INTERIM RECOVERY PLAN NO. 15

MAJESTIC SPIDER ORCHID (*CALADENIA WINFIELDII* MS), INTERIM RECOVERY PLAN

1996-1999

by

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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 are designed to run for three years only and will be replaced by full Recovery Plans where required.

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

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

This IRP was approved by the Director of Nature Conservation on 7 May 1997. Approved IRPs are subject to modification as dictated by new findings, changes in status of the taxon or ecological community and the completion of recovery actions. The 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 March, 1997.

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SUMMARY

Majestic Spider Orchid, *Caladenia winfieldii* ms **Family:** ORCHIDACEAE

Flowering period: October - November

CALM Region: Southern Forest **CALM District:** Pemberton **Shire:** Manjimup

Current status: Declared as Rare Flora in December 1993, ranked as Critically Endangered in September 1995

Recovery team: Southern Forest Region Threatened Flora Recovery Team

Illustrations and/or further information: *Southern Forest Region Threatened Flora Management Program* (in draft). N. Hoffman and A. Brown, *Orchids of South West Australia*. 2nd Ed. (1992).

An attractive dark pink flowered spider orchid, *Caladenia winfieldii* ms is found in an open low woodland of *Eucalyptus rudis, Melaleuca preissiana* and *Banksia littoralis* along a subdued drainage line and flat adjacent to a creek south-east of Manjimup. It is closely related to *C. harringtoniae* ms with which it grows and which is also declared as Rare Flora.

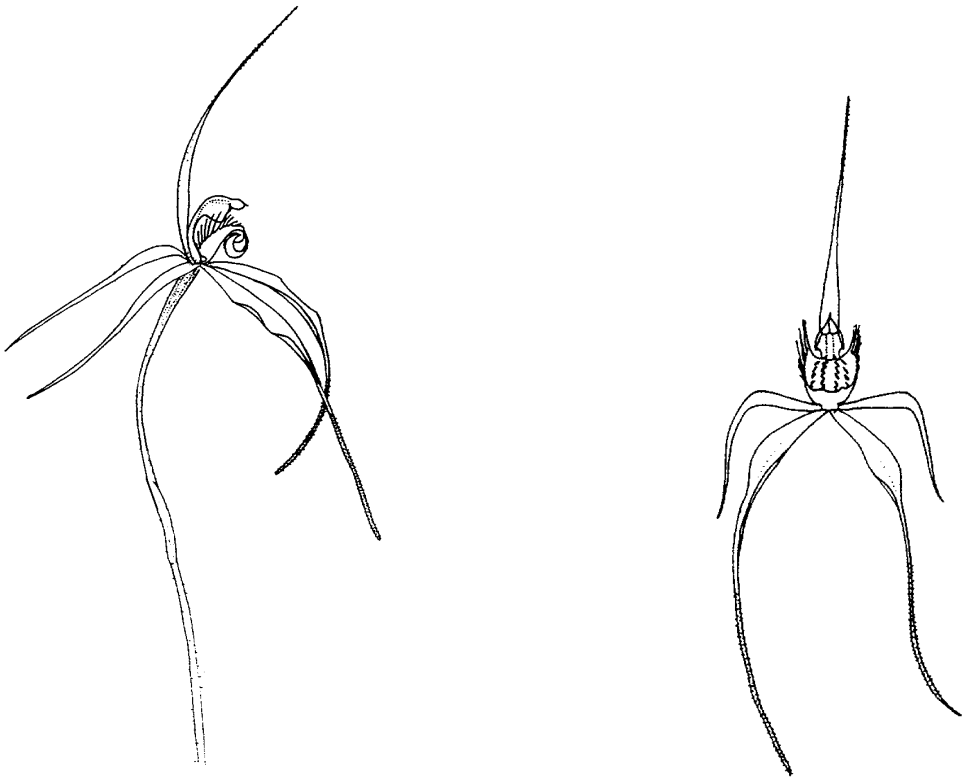
The species is to be named in honour of Mr Harry Winfield who first discovered it in the 1970s and bought it to the attention of the Department of Conservation and Land Management (CALM) in 1987. The species is currently known (March 1997) from one population of 12 plants. Although extensive surveys of suitable habitat by Pemberton and Manjimup CALM District staff, members of the Western Australian Native Orchid Study and Conservation Group (WANOSCG) and volunteers have been undertaken no additional populations have been discovered.

