

HUGHAN'S FEATHERFLOWER

(*VERTICORDIA HUGHANII*)

INTERIM RECOVERY PLAN

2004-2009

Julie Patten¹, Kate Brunt², and Robyn Luu³

¹Project Officer, WA Threatened Species and Communities Unit, CALM, PO Box 51 Wanneroo, 6946.

²Former Flora Conservation Officer, CALM's Merredin District, PO Box 332, Merredin, 6415.

³Project Officer, WA Threatened Species and Communities Unit, CALM, PO Box 51 Wanneroo, 6946.



Photograph: Andrew Brown

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Department of Conservation and Land Management
Western Australian Threatened Species and Communities Unit (WATSCU)
PO Box 51, Wanneroo, WA 6946

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.

The Department is committed to ensuring that 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This Interim Recovery Plan will operate from May 2004 to April 2009 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked 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 26 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:

Robert and Beth Boase	CALM Volunteers, Dowerin
Elizabeth George	Honorary Curator, CALM Western Australian Herbarium
Brett Beecham	Regional Ecologist, CALM Wheatbelt Region, Narrogin
Anne Cochrane	Manager, CALM Threatened Flora Seed Centre
Andrew Crawford	Senior Technical Officer, CALM Threatened Flora Seed Centre
Mike Fitzgerald	Former Special Project Officer, CALM Merredin District
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority
Andras Szito	Entomologist, Agriculture Western Australia

We would like to thank the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and CALM's Wildlife Branch for their extensive assistance.

SUMMARY

Scientific Name:	<i>Verticordia hughanii</i>	Common Name:	Hughan's Featherflower
Family:	Myrtaceae	Flowering Period:	November to April; best between mid November and January
CALM Region:	Wheatbelt	CALM District:	Merredin
Shire:	Dowerin	Recovery Team:	Merredin District Threatened Flora Recovery Team (MDTFRT)

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.; George, E.A. (2002) *Verticordia, The Turner of Hearts*. University of Western Australia Press, Western Australia; Mueller, F. (1878) *Fragmenta Phytographiae Australiae* 11.

Current status: *Verticordia hughanii* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in September 1987 and ranked as Endangered (EN) in May 1997. The species is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It currently meets World Conservation Union (IUCN 2000) Red List Category 'EN' under criteria B1ab(iii)+2ab(iii) as it is known from less than five locations and there is a continuing decline in the area, extent and quality of habitat. The main threats are poor recruitment, rabbits, weeds, salinity and inappropriate fire regimes.

Description: *Verticordia hughanii* is a small openly to densely branched shrub 15-30cm high x 35 -75 cm wide, without a lignotuber and with one to several basal stems. Leaves are spreading and oblong. Flowers are axillary, congregated towards the apex of branches. The calyx-tube is glabrous, with five herbaceous lobes divided into plumose segments. Petals are orbicular, striate, minutely denticulate towards the apex and bright red in colour (Blackall and Grieve 1980; Brown *et al.* 1998). *Verticordia hughanii* is similar to *V. drummondii* but has smaller flowers and lacks fringed margins to the petals (Blackall and Grieve 1980).

Habitat requirements: *Verticordia hughanii* is confined to an area between Dowerin and Goomalling in Western Australia where it grows amongst low scrub in grey/yellow and pink, sandy soil on the edge of salt lakes (Brown *et al.* 1998).

Critical habitat: The critical habitat for *Verticordia hughanii* comprises the area of occupancy of the known populations; remnant vegetation that links subpopulations; additional nearby occurrences of similar habitat that do not currently contain the taxon but may have done so in the past and may be suitable for translocations; and the local catchment for the surface and ground waters that provide the seasonally moist habitat required by the taxon.

