
Recovery Plan for *Arachnorchis woolcockiorum*

(syn. *Caladenia woolcockiorum*)
(Woolcock's spider orchid)

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National Parks and Wildlife SA
Government of South Australia



In partnership with

Threatened Plant Action Group

THREATENED SPECIES NETWORK 120 Wakefield St Adelaide 5000



Natural Heritage Trust
Helping Communities Helping Australia

TABLE OF CONTENTS

<i>PART A: INFORMATION COMPONENTS</i>	3
BACKGROUND INFORMATION	3
CRITICAL HABITAT	4
THREATS	5
<i>PART B: PLANNING COMPONENTS</i>	6
RECOVERY OBJECTIVES	6
PERFORMANCE CRITERIA	7
ACTIONS	7
MONITORING, REPORTING AND REVIEWING	10
MANAGEMENT PRESCRIPTIONS FOR THE EPBC ACT (1999)	10
TOOLS TO ASSIST IMPLEMENTATION	11
<i>ACKNOWLEDGMENTS</i>	13
<i>REFERENCES</i>	13
<i>APPENDIX 1</i>	14
<i>APPENDIX 2</i>Available from the Senior Ecologist, Threatened Species, Bio-Conservation Programs, NPWSA.....	16

PART A: INFORMATION COMPONENTS

BACKGROUND INFORMATION

The Lofty Block Threatened Orchid Recovery Project is a partnership managed jointly by South Australia's Department for Environment and Heritage and the community group Threatened Plant Action Group. The Natural Heritage Trust has provided funding to write and implement Recovery Plans for 12 threatened orchid taxa found in South Australia, including *Arachnorchis woolcockiorum*.

Taxonomy

In 2001 the orchid genus *Caladenia* underwent taxonomic review and subsequently Jones *et al* (2001) proposed a reclassification of the genus that entails the inclusion of *Caladenia woolcockiorum* in a new genus titled *Arachnorchis*. In February 2003 the Adelaide Plant Biodiversity Centre officially adopted the name change. As a consequence, this document will refer to the species as *Arachnorchis woolcockiorum*, except when referring to field specimen collections and older documents that use the previous nomenclature *Caladenia woolcockiorum*.

The Role of Indigenous People and their Knowledge

Indigenous communities involved in the regions affected by this plan have not yet been identified. However this plan has been referred to the Aboriginal Partnerships Section of DEH, who will undertake consultation with the relevant indigenous communities. The consultation will determine the role and interests of indigenous communities with regard to the implementation of this plan.

Social and Economic Impacts

It is not anticipated that any adverse impacts will eventuate as a result of the implementation of this plan. The extant sub-populations are all found in Mount Remarkable National Park and the only suitable areas of critical habitat are either in Conservation Parks or in remnant vegetation managed by Forestry SA. It is unlikely that the implementation of this recovery plan would create an adverse economic impact, since clearance of vegetation for land development at these sites without prior permission would contravene South Australia's Native Vegetation Act (1991).

International Obligations

Although *Caladenia* (syn. *Arachnorchis*) *woolcockiorum* is listed under CITES, this recovery plan does not affect Australia's obligations under international agreements.

Current Species Status

Arachnorchis woolcockiorum (Woolcock's spider orchid) is listed as nationally Vulnerable under the Commonwealth's Environment Protection and Biodiversity Conservation (EPBC) Act (1999). Briggs & Leigh (1995) listed the orchid as 2VC-, because its geographic range is less than 100 km², all known populations are within a national park, and the reserved population size was not accurately known. Since the species was first described (Jones, 1991) its conservation status has not changed. According to the IUCN criterion VU D2 (IUCN, 1994) the species is Vulnerable because the known total area of occupancy (32ha) is considerably less than 100 km². The extent of occurrence of *A. woolcockiorum* is mostly limited to a region of difficult access, and as such there is insufficient historical data on population size and fluctuations. For this reason the species cannot be seen to conform to any IUCN criteria for listing as an Endangered species, however it is predominantly contained within a 12km² area, and an inappropriate disturbance such as disease, weed invasion, unsuitable fire regime or grazing pressure could quickly force its status to Endangered or worse.

