National Recovery Plan for the Spiral Sun-orchid *Thelymitra matthewsii*

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Australian Government

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This is a Recovery Plan prepared under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, with the assistance of funding provided by the Australian Government.

This Recovery Plan has been developed with the involvement and cooperation of a range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the plan due to changes in knowledge.

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Cover photographs: Spiral Sun Orchid *Thelymitra matthewsii* flower and leaf
Nangwarry, South Australia © Cathy and Malcolm Houston

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Summary

The Spiral Sun-orchid *Thelymitra matthewsii* is a small, colorful, seasonal terrestrial orchid occurring in south-eastern Australia and also on the North Island of New Zealand. In Australia it is widely but sporadically distributed from Genoa in eastern Victoria to Kangaroo Island in South Australia. Little is known of the biology and ecology of the species, or of previous decline or threats. Currently there are about 30 populations containing about 1,500 plants, although most populations are small and all are relatively isolated. Current threats include disturbance to or destruction of plants and habitat, altered fire regimes, grazing/predation and weed invasion.

The Spiral Sun-orchid is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. It is also listed as Threatened under the Victorian *Flora and Fauna Guarantee Act 1988*, and Endangered under the South Australian *National Parks and Wildlife Act 1972*. This national Recovery Plan for the Spiral Sun-orchid 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 Spiral Sun-orchid *Thelymitra matthewsii* Cheeseman is a deciduous, perennial, terrestrial orchid emerging annually from an underground tuber. It has a single, linear, spirally-twisted, dark green leaf which is ovate and sheathing at the base. The slender purple flower stem grows to 20 cm tall, has a single small sheathing bract, and bears a single (rarely two) deep bluish to reddish purple flower with darker stripes. The segments are ovate and 10 mm long, with a broader dorsal sepal and narrower labellum. The column is purplish with a yellow apex and anther, while the post anther lobe is obliquely erect, ear-like and lacks hair tufts (description from Nicholls 1969; Backhouse & Jeanes 1995; Bishop 1996). This species is illustrated in Backhouse & Jeanes (1995, p. 348), Bishop (1996, plate 7, no. 45), Bates & Weber (1990, plates 214 & 215), Jeanes & Backhouse (2006, p. 195) and Jones (2006, p. 253).

Very little is known of the biology and ecology of the Spiral Sun-orchid. The single leaf emerges in autumn, following the onset of seasonal rains. The species is one of the first sun-orchids to flower in south-eastern Australia, with flowers fully developed in late August and early September, when the weather is often still cool. Flowers generally only open in sunny conditions, and, in some populations, may not open at all in some seasons if the weather remains cloudy and cool. By late spring the leaf has shrivelled, and if pollination has occurred, the seed capsule is ripening, and seed dispersal occurs soon after. The Spiral Sun-orchid survives the dry summer as a dormant tuber. Reproduction appears to be solely from seed, with vegetative reproduction not known for this species. The ovoid tuber is replaced annually. Recruitment appears to require some soil disturbance (Backhouse & Jeanes 1995), as plants are often found in open areas including old gravel pits and along tracks. If the area remains open, plants can persist for many years. If vegetation regenerates over the site, plant numbers decline and the orchid eventually disappears. Average longevity is not known, but some individuals have been observed to survive in the field for more than 15 years. Seed is minute and readily dispersed by wind and rain (Jones 2006).

The Spiral Sun-orchid is commonly self-pollinating (Jones 2006), as the pollen is mealy and friable, with pieces breaking off and falling onto the stigma. When the flowers do open they are often visited by small native bees that can transfer small amounts of pollen from flower to flower (Jones 2006). The natural cross-pollination rate of *T. matthewsii* is unknown, but is probably quite low, due to the general rarity of the orchid, limited opportunities for flowers to open and hence reduced opportunities for pollinators to find flowers and effect pollination. Flowering of *T. matthewsii* is often enhanced by hot fires during the previous summer (Backhouse & Jeanes 1995). This is thought to be in response to a reduction in competition from the surrounding vegetation and/or changes in mineral and nutrient levels in the soil.