Habitat critical to the survival of the species, and important populations: Given that this taxon is listed as Endangered 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: Recovery actions implemented to improve the quality or security of the habitat of *Verticordia hughanii* will also improve the status of remnant vegetation in which it is located and which includes the Priority 3 taxa *Calothamnus brevifolius*, *Conospermum eatoniae* and *Grevillea roycea*.

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 hughanii* populations. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *V. hughanii*, 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, as one population is located on private property. However, the current landowners are keen to use this area as a private flora conservation reserve and recovery actions refer to continued liaison between stakeholders with regard to this area.

Evaluation of the Plans Performance: The Department of Conservation and Land Management (CALM), in conjunction with the Merredin District Threatened Flora Recovery Team (MDTFRT) 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.

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

1. The owner of the land containing Population 2 was officially notified of the species and its location in May 1987.
2. An area of 54 hectares containing Population 2 of *Verticordia hughanii* was fenced by the landowner in 1988.
3. Approximately 1885 seeds were collected from Population 2 in March 1999 and stored in CALM's Threatened Flora Seed Centre at -18°C.
4. The Botanic Garden and Parks Authority (BGPA) have six clones of *Verticordia hughanii*, three originated from an undetermined source, one from the Department of Agriculture Western Australia (AGWA), one from Western Flora and one from cultivated plants. Most material was received as cuttings.
5. An article about the fencing of Population 2 of *Verticordia hughanii* on private property was published in CALM News in August 1988.
6. Rabbit control using 1080 poisoned oats was undertaken at Population 1 by AGWA in 2001, in liaison with staff from CALM's Merredin District and adjacent property owners.
7. In 2001, sheep were accessing the nature reserve (Population 1) through a hole in the fence and open gates. The fence has been fixed and the gates closed and there has not been any further sign of sheep in the reserve.
8. In 2003, signs were erected at the main entrances to the nature reserve (Population 1) to help control access and rubbish dumping. Bollards were installed to block a minor track in the reserve in 2004.
9. In December 2003, seed was collected from Population 1.
10. The Merredin District Threatened Flora Recovery Team (MDTFRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.
11. Staff from CALM's Merredin District office regularly monitors both populations.

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

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

Recovery actions

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| <ol style="list-style-type: none"> 1. Coordinate recovery actions 2. Map critical habitat 3. Continue rabbit control 4. Undertake weed control 5. Stimulate and monitor germination 6. Remove rubbish from Population 1 7. Conduct further surveys 8. Develop and implement a fire management strategy | <ol style="list-style-type: none"> 9. Monitor populations 10. Collect seed and cutting material 11. Liaise with relevant land owners and land managers 12. Seek improved long-term security of Population 2 13. Promote awareness 14. Obtain biological and ecological information 15. Develop and begin implementing a translocation proposal 16. Review the need for a full Recovery Plan or an update to this IRP and prepare if necessary |
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1. BACKGROUND

History

The type collection of *Verticordia hughanii* was made in 1867 from an unknown location within Western Australia by Allan Hughan, after whom the species is named (Mueller 1867, George 2002). The next collection was made by Alf Gray in 1958 from between Meckering and Goomalling (Population 1). Later attempts to relocate this population proved unsuccessful until it was found by Mary and Basil Smith in December 1983. A second population was identified when private property owners notified CALM staff of an unusual looking plant located on their property in 1986 (Population 2). This is by far the larger of the two populations and consists of approximately 3500 adult plants.

Description

The genus *Verticordia* is well known for its colourful, showy flowers and many species have great horticultural potential. Most species of *Verticordia* also make excellent cut flowers and a considerable market has been established (Leigh *et al.* 1984). *Verticordia hughanii* is a small openly to densely branched shrub 15-30cm x 35-75 cm, lacking a lignotuber and with one to several basal stems. Leaves are spreading and oblong. The foliage often changes to almost purple when plants are under stress during cold weather or summer heat. Flowers are axillary, congregated towards the apex of branches and unscented. The calyx-tube is glabrous, with five herbaceous lobes divided into plumose segments. Petals are ovate, striate, minutely denticulate towards the apex and bright red in colour (Blackall and Grieve 1980; Brown *et al.* 1998).