Distribution and Population Size

In 2002 it was estimated that 3500 – 4500 plants were in existence at 15 locations (see Appendices). These locations were thought to comprise four subpopulations including in total 1500 flowering plants and 2000 - 3000 juveniles and non-flowering mature plants. The annual flowering rate of a subpopulation of spider orchids may vary considerably depending on seasonal conditions, and mature plants do not necessarily flower in consecutive years.

The known distribution is predominantly in an area measuring 2km x 6km in the centre of the Park, although scattered individuals can also be seen in the Park 1.5 – 3km west of the main subpopulations (see Figure 1). Historical records of *A. woolcockiorum* near Mt Remarkable summit and near Mambray Creek are listed on the Threatened Plant Population Database (TPPD), however the species was not seen at these sites in 1999 despite concerted searches in difficult terrain.

Region Covered by the Plan

The species is endemic to South Australia, where it is confined to Mount Remarkable National Park (MRNP) in the Southern Flinders Ranges (Figure 1). The Plan will focus primarily on MRNP, but will include other areas of similar habitat in the Southern Flinders Ranges and Northern Lofty Ranges.

Previous Conservation Activities

Since 1998, Project Officers have conducted extensive searches to locate subpopulations of *A. woolcockiorum* and have begun accumulating data on critical habitat, population size, distribution and threatening processes. Consequently, NPWSA staff members are being consulted with regards to appropriate management at and near known locations, particularly track maintenance and fire prevention procedures.

Biodiversity benefits

As is typical of many native orchids, *A. woolcockiorum* is an indicator of a healthy open woodland or open forest community, because spider orchids are usually found where there is a lack of weeds, an available supply of food for pollinators and not too many vertebrates. Hence, appropriate management of *A. woolcockiorum* sites will also improve the viability and quality of the native vegetation in general. Continued monitoring of *A. woolcockiorum* will also assist in the understanding of other closely related species of the *Arachnorchis patersonii* complex, including the nationally endangered *A. argocalla* and *A. behrii*.

Relationship to Other Documents

The Recovery Plan assisted in the fine-tuning of the MRNP Management Plan (Croft, 2000). It will also aid in the future drafting of a Fire Management Policy for MRNP. Additionally, the draft Regional Biodiversity Plan for the Northern Agricultural Districts (Graham *et al*, 2001) lists *Caladenia woolcockiorum* as a priority species, and the actions recommended therein are complementary to those recommended in this Recovery Plan.

Recovery Team

The Lofty Block North Threatened Orchid Recovery Team manages the recovery of *A. woolcockiorum*. The Team includes the Senior Ecologist and Ecologist, Threatened Species Unit (NPWSA); Regional Ecologist for Northern Agricultural District (NPWSA); District Ranger, Mambray Creek Office (NPWSA) and members from the Threatened Plant Action Group (TPAG) and the Native Orchid Society of South Australia (NOSSA).

CRITICAL HABITAT

The larger subpopulations of *A. woolcockiorum* discovered recently have been in loamy soils near gullies in Sugar Gum ± Long-leaf Box ± SA Blue Gum (*Eucalyptus cladocalyx* ± *E. goniocalyx* ± *E. leucoxydon*)

open forest or woodland (see the locations west and north-west of The Linklands in Figure 1), with Golden Wattle / Curry Bush (*Acacia pycnantha* / *Cassinia laevis*) overstorey and Guinea Flower, Mat-rush and Native Flax-lily (*Hibbertia exutiacies*, *Lomandra densiflora* and *Dianella revoluta* respectively) (see Appendix). In this habitat the *Arachnorchis woolcockiorum* are on gentle or moderate slopes, in or near clearings with herbaceous plants such as *Acaena* spp., *Bulbine bulbosa*, *Caesia vittata*, *Plantago* spp. and *Wurmbea* spp. It is thought that spider orchids benefit from more open habitat because of the extra light, reduced competition and the suitability of conditions for pollinators (Bates, pers. comm.).