Distribution

The Spiral Sun-orchid occurs in Australia and New Zealand. In Australia, *T. matthewsii* is widely but sporadically distributed in Victoria and South Australia, from Genoa in East Gippsland (Vic) to Kangaroo Island (Sth Aust) (Figure 1). The species occurs in the Victorian Midlands, South East Coastal Plain, South East Corner, Naracoorte Coastal Plain and Kanmantoo IBRA bioregions (*sensu*

DEH 2000). Records of *T. matthewsii* from Western Australia are erroneous and have resulted from the misidentification of other small colourful sun-orchids such as *Thelymitra spiralis* or *Thelymitra apiculata* (A.P. Brown Dept of Environment and Conservation WA pers. comm.). In New Zealand, *T. matthewsii* occurs in the far north of the North Island, and is classified as a 'non-resident native coloniser' – a species that has succeeded in becoming established relatively recently without human assistance (de Lange *et al.* 2004). The seed of *T. matthewsii* is minute and it is likely to have been blown by winds to New Zealand. Maps showing the distribution of *T. matthewsii* are available from the Department for Environment and Heritage (DEH) (for South Australia) and the Department of Sustainability and Environment (DSE) (for Vic).

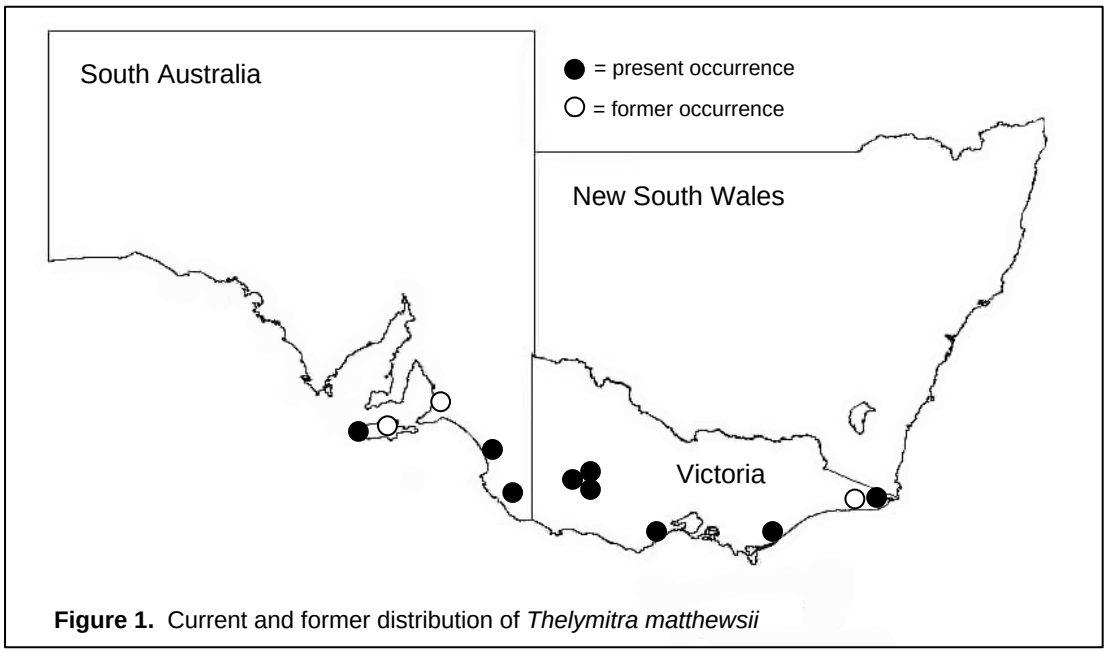

Figure 1. Current and former distribution of *Thelymitra matthewsii*

Habitat

Little is known of the specific habitat requirements of the Spiral Sun-orchid. It grows in heathy open forest and woodlands, on well-drained sand, gravel and clay loam soils, especially areas where there has been some soil disturbance, such as around old quarries and gravel pits, and on road and track verges, including those periodically slashed for fire breaks. Most sites tend to have a relatively open ground layer. A proposed Recovery Action is to more closely determine habitat critical to survival of *T. matthewsii*, especially the role of disturbance in maintaining an open habitat.

