INTERIM RECOVERY PLAN NO. 161

GRANITE FEATHERFLOWER

(*VERTICORDIA STAMINOSA* SUBSP. *CYLINDRACEA* VAR. *CYLINDRACEA*)

INTERIM RECOVERY PLAN

2004-2009

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Photo A. Brown

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Natural Heritage Trust
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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 Vulnerable 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This Interim Recovery Plan will operate from May 2004 to April 2009 but will remain in force until withdrawn or replaced.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 assessed.

This IRP was given regional approval on 25 March, 2004 and was approved by the Director of Nature Conservation on 15 June, 2004. The allocation of staff time and provision of funds identified in this Interim Recovery Plan 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 May 2004.

ACKNOWLEDGMENTS

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

Anne Cochrane	Manager, CALM's Threatened Flora Seed Centre
Andrew Crawford	Senior Technical Officer CALM's Threatened Flora Seed Centre
Dr Colin Yates	Research Scientist, CALM’s Science Division
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority
Greg Durell	District Operations Officer, CALM's Narrogin District

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

SUMMARY

Scientific Name:	*Verticordia staminosa* subsp. *cylindracea* var. *cylindracea*	**Common Name:**	Granite Featherflower
Family:	Myrtaceae	**Flowering Period:**	July-October
Dept Region:	Wheatbelt	**Dept District:**	Katanning and Narrogin
Shires:	Kulin and Lake Grace	**Recovery Teams:**	Narrogin District Threatened Flora Recovery Team (NDTFRT) and Katanning District Threatened Flora Recovery Team (NDTFCRT)

Illustrations and/or further information: A. Brown, C. Thomson-Dans and N. Marchant (Eds) (1998) *Western Australia's Threatened Flora*; A.S. George (1991) Verticordia *(Myrtaceae: Chamelaucieae) Nuytsia*, 7(3), 231-394; George, E.A. (2002) *Verticordia, The Turner of Hearts*. University of Western Australia Press, Western Australia.

Current status: *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* was declared as Rare Flora on 12 March 1982 and currently meets World Conservation Union (IUCN, 1994) Red List Category 'VU' under criteria C2a due to their being less than 10,000 mature plants, a continuing decline in the number of mature individuals and no subpopulation containing more than 1000 mature individuals. The species now meets World Conservation Union (IUCN, 2000) Red List Category 'VU' under criteria C2a(i). The species is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are grazing by rabbits, drought, weeds, limited habitat, recreation, water pipeline maintenance and insecurity of tenure.

Habitat requirements: *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* is currently known from eight localities between Pingaring and east of Newdegate. It grows in seasonally wet shallow soil pockets in crevices and on edges of exposed granite outcrops.

Critical habitat: The critical habitat for *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* comprises the area of occupancy of the known populations; similar habitat within 200 metres of known populations; and additional nearby occurrences of similar habitat i.e. shallow soil pockets on granite that do not currently contain the taxon but may have done so and may be suitable for future translocations.

Habitat critical to the survival of the species, and important populations: Given that this taxon is listed as Vulnerable it is considered that all known habitat for wild and translocated populations is habitat critical, and that all populations, including any resulting from translocations, are important to the survival of the species.

Benefits to other species/ecological communities: Population 5 of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* grows in conjunction with the Critically Endangered *V. staminosa* subsp. *cylindracea* var. *erecta* (Population 2). Recovery actions implemented to improve the quality or security of the habitat of *V. staminosa* subsp. *cylindracea* var. *cylindracea* will also improve the status of *V. staminosa* subsp. *cylindracea* var. *erecta* at this location.

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. Although the taxon is listed under the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES) this IRP does not affect Australia's obligations under 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 *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* populations. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *V. staminosa* subsp. *cylindracea* var. *cylindracea*, and this is discussed in the recovery actions.

Social and economic impacts: The implementation of this recovery plan has the potential to have some limited social and economic impact. The variety occurs on and around large granite outcrops some of which are on private property. However recovery actions refer to continued liaison between stakeholders and negotiations have ensured that the areas that directly support the species will be left uncleared.