Historically *Arachnorchis woolcockiorum* was found “in sparse forests on rock ledges of difficult access and rocky slopes in shallow soil” (Jones, 1991). The type location for the species is the mossy ledges of Upper Mambray Creek. These ledges are typically in *Eucalyptus microcarpa* grassy woodland with *Acacia pycnantha*, *Bursaria spinosa* and *Cassinia laevis*. The soils are shallow dark loams with sandstone gravel (Threatened Plant Population Database [TPPD]). Many of these ledges have become overgrown with weeds in recent years, however the sites remain potential habitat.

Adelaide’s Plant Diversity Centre also has collections of *Caladenia woolcockiorum* from near Mt Remarkable summit, 3kms west of Melrose (see Figure 1). The plant communities in these areas are similar to those associated with the larger recently discovered subpopulations, although the slopes are steeper and the soils are shallower and stonier. The slopes of Mount Remarkable summit and Upper Mambray Creek were searched in 1999 but no *A. woolcockiorum* were discovered.

The scattered individuals found near Blue Gum Flat and the Eaglehawk Dam track (2 – 3km west of the main subpopulations) are in clay loam on the edge of clearings, in open Blue Gum / Drooping Sheoak (*Eucalyptus leucoxylon* / *Allocasuarina verticillata*) woodland. The dominant overstorey vegetation includes *Acacia pycnantha*, *A. gracilifolia*, *Pultenaea graveolans* and *Cassinia laevis* (Bickerton & Bond, 2000).

Rainfall data indicate that extant and historical locations of *Arachnorchis woolcockiorum* populations receive an average annual rainfall of 500 – 700 mm. This rainfall information, when coupled with vegetation mapping of the Southern Flinders Ranges (see Figure 1), indicates that the most suitable areas of habitat extend from the southern slopes of Mt Brown CP to Telowie Gorge CP, Napperby and the adjacent property managed by Forestry SA.

N.B. The southern slopes of Mt Brown CP have been included in the range of potential habitat even though the rainfall is presumed to be less than 500mm annually, because it is likely that isolated pockets within Mt Brown CP receive higher rainfall.

THREATS

The main threats to *Arachnorchis woolcockiorum* include competition from weeds, inappropriate fire regimes, herbivory and inappropriate track maintenance activities. It is important to note that the species has not been seen recently near Upper Mambray Creek, on rocky ledges that have been invaded by weeds such as Milk Thistles and Quaking Grass. This suggests that *A. woolcockiorum* does not tolerate competition from weeds. *Arachnorchis woolcockiorum* is found predominantly in areas of MRNP that are currently weed-free. However, the species usually grows in open habitat. Such habitat is susceptible to weed invasion particularly if disturbed by such activities as track maintenance or fire fighting. A large portion of the Park called The Linklands (see Figure 1) was grazed by cattle until recently annexed to the Park, and because of its close proximity to the larger *A. woolcockiorum* subpopulations a diverse range of weed species may disperse into the orchid’s habitat.

It is unknown what type of fire regimes were used by indigenous Australians prior to European settlement, but it is likely that the change in fire use with European habitation and then Park management has had an impact on the orchid. Since spider orchids typically live for approximately 15 years, a low intensity burn every 10 to 15 years would have reduced competition. However, since European settlement, fires may have become less frequent, but more intense and damaging to orchids. Conversely,

if fires occur too frequently, the orchids could fail to reach maturity (typically two to five years for spider orchids), and recruitment would be diminished. For example, the weeds currently found on the rocky ledges of Upper Mambray Creek appear to have become established after fires in 1982 and 1988. Therefore inappropriate fire regimes within MRNP also pose a threat to the species.

Although there are no data on herbivory for *A. woolcockiorum*, it is known that other species of the *Arachnorchis patersonii* complex are susceptible to grazing pressure by native and introduced vertebrates and invertebrates (Bickerton, 1999; Robertson & Bickerton, 2000). Of particular concern are kangaroos, euros, rabbits, hares and caterpillars. The vertebrates are of concern because of the proximity of most *A. woolcockiorum* populations to The Linklands (see Figure 1), an area of land which was until recently cattle pasture, but is now annexed to the Park. Such land tends to attract vertebrates that feed on the pasture at twilight and take shelter in the remnant vegetation during the day. These herbivores have the potential to severely reduce the number of flowers, and consequently the recruitment rate, in a population of spider orchids. Also caterpillars are known to have an impact on spider orchids found in the Adelaide Hills (Bickerton, 1999), and it is possible that they also graze on *A. woolcockiorum* in MRNP, since the rainfall is similar to some areas in the Adelaide Hills.

