INTERIM RECOVERY PLAN NO. 228

SLENDER ANDERSONIA

(*ANDERSONIA GRACILIS*)

INTERIM RECOVERY PLAN

2006-2011

September 2006

Department of Environment and Conservation
Kensington

Natural Heritage Trust
Helping Communities Helping Australia
An Australian Government Initiative

Government of Western Australia

Government of Western Australia
Department of Environment and Conservation

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM, now Department of Conservation and Environment (DEC)) 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.

DEC is committed to ensuring that Critically Endangered (CR) taxa are conserved through the preparation and implementation of Recovery Plans (RPs) or IRPs 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This IRP will operate from September 2006 to August 2011 but will remain in force until withdrawn or replaced. It is intended that, if the species is still ranked CR, this IRP will be reviewed after five years and the need for a further recovery actions assessed.

This IRP was given regional approval on 23 August 2006 and approved by the Director of Nature Conservation on 13 September 2006. The allocation of staff time and provision of funds identified in this IRP is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

Information in this IRP was accurate in August 2006.

IRP PREPARATION

This Interim Recovery Plan was prepared by Gillian Stack[1], Heather Taylor[1], Leigh Sage[2], Rebecca Evans[3], Gina Broun[4] and Val English[5]

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ACKNOWLEDGMENTS

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

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Anne Cochrane	Manager, DEC's Threatened Flora Seed Centre
Fred Hort	Volunteer, Mundaring District, DEC.
Greg Keighery	Principle Research Scientist, DEC Woodvale.
Bill Loneragan	Plant Biology, University of Western Australia
John Riley	Administrative Officer Flora, Species and Communities Branch, DEC
Andrew Brown	Threatened Flora Coordinator, Species and Communities Branch, DEC

Thanks also to the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and DEC's Species & Communities Branch for assistance.

Cover photograph by Mike Hislop.

CITATION

This Interim Recovery Plan should be cited as:

Department of Environment and Conservation (2006). Slender Andersonia (*Andersonia gracilis*) Interim Recovery Plan 2006-2011. Interim Recovery Plan No. 228. Department of Environment and Conservation, Western Australia.

SUMMARY

Scientific Name:	*Andersonia gracilis*	**Common Name:**	Slender Andersonia
Family:	Epacridaceae	**Flowering Period:**	September – November
DEC Region:	Midwest, Swan	**DEC District:**	Moora, Swan Coastal
Shire:	Dandaragan (Pops 1,3-19)	**Recovery Team:**	Moora District Threatened Flora Recovery Team (MDTFRT) and Swan Region Threatened Flora and Communities Recovery Team (SRTFCRT)
City:	Gosnells (Pop 2)		

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; Lemson, K.L. (2001) *The Phylogeny and Taxonomy of* Andersonia *R.Br. (Ericaceae/ Epacridaceae)*, Unpublished PhD Thesis, University of Western Australia; 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; Patrick, S. and Brown, A. (2001) *Declared Rare and Poorly Known Flora in the Moora District*, Department of Conservation and Land Management, Western Australia; CALM (2003 onwards) *Western Australian Herbarium FloraBase 2 - Information on the Western Australian Flora*, Department of Conservation and Land Management, W.A., http://www.calm.wa.gov.au/science/.

Current status: *Andersonia gracilis* was declared as Rare Flora in November 1997 under the Western Australian *Wildlife Conservation Act 1950* and is ranked as Vulnerable (VU) under Red List (IUCN 1994) criterion B1+2e due to severe fragmentation of populations and a continuing decline in the number of mature individuals. It currently meets IUCN 2001 criteria B1ab(iii)+2Bab(iii). The species is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The populations are restricted to areas of remnant vegetation surrounded by land that has been extensively cleared for urban development and agriculture. Threats include inappropriate fire regimes, rail, road and firebreak maintenance, degraded habitat, dieback disease, mining activities and weeds.

Description: *Andersonia gracilis* is a slender shrub up to 50 cm tall with few, spreading branches. It's narrow, ovate leaves, up to 5 mm long and 1.5 mm wide at the base, have erect or incurved, keeled tips. Pink to pale mauve flowers are clustered in ovoid or oblong groups of 4 to 14 on terminal heads. The sepals are 7 to 9 mm long, exceeding the petals, style and stamens in length. The lobes of the corolla are densely bearded to the tip and are as long as the tube (Brown *et al*. 1998; Lemson 2001). Additional details are available in the taxonomic description provided in Section 6.

Habitat requirements: *Andersonia gracilis* is currently known from the Badgingarra, Dandaragan and Kenwick areas where it is found on seasonally damp, black sandy clay flats near or on the margins of swamps, often on duplex soils supporting low open heath vegetation with species such as *Calothamnus hirsutus*, *Verticordia densiflora* and *Kunzea recurva* over sedges.

Habitat critical to the survival of the species, and important populations: The habitat critical to the survival of *Andersonia gracilis* includes the remnant vegetation in which important populations occur, areas of similar habitat (i.e. winter-wet areas of black, sandy clay flats of open, low heath over sedges) within 200 metres of important populations, remnant vegetation linking populations, the local catchment of surface and ground water that maintain the habitat of the species and additional occurrences of similar habitat that may contain the species.

Given that this species is listed as Vulnerable, it is considered that some populations are more important to the species' ongoing survival than others. These are the larger populations, those on conservation estate and those at the extremes of its range. On the basis of current knowledge it appears that the following are important populations: Populations 1, 2, 4, 5, 6, 7, 8, 9, 10, 13, 15 and 16. This will need to be reappraised when all known populations have been vouchered, when further survey for new populations has been completed, and also after the results of genetic studies are known.