The cause of *C. winfieldii* ms geographic restriction is unknown, however it may be related to a dependence on specific factors in the ecosystem, eg, rare localised pollinators or associated micorrhizal fungi. Little is known of the biology of *C. winfieldii* ms and research into the following fields is recommended: pollination biology, seed production, seed germination requirements, population genetics and response to fire. The aim of this Interim Recovery Plan is to abate identified threats and maintain a viable *in situ* population of *Caladenia winfieldii* ms in order to preserve the wild genetic stock of the species. To achieve this aim the following essential and desirable recovery actions are prescribed.

Recovery actions:

Essential	Desirable
1. Control feral pigs	1. Conduct further surveys
2. Exclude the population from prescribed burns	2. Information dissemination
3. Monitor population	3. Research
4. Extend the exclusion fencing	4. Survey for translocation sites
5. Defer further timber extraction in the catchment	
6. Implement disease control	
7. Preserve genetic diversity of the species	

***Caladenia winfieldii* ms**



Catherine Vasiliu

Distribution of *Caladenia winfieldii* ms
Not available

1. BACKGROUND

1.1 History, taxonomy and status

Caladenia winfieldii ms is an erect, tuberous herb 30-60 cm tall with pink flowers (5-10 cm across). The species is closely related to *C. harringtoniae* ms with which it grows, but has larger, all pink flowers, broader petals and broader, slightly clubbed sepals. *C. winfieldii* ms also resembles *C. gardneri* ms in its pink colouration, but is darker and has tapering sepals, which lack prominently swollen clubs.

A full taxonomic description of *C. winfieldii* ms will be provided by A.P. Brown and S.D. Hopper, when they formally describe the species in 1997. A draft copy is included in Appendix 1.

C. winfieldii ms is named in honour of the late Mr Harry Winfield, a former field officer with the Western Australian Forests Department for 42 years, who knew of and had cultivated the species since the late 1970s. He brought the single known population to the attention of the Department of Conservation and Land Management (CALM) in 1987. Although extensive surveys of suitable habitat by Pemberton and Manjimup CALM District staff, members of the Western Australian Native Orchid Study and Conservation Group (WANOSCG) and volunteers have been undertaken no additional populations have been discovered.

C. winfieldii ms was declared as Rare Flora in 1993 and was ranked as Critically Endangered in September 1995. This is the only plant species currently ranked as Critically Endangered in the Southern Forest Region.

1.2 Distribution and habitat

C. winfieldii ms is known from a single population south east of Manjimup where it is found over an area approximately 150 x 20 m in size. It grows in a subdued drainage line adjacent to a seasonal creek, in grey sandy loam, rich in humus. The associated vegetation is a low woodland of *Eucalyptus rudis*, *Melaleuca preissiana* and *Banksia littoralis* over *Acacia saligna*, *Hakea varia* and *Xanthorrhoea preissii* and open herbs.

Associated species are listed in Appendix Two. A detailed description of the location of the population is included in Appendix Three.

Table 1: Summary of population information

Pop. No & Location.	Land Status	No. of plants.	Condition	Threats
1. SE of Manjimup	State Forest	1989, 200+ 1996, 12	Good	Feral pigs, kangaroo grazing, inappropriate fire regimes (late April-early December), rise in water table, flooding and siltation, dieback

1.3 Biology and ecology

It has been observed that most *C. winfieldii* ms plants grow through the skirts of *Xanthorrhoea preissii* or close to associated shrubs, presumably as these areas provide some protection from grazing kangaroos. The response of *C. winfieldii* ms to fire has not been documented. However, as is the case with the closely related *C. harringtoniae* ms, it is likely that flowering will be stimulated by summer fire. Anecdotal evidence suggests that *C. winfieldii* ms may be killed by fire during its active growing period (late April-November).