Most known *A. woolcockiorum* subpopulations are found adjacent to vehicle tracks, possibly because of the reduced competition and because of the tendency for pollinators to follow tracks when foraging or seeking mates (Although the identity of the pollinator is uncertain, spider orchids are usually pollinated by male thynnid wasps). The tracks are intended for use by National Parks' staff and fire fighting crews, and it is important that Park management and maintenance staff are aware that over-ambitious earthmoving activities could be detrimental to the species. An earthmoving vehicle is potentially a vector for the spread of weeds, and also frequent clearing could favour more aggressive species and alter the structure of the habitat unfavourably.

The pruning of vegetation for track maintenance may have an impact on *A. woolcockiorum* subpopulations through (a) physical damage to individuals and / or habitat by machinery or (b) smothering of the orchids by discarded prunings. Careful planning and implementation of track maintenance will limit damage to plants.

The pre-European extent of occurrence of *Arachnorchis woolcockiorum* is unknown, but it is likely that much of its suitable habitat has disappeared because of land clearing for grazing. Sugar gums are dominant or co-dominant in *A. woolcockiorum* habitat, and they have long been favored for firewood for kilns and ovens. It is probable that land clearance and the resultant fragmentation of habitat has led to the decline of the species. However, since the majority of habitat now critical or suitable for *A. woolcockiorum* is found within National Park reserves, there is no current threat of further land clearance.

PART B: PLANNING COMPONENTS

RECOVERY OBJECTIVES

Overall Recovery Objectives

To secure the status of *A. woolcockiorum* as Vulnerable in the next five years by increasing the total population size to 2500 mature individuals and / or by ensuring that the species remains stable in at least six separate locations.

Since the current distribution of *A. woolcockiorum* is considerably restricted, it is not deemed feasible to attempt to downgrade the conservation status from Vulnerable in the short term. However, the aim of this Recovery Plan is to ensure that known subpopulations are stabilized and increased in size and abundance if possible, and to make certain that an appropriate management regime is implemented at all locations.

Specific Recovery Objectives

1. Minimize the loss of genetic variability across the species range.
2. Maintain or increase the area of occupancy of the species over the next five years.
3. Maintain or increase the abundance of the species over the next five years.
4. Maintain or increase the extent of occurrence of the species over the next five years.

Primarily there is a need to minimize the risk of local extinction of smaller subpopulations and the associated loss of genetic material. Secondly the area of occupancy is restricted to 32ha and it must be maintained or increased to ensure the species does not become Endangered. Additionally the stability of *A. woolcockiorum* can be improved through enhancement of species abundance and attempts to find new subpopulations, thus increasing the currently restricted known extent of occurrence.

PERFORMANCE CRITERIA

- 1.1. Seed from all known subpopulations greater than one plant is collected and stored within five years to minimize the loss of genetic variability.
- 2.1. The total area of occupancy of the species is not reduced by weed invasion or herbivory over the next five years.
 - 3.1. Track maintenance policies and fire prevention protocols suitable for the species are developed and implemented within five years.
 - 3.2. Subpopulations currently with fewer than five mature plants are protected from extrinsic threats and all sub-populations contain as many or more mature plants after five years.
- 4.1. Systematic searches have been conducted annually for five years, for new subpopulations of *A. woolcockiorum* in areas of critical and potential habitat.

ACTIONS

1.1.1. Collect and cryogenically store seed from all known subpopulations.

The Recovery Team will collect seed from all known sites within five years. It will be sent to Kings Park and Botanic Gardens WA, where it can remain viable in cryogenic storage.