Benefits to other species or ecological communities: Recovery actions implemented to improve the quality or security of habitat of *A. gracilis* will also protect other threatened and priority species and the ecological community in which the populations are located. *A gracilis* occurs in winter-wet depressions to the west of Dandaragan, with *Anigozanthos viridis* subsp. *terraspectans* (DRF, Vulnerable under Wildlife Conservation Act; Vulnerable under EPBC Act) and *Jacksonia carduacea* (Priority 3) (Cockerton 1998). *A. gracilis* occurs with twenty four other conservation-listed flora species and two Threatened Ecological Communities (TECs) at the site in Swan Region (State of Western Australia 2000). The species are listed in the table below. The two TECs are the 'Endangered' shrublands on dry clay flats (Swan Coastal Plain (SCP) community type 10a); and the 'Vulnerable' herb-rich saline shrublands in clay pans (SCP community type 7). These communities and the conservation-listed flora species will benefit from actions implemented under this IRP that help to improve the quality of the habitat.

Conservation-listed flora species occurring in habitat of *Andersonia gracilis*

Species name	Conservation Status (Western Australia)	Conservation Status (EPBC Act)
Calytrix breviseta subsp. breviseta	DRF, Critically Endangered	Endangered
Diuris purdiei	DRF, Endangered	Endangered
Eleocharis keigheryi	DRF, Vulnerable	Vulnerable
Hydatella dioica	DRF, Vulnerable	Endangered
Lepidosperma rostratum	DRF, Endangered	Endangered
Schoenus pennisetis	Priority 1	-
Byblis gigantea	Priority 2	-
Comesperma rhadinocarpum	Priority 2	-
Schoenus capillifolius	Priority 2	-
Trichocline sp. Treeton	Priority 2	-
Chamaescilla gibsonii	Priority 3	-
Eryngium subdecumbens	Priority 3	-
Haemodorum loratum	Priority 3	-
Rhodanthe pyrethrum	Priority 3	-
Schoenus benthamii	Priority 3	-
Schoenus sp. Waroona	Priority 3	-
Triglochin stowardii	Priority 3	-
Anthotium junciforme	Priority 4	-
Aponogeton hexatepalus	Priority 4	-
Drosera occidentalis subsp. occidentalis	Priority 4	-
Grevillea thelemanniana	Priority 4	-
Hydrocotyle lemnoides	Priority 4	-
Verticordia lindleyi subsp. lindleyi	Priority 4	-
Villarsia submersa	Priority 4	-

DRF – Declared Rare Flora.
For a description of the Priority categories see Atkins (2003)

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. *A. gracilis* is not specifically listed under any international treaty, and therefore this plan 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 one art site is listed in the vicinity of *Andersonia gracilis* and the involvement of the Indigenous community is currently being sought to determine whether there are any issues or interests identified in the Plan. If no role is identified for indigenous communities in the recovery of this species, opportunities may exist through cultural interpretation and awareness of the species.

The advice of South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs is being sought to assist in the identification of potential indigenous management responsibilities for land occupied by threatened species, or groups with a cultural connection to land that is important for the species' conservation.

Continued liaison between DEC and the indigenous community will identify areas in which collaboration will assist implementation of recovery actions.

An Aboriginal Heritage Sites Register is kept by the Department of Indigenous Affairs, and this Indigenous communities interested or involved in the region affected by this plan have not yet been identified. Implementation of recovery actions under this plan will include consideration of the role and interests of indigenous communities in the region and this is discussed in the recovery actions. Input and involvement will be sought from any Aboriginal groups that have an active interest in the areas that are habitat for *A. gracilis*.

Social and economic impact: The implementation of this recovery plan is unlikely to cause significant adverse social or economic impacts. However, as some populations are located on private property and in areas leased for mining activities, their conservation may potentially affect farming and mining activities. Actions will involve liaison and cooperation with all stakeholders with regard to these areas.

Affected interests: Stakeholders potentially affected by the implementation of this plan include the Shire of Dandaragan, City of Gosnells, Department of Environment and Conservation, University of Western Australia, Tiwest Pty Ltd (a mining company) and the owners of five private property locations. Western Power is responsible for a transmission line that runs through the vicinity of populations, and the federal Department of Defence has a training area to the south of known populations.

Evaluation of the plan's performance: The Department of Environment and Conservation will evaluate the performance of this IRP in conjunction with the Moora District Threatened Flora Recovery Team (MDTFRT) and Swan Region Threatened Flora and Communities Recovery Team (SRTFCRT). 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 relevant land managers have been notified of the presence of *A. gracilis*.
2. The Nature Reserve containing Population 2 is fenced and seldom accessed.
3. *Phytophthora cinnamomi* (dieback) samples were collected in November 1996 and the pathogen was identified approximately 100m upslope from Population 2 (Papenfus 1996). No further action has been taken since this time.
4. *Phytophthora cinnamomi* has also been identified in the vicinity of Populations 1 and 4.
5. Dr Kristina Lemson has reviewed the phylogeny and taxonomy of the *Andersonia* genus. More accurate descriptions of species in this genus are now available.
6. Extensive surveys have been conducted for the species in the Swan Region, with limited success. Surveys conducted in the Midwest Region have yielded much more positive results, with several new populations being discovered by a Landcare group in 1998, and also by Tiwest mining company (via consultants) in the area around their mining activities.
7. A population previously thought to be *A. gracilis* (Population 20) was discovered to be *A. heterophylla* following a survey by Swan Region Volunteers Fred and Jean Hort.
8. Over 10,000 seeds were collected from Population 1 in October 1997 by staff from DEC's Threatened Flora Seed Centre (TFSC) and are currently stored at –18°C. Initial germination studies show the species has relatively high seed viability of 78-81%.
9. An information sheet that describes and illustrates the species has been drafted and will be printed in the future.
10. Staff from DEC's Moora and Swan Coastal Districts regularly monitor the populations.
11. The Moora District Threatened Flora Recovery Team and Swan Region Threatened Flora and Communities Recovery Team are overseeing the implementation of this IRP and will include information on progress in an annual report to DEC's Corporate Executive and funding bodies.