Evaluation of the Plans Performance: CALM, in conjunction with the Narrogin and Katanning District Threatened Flora Recovery Teams (NDTFRT and KDTFRT), will evaluate the performance of this IRP. In addition to annual reporting on progress with 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. All land managers (except in the case of the recently discovered Population 9 on Water Corporation Land) have been formally notified of the presence of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea*
2. Population 5 has been fenced from stock.
3. Seeds were collected from Population 2 in 1995, Population 1 and 3 in 1998, Population 5 in 2002 and Populations 1, 4, 6, 7, and 9 in 2003. Germination trials have been conducted on seed collected in the 1990's and germination rates vary from 57 to 96 %. The remaining seed is stored in CALM's Threatened Flora Seed Centre at –18°C. Results from later seed collections will not be available until early April (Crawford.[1], personal communication).
4. A number of searches have been carried out at the Burngup Water Reserve; Glenelg Hills; UCL near Hyden; a Nature Reserve north of Hyden; a rock south of Lake Varley townsite; King Rocks; Dragon Rocks, McDonald Rock, Lane Rock and a granite rock east of McDonald Rock; granite outcropping a few hundred metres from Newdegate North Rd; a Water Reserve west of Varley on Dempster Rd and McGann Rock. No plants of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* were found during these searches.
5. Seed has been collected for a genetic study comparing *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* and the var. *erecta*. Genetic work will be conducted by CALM's Science division and is scheduled to begin in April – May 2004.
6. An information sheet has been produced for *Verticordia staminosa* subsp. *cylindracea* var. *erecta*, which includes a description of the plant, its habitat, threats, recovery actions and photos. Although the poster is not specifically for var. *cylindracea* it has still been used to promote awareness of both varieties. A reply paid postal drop of the information sheet has been distributed by the CALM's Katanning District office to local farmers and other residents in Shires containing possible habitat of the taxon. These information sheets were posted at the Pingaring local community store and Pingaring Golf Club by CALM's Narrogin District whilst conducting survey work in 2003.
7. Staff from CALM's Katanning and Narrogin Districts regularly monitor populations of the taxon. All known populations were monitored in 2002 and 2003.
8. The Katanning and Narrogin District Threatened Flora Recovery Teams are overseeing the implementation of this IRP and will include information on progress in an annual report to CALM's Corporate Executive and funding bodies.

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 taxon 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. Map critical habitat
3. Formally notify land managers
4. Conduct further surveys
5. Achieve long-term protection of habitat
6. Monitor populations
7. Rabbit control
8. Weed control if required
9. Conduct genetic testing
10. Promote awareness
11. Collect seed and cutting material
12. Develop a fire management strategy, if required in future
13. Liaise with land managers
14. Review the need for further recovery actions or an update to this IRP and prepare if necessary

[1] Andrew Crawford, Senior Technical Officer, CALM's Threatened Flora Seed Centre

1. BACKGROUND

History

Verticordias, or featherflowers as they are commonly known, are among the most attractive of our native plant species. Currently, 101 species are known and these can be found scattered throughout the south-west of Western Australia. Some even occur in the arid interior.

Although many are common and widespread some are confined to very specialized habitats and several of these are currently listed as threatened. One of the rarest is *Verticordia staminosa*, a species that is confined to granite outcrops in the Western Australian Wheatbelt.

Verticordia staminosa has two subspecies and one of these is further divided into two varieties. All are currently declared as rare flora with two of them (*Verticordia staminosa* subsp. *staminosa* (Wongan featherflower) and *Verticordia staminosa* subsp. *cylindracea* var. *erecta* (pine featherflower)) ranked as Critically Endangered (CR). The third taxon, *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* (granite featherflower), is currently ranked Vulnerable (VU) but like the others is confined to inland granite outcrops. Interestingly, pine featherflower grows with granite featherflower at one location and the two do not appear to hybridize

Verticordia staminosa subsp. *cylindracea* var. *cylindracea* was first collected near Pingaring by Alex George and Elizabeth Berndt on 23 October 1984. The variety is currently known from nine populations and a total of approximately 1000 mature plants on granite outcrops between Pingaring and east of Newdegate.

Description

Verticordia staminosa subsp. *cylindracea* var. *cylindracea* is a small, much branched shrub with very narrow, more or less stalkless leaves to 1.5 cm long. Its solitary yellow flowers have protruding stamens 6-7 mm long that are bright red with yellow tips. Below these are yellow, very feathery sepals 5-6 mm long and two bright red persistent bracts (Brown *et al*. 1998; Brown 2002).

