National Recovery Plan for the Desert Greenhood *Pterostylis xerophila*

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Australian Government



Government of South Australia Department for Environment and Heritage



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Summary

The Desert Greenhood *Pterostylis xerophila* is a small, deciduous, terrestrial orchid endemic to inland South Australia and Victoria. Little is know of its biology, ecology, distribution and abundance. It occurs in generally remote locations in semi-desert environments, growing mostly on rock outcrops under low shrubs. Only eight populations containing about 150 plants are known. Current threats include grazing and habitat degradation by native and introduced herbivores, disturbance and climate change. The Desert Greenhood is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, and is listed as Threatened under the Victorian *Flora and Fauna Guarantee Act* 1988 and Vulnerable under the South Australian *National Parks and Wildlife Act* 1972. This national Recovery Plan for the Desert Greenhood is the first recovery plan for the species, and details its distribution, habitat, threats and recovery objectives and actions necessary to ensure its long-term survival.

Species Information

Description

The Desert Greenhood *Pterostylis xerophila* M.A. Clem. is a deciduous, perennial, terrestrial orchid emerging annually from an underground tuber. It produces a ground-hugging, stem-encircling, crowded basal rosette of 4–10 greenish leaves that are usually withered at flowering time. A slender greenish stem to 20 cm tall, with 1–2 closely sheathing bracts, bears 1–8 small (to 20 mm long), light green flowers with darker green or brownish stripes and suffusions, on long slender pedicels. The dorsal sepal has an upturned, pointed apex, while the lateral sepals are deflexed, joined at the base, shallowly concave, sparsely ciliate, and taper quickly to slender, curved free points. The labellum is mobile, broadly ovate, fleshy and channelled, and the margins have 4–5 pairs of coarse white setae (description from Jessop & Toelken 1986; Backhouse & Jeanes 1995; Bates & Weber 1990; Bishop 1996; Jeanes & Backhouse 2006). The species is illustrated in Bates & Weber (1990, plate 190), Backhouse & Jeanes (1995, pg. 320), Bishop (1996, plate 213), Jeanes & Backhouse (2006, pg. 140) and Jones (2006, pg. 331). *Pterostylis xerophila* is most similar to *Pterostylis boormanii*, but can be distinguished by its widely opening galea, the broad, shallowly concave, sparsely ciliate lateral sepals, and the ovate, fleshy labellum with a few coarse marginal setae.

Very little is known of the biology and ecology of *P. xerophila*. It is dormant during the drier summer months, emerging following autumn and early winter rains. In the Gawler Ranges in South Australia, flowering commences in September and is usually completed by mid October, while in north-western Victoria, flowering commences in early October and is completed by early November. Flowering can be quite sporadic, and relies on good autumn and winter rainfall, and few, if any, plants flower in dry years. The basal rosette has usually withered by flowering time. About four weeks after flowering finishes, if pollination has occurred, the seed capsule is ripening, and seed dispersal occurs soon after. In related species, pollination is via pseudocopulation (Backhouse & Jeanes 1995; Jones & Clements 2002), although the pollinator is not known, but many *Pterostylis* species are pollinated by small gnats and/or flies. Longevity of the Desert Greenhood and response to fire are not known.

Taxonomy

Pterostylis xerophila was described by Mark Clements in 1986, based on plants grown in cultivation that were collected at Wynbring in the Great Victoria Desert in South Australia (Clements 1989). The species belongs to a taxonomically complex group within Pterostylis called the 'rufa group', so called because of their general similarity to Pterostylis rufa. This group is characterised by having a basal rosette that is usually withered at flowering time, flowers with deflexed lateral sepals and a labellum adorned with bristles, and mostly growing in drier, sometimes semi-desert habitats. The rufa group of Pterostylis contains many undescribed taxa (e.g. Jeanes & Backhouse 2006; D. Jones, Centre for Plant Biodiversity Research Canberra pers. comm.), and several other un-named dryland rufa group species (particularly in Victoria) have been included in P. xerophila. This, combined with infrequent observations of plants because of remote locations and sporadic flowering, has led to confusion as to the exact identity, distribution and abundance of P. xerophila. Reports of P. xerophila-like plants from near Swan Hill (Wemen Flora and Fauna Reserve) are believed to be of a different, un-named taxon (D. Jones pers. comm.), while reports of a similar species at Neds Corner, Pink Lakes and Walpeup (Vic) are referable to another un-named species Pterostylis. sp. aff. biseta 1 (sensu Jeanes & Backhouse 2006). A proposed action in this Recovery Plan is to accurately determine the identity of all extant populations of *P. xerophila*, especially the disjunct Victorian populations.