IRP objective: The objective of this Interim Recovery Plan is to abate identified threats and maintain or enhance viable *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

1. Coordinate recovery actions
2. Verify known populations
3. Map habitat critical to the survival of the species
4. Install DRF markers
5. Liaise with relevant land managers
6. Map and manage dieback disease
7. Monitor populations
8. Conduct further surveys
9. Collect and preserve seed and cutting material
10. Research fire ecology and develop a fire management strategy
11. Implement a fire management strategy
12. Implement weed control
13. Install fencing if required
14. Promote awareness
15. Seek security of tenure for important populations
16. Obtain biological and ecological information
17. Review the need for further recovery actions

1. BACKGROUND

History

Swiss botanist Augustin de Candolle described *Andersonia gracilis* in 1839 from specimens collected by James Drummond (Brown *et al*. 1998). The Western Australian Herbarium records show the species was located in the Cannington area in 1902, 1921 and 1963, but no populations are recorded there currently. Only Population 2 is currently recorded from Swan Coastal District. The population occurs within a Reserve that is part of a Bush Forever site because it is an area of 'regional significance bushland to be retained and protected forever' (State of Western Australia 2000). The species is believed to have been quite abundant on the Swan Coastal Plain, in winter-wet areas surrounding swamps and waterways. However, due to urban development, much of the habitat for the species has been destroyed and 'filled in' over time for human use.

The populations in the Moora District are much more numerous and widespread than in the Swan Coastal District. In an area southeast of Cervantes, records show that specimens were collected in 1974 by A. Orchard, and reconfirmed with further specimens being collected in 1984, 1988 and during surveys in this vicinity during the 1990s. Eighteen populations are found in this general area, with most of these being identified in 1996 and 1998 by Landcare and Consultant surveys.

In 2001, Dr. Kristina Lemson completed her PhD at the University of Western Australia on *Andersonia* taxonomy and phylogeny. This revision of the genus provided better taxonomic descriptions of this and other *Andersonia* species. An *A. gracilis* population previously recorded from Moore River National Park was vouchered at the WA Herbarium. Extensive surveys by Fred and Jean Hort, accomplished Threatened Flora volunteers, failed to relocate this population, and Dr. Lemson later identified the 1992 herbarium specimen as the common species *Andersonia heterophylla*, not *A. gracilis* (K. Lemson[1], personal communication). This highlighted the need for all known populations of this species to be re-surveyed, and voucher specimens to be sent for confirmation of identity. All new populations should also be supported by a voucher specimen.

Description

Andersonia gracilis is a slender shrub to 50 cm tall with few, spreading branches. Its narrow, ovate leaves, up to 5 mm long and 1.5 mm wide at the base, have erect or incurved, keeled tips. Pink to pale mauve flowers are clustered in ovoid or oblong groups of 4 to 14 on terminal heads from September to November. The sepals are 7 to 9 mm long, exceeding the petals, style and stamens in length. The lobes of the corolla are densely bearded to the tip and are as long as the tube (Brown *et al.* 1998; Lemson 2001).

Distribution and habitat

Andersonia gracilis is widely distributed, with populations occurring as far apart as the Dandaragan and Kenwick areas (220 km apart). Nineteen populations are known, occurring within Nature Reserves, Unallocated Crown Land, private property and Shire road reserves. Unfortunately, few of these populations have been verified with voucher specimens. However, many of the newer unconfirmed populations are in the vicinity of confirmed populations and are likely to be that species. Population sizes are also difficult to estimate due to large fluctuations in mature plant numbers, and lack of regular monitoring.

The species occurs in damp black, sandy clay flats near swamps in open low heath with *Calothamnus hirsutus* (hairy clawflower), *Verticordia densiflora* (compact featherflower), *Kunzea recurva* (recurved kunzea) and *Banksia telmatiaea* over sedges.

[1] Kristina Lemson, Edith Cowan University.

Summary of population land vesting, purpose and tenure

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Tenure
1a. West of Dandaragan	Moora	Dandaragan	Conservation Commission	Conservation of Flora	Nature Reserve
1b. West of Dandaragan	Moora	Dandaragan	Shire of Dandaragan	Road verge	
1c. West of Dandaragan	Moora	Dandaragan	-	Private property	Private property
1d. West of Dandaragan	Moora	Dandaragan	DEC	UCL	UCL
2. Kenwick	Swan	City of Gosnells	University of Western Australia	Education	Private property
3. West of Dandaragan	Moora	Dandaragan	DEC	UCL	UCL
4a. West of Dandaragan	Moora	Dandaragan	Shire of Dandaragan	Road verge	
4b. West of Dandaragan	Moora	Dandaragan	DEC	UCL	UCL
5a. West of Dandaragan	Moora	Dandaragan	Conservation Commission	Conservation of Flora	Nature Reserve
5b. West of Dandaragan	Moora	Dandaragan	Conservation Commission	Conservation of Flora	Nature Reserve
6a. West of Dandaragan	Moora	Dandaragan	-	Private property	Private property
6b. West of Dandaragan	Moora	Dandaragan	-	Private property	Private property
6c. West of Dandaragan	Moora	Dandaragan	-	Private property	Private property
7a. West of Dandaragan	Moora	Dandaragan	Shire of Dandaragan	Road verge	
7b. West of Dandaragan	Moora	Dandaragan	DEC	UCL	UCL
8. West of Dandaragan	Moora	Dandaragan	DEC	UCL	UCL
9. West of Dandaragan	Moora	Dandaragan	DEC	UCL	UCL
10a. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
10b. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
10c. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
11. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
12. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
13. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
14. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
15. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
16. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
17. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
18. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL
19. West of Dandaragan	Moora	Dandaragan	DEC	UCL (Mining lease)	UCL

Populations in **bold text** are considered to be Important Populations. UCL = Unallocated Crown Land

Biology and ecology

A study of the biology and conservation of the Western Australian Epacridaceae states that the genus *Andersonia* is endemic to Western Australia and has the greatest species diversity in the Albany region (Keighery 1996). Two *Andersonia* species are listed as being pollinated by birds but Keighery suggests that insects, possibly moths and butterflies, pollinate most species. A beetle has been observed pollinating flowers at Population 1. Gravity or wind probably disperse seed (Keighery 1996), but very little research has been done specifically on *A. gracilis*.