Its distinctive low, spreading habit distinguishes it from *Verticordia staminosa* subsp. *cylindracea* var. *erecta* that has an upright habit and can grow to 1m tall. Both varieties share floral characters that distinguish them from *Verticordia staminosa* subsp. *staminosa*; namely, smaller flowers (sepals 5-6 mm rather than 7 mm), shorter stamens (6-7 mm long compared to 9-12 mm long) that are united for half their length instead of 2-3 mm, and staminode (infertile stamens) insertion between the stamens rather than outside the staminal tube (George 1991).

Distribution and habitat

Verticordia staminosa subsp. *cylindracea* var. *cylindracea* is currently known from nine localities between Pingaring and east of Newdegate. It grows in very shallow pockets of sandy soils and humus in crevices on and fissures in bare rock on exposed granite outcrops. Associated species include *Borya sphaerocephala*, *B. constricta*, *Thryptomene australis*, *Dodonaea viscosa*, *Kunzea pulchella*, *Stypandra glauca* subsp. *angustifolia*, *Chamaescilla* sp., *Melaleuca elliptica*, *Spartochloa scirpoidea*, *Acacia lasiocalyx*, *Allocasuarina campestris*, *Leptospermum roei*, *Platysace* sp., *Spartochloa* sp., *Baeckea crispiflora*, *Lepidosperma* sp., *Thelymitra* sp., *Stackhousia* sp., and *Diuris* sp.

Populations 1, 3, 4, 5, 6 and 9 occur in CALM's Katanning District, whilst Populations 2, 7 and 8 occur in CALM's Narrogin District.

Biology and ecology

Verticordias are generally considered to be fire sensitive with post-fire regeneration occurring mainly from seed. Hybridisation between some species of *Verticordia* has been noted after soil disturbance or fire, however

the mechanisms are unknown (George[2], personal communication). *Verticordias* grow relatively rapidly and are often at their most floriferous stage within five years (George 2002).

The floral morphology of *Verticordia staminosa* differs from most species in the subgenus *Chrysoma* in that its staminal filaments form a tube. This, combined with the showy red and yellow colouration and the presentation of flowers hanging beneath branchlets, suggest that the species is bird pollinated (Yates and Ladd in press).

Although they did not specifically study *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* Yates and Ladd did study the breeding system, pollinator activity, flowering rates, frequency of pollination, seed production, seedling demography, mature plant mortality and population structure of the closely related *Verticordia staminosa* subsp. *staminosa* over a period of three years and it is likely that *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* would share many of the same characteristics and that the results of their research could be applied to this variety (Yates[3], personal communication).

Yates and Ladd (2004) suggest that feral honeybees (*Apis mellifera*) have displaced birds as the dominant visitors of *Verticordia staminosa* subsp. *staminosa*, and although the honeybee doesn't harvest the oily pollen, it does deplete nectar resources, changing bird foraging behavior and, potentially, patterns of pollen dispersal. *V. staminosa* subsp. *staminosa* has been found to be hermaphroditic and capable of self-fertilisation. This means that although rates of intra-plant foraging and crossing between near neighbours may have increased, there is no reduction in the number of seeds produced (Yates and Ladd 2004). *Verticordia* species have highly variable seed set and viability within population over different years and between populations in the same year (Cochrane[4], personal communication).

The fruits of *Verticordia staminosa* subsp. *staminosa* are passively dispersed each year, and may accumulate in organic matter at the base of plants or dispersed across the rock surface by wind and water flow. Germination and growth of seedlings occurred in each year of the study but the highest numbers were associated with the wettest years. Germination and initial growth occurred in moss mats or mineral soils, but recruitment was much more likely where individuals were found in rock fissures. Yates and Ladd (2004) noted that recruitment far exceeded mature plant mortality in the three year study period.

Yates and Ladd (2004) concluded that the constraints to population growth in *Verticordia staminosa* subsp. *staminosa* were climate and suitable establishment crevices rather than the breeding system, pollinator activity or vector, or seed production. They noted that increasingly dry winters and springs in south-western Australia (CSIRO 2001, cited in Yates and Ladd, 2004) and competition from annual weeds in the rock crevices are likely to be factors affecting the long-term survival of the taxon. This seems likely to also apply to *V. staminosa* subsp. *cylindracea* var. *cylindracea*.