Distribution

The Desert Greenhood is endemic to inland south-eastern Australia, where it occurs in Victoria and South Australia, in the Murray-Darling Depression, Eyre-York Block, Gawler, and Great Victoria Desert IBRA bioregions (*sensu* DEH 2000) (Figure 1). There is apparently a major disjunction between the Victorian and extant South Australian populations of the species. Maps showing the distribution of *P. xerophila* are available from the Department for Environment and Heritage (DEH) (for South Australia) and the Department of Sustainability and Environment (DSE) (for Victoria).



Population Information

The Desert Greenhood is currently known from only eight populations containing about 150 plants (Table 1). Plants have not been seen recently at many of these populations due to the remoteness of the sites, difficulty of access, paucity of visits, and high dependence upon good autumn and winter rainfall for flowering to occur. Also, there has been little general searching for *P. xerophila* in either Victoria or South Australia. Therefore, while the data presented for population size and extent are the best available, it may not accurately represent the current population size or extent. Surveys for *P. xerophila* are a priority at all sites in the spring following above average autumn and winter rainfall. Specific details of population localities (including GPS data) are held on internal DSE and DEH files.

Location	Size Area Manager		Manager	Comments		
South Australia						
Gawler Ranges National Park	~50 plants (1998)	<10 ha	DEH	at least 3 scattered sub-populations on separate rock outcrops		
Yellabinna Recreation Reserve (Great Victoria Desert)	~3 plants (2004)	<1 ha	DEH	closest extant population to the type location		
Caralue Bluff Conservation Reserve	<10 plants (2000)	<1 ha	DEH			
Coolanie	<10 plants (1998)	<1 ha	?	land tenure not determined		
30 km north of Cowell	<10 plants (1998)	<1 ha	?	land tenure not determined		
Evans outstation, W of Nepabunna	? (1998)	?	private			
Victoria						
Murray-Sunset National Park	~65 plants (2000)	~100 ha	PV	plants occur in two sub-populations		
Wyperfeld National Park (1)	<10 plants (1980)	<1 ha	PV			
Wyperfeld National Park (2)	~25 plants (2002)	?	PV	plants scattered on rock outcrops		

Table 1.	Population	information	for	Pterostylis xerophila
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Abbreviations: DEH = Department for Environment and Heritage, South Australia; PV = Parks Victoria

Habitat

Little is known of the precise habitat requirements of *P. xerophila*. In South Australia, *P. xerophila* occurs in dry woodland on fertile red loamy soils (Bates & Weber 1990), on or around granite or quartzite rock outcrops (Jessop & Toelken 1986). Species commonly found in areas where *P. xerophila* occurs on the Eyre Peninsula include Broombush *Melaleuca uncinata*, Ridge-fruited Mallee *Eucalyptus incrassata*, Beaked Red Mallee *Eucalyptus socialis* and/or Narrow-leaf Red Mallee *Eucalyptus leptophylla* (Pobke 2007). In Victoria, it occurs in open mallee scrublands, usually on rocky outcrops or stony rises, under Broombush or Mallee Tea-tree *Leptospermum coriaceum*, on well-drained red sands and heavier clay loams (Backhouse & Jeanes 1995). A proposed Recovery Action is to more closely determine habitat critical to survival of *P. xerophila*.

Decline and Threats

Virtually nothing is known of the previous distribution or abundance of the Desert Greenhood, so it is not possible to determine if there has been any decline in range and/or abundance. A population recorded from private property near Pinnaroo (SA) has not been seen for many years, and is likely to be now extinct there (B. Bates, State Herbarium of South Australia pers. comm.).

Historically, there has been substantial loss of mallee habitat, especially in South Australia, which may have had an impact on the distribution and abundance of *P. xerophila*. Much of the Gawler Range was under pastoral lease and subject to stock grazing, plus had high numbers of rabbits and feral goats, so it is likely that potential habitat there has suffered severe degradation that may have had an impact on *P. xerophila* populations.