Adult plants are killed by fire, so population persistence is contingent on the availability of soil-stored seed which germinates following fire. Field observations indicate that there is mass germination and seedling growth post-fire, however little is known about the survival rates of seedlings (K. Lemson, personal communication). The species is therefore susceptible to local extinction of populations if fire intervals exceed minimum or maximum range. The fire interval must be long enough for plants to reach reproductive maturity and establish a soil seed bank. If it is shorter then local extinction or population decline can result. However if the fire interval exceeds the longevity of the plants and the soil-stored seed bank then local extinction may also occur. In such cases prescribed fire as a tool for managing the species is warranted (C. Yates[1], personal communication).

Andersonia gracilis is known to be highly susceptible to dieback disease (caused by *Phytophthora cinnamomi*), ranking 8 on a scale of 1 to 10 where 7 is considered a significant risk (Keighery 1988). Initial tests using 17 seeds at the Threatened Flora Seed Centre (TFSC) support the information that it is highly susceptible to dieback disease (*Phytophthora cinnamomi*). Population 2 occurs in an area known to be infected with dieback disease and this may be contributing to the decline in plant numbers at this site. Dieback is also known to be present in the vicinity of Populations 1 and 4.

[1] Dr. Colin Yates, Senior Research Scientist (Ecology), CALM's Science Division

Threats

Andersonia gracilis was declared as Rare Flora in November 1997 under the Western Australian *Wildlife Conservation Act 1950* and is ranked as Vulnerable (VU) under Red List (IUCN 1994) criterion B1+2e due to severe fragmentation of populations and a continuing decline in the number of mature individuals. It currently meets IUCN 2001 criteria B1ab(iii)+2Bab(iii). The species is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Populations are restricted to areas of remnant vegetation surrounded by land that has been extensively cleared for urban development and agriculture. Threats include inappropriate fire regimes, rail, road and firebreak maintenance, degraded habitat, dieback disease, mining activities and weeds.

- **Dieback disease:** *Andersonia gracilis* is highly susceptible to the effects of dieback disease caused by *Phytophthora cinnamomi* (Keighery 1988). In relatively undisturbed habitat *Phytophthora* spreads through root-to-root contact and through free water flow (Shearer and Tippet 1989). Although it spreads most quickly downhill it is capable of moving uphill. It also spreads through movement of infected soil, usually by vehicles during firebreak and track use. *P. cinnamomi* thrives best in mild moist conditions such as that produced by spring, autumn or summer rainfall. In 1996, *P. cinnamomi* was reported upslope of Population 2 and in the vicinity of Populations 1 and 4 (D. Papenfus[2], field notes on DEC file). This pathogen threatens this species and also its habitat.

- **Inappropriate fire regimes** may affect the viability of populations, as seeds of *A. gracilis* are thought to germinate following fire. If this is the case, the soil seed bank would rapidly be depleted if fires recurred before regenerating or juvenile plants reached maturity and replenished the soil seed bank. However, occasional fires are needed for reproduction of this species. An additional consideration is the role of fire in facilitating weed invasion.

- **Weeds** are currently a significant threat to Population 2, and a lesser threat to other populations. Weeds compete with any seedlings and plants for soil nutrients and space. They could dramatically increase in numbers if a fire or other disturbance occurred in the area. 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 grass weed species.

- **Road and firebreak maintenance** threaten roadside populations in the Moora District. Threats include grading, chemical spraying, construction of fencing or drainage channels and slashing of roadside vegetation. Several of these actions also encourage weed invasion. Relevant landowners and managers have been informed of the populations and the need to preserve the species.

- **Mining activity** requires the removal of vegetation and topsoil, hence plants are removed in the process and the soil seed bank dynamics are disturbed. This activity has led to the removal of 4 plants in 1998 and 126 plants in 1999. The movement of soil in an area can often also lead to increased weed invasion and spread of disease. Populations 10 to 19 in the Moora District are affected by this process.

- **Grazing** and trampling by rabbits, kangaroos and livestock has been indicated as a minor problem at Populations 6a, 6b and 6c. Soil disturbance, weed invasion and the addition of nutrients are secondary effects of animal movement in areas inhabited by the species.

- **Degraded habitat:** the seasonally damp, black sandy clay flats near swamps are often areas that have been developed for urban purposes, particularly in the Metropolitan area in Swan Coastal District. Suitable remaining areas are small, fragmented and subject to the pressures of urbanization. In Moora District, much of the suitable habitat has been cleared for agricultural purposes, or is affected by rising salinity due to extensive clearing in the landscape.

- **Rising saline water tables** may become a threat to populations in the future. Populations occur in seasonally wet areas low in the landscape, and are not salt-tolerant (G. Cockerton, unpublished correspondence).