Verticordia hughanii is similar to *V. drummondii* but has smaller flowers and lacks fringed margins to the petals (Blackall and Grieve 1980).

Distribution and habitat

Verticordia hughanii is confined to an area between Dowerin and Goomalling in Western Australia where it grows in pinkish white sand with gypsum crystals adjacent to saline flats and in pink to yellow/grey sandy loam in open heath and low shrubland up slope. Associated species include; *Acacia saligna*, *Acacia filifolia*, *Allocasuarina campestris*, *Actinostrobos arenarius*, *Banksia prionotes*, *Beaufortia interstans*, *Calothamnus brevifolius*, *Conospermum eatoniae*, *Daviesia drummondii*, *Eremaea pauciflora*, *Grevillea hookeriana* subsp. *apiculoba*, *Grevillea paniculata*, *Grevillea roycei*, *Leptospermum erubescens*, *Melaleuca hamulosa* and *Verticordia densiflora*.

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 (George¹, personal communication). *Verticordias* grow relatively rapidly and are often at their most floriferous stage within five years (George 2002). *Verticordia hughanii* at Population 2 began flowering in their second year. Age to senescence is relatively unknown, however one old dead plant at Population 2 was dissected to look at growth rings and 35 seasonal rings were noted (Boase², personal communication). Plants grown in Kings Park from cuttings have had an average lifespan of nine to fifteen years (Shade, unpublished data).

The method of pollination is still unclear but feral bees and moths have been seen around the flowers (Boase, personal communication). In general, *Verticordias* produce one seed per flower in the wild. Research by staff of CALM's Threatened Flora Seed Centre (TFSC) has shown that seed set is generally low in *Verticordia* (less than 51%) and is variable between species, within the same species in different locations, and in different years at the same location (Cochrane and McChesney 1995). Trials conducted by the TFSC in 1991 using seed collected at Population 2 yielded a seed set between 6 and 24% and initial germination rates of 57 to 69%, dropping to 40% after one year in storage.

¹ Elizabeth A. George, Honorary Curator, WA Herbarium

² Robert Boase, CALM Volunteer

Verticordia hughanii was first propagated in 1984 and can be produced by cuttings relatively easily in well drained soil (George 2002). However some difficulty in maintaining live cuttings has been recorded, possibly due to cold weather or too much water (Shade³, personal communication).

A red-brown scale has been observed on some older *Verticordia hughanii* plants and other associated species at Population 1. The scale is thought to be from a wasp and is most likely a natural occurrence during senescence (Szito⁴ personal communication). Distinctive small insect galls that were present on first collection in 1867 can still be seen on the plants today (George 2002). *Verticordia hughanii* has been shown to be susceptible to *Phytophthora cinnamomi* (Cochrane⁵ unpublished data).

Threats

Verticordia hughanii was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in September 1987 and ranked as Endangered (EN) in May 1997. The species is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It currently meets World Conservation Union (IUCN 2000) Red List Category 'EN' under criteria B1ab(iii)+2ab(iii) as it is known from less than five locations (two) and there is a continuing decline in the area, extent and quality of habitat. The main threats are uncontrolled vehicle access, poor recruitment, rabbits, weeds, salinity and inappropriate fire regimes.