Verticordia staminosa subsp. *cylindracea* var. *cylindracea* has demonstrated a capacity for some recovery from drought stress. A number of plants observed during monitoring in June 2002 would have been considered dead, as they were mostly leafless and sometimes had also collapsed. However, following rain they produced small, vigorous tufts of new growth on the tips of old branches.

Plants have grown well in cultivation in sand and gravelly and loamy soils when given good drainage and plenty of sunshine (George 2002). They are prone to foliar fungal attack, but rarely defoliate completely and usually recover without treatment. Tip pruning and the removal of dead wood usually keeps plants growing actively (George 2002). Propagation from tip cuttings that strike readily from new growth, have sometimes proved slow and difficult to grow in the garden (George 2002)

The response of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* to fire is unknown, but the species is not at risk due to the large areas of exposed granite in its surrounding habitat.

Threats

[2] Elizabeth A. George, Honorary Curator, WA Herbarium
[3] Dr. Colin Yates, Senior Research Scientist, CALM's Science Division
[4] Anne Cochrane, Manager, CALM's Threatened Flora Seed Centre

Verticordia staminosa subsp. *cylindracea* var. *cylindracea* was declared as Rare Flora on 12 March 1982 and currently meets World Conservation Union (IUCN, 1994) Red List Category 'VU' under criteria C2a due to their being less than 10,000 mature plants, a continuing decline in the number of mature individuals and no subpopulation containing more than 1000 mature individuals. The species now meets World Conservation Union (IUCN, 2000) Red List Category 'VU' under criteria C2a(i). The species is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are grazing by rabbits, drought, weeds, limited habitat, recreation, water pipeline maintenance and insecurity of tenure.

- **Rabbits and kangaroos** are present at Populations 2, 5 and 7 but do not appear to graze or disturb adult plants. However, rabbits do graze native plant seedlings, presumably including those of the *Verticordia* thus affecting recruitment. In areas where rabbits are present there appears to be little recruitment suggesting that rabbits may be grazing on young seedlings.

- **Poor rainfall** between 2000-2003has resulted in a number of plants becoming stressed. However, at least some of these plants are likely to recover following seasons of better rainfall.

- **Weeds** are evident in many of the soil pockets occupied by *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* and may be inhibiting recruitment. Weeds also encourage grazing.

- **Limited habitat** Yates and Ladd (2004) concluded that the one of the main constraints to population expansion in *Verticordia staminosa* subsp. *staminosa* was a lack of suitable soil crevices on the granite outcrop habitat of the taxon. As *V. staminosa* subsp. *cylindracea* var. *cylindracea* is also confined to these small soil crevices it suffers the same constraints.

- **Recreation** at Pingaring rock (Population 2) may be impacting on the population. Many smaller surface rocks have been turned over and may indicate a high level of recreational use (probably due to the proximity to the golf club). Trampling and soil disturbance may have a negative effect on seedling recruitment and survival.

- **Water pipeline maintenance** may impact on Population 9 as the plant is located very close to a water pipeline.

- **Insecure tenure of private property populations** may result in a change of land ownership and place populations at risk from inappropriate future management practices.

- **Fire** is presumed to kill mature *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* plants but is only a potential threat as the large surrounding areas of exposed rock prevent it from reaching most plants. However, if there were a rise in quantity of grassy weeds the threat would become more significant.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1 Purnta Rock	Water Reserve	1988 207 2000 234 (25) 2003 206 (37)	Healthy, dry conditions but plants generally healthy	Some weeds
2 Eastern side of Pingaring Rock.	Water Reserve	1984 30+ 2003 36	Moderate, many plants appear to be dying back	Some introduced weeds, rabbits, recreation
3 Marchettis Rock.	Water Reserve	1985 51 2002 88 (7) 2003 129 (16)	Healthy	nil
4 Dingo Rock.	Water Reserve MWA	1985 300 2002 627 (52)	Moderate	Recreational activities and weeds
5a Carnaby Rock.	Private Property	1988 700* 2002 75*	Undisturbed. Fenced from stock.	nil
5b Carnaby Rock.	Private Property	1988 700* 2002 75*	Good condition. Fenced from stock	Potential threats: rabbits.