[2] Diana Papenfus, Botanist

Summary of population information and threats

Pop. No. & Location	Year	No. plants	Condition	Threats
1a. West of Dandaragan	1996 1998	ca 100 2900*	Healthy	Dieback (*Phytophthora cinnamomi*), inappropriate fire, drought
1b. West of Dandaragan	1997 1998	ca 20 *	Healthy	Road and firebreak maintenance, inappropriate fire, drought, degraded habitat
1c. West of Dandaragan	1997 1998	ca 300 *	Healthy	Inappropriate fire, drought, degraded habitat
1d. West of Dandaragan	1998	*	Healthy	Inappropriate fire, drought
2. Kenwick	1998 1999 2002	22 1 8	Moderate	Dieback (*Phytophthora cinnamomi*), weeds, inappropriate fire
3. West of Dandaragan	1996	0	Poor	Inappropriate fire, drought
4a. West of Dandaragan	1996	400*	Healthy	Dieback (*Phytophthora cinnamomi*), drought, inappropriate fire, road and firebreak maintenance
4b. West of Dandaragan	1996	*	Healthy	Dieback (*Phytophthora cinnamomi*), inappropriate fire, drought,
5a. West of Dandaragan	1998	47	Moderate	Inappropriate fire, drought
5b. West of Dandaragan	1998	2	Moderate	Inappropriate fire, drought
6a. West of Dandaragan	1998	4	Healthy	Inappropriate fire, drought, grazing
6b. West of Dandaragan	1998	21	Healthy	Inappropriate fire, drought, grazing
6c. West of Dandaragan	1998	17	Healthy	Inappropriate fire, drought, grazing
7a. West of Dandaragan	1998	228*	Moderate	Road and firebreak maintenance, inappropriate fire, drought
7b. West of Dandaragan	1998	*	Moderate	Inappropriate fire, drought
8. West of Dandaragan	1998	ca 20,000	Healthy	Inappropriate fire, drought
9. West of Dandaragan	1998	ca 350	Moderate	Inappropriate fire, drought
10a. West of Dandaragan	1998	87	Healthy	Mining, inappropriate fire, drought
10b. West of Dandaragan	1998	39	Moderate	Mining, inappropriate fire, drought
10c. West of Dandaragan	1998	75	Healthy	Mining, inappropriate fire, drought
11. West of Dandaragan	1998	4	Moderate	Mining, inappropriate fire, drought
12. West of Dandaragan	1998	12	Moderate	Mining, inappropriate fire, drought
13. West of Dandaragan	1998	300	Healthy	Mining, inappropriate fire, drought
14. West of Dandaragan	1998	21	Moderate	Mining, inappropriate fire, drought
15. West of Dandaragan	1998	88	Moderate	Mining, inappropriate fire, drought
16. West of Dandaragan	1998	260	Healthy	Mining, inappropriate fire, drought
17. West of Dandaragan	1998	24	Healthy	Mining, inappropriate fire, drought
18. West of Dandaragan	1999	12	Healthy	Mining, inappropriate fire, drought
19. West of Dandaragan	1999	9	Healthy	Mining, inappropriate fire, drought

Populations in **bold text** are considered to be Important Populations. * = total for all subpopulations combined.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of any of the populations or within the defined critical habitat of *Andersonia gracilis* will require assessment. Developments should not be approved unless the proponents can demonstrate that they will have no significant impact on the species, its habitat or potential habitat, or have the potential to spread or amplify plant diseases such as that caused by *Phytophthora cinnamomi*.

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

Habitat critical to the survival of the species includes the area of occupancy of important populations; areas of similar habitat within 200 m of important populations (i.e. winter-wet areas of black, sandy clay flats of open, low heath over sedges - these provide potential habitat for natural range extension); remnant vegetation that surrounds and links populations (this is necessary to allow pollinators to move between populations); the local catchment of the surface and possibly ground waters that maintain the habitat of the species; and additional occurrences of similar habitat that may contain the species.

Given that this species is listed as Vulnerable, it is considered that some populations are more important to the species' ongoing survival than others. These are the larger populations, those on conservation estate and those at the extremes of its range. On the basis of current knowledge it appears that the following are important populations: Populations 1, 2, 4, 5, 6, 7, 8, 9, 10, 13, 15 and 16. This will need to be reappraised when all known

populations have been vouchered, when further survey for new populations has been completed, and after the results of genetic studies are known.

Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of habitat of *A. gracilis* will also protect other threatened species, priority species and the ecological community in which the populations are located. *A. gracilis* occurs with five DRF species, nineteen Priority flora species and two Threatened Ecological Communities (TECs) at one site in Swan Region (State of Western Australia 2000). The species are listed in the table below. The two TECs are the 'Endangered' shrublands on dry clay flats (Swan Coastal Plain (SCP) community type 10a); and the 'Vulnerable' herb-rich saline shrublands in clay pans (SCP community type 7). These communities and flora species will benefit from actions implemented under this IRP that help to improve the quality of the habitat.

Conservation-listed flora species occurring in habitat of Andersonia gracilis

Species name	Conservation Status (Western Australia)	Conservation Status (EPBC Act)
Calytrix breviseta subsp. breviseta	DRF, Critically Endangered	Endangered
Diuris purdiei	DRF, Endangered	Endangered
Eleocharis keigheryi	DRF, Vulnerable	Vulnerable
Hydatella dioica	DRF, Vulnerable	Endangered
Lepidosperma rostratum	DRF, Endangered	Endangered
Schoenus pennisetis	Priority 1	-
Byblis gigantea	Priority 2	-
Comesperma rhadinocarpum	Priority 2	-
Schoenus capillifolius	Priority 2	-
Trichocline sp. Treeton	Priority 2	-
Chamaescilla gibsonii	Priority 3	-
Eryngium subdecumbens	Priority 3	-
Haemodorum loratum	Priority 3	-
Rhodanthe pyrethrum	Priority 3	-
Schoenus benthamii	Priority 3	-
Schoenus sp. Waroona	Priority 3	-
Triglochin stowardii	Priority 3	-
Anthotium junciforme	Priority 4	-
Aponogeton hexatepalus	Priority 4	-
Drosera occidentalis subsp. occidentalis	Priority 4	-
Grevillea thelemanniana	Priority 4	-
Hydrocotyle lemnoides	Priority 4	-
Verticordia lindleyi subsp. lindleyi	Priority 4	-
Villarsia submersa	Priority 4	-

DRF – Declared Rare Flora.
For a description of the Priority categories see Atkins (2003)

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. *A. gracilis* is not specifically listed under any international treaty, and therefore this plan 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 one art site is listed in the vicinity of *Andersonia gracilis* and the involvement of the Indigenous community is currently being sought to determine whether there are any issues or interests identified in the Plan. If no role is identified for indigenous communities in the recovery of this species, opportunities may exist through cultural interpretation and awareness of the species.

The advice of South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs is being sought to assist in the identification of potential indigenous management responsibilities for land

occupied by threatened species, or groups with a cultural connection to land that is important for the species' conservation.