It appears likely that the appropriate insect pollinator is rare in the area, as during a survey of the *C. winfieldii* ms population in 1995, it was discovered that the flowers had shrivelled by early November and had failed to set seed, and just one naturally pollinated plant was found in November 1996. Flowers were hand pollinated in November 1996 and all developed healthy seed capsules, indicating that there is no internal mechanism that prevents seed set.

As with other geophytic Western Australian orchids, seed germination is aided by a specific micorrhizal soil fungus. The same fungus sends hyphae into the outer cells of the underground stems of adult plants where they are digested, providing essential starches for the plant.

1.4 Threatening processes

1.4.1 Causes of the Critically Endangered status of this species

Despite extensive surveys for the species since it was first bought to CALM's attention in 1987 only the original population is known. This natural geographic restriction suggests that the species is naturally rare and requires specific components within the ecosystem for reproduction and survival.

1.4.2 Threats to the ongoing survival of this species in the wild

- **Feral pigs** and evidence of their diggings have been observed in the area of the population over a period of several years. In early January 1996 a sow and her piglets were recorded in a swamp 2 - 3 km north of the population. Pig diggings can destroy the underground storage tubers of the orchid and affect the growth of symbiotic fungi essential for providing starches for the plant and seed germination (Hoffman and Brown 1992).

- **Inappropriate fire regimes** may interfere with the reproduction phase of the orchid (flowering, pollination, seed development, seed dispersal) resulting in low/nil seedling recruitment and the possible death of the parent plant.

It is known that the flowering of many orchid species is stimulated by summer wildfire (December-March), however, observation of many populations of orchid species suggests that plants may be killed by fire during their active growing period in late April-November (A. Brown pers comm.). Seedlings can be destroyed by inappropriately timed fire in the first couple of years before the tubers are fully developed (Hoffman and Brown 1992). Due to the restricted distribution and low numbers of the species, it is of concern that the single known population may be seriously reduced in size or destroyed if burnt in the late autumn, winter or spring, ie. late April to early December (Hoffman and Brown 1992).

- **Kangaroo grazing** is likely to have an impact upon the species in open sites. The orchid has been observed to grow under *Xanthorrhoea preissii* skirts and amongst other shrubs providing physical protection from grazing.

- **Potential hydrological changes** as a result of timber extraction in the catchment containing the *C. winfieldii* ms site may impact on the ecosystem in which the species occurs due to a rise in the water table. If this occurs it may cause flooding and silting (due to the close proximity of the stream and the naturally high water table at the site). Research has been undertaken (Borg *et al.* 1987) into the ground water and stream flow impacts of timber extraction in intermediate rainfall zones (eg, the area <20 km north of the *C. winfieldii* ms population). Results have shown an immediate rise in the ground water table within the lower parts (stream zone) of catchments of at least a meter. This was sustained beyond the completion of the study at 10 years post timber extraction.

- **Dieback** (*Phytophthora cinnamomi*) is present at the *C. winfieldii* ms site, and may impact on the species due to the death of susceptible plants such as *Xanthorrhoea preissii*, *Eucalyptus marginata, Banksia littoralis,* and several *Melaleuca* and *Hakea* spp. Such a loss will remove some of the protective cover of the orchid and may expose it to increased grazing pressure.

1.5 Conservation status

Caladenia winfieldii ms is known from a single population in State Forest near Manjimup. No populations are known to occur in conservation reserves. The area is listed on the Register of the National Estate by the Australian Heritage Commission.

1.6 Strategy for recovery

The following essential strategies will be implemented (see 3.2):

1. Protect the population from pig diggings by continuing feral pig control (see 3.2.1).
2. Protect the population from possible damage from controlled burns (autumn, winter, spring) until the orchids response to such fire is better understood, by developing a fire management plan (see 3.2.2).
3. Monitor population (see 3.2.3).
4. Protect *C. winfieldii* ms from possible future threats (eg, kangaroo grazing, altered hydrology, sedimentation, dieback), by appropriate management practices (see 3.2.4, 3.2.5, 3.2.6).
5. Preserve the genetic diversity of *C. winfieldii* ms by including it in cryostorage and/or *ex situ* cultivation (see 3.2.7).