5c Carnaby Rock.	Private Property	1988 700* 2002 75*	Undisturbed. Fenced from stock.	Potential threats: rabbits
5d Carnaby Rock.	VCL	1988 700* 2002 75*	Good condition. Fenced from stock	Undisturbed. Potential threats: rabbits.
6 SW of McGlinn NR.	Private Property	1996 25 (12) 2002 73 (13)	Healthy	nil
7 East of Pingaring	Nature Reserve	1999 100 2003 205 (1)	Healthy. Some younger plants seen	Some weeds and rabbits
8 Western side of Pingaring Rock	Water Reserve	2003 1	Healthy	Water pipeline maintenance
9 Vernon Valley road	Nature Reserve	2003 41(2)	Healthy	nil

Numbers in brackets = number of seedlings. * = total for both subpopulations combined.

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* (EPBC Act)).

The critical habitat for *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* comprises:

- the area of occupancy of known populations;
- areas of similar habitat within 200 metres of known populations, i.e. shallow sandy soils on granite outcrops with *Borya* sp. and *Dodonaea viscosa* (these provide potential habitat for natural range extension);
- additional occurrences of similar habitat on nearby granite outcrops that do not currently contain the taxon but may have done so in the past (these represent possible translocation sites).

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

Given that this taxon is listed as Vulnerable it is considered that all known habitat for wild and translocated populations is habitat critical, and that all populations, including any resulting from translocations, are important to the survival of the species.

Benefits to other species/ecological communities

Two other Declared Rare Flora (DRF) species - *Verticordia staminosa* subsp. *cylindracea* var. *erecta* (Pine Featherflower) and *Tribonanthes purpurea* (Granite Pink) occur in the habitat of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea*. The variety *erecta* is ranked as Critically Endangered (CR) and *Tribonanthes purpurea* is ranked as Vulnerable (VU). Both taxa are ranked as Endangered under the EPBC Act. *Daviesia lineata* also occurs in this general area, and is listed as Priority 2 on CALM's Priority Flora list (Atkins 2003). Recovery actions implemented to improve the quality or security of the habitat of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* such as weed control and habitat rehabilitation will benefit these taxa and the remnant bushland habitat in which they occur.

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. Although the taxon is listed under the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES) this IRP does not affect Australia's obligations under 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 *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* populations. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *V. staminosa* subsp. *cylindracea* var. *cylindracea*, and this is discussed in the recovery actions.

Social and economic impacts

The implementation of this recovery plan has the potential to have some limited social and economic impact. The variety occurs on and around large granite outcrops some of which are on private property. However recovery actions refer to continued liaison between stakeholders and negotiations have ensured that the areas that directly support the species will be left uncleared.

Guide for decision-makers

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

Evaluation of the Plans Performance

CALM in conjunction with the Narrogin and Katanning District Threatened Flora Recovery teams (NDTFRT and KDTFRT) will evaluate the performance of this IRP. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following five years of implementation.

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 taxon in the wild.

Criteria 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.

Criteria 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.

3. RECOVERY ACTIONS

Existing recovery actions

The owners and managers of land containing all but the newly discovered Population 9 have been formally notified of the presence of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea*. This notification details the Declared Rare status of the taxon and the associated legal responsibilities.

Populations 5 and 6 have been fenced to prevent grazing by stock.

Seed has been collected from populations 1, 2 and 3 by Threatened Flora Seed Centre (TFSC) staff with initial germination rates varying from 57-97%. After one year in storage the germination rate was 100% (Crawford,

unpublished data). Seed has also been collected from populations 4, 5, 6, 7 and 9 however results from these seed collections will not be available until early April (Crawford, unpublished data).

Propagation protocols and germplasm storage techniques that have been successfully developed for *Verticordia staminosa* subsp. *staminosa* could also be applied to *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* for *ex situ* conservation of the species (Yates *et al*, 2000). No propagation records of this species could be found at the Botanic Gardens and Parks Authority (BGPA) (Shade[5], personal communication).

Seed has been collected to enable a genetic study between *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* and var. *erecta.* Genetic work by staff from CALM's Science division is scheduled to begin in April – May 2004.