- **Lack of recruitment**, threatens Population 1 as all plants are old and very few young plants have been observed. The reasons for lack of recruitment are unknown as there is sufficient open space for new plants to establish in a weed free environment. However it is most likely that some grazing from sheep and rabbits has occurred and the increasing salinity at the site is impacting on regeneration. There may also be a need for some sort of disturbance to occur for regeneration, although the mechanics of this are unknown.
- **Rabbits** (*Oryctolagus cuniculus*) have the potential to impact on Population 1. It is not clear if the rabbits are grazing directly on mature *Verticordia hughanii* plants, however, they may impact on the establishment of seedlings thereby limiting natural recruitment. In addition, disturbance of soil by rabbit warren construction, increased nutrient levels from their droppings and the introduction of weeds impact on the habitat of the species. Rabbit scratching was noticed around population 1 in December 2003.
- **Weed invasion** by wild oats (*Avena fatua*) is an increasing problem at Population 2. 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 that are produced annually.
- **Salinisation** of groundwater as a result of altered hydrology is a severe and increasing problem in the wheatbelt. *Verticordia hughanii* grows near saline flats that are likely to expand due to the rising water table.
- **Inappropriate fire regimes** may affect the long-term viability of populations. Although research has not been done into how the species responds to fire, it is likely that frequent fire is likely to kill plants before regenerating or juvenile plants reach maturity and are able to disperse seed. Population 2 has continued to recruit well without fire. Further investigation into the effects of fire is required.
- **Change in land ownership**. The current landowners of Population 2 are very enthusiastic about the conservation of *Verticordia hughanii* and the remnant vegetation on their property in which it occurs is registered under a CALM Land for Wildlife Voluntary agreement. However, a future change in land ownership may impact on the remnant. Liaison with possible future landowners in protecting this species may be required.

Summary of population information and threats

³ Amanda Shade, Horticulturalist, Botanic Gardens and Parks Authority

⁴ Andras Szito, Entomologist, Agriculture Western Australia

⁵ Anne Cochrane, Manager, CALM Threatened Flora Seed Centre

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. SE of Dowerin	Nature Reserve (Conservation of Flora and Fauna)	1984 80+ 1988 100+ (100+) 1991 58 [8 dead] 2001 18 2003 14	Moderate	Lack of recruitment, uncontrolled access, rabbits, salinity, inappropriate fire regimes, change in land ownership
2. S of Dowerin	Private Property	1986 30+ 1987 1000 (300+) 1988 1000 (100+) 1990 1000+ 1991 2700 (400) [400 dead] 1994 1000 2001 3000+ 2003 3500+	Healthy	Weeds, salinity, inappropriate fire regimes, change in land ownership.

Numbers in brackets = number of seedlings.

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 that have the potential to be reintroduced. (*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)).

Verticordia hughanii is listed as Endangered and as such it is considered that all known habitat for wild and translocated populations is critical habitat. Critical habitat includes:

- the area of occupancy of the known populations,
- areas of similar habitat within 200 metres of known populations, i.e. areas of grey/yellow/pink, sandy soil among low shrubs, on the edge of salt lakes and saline flats (these provide potential habitat for natural range extension);
- the local catchment for the surface and ground waters that provide the seasonally moist habitat of the species (the species occurs on saline flats and is dependent on maintenance of local surface hydrology),
- additional occurrences of similar habitat i.e. areas of grey/yellow/pink, sandy soil among low shrubs, on the edge of salt lakes and saline flats that do not currently contain the species (these represent possible translocation sites).

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

Given that this taxon is listed as Endangered 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

Recovery actions implemented to improve the quality or security of the habitat of *Verticordia hughanii* will also improve the status of remnant vegetation in which it is located and which includes the Priority 3 taxa *Calothamnus brevifolius*, *Conospermum eatoniae* and *Grevillea roycea*.

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 hughanii* populations. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *Verticordia hughanii*, 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, as one population is located on private property. However, the current landowners are keen to use this area as a private flora conservation reserve and recovery actions refer to continued liaison between stakeholders with regard to this area.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of either population or within the defined critical habitat of *Verticordia hughanii* 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 Plan's Performance

The Department of Conservation and Land Management (CALM), in conjunction with the Merredin District Threatened Flora Recovery Team (MDTFRT) 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 species in the wild.