2.1.1. Monitor sites for weed invasion, and if necessary implement weed control measures.

All *A. woolcockiorum* sites will be visited annually and assessed for weed invasion. Should weed numbers increase to a size deemed potentially detrimental to the spider orchid, community groups such as TPAG, NOSSA and Friends of MRNP will be encouraged to assist in weed control. NPWSA staff will also be consulted with regards to controlling weeds at the source.

2.1.2. Monitor all known sites for herbivory rate, and if necessary implement herbivore control measures.

All sites will be visited annually and assessed for grazing pressure. Also the primary cause of grazing pressure (e.g. kangaroos, rabbits or caterpillars) will be assessed. If necessary the options of fencing subpopulations, placing tree guards around individual plants or controlling invertebrates will be implemented. The Recovery Team and NPWSA staff will be responsible for these activities. NPWSA staff will also be consulted if it is necessary to control herbivores such as kangaroos or rabbits feeding at a nearby source such as The Linklands (see Figure 1).

3.1.1. Liaise with NPWSA management staff and track maintenance contractors.

It is important that track maintenance does not adversely affect *A. woolcockiorum*, because the known subpopulations are found close to fire tracks in relatively undisturbed vegetation. Planning and implementation of track maintenance should consider the frequency and method of vegetation clearance

near tracks, disposal of cleared vegetation and use of earthmoving equipment. A track maintenance policy will be developed in collaboration with NPWSA staff and contractors.

3.1.2. Liaise with local fire prevention managers and crews.

The tracks that pass by the *A. woolcockiorum* sites are important access tracks for fire fighting, and two of the *A. woolcockiorum* subpopulations are in the vicinity of water refill facilities (see Appendix 1 – Sugar gum Camp and Woods Hut No. 8). It is important that the movements of fire trucks, especially during the active season of the spider orchid, have a minimal effect on the plants where possible, and likewise that the use of earthmoving equipment to create firebreaks is not detrimental to subpopulations. The Recovery Team and NPWSA management will hold discussions with Country Fire Service (CFS) crews and, alerting them to the concerns for biodiversity, providing information on the locality of sites and working with them to devise suitable fire prevention protocols for critical areas. If necessary, training sessions will also be held for operational staff.

3.2.1. Herbivore control at Blue Gum Flat and Eaglehawk Dam Track.

Individual plants found in the outlying subpopulations will be protected from herbivores by tree guards, wire netting or use of deterrents for invertebrates. The Recovery Team will be responsible for initiation of controls and annual monitoring of the effectiveness of the methods used, and NPWSA and / or Friends of MRNP will be asked to assist with follow-up maintenance of guards or netting.

3.2.2. Enhance recruitment at Blue Gum Flat and Eaglehawk Dam Track.

A translocation feasibility study (Bickerton, 2001[a]) has recently been conducted for *A. woolcockiorum* and it was deemed not a necessary option for the species at this stage. Instead, *in-situ* management alternatives will be explored. A proportion of flowering plants in the smaller subpopulations will be hand-pollinated in order to increase seed set. The proportion of flowers to be hand-pollinated will be determined by guidelines set by the Recovery Team (Bickerton, 2001[b]). Additionally, recruitment will be enhanced by collecting mature seed in October / November and re-dispersing it in late autumn. It is expected that the Recovery Team will carry out such tasks with little or no assistance from community groups, because the hand pollination of orchids requires expertise, and although members of NOSSA would be capable of such work, the difficulty of access and distance to be traveled would be an unreasonable expectation for volunteers.

3.3.1. See 2.1.1.

3.3.2. See 2.1.2.

4.1.1. Conduct an annual search for additional subpopulations in areas of critical habitat.

Members of NOSSA and Friends of MRNP will be asked to assist in annual searches of previously unexplored critical and potential habitat, particularly outside MRNP.

Table 2: The relationship between the specific objectives, performance criteria and actions recommended for the recovery of *A. woolcockiorum*.

SPECIFIC OBJECTIVE	PERFORMANCE CRITERION	ACTION
1. Minimize the loss of genetic variability across the species range.	1.1. Seed from all known subpopulations greater than one plant is stored within 5 years.	1.1.1. Collect and cryogenically store seed from all known subpopulations.
2. Maintain or increase the area of occupancy of the species over the next 5 years.	2.1. The current area of occupancy is maintained or increased over the next 5 years.	2.1.1. Monitor sites for weed invasion, and if necessary implement weed control.