Much of the range of the Desert Greenhood has suffered from extended drought conditions for a decade or more, which has made relocating populations and determining population sizes difficult. The extended dry conditions may also have led to population decline/loss, as the species probably only flowers well in years of above average rainfall. Individual populations of *P. xerophila* are at high risk of extinction from stochastic events, especially extended dry conditions, due to the small population sizes and the highly fragmented distribution. Apparent hybrids between *P. xerophila* and *Pterostylis* sp. aff. *boormanii* (*sensu* Jeanes & Backhouse 2006) have been observed at the Murray-Sunset National Park site, although the extent and significance of this is not known.

Little is known of the extent or impact of current threats to populations, although several threats are evident. These include:

Grazing

Grazing by native and/or introduced herbivores may be a threat at all sites. Feral goats and rabbits are present at most sites, and grazing by kangaroos may also be a problem. Heavy grazing by rabbits and goats can also cause severe habitat degradation.

Weed invasion

Weeds, especially Paterson's Curse *Echium plantagineum* and Ward's Weed *Carrichtera annua* are a minor problem at some sites in the Gawler Ranges National Park (D. Bickerton DEH DA, pers. comm.).

Disturbance

Accidental destruction by vehicle movement and trampling by people is a potential threat at sites where plants occur close to tracks and/or roadsides; one site in Murray-Sunset National Park is at high risk.

Fire

The use of prescribed burning for fuel management or asset protection (or wildfires early in the season) during the growing/flowering/seeding period of *P. xerophila* (June to December) is likely to be detrimental to this species. Prescribed burning at *P. xerophila* sites should be avoided when plants are actively growing and flowering.

Climate change

Climate change probably poses the most significant long-term threat to the Desert Greenhood. Many of the rufa group *Pterostylis* species are adapted to dry conditions. However, with the predicted decrease in rainfall and increase in temperatures and evaporation rates resulting from climate change, environmental conditions for *P. xerophila* are likely to become even more marginal, with a reduction in opportunities for flowering, pollination, seed production and recruitment of plants to the adult population, as well as increasing mortality of existing plants. The frequency of wildfires may also increase with climate change.

Existing Conservation Measures

Little conservation action for the Desert Greenhood has occurred, mainly because of the remoteness of its habitat and poor understanding of its distribution and abundance. Sheep have been removed from the Gawler Ranges National Park, and there is an ongoing control program for feral goats there, which should be beneficial for the orchid. The Wyperfeld National Park (1) site was fenced in the 1980s to protect plants from grazing by rabbits.

Recovery Objectives

The Overall Objective of recovery is to minimise the probability of extinction of the Desert Greenhood in the wild and to increase the probability of populations becoming self-sustaining in the long term. Within the duration of this Recovery Plan, the Specific Objectives for the recovery of the Desert Greenhood are to:

- 1. Determine distribution, abundance and population structure
- 2. Determine habitat requirements
- 3. Manage threats to populations
- 4. Identify key biological characteristics
- 5. Determine life history and viability of populations
- 6. Establish an ex situ collection
- 7. Build community support for its conservation

Program Implementation and Evaluation

This Recovery Plan guides recovery actions for the Desert Greenhood and will be implemented and managed by the Victorian Department of Sustainability and Environment and the South Australian Department for Environment and Heritage, supported by other agencies, educational institutions, regional natural resource management authorities and community groups as appropriate. Technical, scientific, habitat management or education components of the Recovery Plan will be referred to specialist groups on research, *in situ* management, community education and cultivation as required. Contact will be maintained between the State agencies on recovery issues concerning the Desert Greenhood. The Recovery Plan will run for five years from the date of its adoption under the EPBC Act, and will be reviewed and revised within five years of the date of its adoption.

Recovery Actions and Performance Criteria

Action	Description	Performance Criteria						
Specific	Specific Objective 1: Determine distribution, abundance and population structure							
1.1	Clarify taxonomy to enable the accurate identification of Desert Greenhood.	 All populations attributed to <i>P. xerophila</i>, especiall those in Victoria, identified and confirmed. 						
	Responsibility: DSE, DEH, CPBR, NHV							
1.2	Undertake surveys to determine area & extent of populations, number, size & structure of populations, and	 All population sites searched in spring following average/above average autumn/winter rainfall. 						
	inference or estimation of population change.	 If plants detected, sites mapped for population 						
Responsibility: DEH, DSE, PV		size, condition and habitat; land tenure determined						
Specific	Objective 2: Determine habitat requirements							
2.1	Survey known habitat, collect floristic and environmental	 Species/habitat specific survey design prepared. 						
	information relevant to community ecology and condition.	 Habitat critical to survival mapped for any extant 						
	Responsibility: DEH, DSE, PV	populations.						
2.2	Identify & survey potential habitat, using ecological &	 Potential habitat at/near current sites surveyed. 						
	bioclimatic information indicating habitat preference.	Predictive model for potential habitat developed &						
	Responsibility: DEH, DSE, PV	tested at five sites.						