An information sheet has been produced for *Verticordia staminosa* subsp. *cylindracea* var. *erecta*, which includes a description of the plant, its habitat, threats, recovery actions and photos. Although the poster is not specifically for var. *cylindracea* it has still been used to promote awareness of both varieties. A reply paid postal drop of the information sheet has been distributed by the CALM's Katanning District office to local farmers and other residents in Shires containing possible habitat of the taxon. These information sheets were posted at the Pingaring local community store and Pingaring Golf Club by CALM's Narrogin District whilst conducting survey work in 2003.

Five volunteers from the Newdegate Rare Flora Volunteer Group have assisted in the survey and monitoring of three populations of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea.*

CALM Staff searched for the taxon on an unnamed rock south of Lake Varley in 1986, the Glenelg Hills in September 1999, Nature Reserve 28715 in August 2000, King Rocks in December 2001, Burngup Water Reserve in June 2002 and UCL 301 near Hyden, Dragon Rocks, McGann Rock, McDonald Rock and Lane Rock in October 2003 but no plants of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* were found.

Staff from CALM's Katanning and Narrogin Districts regularly monitor all populations of this taxon.

The Katanning and Narrogin District Threatened Flora Recovery Teams are overseeing the implementation of this IRP and will include information on progress in an annual report to CALM's Corporate Executive and funding bodies.

Future recovery actions

Where populations occur on lands other than those managed by CALM, permission has been or will be sought from the appropriate land owners and 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 KDTFRT and NDTFRT will continue to oversee the implementation of recovery actions for *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: CALM (Katanning and Narrogin Districts) through the KDTFRT and NDTFRT
Cost: $2,200 per year.

2. Map critical habitat

It is a requirement of the EPBC Act that spatial data relating to critical habitat be determined. Although critical habitat is described in Section 1, the areas as described have not yet been mapped and will be addressed under

[5] Amanda Shade, Horticulturalist, Botanic Gardens and Parks Authority

this action. If any additional populations are located, then critical habitat will also be determined and mapped for these locations.

Action: Map critical habitat
Responsibility: CALM (Narrogin and Katanning District, WATSCU) through the NDTFRT and KDTFRT
Cost: $2,000 in the first year.

3. Formally notify land managers

The Water Corporation needs to be formally notified of the presence of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* on land that contains Population 9.

Action: Formally notify land owners
Responsibility: CALM (Wildlife Branch)
Cost: $100 in first year

4. Conduct further surveys

Although extensive surveys have been carried out on many granite outcrops in the species' range, further surveys will be conducted for this taxon during its flowering period (July-October). Granite rocks on private property to the south of Population 7 have been suggested as one possible survey area.

Action: Conduct further surveys
Responsibility: CALM (Katanning and Narrogin Districts) through the KDTFRT and NDTFRT
Cost: $3,000 per year for first four years

5. Achieve long-term protection of habitat

Staff from the CALM's Katanning and Narrogin Districts will continue liaison with landowners and managers 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. This may include purchase, conservation covenants or the Land for Wildlife scheme.

Action: Achieve long-term protection of habitat
Responsibility: CALM (Narrogin and Katanning District) through the NDTFRT and KDTFRT
Cost: $1,000 per year

6. Monitor populations

Annual monitoring of factors such as population stability (expansion or decline), habitat degradation, pollinator activity, seed production, recruitment, longevity and predation is essential. Particular attention should be paid to the level of threat posed by weeds and rabbits and if this should increase, appropriate control should be undertaken.

Action: Monitor populations
Responsibility: CALM (Katanning and Narrogin Districts) through the KDTFRT and NDTFRT
Cost: $2,000 per year

7. Rabbit control

Rabbits do not appear to graze adult plants of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea*, and there is no evidence of disturbance near plants through diggings. However, rabbits are known to preferentially graze soft young growth of native species and in areas where rabbits are present there appeared to be little recruitment suggesting that rabbits are grazing on young seedlings. Rabbit control will be implemented in consultation with the landholders at Populations 2, 5 and 7.