		2.1.2. Monitor sites for herbivory rate, and if necessary implement herbivore control.
3. Maintain or increase the abundance of the species over the next 5 years.	3.1. Track maintenance policies and fire prevention protocols suitable for the species are developed and implemented within 5 years.	3.1.1. Liaise with NPWSA management staff and track maintenance contractors.
		3.1.2. Liaise with local fire prevention managers and crews.
	3.2. Subpopulations with fewer than 5 mature plants are protected from extrinsic threats within 1 year and all subpopulations contain at least as many mature plants after 5 years.	3.2.1. Herbivore control at Blue Gum Flat and Eaglehawk Dam Track through use of tree guards, netting and / or invertebrate deterrents.
		3.2.2. Enhance recruitment at Blue Gum Flat and Eaglehawk Dam Track by hand pollinating.
3.3. See 2.1.	3.3.1. See 2.1.1.	
	3.3.2. See 2.1.2.	
4. Maintain or increase the extent of occurrence of the species over the next 5 years.	4.1. All areas of critical habitat in the Southern Flinders and Northern Lofty Ranges are searched within 5 years.	4.1.1. Conduct an annual search for additional subpopulations in areas of critical habitat.

Affected Interests

Table 1: Interests affected by the Recovery Plan's recommended actions; also the manner in which these interests have been or will be addressed. P.O. - Project Officer; R.T. - Recovery Team

ACTION	INTEREST(S) AFFECTED	MANNER OF ADDRESS
1.1.1. Collect and store seed	WA Botanic Gardens	Liaison with P.O.
2.1.1. Monitor for weed invasion and if necessary implement weed control	NPWSA Staff	R.T. member
2.1.2. Monitor for herbivory rate and if necessary implement herbivore control	NPWSA Staff	R.T. member
3.1.1. Devise track maintenance policy	NPWSA Staff	R.T. member
	Track maintenance contractors	Liaison with P.O. & NPWSA Staff
3.1.2. Devise fire prevention procedures	NPWSA Staff	R.T. member
	CFS Management	Liaison with P.O. & NPWSA Staff
3.2.1. Herbivore control at Blue Gum Flat and Eaglehawk Dam Track	NPWSA Staff	R.T. member
3.2.2. Hand-pollinating at Blue Gum Flat and Eaglehawk Dam Track	-	P.O.
4.1.1. Search for new subpopulations	NPWSA	R.T. member
	Forestry SA	Liaison with P.O.

MONITORING, REPORTING AND REVIEWING

Data on the following information will be collected: population size and fluctuations, herbivory rate, natural pollination rate, herbivore control rate, success of hand pollination, weed invasion, effects of disturbance (e.g. track maintenance) and volunteer participation. The Recovery Team will evaluate the information biennially, and progress will be reported to the Biodiversity Conservation Programs section of the Department for Environment and Heritage (DEH), Southern Flinders District of NPWSA, TPAG, Threatened Species Network and NOSSA. The biennial Recovery Team meetings will also provide the forum for on-going review of the Recovery Plan.

MANAGEMENT PRESCRIPTIONS FOR THE EPBC ACT (1999)

Spider orchids such as *A. woolcockiorum* are considered to be indicator species, because of their need for intact habitat. Consequently, all known subpopulations and areas of critical habitat should be left undisturbed or at best subjected to minimal disturbance in accordance with the following guidelines.

- Vegetation clearance by any means other than slashing or control burns is likely to alter the habitat to the detriment of the *A. woolcockiorum* present.
- Slashing or control burning during the months of May to November would be harmful to *A. woolcockiorum* plants in the active stage of growth.
- Slashing or control burning conducted at any one site any more frequently than every ten years would noticeably reduce recruitment of *A. woolcockiorum*, because such a disturbance regime will favour other species that establish more quickly, crowd out smaller species and reach maturity earlier.