Specific	Objective 3: Manage threats to populations				
3.1	Control threats from pest plants. Responsibility: DEH, PV	Reduction in cover of weeds (notably <i>Echium plantagineum</i>) at and near all sites.			
3.2	Control threats from grazing native and feral animals. Responsibility: DEH, PV	 Reduction in damage by pest animals (notably goats and rabbits) at and near all sites. 			
		 Fencing installed/maintained as required. 			
3.3	Control the threat of direct damage by human activities. Responsibility: DEH, PV	 Impact of off-road vehicle movement monitored and reduced if required. 			
3.4	Manage fire to ensure populations are not threatened by prescribed burning.	 No prescribed burning at population sites during the growing/flowering/seeding period (June–Dec). 			
	Responsibility: DEH, DSE, PV				
3.5	Manage microhabitat for seedling recruitment, collect seed and restock populations with seed.	Measurable increase in recruitment at three treated sites.			
	Responsibility: DSE, PV, DEH				
Specific	Objective 4: Identify key biological characteristics				
4.1	Evaluate current reproductive status, seed bank status, longevity, fecundity and recruitment levels.	 Reproductive ecology and regenerative potential quantified for four representative sites. 			
	Responsibility: DEH, DSE	 Seed bank potential quantified for five representative sites. 			
4.2	Identify key stimuli for seed germination requirements.	Stimuli for recruitment identified.			
	Responsibility: DEH, DSE	 Management strategies identified to maintain, enhance or restore population processes. 			
Specific	Objective 5: Determine life history demography and via	bility of populations			
5.1	Measure population trends & responses against recovery actions by collecting demographic information e.g.	 Techniques for monitoring developed and implemented. 			
	recruitment, mortality, life history stages, morphology. Responsibility: DEH, DSE	 Population growth rates determined and Population Viability Analysis completed for five populations. 			
Specific	Objective 6: Establish an ex situ collection in cultivation	1			
6.1	Establish plants in cultivation to provide a research population and potentially for reintroductions.	 Effective propagation and cultivation techniques developed. 			
	Responsibility: DEH, DSE, RBG, NOGN	 At least 50 healthy, genetically diverse, mature plants in cultivation. 			
6.2	Establish a seed bank and determine seed viability.	 Seed from all extant populations in storage. 			
	Responsibility: RBG				
Specific	Objective 7: Build community support for its conservation	on			
7.1	Identify opportunities for community involvement in the conservation of the Desert Greenhood and implement them.	Community nature conservation and Landcare groups aware of the species and support its conservation.			
	Responsibility: DEH, DSE, PV				

Abbreviations: CPBR – Centre for Plant Biodiversity Research Biology, Canberra; DEH – Department for Environment and Heritage, South Australia; DSE – Department of Sustainability and Environment (Victoria); NOGN – Native Orchid Growers Network; PV – Parks Victoria; RBG – Royal Botanic Gardens, Melbourne

Management Practices

The philosophy of the strategy for recovery is habitat conservation, restoration and management combined with an understanding of the ecological and biological requirements of *Pterostylis xerophila* necessary for specific population management. The emphasis is on using knowledge to better implement *in situ* management techniques that protect populations and promote regeneration and recruitment. To achieve this, recovery actions are structured to acquire baseline data, assess habitat condition, including ecological and biological function, and maintain or improve population growth through protection and management. On-ground site management will aim to mitigate threatening processes and thereby insure against extinction. Major threats requiring management include accidental destruction, competition from pest plants, inappropriate fire regimes, and grazing by pest animals. A range of strategies will be necessary to mitigate these threats including weed control, caging / fencing, control of pest animals, and biomass management.

Broadscale protection measures applicable to all populations include habitat retention and liaison with land managers. In addition, searches of known and potential habitat should continue to better define the distributions and size of populations. The recovery plan also advocates strategies to fill some of the major gaps in our knowledge to date. These include an understanding of seed bank dynamics and recruitment. Successful *in situ* population management will be founded on understanding the obligate relationships between *P. xerophila* and associated flora, as well as its response to environmental processes. These are directly linked to seed production, recruitment and regeneration and are thus vital to recovery. A demographic census will be necessary to gather life history information and to monitor the success of particular management actions. In addition to the above, *ex situ* conservation measures will be required and will include seed storage and plant cultivation. Cultivating *ex situ* collections will also serve to increase the amount of seed available for reintroduction to sites. Community participation in recovery actions will be sought, particularly in regard to recovery team membership and implementation of on-ground works.