Criteria for success: The number of individuals within populations and/or the number of populations have 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 have 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 owner of the land containing Population 2 was officially notified of the species and its location in May 1987. This notification details the Declared Rare status of the taxon and the associated legal responsibilities.

An area of 54 hectares containing Population 2 of *Verticordia hughanii* was fenced by the landowner in 1988. A smaller fence of 100 metres square immediately around the population was also erected for further protection.

Approximately 1885 seeds collected from Population 2 in March 1999 and an unknown amount from Population 1 in December 2003 are stored in CALM's TFSC at -18°C . The TFSC tests the viability of seed initially and after one year in storage. The initial germination rate of *Verticordia hughanii* seed from Population 2 was found to range between 69 and 72%, and dropped to 40% after one year in storage (Cochrane, unpublished data).

The Botanic Garden and Parks Authority (BGPA) have six clones of *Verticordia hughanii*, three originated from an undetermined source, one from the Department of Agriculture Western Australia (AGWA), one from Western Flora and one from cultivated plants. Most material was received as cuttings. Propagation of *Verticordia hughanii* is usually quite difficult, with the strike rate ranging from 0 – 84% (But generally below 50%), with a 20% mortality rate recorded after potting (Shade, personal communication). This has mainly been due to cold weather and possible over watering.

An article on the fencing of the private property population (Population 2) was published in CALM News in August 1988.

Rabbit control using 1080 poisoned oats was undertaken in the area of Population 1 by Agriculture Western Australia, in liaison with CALM staff from the Merredin District and adjacent property owners in 2001. Further control has not been conducted since and rabbits are again threatening the population.

Boundary fences on the reserve (Population 1) have been repaired. Since this has been done there has been no evidence of grazing by sheep.

Nature reserve signs were erected at the major entrances to the reserve (Population 1) early in 2003 to help prevent rubbish dumping crushing of plants through trampling, turning of vehicles and track creation. Bollards were also erected to block a minor track near Population 2.

The Merredin District Threatened Flora Recovery Team (MDTFRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

Staff from CALM's Merredin District office regularly monitor both populations and the landowners of the area containing Population 2 also monitor that population.

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 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 MDTFRT will continue to oversee the implementation of recovery actions for *Verticordia hughanii* and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$2,000 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 alluded to in Section 1, the areas described have not yet been accurately mapped and will be addressed under this action. If additional populations are located, critical habitat will also be determined and mapped for them.

Action: Map critical habitat
Responsibility: CALM (Merredin District, WATSCU) through the MDTFRT
Cost: \$2,000 in the first year.

3. Continue rabbit control

Although some rabbit control was conducted in the past, rabbits are continuing to cause damage to the habitat at Population 1. CALM will recommence rabbit control using the most appropriate method in cooperation with adjacent land owners and managers.

Action: Continue rabbit control
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$600 per year.

4. Undertake weed control

Weeds are a minor but increasing threat to the population 2. The main weeds are wild oats that the landowner has been controlling by manual pulling. However, this has proven only partially effective and the wild oats are increasing. Once an appropriate herbicide is selected the following actions will be implemented:

1. Invasive weeds will be controlled by hand removal and spot spraying when they first emerge.
2. Weed control will be scheduled to coincide with spraying at other threatened flora populations within the district.

The tolerance of associated native plant species to herbicides at the site of *Verticordia hughanii* is not known and weed control programs will be undertaken in conjunction with research.

Action: Undertake weed control
Responsibility: CALM (Merredin District, Science Division) through the MDTFRT
Cost: \$800 per year.

5. Stimulate and monitor germination

Burning, smokewater and other disturbance methods may be effective in stimulating the germination of soil-stored seed and will be trialed around selected plants at Population 1. Monitoring will include recording the time when flowering occurs, seed is produced and the age of senescence is reached. This will enable the optimum interval time between disturbances to be estimated. Soil seed bank monitoring will be addressed under Recovery Action 14.