The following desirable strategies will be implemented if resources permit (see 3.3):

1. Ensure that relevant land managers and CALM personnel are aware of the presence of *C. winfieldii* ms, and the need to protect it (eg, notification) and ensure that all are familiar with the threatening processes identified in these guidelines (see 3.3.2).
2. Research the biology and ecology of *C. winfieldii* ms (see 3.3.3).
3. If deemed necessary, enhance plant numbers (eg, by removal of a limiting factor or by using propagation and translocation techniques, see CALM Policy Statement No 29, *Translocation of Threatened Flora and Fauna* (see 3.3.4).

2. RECOVERY OBJECTIVE AND CRITERIA

2.1 Objective

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

2.2 Criteria

2.2.1 Criteria for success

Recovery will be deemed a success if threatening processes identified within this IRP have been reduced or removed within the three year period.

2.2.2 Criteria for failure

The recovery process will have been unsuccessful if threats identified have not abated within the three year period of this IRP or there has been a substantial decrease in the number of mature plants.

3. RECOVERY ACTIONS

3.1 Existing recovery actions

Feral pig activity was reported in the area in 1994. Six pigs were shot in the area in March 1996 by CALM Pemberton District staff. Monitoring of pig pellet and grain feeding stations is ongoing.

Further timber extraction within the catchment has been deferred until potential impacts on *C. winfieldii* ms have been identified and addressed (see 1.4.2).

The population was excluded from the 1995/96 spring burn of the surrounding area and will be excluded from future prescribed burns, apart from approved research burns.

A fence was erected around the population in 1996 to exclude feral pigs and kangaroos. Inspection during the subsequent flowering season revealed that some plants were outside the fence.

Individual plants are now marked in the field, each with an assigned number for long term monitoring.

Seed of *Caladenia winfieldii* was collected in November - December 1996 and has been sent to Kings Park and Botanic Garden (KPBG). Seed taken for storage in 1996 is of known parentage for three plants with the mother plant known for the fourth. Associated micorrhizal soil fungi were also collected in 1996 and are now in culture at KPBG.

The Threatened Flora Recovery Team for the Southern Forest Region is overseeing the implementation of this IRP and will include information about it in its annual report to CALM's Corporate Executive.

3.2 Essential recovery actions

3.2.1 Continue feral pig control

Pemberton and Manjimup CALM Districts will continue the monitoring of pig pellet and grain feeding stations and undertake appropriate measures to control pig numbers and potential impacts.

Action:	Monitor pellet and feeding stations and implement other measures to control feral pigs
Responsibility:	CALM (Pemberton District, Western Australian Threatened Species and Communities Unit (WATSCU))
Cost:	$3500

3.2.2 Develop a fire management plan

To protect the population from the possible detrimental effects of autumn, winter and spring burns (see 1.3 and 1.4.2) the habitat of *C. winfieldii* is currently excluded from prescribed burns. This no planned burn policy should be maintained until further scientific information becomes available regarding the species' response to fire (see Research 3.3.3). Fire exclusion of the area will be maintained by both Pemberton and Manjimup Districts. Research burns may take place after the approval of a science project proposal by the Directors of Science and Information and Nature Conservation.

Action:	Develop a fire management plan for the species habitat
Responsibility:	CALM (Pemberton District, WATSCU)
Cost:	$1000

3.2.3 Monitor population

Regular monitoring of factors such as pig activity, habitat degradation, population stability (expanding or declining), pollination activity, seed production, recruitment, and longevity is essential.