Continued liaison between DEC and the indigenous community will identify areas in which collaboration will assist implementation of recovery actions.

Social and economic impacts

The implementation of this recovery plan is unlikely to cause significant adverse social or economic impacts. However, as some populations are located on private property and in areas leased for mining activities, their conservation may potentially affect farming and mining activities. Actions will involve liaison and cooperation with all stakeholders with regard to these areas.

Affected interests

Stakeholders potentially affected by the implementation of this plan include the Shire of Dandaragan, the City of Gosnells, the Department of Environment and Conservation, the Conservation Commission, the University of Western Australia, Tiwest Pty Ltd (a mining company) and the owners of private property locations. Western Power is responsible for a transmission line that runs through the vicinity of populations, and the federal Department of Defence has a training area to the south of known populations.

Evaluation of the plan's performance

DEC in conjunction with the Moora District Threatened Flora Recovery Team (MDTFRT) and Swan Region Threatened Flora and Communities Recovery Team (SRTFCRT) will evaluate the performance of this IRP. In addition to annual reporting on progress with listed actions 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 term of the plan.
Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more over the term of the plan.

3. RECOVERY ACTIONS

Existing recovery actions

All relevant land managers and stakeholders (eg, wildflower groups) have been contacted, and the significance of the presence of DRF in the habitat has been highlighted, including associated legal obligations.

The reserve that contains Population 2 is fenced and seldom accessed. However, the presence of *Phytophthora* dieback disease has been identified in this area, and also in the vicinity of Populations 1 and 4 (Papenfus 1996).

Over 10,000 seeds were collected from Population 1 in October 1997 by DEC's Threatened Flora Seed Centre (TFSC) and is currently stored at –18°C. Initial germination studies show the species has relatively high seed viability, at around 78-81%. Using 17 *Andersonia gracilis* seeds in preliminary studies, the TFSC have shown

that the species is highly suceptible to the effects of *Phytophthora cinnamomi* dieback disease (A.Cochrane[3], unpublished data).

Dr Kristina Lemson has reviewed the phylogeny and taxonomy of *Andersonia* and a more accurate description of *Andersonia gracilis* is now available. Further information on the genus can be found in her thesis (Lemson 2001).

Extensive surveys have been conducted for the species in the Swan Region and include 1990-1993 Floristic Survey of the southern Swan Coastal Plain; 1992 survey of remnant vegetation in the eastern side of the Swan Coastal Plain and the Systems Six reserves survey in 1996. These failed to locate additional wild populations in the metropolitan area. A survey in 1999 by Threatened Flora Volunteers Fred and Jean Hort discovered that *A. gracilis*' Population 20 was actually a population of the common species *A. heterophylla*.

A Declared Rare Flora (DRF) survey was conducted in 1998 in the lease area held by Tiwest Joint Venture, Cooljarloo Minesite, southeast of Cervantes. The survey showed that there were a number of populations in the leased area. Although these populations have been recorded on the Western Australian Declared Rare Flora Database (DEFL), voucher specimens were not lodged with the WA Herbarium for all new populations.

A double-sided information sheet has been drafted, and includes a description of *A. gracilis*, its habitat, threats, recovery actions and photos. This will be printed and distributed to community members through local libraries, wildflower shows and so on. It is hoped that this may result in the discovery of new populations, and raise community awareness of the value of native flora.

Staff from DEC's Moora and Swan Coastal Districts regularly monitor populations of this species and liaise with relevant land managers.

The Moora District Threatened Flora Recovery Team and the Swan Region Threatened Flora and Communities Recovery Team are overseeing the implementation of this IRP and will include information on progress in their annual reports to DEC's Corporate Executive and funding bodies.

Future recovery actions

Where populations occur on lands other than those managed by DEC, permission has been or will be sought from appropriate land managers prior to recovery actions being undertaken. The following recovery actions are roughly in order of descending priority, influenced by their timing over the term of the Plan. 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 Moora District Threatened Flora Recovery Team and the Swan Region Threatened Flora and Communities Recovery Team coordinate recovery actions for *Andersonia gracilis* and other Declared Rare Flora in their districts. They will include information on recovery progress in their annual reports to DEC's Corporate Executive and funding bodies.

Action:	Coordinate recovery actions
Responsibility:	DEC (Moora and Swan Coastal Districts) through the MDTFRT and SRTFCRT Recovery Teams
Cost:	**Moora** $1,400 per year **Swan** $1,400 per year

2. Verify known populations

[3] Anne Cochrane, Manager, CALM's Threatened Flora Seed Centre

Accurate identification of this species can be difficult; hence voucher specimens for all new populations in the Moora District should be sent to the WA Herbarium for confirmation. Population 2 has previously been vouchered and determined to be *A. gracilis*. When the identity of those populations has been confirmed, the status of the species should be reviewed.

Action: Voucher and verify known populations
Responsibility: DEC (Moora District, WA Herbarium) through the MDTFRT
Cost: **Moora** $2,600 in year 1

3. Map habitat critical to the survival of the species

It is a requirement of the EPBC Act that spatial data relating to habitat critical to survival be determined. Although habitat critical to the survival of the species is described in Section 1, the areas as described have not yet been mapped and that will be redressed under this action. If any additional populations are located, then total habitat will also be determined and mapped for these locations.

Action: Map habitat critical to the survival of the species
Responsibility: DEC (Moora and Swan Coastal Districts, SCB) through the MDTFRT and SRTFCRT Recovery Teams
Cost: **Moora** $2,300 in year 1
Swan $700 in year 1

4. Install Declared Rare Flora markers

Declared Rare Flora (DRF) markers are required at all road verge populations (Populations 1b, 4a and 7a) and Population 2. The installation of these will occur during the flowering period, to ensure that all road verge plants are between the markers. These will help road maintenance workers to avoid accidental damage to the plants or their habitat.