Action: Rabbit control, if required in future
Responsibility: CALM (Katanning and Narrogin Districts) through the KDTFRT and NDTFRT
Cost: $1,000 per year

8. Weed control if required

With the exception of Population 2 the level of threat from weeds is very low. However, if weed density increases at in the area of other populations there is potential that they will have a negative impact by preventing seed germination, competing for resources, exacerbating grazing pressure, and increasing the risk and severity of fire. Weed control should be carried out at Population 2 in consultation with the landholder. If during monitoring it is deemed that the threat from weeds has increased at other locations, weed control will be also be undertaken in those areas in consultation with the landholders and land managers. The method used will include hand weeding or careful spot spraying to minimise herbicide washing off the rock and into surrounding vegetation.

Action: Weed control
Responsibility: CALM (Narrogin District and Katanning District if weeds spread) through the NDTFRT and KDTFRT
Cost: $700 per year until weeds are no longer a problem

9. Conduct genetic testing

Seed collections for genetic testing were completed for 2003 and genetic work is scheduled to begin in April – May 2004. This will determine the relationships/differences between *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* and var. *erecta.*

Action: Genetic testing
Responsibility: CALM (Science Division)
Cost: $5,000 over years one and two

10. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of the wild population 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. In the past the promotional material for *Verticordia staminosa* subsp. *cylindracea* var. *erecta* has been used to help promote var. *cylindracea* however it should be promoted as a separate taxon.

A reply paid postal drop of a pamphlet that illustrates *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* and describes its distinctive features and habitat will be developed and will be distributed to residents in Shires that contain possible habitat for the species. Postal drops aim to stimulate interest, provide information about threatened species and provide a name and number to contact if new populations are located by members of the community. An information sheet, which includes a description of the plant, its habitat type, threats, management actions and photos will also be produced.

Action: Promote awareness
Responsibility: CALM (Narrogin and Katanning District, Strategic Development and Corporate Affairs Division) through the KDTFRT and NDTFRT
Cost: $1,300 in first year and $900 in subsequent years.

11. Collect seed and cutting material

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Such collections are also needed to propagate plants for possible future translocations. Seeds have been collected from Populations 1-7 and 10, but further collections from the newly discovered Population 9 when more plants are discovered would be beneficial to expand the range of genetic material available. At this time cuttings will also be obtained to enhance the living collection at the BGPA.

Action: Collect seed and cutting material
Responsibility: CALM (TFSC, BGPA, Katanning and Narrogin Districts) through the KDTFRT and NDTFRT
Cost: $1,000 (if more individuals establish at Population 9)

12. Develop a fire management strategy, if required in future

Fire is thought to kill adult plants of *Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* and is unlikely to stimulate germination of soil-stored seed as the taxon occurs in habitat that would rarely if ever experience fire naturally. Currently, fire presents a low level of threat to the taxon as the large areas of surrounding exposed granite provide a buffer. However, if vegetation were to become more continuous over the rock through the introduction of weeds the fire risk would increase sharply. This may occur if grassy weeds succeed in establishing in the small fissures between soil pockets where the *Verticordia* occurs. If during monitoring it is deemed that the fire risk has increased, a fire management strategy will be developed to determine fire control measures.

Action: Develop a fire management strategy, if required
Responsibility: CALM (Katanning and Narrogin Districts) through the KDTFRT and NDTFRT
Cost: $2,400 for preparation in year deemed necessary and $1,000 for implementation in subsequent years (if required)

13. Liaise with land managers

Staff from CALM's Narrogin and Katanning Districts will continue to liaise with private landowners and the Water Corporation to ensure that populations are not accidentally damaged or destroyed. Input and involvement will also be sought from any indigenous groups that have an active interest in areas that are habitat for *Verticordia staminosa* subsp. *cylindracea*.

Action: Liaise with land managers
Responsibility: CALM (Wildlife Branch, Katanning and Narrogin Districts) through the KDTFRT and NDTFRT
Cost: $600 per year

14. Review the need for further recovery actions or an update to this IRP and prepare if necessary

If the species is still ranked as Vulnerable at the end of the fourth year of the five-year term of this Interim Recovery Plan, the need for further recovery actions or an update to this IRP will be assessed.