The population should be inspected annually as a requirement under CALM's Policy Statements, No. 9 *Conservation of Threatened Flora in the Wild* and No 28 *Reporting Monitoring and Re-evaluation of Ecosystems and Ecosystem Management*. See also below 3.3.3, *Development of a quadrat/transect based monitoring system for threatened plant species.*

Action:	Monitor population annually
Responsibility:	CALM (Pemberton District, WATSCU)
Cost:	$500 pa

3.2.4 Extend the exclusion fencing

To ease the pressure from kangaroo grazing and pig activity, it is recommended that the existing fence be extended to include the whole population. Once fenced, a monitoring program is recommended to study seedling recruitment and survival rate and should be done in conjunction with several of the research projects outlined in 3.3.3.

Action:	Fence whole population
Responsibility:	CALM (Pemberton District, WATSCU)
Cost:	$1800

3.2.5 Defer further timber extraction

Until potential impacts have been identified and addressed, ie. changes to the hydrology or initiation of sedimentation at the site, further timber extraction should be deferred within the catchment (see 1.4.2, 3.1).

Action:	Defer timber extraction within catchment
Responsibility:	CALM (Manager Southern Forest Region Business Unit, Pemberton District, WATSCU)
Cost:	$200

3.2.6 Implement disease control

The site should be routinely monitored for *Phytophthora cinnamomi* (dieback) and the area treated if required. Selective or broad scale treatment with Phosphonate at the site is recommended if deaths of associated species occur, ie. *Xanthorrhoea preissii*, *Eucalyptus marginata, Banksia littoralis.* Two sprays would be required, six weeks apart, each year to keep the Phosphonate concentrations within the plant tissue high enough to fight the pathogen. Ultra low volume (ULV) of 20 % Phosphonate is recommended (F. Bunny pers comm.).

Action:	Monitor *Phytophthora* impact and spray if required
Responsibility:	CALM (Pemberton District, WATSCU)
Cost:	$1200

3.2.7 Conserve the genetic diversity of the species

Due to the possible future extinction of *Caladenia winfieldii* ms in the wild from disease (dieback), its limited distribution and low numbers of extant plants, some germplasm storage has been undertaken, with seed being collected in November - December 1996 and stored at KPBG. Due to the low numbers of adult plants remaining, taking of further seed may cause a significant reduction in seedling recruitment and must be carefully monitored. The first aim of a germplasm collection should be the recovery of the species in the wild.

Due to the apparent low numbers of insect pollinators (see 1.3) flowers were hand pollinated in November 1996 and will continue to be hand pollinated in future years to promote a high seed set. A proportion of seed will be collected from the population annually, attempting to ensure an adequate representation of its genetic diversity. Collections in future years will target parents not yet in storage; those already represented in storage to be left for dispersal in the field and *in situ* recruitment.

If it is not possible to collect adequate quantities of viable seed in future years, other more costly methodologies may need to be investigated such as living collections obtained from other source material (tubers or tissue culture material). If resources are limited these techniques will need to be carefully prioritised in relation to *in situ* conservation. This should be coordinated by the Southern Forest Threatened Flora Recovery Team (SFTFRT).

Genetic conservation of the species should be incorporated into the research component (see 3.3.3).

Action:	Collect seed and/or other genetic material from the population, conduct hand pollination annually
Responsibility:	SFTFRT, CALM Pemberton District and Threatened Flora Seed Centre (TFSC), KPBG
Cost:	$1600

3.3 Desirable recovery actions

3.3.1 Conduct further surveys

Surveying areas of suitable habitat for translocation and possible further populations of *C. winfieldii* ms should be undertaken on a systematic basis during the flowering period of the species (October - early November), particularly in the season following summer wildfire (December-March). Volunteers from the local community, Wildflower societies, Naturalist Clubs and WANOSCG could be involved in these surveys which should be supervised by CALM staff.

Action:	Survey areas of suitable habitat for *C. winfieldii* ms
Responsibility:	CALM (Pemberton District, WATSCU)
Cost:	$1500

3.3.2 Information dissemination

To promote an awareness of *C. winfieldii* among relevant CALM staff and members of the public the production of an information leaflet or poster, which illustrates and provides information on the species, is recommended.