Action: Stimulate and monitor germination
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$2,300 in first and second years, \$600 in subsequent years.

6. Remove rubbish at Population 1

Fencing materials and other rubbish has been dumped at Population 1. Whilst being unsightly in a Nature Reserve, and possibly (although not currently) contributing to more rubbish at the site. It is also an issue due to encouraging weeds and providing habitat for rabbits. Rubbish removal will need to be carried out by a contractor during summer to avoid bogging and increased soil disturbance with careful supervision from CALM Merredin staff to ensure disturbance to surrounding plants is minimized. Wire will need to be taken off site and buried, and a suitable location for this burial will need to be sought. Nature Reserve signs that were erected in early 2003 and bollards and rehabilitation signs erected in 2004 will hopefully aid in the future protection of the habitat by alerting locals to the status of the land.

Action: Remove rubbish from Population 1
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$1500 in the first year.

7. Conduct further surveys

Further surveys by CALM staff with assistance from local naturalists and wildflower society members will be conducted during the species' flowering period between November and April.

Action: Conduct further surveys
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$2,100 per year.

8. Develop and implement a fire management strategy

As the response of *Verticordia hughanii* to fire is not known and the threat of weed invasion will increase post fire, fire should if possible be prevented from occurring in the area of both populations at least in the short term. Prevention may involve the development of firebreaks around both populations, increasing the fire response rating for Hindmarsh reserve in CALM's Merredin District's Fire Protection Policy, and liaising with the local Bush Fire Brigade and adjoining landholders.

A fire management strategy will be developed that recommends fire frequency, intensity, season, and control measures.

Action: Develop and implement a fire management strategy
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$2,600 in first year and \$1,000 in subsequent years.

9. Monitor populations

Annual monitoring of factors such as habitat degradation, salinity, population stability (expansion or decline), weed invasion, pollination activity, recruitment, longevity and predation is essential.

Action: Monitor population
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$1,200 per year.

10. Collect seed and cutting material

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Seed collections are also needed to propagate plants for translocations. A small quantity of seed has been collected but additional seed is required from both populations. Cuttings will also be collected to help establish a living collection of genetic material at the BGPA.

Action: Collect seed and cutting material
Responsibility: CALM (Merredin District, TFSC) and the BGPA, through the MDTFRT
Cost: \$3,200 in first year and \$2,500 in second and fourth year.

11. Liaise with relevant land owners and land managers

Staff from CALM's Merredin District will continue to liaise with landowners and land managers to ensure that populations are not inadvertently 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 hughanii*.

Action: Liaise with relevant land owners and land managers
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$600 per year.

12. Seek improved long-term security for Population 2

Although the current owners of land on which Population 2 occurs have put in place conservation measures to protect plants, ways and means of achieving the long-term protection of the land will be investigated. Possible methods of achieving future conservation management include covenanting and land purchase.

Action: Seek improved long-term security for Population 2
Responsibility: CALM (Merredin District) through the MDTFRT

Cost: To be determined

13. 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.

A reply paid postal drop of a pamphlet that illustrates *Verticordia hughanii* 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 (Merredin District, Strategic Development and Corporate Affairs Division) through the MDTFRT

Cost: \$1,300 in first year and \$900 in subsequent years.

14. Obtain biological and ecological information

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

1. The study of the soil seed bank dynamics and the role of various factors including disturbance (such as fire), competition, rainfall and grazing on recruitment and seedling survival.
2. A determination of reproductive strategies, phenology and seasonal growth.
3. An investigation into its mating system and pollination biology.
4. An investigation of population genetic structure, levels of genetic diversity and minimum viable population size.
5. The impact of salinity on *Verticordia hughanii* and its habitat.

Action: Obtain biological and ecological information

Responsibility: CALM (Science Division, Merredin District) through the MDTFRT

Cost: \$18,900 per year for first three years.