Affected Interests

Five populations of *P. xerophila* occur in national parks and their management is the responsibility of Parks Victoria (for Vic) and the Department for Environment and Heritage (for SA). The land tenure of the other populations on the Eyre Peninsula (SA) is unknown. The recovery plan has the support of government agencies, statutory authorities and community groups involved in orchid conservation in Victoria and South Australia, who will assist in the management and monitoring of this species.

Role and Interests of Indigenous Groups

Indigenous communities on whose traditional lands the Desert Greenhood occurs are being advised, through the relevant regional Indigenous facilitator, of the preparation of this Recovery Plan and will be invited to provide comments and be involved in the implementation of the plan.

Biodiversity Benefits

The recovery plan includes a number of potential biodiversity benefits for other species and vegetation communities in Victoria. Principally, this will be through the protection and management of habitat. The adoption of broad-scale management techniques and collection of baseline data could also benefit a number of other plant species growing in association with *P. xerophila*, particularly those species with similar life forms and/or flowering responses. The nationally threatened *Grevillea treueriana* occurs in same area of the Great Victoria Desert as *P. xerophila*, while *Acacia cretacea* is found in the same area north of Cowell as *P. xerophila*.

The recovery plan will also provide an important public education role as orchids have the potential to act as 'flagship species' for highlighting broader nature conservation and biodiversity issues such as land clearing, grazing, weed invasion and habitat degradation. Germination and cultivation techniques developed during the recovery phase will be of use for other threatened orchids elsewhere in southeast Australia while the requirement to recover species across state boundaries will better develop working relationships between state departments on a broader range of biodiversity conservation issues.

Social and Economic Impacts

The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. Most populations occur on public land, either crown land reserved for various public purposes, or on road reserves, managed by a variety of local and State government agencies. Any protection measures required at these sites (eg. fencing, signage, track closures) will have minimal impact on current recreational and commercial activities. Protection of these populations has been negotiated with the relevant land manager. Protection of any populations on private land or on land managed by other authorities will be achieved through voluntary agreements with landowners and managers.

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Priority,	Feasibility	y and Estimated	Costs of	Recovery	y Actions
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Action	Description	Priority	Feasibility	Responsibility	Cost estimate					
					Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Distribution, abundance									
1.1	Taxonomy	1	100%	DSE, DEH, CPBR, NHV	\$5,000	\$5,000	\$5,000	\$0	\$0	\$15,000
1.2	Surveys	1	100%	DSE, PV, DEH	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000
2	Habitat requirements									
2.1	Known habitat	1	100%	DSE, PV, DEH	\$15,000	\$15,000	\$15,000	\$0	\$0	\$45,000
2.2	Potential habitat	2	75%	DSE, PV, DEH	\$0	\$0	\$15,000	\$15,000	\$15,000	\$45,000
3	Threat management									
3.1	Pest plants	1	90%	PV, DEH	\$8,000	\$8,000	\$8,000	\$8,000	\$8,000	\$40,000
3.2	Grazing animals	1	90%	PV, DEH	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000
3.3	Human damage	1	75%	PV, DEH	\$10,000	\$10,000	\$8,000	\$5,000	\$5,000	\$38,000
3.4	Fire management	2	50%	DSE, PV, DEH	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
3.5	Microhabitat management	2	50%	DSE, PV, DEH	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$25,000
4	Biological characteristics									
4.1	Reproductive status	3	75%	DSE, DEH	\$8,000	\$8,000	\$8,000	\$8,000	\$8,000	\$40,000
4.2	Seed germination	3	75%	DSE, DEH	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$25,000
5	Population viability									
5.1	Censusing	1	100%	DSE, DEH	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000
6	Ex situ Cultivation									
6.1	Cultivated plants	3	75%	DSE, RBG, NOGN, DEH	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$12,000
6.2	Seed bank	3	75%	DSE, PV, DEH	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
7	Community support									
7.1	Community extension	3	75%	DSE, PV, DEH	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$10,000
				TOTALS	\$93,000	\$93,000	\$106,000	\$83,000	\$83,000	\$455,000