The importance of biodiversity conservation and the preservation of critically endangered species need to be promoted to the general public, but the exact location of *C. winfieldii* should remain confidential. Awareness can be encouraged throughout the community by a publicity campaign using the local print and electronic media and by setting up poster displays in venues of high exposure. Formal links with local naturalist groups and interested individuals should also be encouraged. Such activities may lead to the discovery of new populations of the species.

Action:	Produce information leaflets and posters, implement a publicity campaign
Responsibility:	CALM (Corporate Relations Division, WATSCU, Pemberton District)
Cost:	$1500

3.3.3 Research

Research designed to increase understanding of the biology and ecology of *C. winfieldii* ms will provide a scientific base for the management of the species in the wild. Research would ideally include:

1. **Monitoring** of the population is essential to determine pollinator activity, seed set, recruitment rates, longevity of individual plants, effects of disturbance (ie. fire) and the effects of competition. A quadrat/transect based monitoring system is in the process of being developed and will be outlined in a future CALM discussion paper *Development of a quadrat/transect based monitoring system for threatened plant species*, A. Brown, D. Coates and P. Pigott (in prep).

2. **Seed development, seed germination and protocorme** research is essential for understanding the seed biology, seed germination requirements and how the subsequent development of protocormes and juvenile plants of *C. winfieldii* ms takes place. Any seed collection must be carefully managed due to the significant risk of a future reduction in the size of the population if too little seed is left on the plants for natural recruitment.

3. The **response to summer fire** is well documented for many Western Australian orchid species, however little information is currently available for *C. winfieldii* ms. Determination of *C. winfieldii* ms response to summer fire and sensitivity to different fire regimes (autumn, winter, spring) would provide valuable information on the future effects of unplanned fire events on the species. Due to the low numbers of plants, burning and smoke trials should be limited to a small part of the population. All trials should be incorporated with monitoring**.**

4. The **pollination biology** of many Western Australian orchid species is known to be highly selective with many being pollinated by different insect species. To date, no pollinator activity has been observed on *C. winfieldii* ms, however it is likely that the species is wasp pollinated as it shares morphological features found in several other *Caladenia* species known to be visited by flower wasps. It is possible that the appropriate pollinator is very rare at the site. Research could be incorporated into a larger study of the pollination of the genus *Caladenia*.

Other areas of research are:

5. Investigation of factors determining level of flower and fruit abortion.
6. The longevity of individual plants, and time taken to reach maturity.
7. Quantification of level of invertebrate damage to seed capsules.
8. Knowledge of the extent of genetic variation within the population is essential if new populations are to be established (3.2.7).

Action: Conduct research
Responsibility: CALM (Science and Information Division (SID), WATSCU, Southern Forest Region)
Cost: $2000

3.3.4 Translocation

Information on the translocation of threatened animals and plants in the wild is provided in CALM Policy Statement No 29. Surveying potential habitat for possible future translocation sites is recommended within the scope of IRPs, with actual translocation addressed in full Recovery Plans where necessary. This should be coordinated by the Southern Forest Region Threatened Flora Recovery Team (SFRTFRT). All translocation proposals require endorsement by the Director of Nature Conservation.

Action: Survey potential habitats for translocation
Responsibility: CALM, SFRTFRT
Cost: See Section 3.3.1

Table 2: Summary of recovery actions

Recovery Actions	Priority	Responsibility	Completion date
Essential			
Continue feral pig control	High	CALM Pemberton District, WATSCU	Ongoing
Develop a fire management plan	High	CALM Pemberton District, WATSCU	February 1996, ongoing
Monitor population	High	CALM Pemberton District, WATSCU	Commenced September-October 1996, ongoing
Extend exclusion fencing	High	CALM Pemberton District, WATSCU	September 1997
Defer further timber extraction	High	CALM SFR Business Unit, Pemberton District, WATSCU	Ongoing
Implement disease control	High	CALM Pemberton District, WATSCU	Ongoing
Preserve genetic diversity of the species	High	SFRTFRT, CALM Pemberton District & TFSC, KPBG	September-October 1996,1997,1998
Desirable			
Conduct further surveys	Mod	CALM Pemberton District, WATSCU	September-October 1996,1997,1998
Information dissemination	Mod	CALM Corporate Relations, WATSCU, CALM Pemberton District	February 1996
Research	Mod	CALM SID, WATSCU, Southern Forest Region	Commence September-October 1996, ongoing
Translocation	Low	CALM, SFRTFRT	see further surveys