15. Develop and begin implementing a translocation proposal

Although translocations are generally undertaken under full Recovery Plans, because of the continuing decline in population 1, it is possible to develop a translocation proposal and start propagating plants within the time frame of an Interim Recovery Plan. This will be coordinated by the MDTFRT. Information on the translocation of threatened animals and plants in the wild is provided in CALM Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. All translocation proposals require endorsement by the Director of Nature Conservation.

Action: Develop and begin implementing a translocation proposal

Responsibility: CALM (Merredin District) through the MDTFRT

Cost: \$5,300 in the fifth year

16. Review the need for a full Recovery Plan or an update to this IRP and prepare if necessary

If the species is still ranked as Endangered at the end of the fourth year of the five-year term of this Interim Recovery Plan, the need for further recovery actions will be assessed and if necessary funding to write a full Recovery Plan or an update of this IRP will be sought.

Action:	Review the need for a full Recovery Plan or an update to this IRP and prepare if necessary
Responsibility:	CALM (WATSCU, Merredin District) through the MDTFRT
Cost:	\$20,300 in fifth year.

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 Critically Endangered after four years, the need to review this IRP or to replace it with a full Recovery Plan will be determined.

5. REFERENCES

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6. TAXONOMIC DESCRIPTION

George, E.A. (2002) *Verticordia, The Turner of Hearts*, University of Western Australia Press, Western Australia.

A small shrub 15 – 30 cm x 35 – 75 cm, without lignotuber, and with one to several basal stems, openly to densely branched. Stem leaves elliptic to narrowly obovate, concave, obtuse but mucronate, 2-3 mm long, shortly ciliate. Floral leaves similar to stem leaves. Flowers spreading or penpulous, in spike-like groups, unscented. Peduncles 2-2.5 mm long. Bracteoles not keeled, cuspidate, caducous. Hypanthium broadly turbinate, 1.5 mm long, 5 – ribbed, smooth to slightly verrucose, glabrous; reflexed green appendages rounded, thick, 0.5 -0.6 mm long. Sepals 3.5-4mm long, spreading, red; lobes 5 or 6, fimbriate; auricles absent. Petals 2.5-3mm long, ovate, shortly dentate at apex, erect, red. Stamens and staminodes united; stamens uniform, erect 1.3 – 1.5 mm long, straight or gently curved, glabrous except for a short beard below the apex; stigma slightly enlarged. Ovules 8.

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	1500	500		1500	500		1500	500		1500	500		1500	500	
Map critical habitat	500		1500												
Continue rabbit control	200		400	200		400	200		400	200		400	200		400
Undertake weed control	500		300	500		300	500		300	500		300	500		300
Stimulate and monitor germination	1200		1100	1200		1100	100		500	100		500	100		500
Remove rubbish from Population 1	500		1000												
Conduct further surveys	700	300	1100	700	300	1100	700	300	1100	700	300	1100	700	300	1100
Develop and implement a fire management strategy	1000		1600	100		900	100		900	100		900	100		900
Monitor populations	400		800	400		800	400		800	400		800	400		800
Collect seed and cutting material	1300	600	1300	1300		1200				1300		1200			
Liaise with relevant land owners and land managers	100		500	100		500	100		500	100		500	100		500
Seek improved long-term security of Population 2	To be determined														
Promote awareness	600		700	600		300	600		300	600		300	600		300
Obtain biological and ecological information	9500		9400	9500		9400	9500		9400						
Develop and begin implementing a translocation proposal													1400		3900
Review the need for a full Recovery Plan or an update to this IRP and prepare if necessary													12000		8300
Total	18000	1400	19700	16100	800	16000	13700	800	14200	5500	800	6000	17600	800	17000
Yearly Total		\$39,100			\$32,900			\$28,700		\$12,300			\$35,400		

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

Total CALM: \$ 70,900
 Total Other: \$ 4,600
 Total External Funding: \$ 72,900
Total Costs: \$148,400