Action: Review the need for a full Recovery Plan
Responsibility: CALM (WATSCU, Katanning and Narrogin District) through the KDTFRT and NDTFRT
Cost: $20,300 in the fifth year (if required)

4. TERM OF PLAN

This Interim Recovery Plan will operate from May 2004 to April 2009 but will remain in force until withdrawn or replaced. If the taxon is still ranked Vulnerable after five years, the need to review this IRP will be determined.

5. REFERENCES

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6. TAXONOMIC DESCRIPTION

George, A.S. (1991) *Verticordia* (Myrtaceae: Chamelaucieae). *Nuytsia*, 7(3), 231-394.

***Verticordia staminosa* subsp. *staminosa* -** Shrub with widely spreading branches, to 30cm tall. Sepals 7mm long. Stamens 9-12mm long, united for 2-3mm; staminodes subulate, inserted on outside of staminal tube, the free part c. 1.5mm long.
Distribution and habitat. Recorded only near Wongan Hills, W.A. Grows on exposed granitic slopes.
Flowering period. June-October.

***Verticordia staminosa* subsp. *cylindracea* -** Differs from *Verticordia staminosa* subsp. *staminosa* in the smaller flowers, the longer staminal tube, and the staminodes inserted between the staminal filaments. Sepals 5-6mm long. Stamens 6-7mm long. Staminodes c. 1mm long, obtuse.
Distribution and habitat. Occurs on granitic hills from Pingaring to east of Newdegate, W.A.
The smaller flowers, shorter stamens but united for half their length, and the staminode insertion between the stamens, distinguish this subspecies from subsp. *staminosa*.
Etymology. From the Latin *cylindraceus* (cylindrical), in reference to the androecium.

***Verticordia staminosa* subsp. *cylindracea* var. *cylindracea* -** Shrub with widely spreading branches.
Distribution and habitat. Occurs on several granitic outcrops from Pingaring to east of Newdegate, W.A.
Flowering period. July-October.

***Verticordia staminosa* subsp. *cylindracea* var. *erecta* -** Differs from *V. staminosa* var. *cylindracea* in the erect habit (to 1m tall).
Distribution and habitat. Recorded only from two localities on private property. Grows in coarse soil on granitic hills with *Borya*.
Flowering period. June-October.
Etymology. Named from the Latin *erectus*, in reference to the habit.

The erect, pine-like growth, consistent in the population, distinguishes this taxon from *V. staminosa* var. *cylindracea*, with which it shares the same floral characters that separate the subspecies from subsp. *staminosa*.

SUMMARY OF RECOVERY ACTIONS AND COSTS

Recovery Action	Year 1			Year 2			Year 3			Year 4			Year 5		
	CALM	**Other**	**Ext.**	**CALM**	**Other**	**Ext.**	**CALM**	**Other**	**Ext.**	**CALM**	**Other**	**Ext.**	**CALM**	**Other**	**Ext.**
Coordinate recovery actions	1200	500	500	1200	500	500	1200	500	500	1200	500	500	1200	500	500
Map critical habitat	800		1200												
Formally notify land managers	100														
Conduct further surveys	1 000	500	1 500	1 000	500	1 500	1 000	500	1 500	1 000	500	1 500			
Achieve long-term protection of habitat	600		400	600		400	600		400	600		400	600		400
Monitor populations	800		1 200	800		1 200	800		1 200	800		1 200	800		1 200
Rabbit control	500		500	500		500	500		500	500		500	500		500
Weed control if required	100		600	100		600	100		600	100		600	100		600
Conduct genetic testing	1000		2500	500		1000									
Promote awareness	600		700	600		300	600		300	600		300	600		300
Collect seed and cutting material										200		800			
Develop a fire management strategy, if required in future				1 300		1 100	200		800	200		800	200		800
Liaise with land managers	100		500	100		500	100		500	100		500	100		500
Review the need for further recovery actions or an update to this IRP and prepare if necessary													15300		7700
Total	**5800**	**1000**	**6900**	**4600**	**1000**	**3800**	**4100**	**1000**	**3600**	**4300**	**1000**	**4400**	**19400**	**500**	**11300**
Yearly Total		**13,700**			**9,200**			**8,700**			**9,700**			**31,200**	

Ext. = External funds (funding to be requested), Other = funds contributed by NHT, in kind contribution and the BGPA.

Total CALM: $38,000
Total Other: $4,500
Total External Funds: $30,000
Total Costs: $72,500