Action: Install DRF markers
Responsibility: DEC (Moora and Swan Coastal Districts) through the MDTFRT and SRTFCRT Recovery Teams
Cost: **Moora** $900 in year 1
Swan $300 in year 1

5. Liaise with relevant land managers

Staff from DEC's Swan Coastal District will continue to liaise with stakeholders to ensure that Population 2 is not accidentally damaged and that the presence of dieback in the reserve is managed appropriately. Staff from DEC's Moora District will also liaise with appropriate land managers to ensure that the other populations are not accidentally damaged or destroyed. Input and involvement will also be sought from any Aboriginal groups that have an active interest in areas that are habitat for *Andersonia gracilis*.

Action: Liaise with relevant land managers
Responsibility: DEC (Moora and Swan Coastal Districts) through the MDTFRT and SRTFCRT Recovery Teams
Cost: **Moora** $1,300 per year
Swan $400 per year

6. Map and manage dieback disease

A. gracilis is known to be highly susceptible to dieback disease caused by *Phytophthora* species. This situation is exacerbated by *A. gracilis*' preference for seasonally wet habitat in an area with a temperate climate; conditions under which *Phytophthora* species typically flourish.

Disease hygiene measures as outlined in DEC's *Phytophthora cinnamomi* Management Guidelines (DEC 2003) will be applied at all populations. Hygiene measures will primarily involve restricting access to the area,

especially when the soil is wet. The need for phosphite application at a site will be assessed through evaluation of the impact of the disease on the habitat and on *Andersonia gracilis*.

Disease spread and levels of plant death near Populations 1, 2 and 4 should be monitored, as the pathogen has been identified in these areas. After disease mapping has been conducted, a management strategy will be developed and implemented, including the need for adequate disease hygiene measures, monitoring programs (for habitat and specific taxa) and the possibility of treatment (phosphite application).

Action: Map and manage dieback disease
Responsibility: DEC (Moora and Swan Coastal Districts) through the MDTFRT and SRTFCRT Recovery Teams
Cost: **Swan** $6,000 year 1; $9,900 year 2; $4,200 year 3; $11,700 year 4; $4,200 year 5
Moora $5,300 year 1; $6,900 year 2; $6,900 year 3; $9,200 year 4; $6,900 year 5

7. Monitor populations

Annual monitoring of factors such as habitat degradation (weed invasion, rising saline water tables, disease (*Phytophthora cinnamomi*) and grazing have all been identified as threats to this species), population stability (expansion or decline), pollination activity, seed production, recruitment, longevity and predation is essential. The visibility of DRF markers will be monitored to ensure they remain effective, and have not faded or been covered by vegetation growth.

Action: Monitor populations
Responsibility: DEC (Moora and Swan Coastal Districts) through the MDTFRT and SRTFCRT Recovery Teams
Cost: **Moora** $1,700 per year in years 1, 3 and 5
Swan $400 per year in years 1, 3 and 5

8. Conduct further surveys

Further surveys by DEC staff and community volunteers will be conducted during the flowering period of the species (September to November). Records of the areas surveyed will be sent to Species and Communities Branch and copies retained at the districts, even if *A. gracilis* is not found. Particular attention will be paid to areas of UCL near existing populations west of Dandaragan.

Action: Conduct further surveys
Responsibility: DEC (Moora District) through the MDTFRT
Cost: **Moora** $2,200 per year in years 2 and 3

9. Collect and preserve seed and cutting material

It is necessary to store germplasm as a genetic resource, ready for use in translocations and as an *ex situ* genetic 'blueprint' of the species. This will include seed collections, plant material for tissue culture and live plants in cultivation. Some seed has been collected from Population 1 but additional collections are required from both it and other populations to maintain adequate representation of the remaining genetic diversity of this species. Cuttings will also be collected to enhance the living collection at BGPA.

Action: Collect and preserve seed and cutting material
Responsibility: DEC (TFSC, Moora and Swan Coastal Districts), BGPA through the MDTFRT and SRTFCRT Recovery Teams
Cost: **Moora** $2,400 per year in years 1, 3 and 5
Swan $1,400 per year in years 1 and 3

10. Research fire ecology and develop a fire management strategy

Long term research is required to determine the longevity of *Andersonia gracilis* plants and the time required to replenish seed stores after a fire. Once this information becomes available, a fire management strategy will be

prepared that will include recommendations on prescription fire frequency and intensity; precautions to prevent fire; a strategy for reacting to wildfire; and the need, method of construction, and maintenance of firebreaks. Until the fire management strategy has been developed, planned burns will not occur in the habitat of populations.

Action: Research fire response and develop a fire management strategy
Responsibility: DEC (Science Division, Moora & Swan Coastal Districts) through the MDTFRT and SRTFCRT Recovery Teams
Cost: $6,000 in year 1; $2,500 in years 2,3,4 and 5

11. Implement a fire management strategy

Once a fire ecology research has been completed and a fire management strategy prepared the strategy will be implemented by DEC District staff in consultation with land managers.

Action: Implement a fire management strategy
Responsibility: DEC (Moora and Swan Coastal Districts) through the MDTFRT and SRTFCRT Recovery Teams
Cost: **Moora** $3,500 in year 5
Swan $2,500 in year 5

12. Implement weed control

Weeds have been identified as a threat to Population 2. Weeds compete for resources, degrade habitat, exacerbate grazing pressure and increase the risk and severity of fire. Recruitment is likely to be particularly affected. Weed control will be undertaken in consultation with relevant land managers. This will be by hand weeding or localised application of herbicide during the appropriate season to minimise the effect of herbicide on the species and the surrounding native vegetation. Weed control will be followed by a report on the method, timing and success of the treatment against weeds, and the effect on *A. gracilis* and associated native plant species. Copies will be retained at the district and sent to Species and Communities Branch.

Action: Implement weed control
Responsibility: DEC (Swan Coastal District) through the SRTFCRT; relevant land managers
Cost: **Swan** $1,300 per year
Moora $1,700 per year in years 3 and 4

13. Install fencing if required

Fencing may be required for some populations found in the Moora District to protect the DRF from grazing and accidental destruction. Liaison with landholders will be undertaken by district staff to determine the need for fencing, and the most appropriate size and type of fencing.