3.4. Costs

Table 3: Summary of costs for each recovery action

Recovery Action	1996			1997		1998	
	CALM	EA	KPBG	CALM	EA	CALM	EA
Essential							
Continue feral pig control	1500			1000		1000	
Develop a fire management plan	500			500			
Monitor population	200	300		200	300	200	300
Extend exclusion fencing	1600	300		500			
Defer further timber extraction	200			200			
Implement disease control	400			400		400	
Preserve genetic diversity of the species		500	1100				
Sub-total	**$4400**	**$1100**	**$1100**	**$2800**	**$300**	**$1600**	**$300**
Desirable							
Conduct further surveys	300	200		300	200	300	200
Information dissemination		500			1500		
Research	1000			1000			
Sub-total	**$1300**	**$700**		**$1300**	**$1700**	**$300**	**$200**
Total	**$5700**	**$1800**	**$1100**	**$4100**	**$2000**	**$1900**	**$500**

EA Environment Australia (formerly ANCA)

Total of all costs : $17 100

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Ian Wilson	Manjimup District, CALM
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Appendix One: Extract from a draft taxonomic description of *Caladenia winfieldii* by S.D. Hopper and A. P. Brown, in prep.

Caladenia winfieldii can be distinguished from other members of the *C. huegelii* complex in its rich pink colouration, its petals and sepals stiffly held near the base with drooping apices; its lateral sepals 4.5-7.5 cm long and 4-6.5 mm wide, usually splayed out at 45° below horizontal before drooping vertically as slender filiform greyish-pink clubs 15-35 mm long; its petals 3-5.5 cm long by 3-4.5 mm wide, splayed horizontally or slightly ascending before curving downwards as finely tapering sometimes glandular acute apices, lacking conspicuous clubs; its labellum 15-23 mm long and 8-11 mm wide, the basal lamina pale pink with prominent to inconspicuous pink radiating stripes; its labellum fringe of slender to robust dark pink segments to 5 mm long with enlarged or tapering pale pink or white-tipped apices; and its small column 13-16 mm tall and 7-8 mm wide across the wings.

Appendix Two: Associated species

LINDSAEACEAE
Lindsaea linearis

CYPERACEAE
Cyathochaeta avenacea

XANTHORRHOEACEAE
Xanthorrhoea preissii

ANTHERICACEAE
Sowerbaea laxiflora
Johnsonia lupulina

HAEMODORACEAE
Anigozanthos bicolor
Anigozanthos flavidus

IRIDACEAE
Patersonia occidentalis

ORCHIDACEAE
Caladenia flava

GOODENIACEAE
Lechenaultia biloba

SANTALACEAE
Leptomeria cunninghamii

RANUNCULACEAE
Clematis pubescens
Ranunculus colonorum

DROSERACEAE
Drosera gigantea
Drosera modesta

MIMOSACEAE
Acacia saligna

PAPILIONACEAE
Bossiaea linophylla
Chorizema ilicifolium
Kennedia ?glabrata

TREMANDRACEAE
Platytheca galioides
Tetratheca affinis

STERCULIACEAE
Thomasia pauciflora

DILLENACEAE
Hibbertia amplexicaulis

MYRTACEAE
Agonis ? parviceps
Eucalyptus marginata
Eucalyptus rudis
Kunzea recurva
Melaleuca preissiana

EPACRIDACEAE
Leucopogon australis
Leucopogon ? unilateralis
Leucopogon verticillatus
Leucopogon sp.

PROTEACEAE
Banksia littoralis
Hakea varia
Hakea oleifolia