700	2200	500	700
Develop and implement a fire management strategy	1900		2300	300		1700	300		1700	300		1700	300		1700
Undertake weed control	2800		1700	2800		1700	2800		1700	2800		1700	2800		1700
Install fencing	To be determined for population 3														
Collect seed	1400	500	2400	1400	500	2400	1400	500	2400	1400	500	2400	1400	500	2400
Seek improved security for populations	300		200	300		200	300		200	300		200	300		200
Promote awareness	600		800	600			600			600			600		
Obtain biological and ecological information	12800		7400	12800		7400	12800		7400						
Review the need for a full Recovery Plan and prepare if necessary													6600		9100
Total	33500	3600	20600	31200	3600	17100	31200	3600	17100	18400	3600	9700	18400	3600	9700
Yearly Total		**57,700**			**51,900**			**51,900**			**31,700**			**31,700**	

Ext =NHT = Natural Heritage Trust (future funding to be requested), Other = volunteer input and the BGPA in kind contribution.

Total Department: $132,700
Total Other: $18,000
Total External Funding: $74,200
TOTAL COSTS: $224,900