Action: Install fencing if required
Responsibility: DEC (Moora District) through the MDTFRT
Cost: **Moora** $7,300 in year 3

14. 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 A4 information sheet will be produced, and will include a description of the plant, its habitat, threats, recovery actions and photos. This will be distributed to the public through DEC's Swan Coastal and Moora District offices and at the offices and libraries of the Shire of Dandaragan and City of Gosnells. Such information distribution may lead to the discovery of new populations.

Action: Promote awareness

Responsibility: DEC (Swan Coastal and Moora Districts) through the MDTFRT and SRTFCRT Recovery Teams
Cost: $1,600 in year 1; $1,000 per year in years 3 and 5

15. Seek security of tenure for important populations

The reservation status of the land parcels that support Populations 1d, 2, 4b, 7b, 8, 9, 10, 13, 15 and 16 (including an education reserve and UCL) will be reviewed, and the possibility of additional protection through the reservation system investigated. The possibility of protecting important populations on private land through conservation covenants or registration with the Land for Wildlife scheme will also be investigated.

Action: Seek security of tenure for important populations
Responsibility: DEC (Moora District) through the MDTFRT
Cost: **Moora** $1,500 per year in years 3 and 4
Swan $900 in year 2

16. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Andersonia gracilis* will provide a scientific basis for its management in the wild. An understanding of the following is necessary for effective management:

1. Soil seed bank dynamics, including seedbank location and viability.
2. The population genetic structure, levels of genetic diversity and minimum viable population size. This is useful to better identify genetically important populations and efficiently target resources.

Action: Obtain biological and ecological information
Responsibility: DEC (Science Division, Moora & Swan Coastal Districts) through the MDTFRT and SRTFCRT Recovery Teams
Cost: $7,500 per year in years 2 and 3; $18,800 in year 4

17. Review the need for further recovery actions

At the end of the fourth year of its five-year term this Interim Recovery Plan will be reviewed and the need for further recovery actions will be assessed.

Action: Review the need for further recovery actions
Responsibility: DEC (SCB, Moora and Swan Coastal Districts) through the MDTFRT and SRTFCRT Recovery Teams
Cost: $200 in the fifth year

4. TERM OF PLAN

This Interim Recovery Plan will operate from November 2005 to October 2010 but will remain in force until withdrawn or replaced. If the species is still ranked Vulnerable after five years, the need for further recovery actions will be determined.

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6. TAXONOMIC DESCRIPTION

Excerpt from: Lemson, K.L. (2001*) The Phylogeny and Taxonomy of* Andersonia *R. Br. (Ericaceae/Epacridaceae).* Unpublished PhD Thesis, The University of Western Australia.

Andersonia gracilis

A spindly, few branched, decumbent *bush*, 30 to 50 cm high, often growing through the surrounding plants and with the lower stems denuded of leaves. *Leaves* ovate, with narrowly acuminate tips, the longest 5 to 9 mm; erect to widely spreading or squarrose, not twisted; with abaxial ridges; adaxial surface shortly hairy, abaxial surface glabrous; margins ciliate near the base, not hyaline; the sheath long, often equal to or longer than the blade, glabrous. *Flowers* axillary, in ovoid or oblong groups of 4 to 14; the shoot apex blastotelic. *Pherophylls* broadly ovate to circular, 5.8 to 7 mm, shorter than the subtended flower; not twisted; tips erect, acuminate; adaxial surface glabrous or shortly pubescent, abaxial surface glabrous, margins shortly ciliate. *Floral prophylls* narrowly ovate, 4.3 to 5.2 mm; folded or naviculate and flattened laterally, usually keeled although sometimes only slightly so; adaxial surface pubescent, abaxial papillate; keel and margins ciliate. *Sepals* narrowly ovate, 7 to 10 mm; pink; adaxial surface glabrous, abaxial surface usually with scattered hairs; margins ciliate, not hyaline; base not sharply tapered. *Corolla* narrowly urceolate to cylindrical, the lobes with erect bases and spreading tips, 7 to 10 mm, shorter than the calyx; pink to pale mauve; adaxial hairs on both the tube and lobes; abaxially glabrous. *Corolla lobes* valvate, 3 to 5 mm; usually shorter than but sometimes equal to the tube; apex acute; densely hairy on the lower half of the adaxial surface but without a distinct tuft. *Tube* hairy over the upper half, the hairs less dense than on the lobes. *Stamens* 4 to 7 mm, not elongating at anthesis; the anthers manifest and below the stigma. *Anthers* oblong, not split at the apex, 1.6 to 2.2 mm, white; attached near the middle. *Pollen* yellow; in tetrads. *Filaments* linear, not lobed, longer than the anther; flattened; straight; completely glabrous. *Gynoecium* 6 to 9 mm, equal to or shorter than the corolla and not elongating at anthesis; the stigma manifest, exposed by the spreading corolla lobes. *Style* linear; white; not coiled at the base; glabrous or minutely papillate. *Stigma* shortly clavate, the lobes erect. *Ovary* globular or slightly flattened, 1.1 mm; deeply lobed, with lobe apices rounded or angular, papillate. *Nectary scales* entirely free, $\pm$0.3 mm; ovate; with the apex emarginate. *Ovules* 9 or 10 per locule; placenta basal.

Habitat: In low open heath, in winter wet depression or the margins of swamps, often on duplex soils.

Distribution: Swan Coastal Plain. Currently known from only four confirmed populations, east of Cervantes and in the south eastern Perth metropolitan area.

Flowering Period: September to November.

Conservation Status: Rare, Endangered. One population is on a Nature Reserve and extends into adjacent vacant crown land, whilst the others are on vacant crown or private land. All known populations have been surveyed; two are currently under threat from disease (*Phytophthora cinnamomi*) and the total number of mature individuals is low.