- The placement of large piles of pruning waste from slashing activities would inhibit the growth of mature and juvenile plants.
- The placement of beehives in the vicinity of known *A. woolcockiorum* subpopulations would adversely affect the orchids' pollinators.
- Uncontrolled or poorly controlled weeds in the vicinity of known *A. woolcockiorum* subpopulations may reduce the area of occupancy for the species.
- The use of earthmoving equipment, at any time of year, in the vicinity of known *A. woolcockiorum* subpopulations has the potential to damage plants.
- Uncontrolled or poorly controlled vertebrates in the vicinity of known *A. woolcockiorum* subpopulations may reduce the abundance of the species.
- The use of insecticides in the vicinity of known *A. woolcockiorum* subpopulations during the months of August to December may reduce the abundance of the orchid's pollinators and consequently the orchid.

TOOLS TO ASSIST IMPLEMENTATION

Community Participation

Due to the difficulty of access to known *A. woolcockiorum* sites, participation by community groups will be minimal. However, members of NOSSA and TPAG with expertise in hand pollination and monitoring will be encouraged to take part in the recovery. Also, Members of Friends of MRNP will be encouraged to assist in weed and herbivore control where necessary.

Communication

The Recovery Team will continue to serve as a means for communication between Team members. Additionally the Project Officer will deliver presentations to such groups as NOSSA and Friends of MRNP and the Regional Ecologist (NPWSA) will deliver presentations to local NPWSA staff. Track maintenance crews and fire prevention crews will be contacted directly. Articles will be compiled for local newspapers, the Parks and Wildlife journal, the NOSSA journal and the Threatened Species newsletter. These presentations and articles will cover such topics as the issues and problems related to recovery of *A. woolcockiorum*, the results of monitoring and the progress of recovery.

The Aboriginal Partnerships Section of DEH will undertake consultation with relevant indigenous communities. Following consultation with indigenous communities, their role and interests will be addressed in recovery plan implementation.

Table 3: Estimated Cost of Recovery

CFS – Country Fire Service; NOSSA - Native Orchid Society of South Australia; NPWSA – National Parks and Wildlife, South Australia; TPAG – Threatened Plant Action Group; MRNP – Mt Remarkable National Park

ACTION	EXPENSES	COST	RESPONSIBILITY	TIMEFRAME
1.1.1. Collect and store seed	Travel, accommodation, labour	\$1900	Recovery Team	Year 1 to 5
2.1.1. Monitor sites for weed invasion, and if necessary implement weed control	Herbicides, pruning equipment, travel, accommodation, labour	\$2080	Recovery Team, TPAG, NOSSA, Friends of MRNP	Year 1 to 5
2.1.2. Monitor sites for herbivory rate, and if necessary implement herbivore control	Tree guards, wire netting, invertebrate deterrent, travel, accommodation, labour	\$4170	Recovery Team	Year 1 to 5
3.1.1. Devise track maintenance policies	Telecommunications, travel, accommodation, labour	\$1500	Recovery Team, NPWSA	Year 1 to 2
3.1.2. Devise fire prevention procedures	Telecommunications, travel, accommodation, labour	\$1500	Recovery Team, CFS	Year 1 to 2
3.2.1. Herbivore control at Blue Gum Flat and Eaglehawk Dam Track	Tree guards, wire netting, invertebrate deterrent, travel, accommodation, labour	\$850	Recovery Team, NPWSA, Friends of MRNP	Year 1 to 5
3.2.2. Hand-pollinating at Blue Gum Flat and Eaglehawk Dam Track	Travel, accommodation, labour	\$3750	Recovery Team	Year 1 to 5
4.1.1. Search for new subpopulations	Travel, accommodation, labour	\$5250	Recovery Team, NOSSA	Year 1 to 5

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APPENDIX 1

Table 5: A brief (not comprehensive) plant species list for selected *Arachnorchis woolcockiorum* sites.

Locations: Surveyor(s), Date:

Woods Hut 1: D. Bickerton, 20/9/00

Woods Hut 2: R. Bates & D. Bickerton, 12/9/99

Woods Hut 3: D. Bickerton, 20/9/00

Woods Hut 4: D. Bickerton, 20/9/00

Woods Hut 5: D. Bickerton, 20/9/00

Woods Hut 6: D. Bickerton, 20/9/00

Sugar Gum Camp: D. Bickerton, 28/9/99

*: Non-indigenous species

SPECIES	LOCATION
<i>Acacia paradoxa</i>	Woods Hut 5, 6, Sugar Gum Camp
<i>A. pycnantha</i>	Woods Hut 1 - 6, Sugar Gum Camp
<i>Acaena</i> sp.	Woods Hut 1 - 3, Sugar Gum Camp
* <i>Anagallis arvensis</i>	Woods Hut 1
<i>Billardiera versicolor</i>	Woods Hut 4
* <i>Briza maxima</i>	Woods Hut 1, 2, Sugar Gum Camp
<i>Bulbine bulbosa</i>	Woods Hut 1 - 5, Sugar Gum Camp
<i>Bursaria spinosa</i>	Woods Hut 2, 4, 5
<i>Caesia vittata</i>	Woods Hut 1, 3 - 5, Sugar Gum Camp
<i>Caladenia deformis</i>	Woods Hut 1
<i>Arachnorchis woolcockiorum</i>	Woods Hut 1 - 6, Sugar Gum Camp
<i>Calocephalus cinearia</i>	Woods Hut 4, 5, Sugar Gum Camp
<i>Cassinia laevis</i>	Woods Hut 1, 3 - 6, Sugar Gum Camp
<i>Craspedia variabilis</i>	Woods Hut 4
<i>Cymbonotus priessianus</i>	Woods Hut 1
<i>Daucas glochidiatus</i>	Woods Hut 5
<i>Dianella revoluta</i>	Woods Hut 1 - 4, Sugar Gum Camp
<i>Dodonaea viscosa</i>	Woods Hut 3 - 5
<i>Drosera</i> sp.	Woods Hut 1
* <i>Echium plantagineum</i>	Woods Hut 1
<i>Elymus scabrus</i>	Woods Hut 2
<i>Eucalyptus camaldulensis</i>	Sugar Gum Camp
<i>E. cladocalyx</i>	Woods Hut 1, 2, 4, Sugar Gum Camp
<i>E. goniocalyx</i>	Woods Hut 2

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(APPENDIX 1 CONTINUED)

SPECIES	LOCATION
<i>E. microcarpa</i>	Woods Hut 2 - 6, Sugar Gum Camp
<i>Exocarpus cupressiformis</i>	Woods Hut 2, 3
<i>Geranium</i> sp.	Woods Hut 2
<i>Haloragis aspera</i>	Woods Hut 1
<i>Hibbertia exutiacies</i>	Woods Hut 1 - 5, Sugar Gum Camp
<i>Hydrocotyle</i> sp.	Woods Hut 2
* <i>Hypochoeris glabra</i>	Sugar Gum Camp
<i>Lomandra densiflora</i>	Woods Hut 1 - 4
<i>Luzula meridionalis</i>	Woods Hut 2
<i>Medicago sativa</i>	Woods Hut 1
<i>Microtis</i> sp.	Woods Hut 2
<i>Oxalis perennans</i>	Woods Hut 1, 3
<i>Plantago</i> spp.	Woods Hut 1 - 3, Sugar Gum Camp
<i>Poa</i> sp.	Woods Hut 2
<i>Pterostylis robusta</i>	Woods Hut 3
<i>Pultenaea graveolens</i>	Woods Hut 1, 4, 5
<i>P. largiflorens</i>	Sugar Gum Camp
<i>Ranunculus</i> sp.	Woods Hut 2
<i>Spyridium</i> sp.	Woods Hut 3
<i>Stackhousia monogyna</i>	Woods Hut 4
<i>Wahlenbergia stricta</i>	Woods Hut 2, Sugar Gum Camp
<i>Wurmbea biglandulosa flindersii</i>	Woods Hut 1, 2, 4, 5

Appendix 2 contains confidential information and is available only from the Senior Ecologist, Threatened Species, Bio-Conservation Programs, NPWSA.