Population Information

There are about 30 populations of *T. matthewsii* seen within the last 20 years, containing about 1,500 plants, with about 40% of all plants occurring in one population (Table 1). Specific details of population localities (including GPS data) are held by DSE and DEH.

Decline and Threats

There is little information on the previous distribution and abundance of the Spiral Sun-orchid, although it appears the species has suffered at least some decline in abundance. There are historic herbarium records from Willalooka, the Adelaide Hills and Snug Cove on Kangaroo Island in South Australia (State Herbarium of South Australia 2009) but with imprecise locality details, and plants have not been seen in these locations for several decades. There are also historic records from near Ararat and Cann River in Victoria, but plants have not been seen at these sites for many decades, and are probably extinct there. At several current sites, plants have not been seen for a decade or two, and it is not clear if the species still persists or has become extinct at those sites. The Spiral Sun-orchid appears to be able to disperse fairly widely, as its establishment in New Zealand indicates. With its small stature and poorly-opening flowers, it may also have been overlooked at some sites, although it is possible to identify the species from the leaf alone.

Table 1. Population information for *T. matthewsii*

Location	Size	Area	Manager	Comments
South Australia				
Nangwarry Native Forest Reserve	~600 plants	~50 ha	FSA	largest known pop., discovered in 2008
Western River Conservation Park, KI	<20 plants	<1 ha	DEH	2007 record
Flinders Chase National Park, KI	<10 plants	<1 ha	DEH	recorded in 1992
Messent Conservation Park	<10 plants	<1 ha	DEH	plants not seen since 1988
Meningie (private property)	unknown	<1 ha	private	plants not recently seen
Victoria		ha		
Anglesea (Gum Flat)	~180 plants	<1 ha	DSE	
Grampians National Park (Wartook)	~150 plants	<1 ha	PV	
Grampians National Park (Asses Ears)	~110 plants	~20 ha	PV	plants in small scattered groups
Grampians National Park (Serra)	~110 plants	<5 ha	PV	
Grampians National Park (Mirranatwa Gap)	~50 plants	<1 ha	PV	
Grampians National Park (Pohlners)	~30 plants	<1 ha	PV	
Angahook-Lorne State Park	~30 plants	<10 ha	PV	research population; plants in 3 groups
Genoa (2)	~70 plants	<10 ha	DSE	
Rocklands State Forest	~60 plants	<1 ha	DSE	
Mirranatwa (private property)	~25 plants	<1 ha	private	
Grampians National Park (Crutes)	~15 plants	<1 ha	PV	
Anglesea Foreshore Reserve	~15 plants	<1 ha	DSE	
Grampians National Park (Henham)	<10 plants	<1 ha	PV	plants not seen for >20 years (extinct?)
Wartook (private property)	<10 plants	<1 ha	private	
Cann River	<10 plants	<1 ha	?	imprecise locality information
Eumerella Flora Reserve (2)	6 plants	<1 ha	PV	
Eumerella Flora Reserve (1)	<5 plants	<1 ha	PV	
Genoa (1)	<5 plants	<1 ha	DSE	
Mullundung Flora and Fauna Reserve	2 plants	<1 ha	PV	
Anglesea (Messmate)	2 plants	<1 ha	PV	
Genoa (3)	2 plants	<1 ha	DSE	
Grampians National Park (Golton 1)	1 plant	<1 ha	PV	
Anglesea (roadside)	?	<1 ha	DSE	plants not seen for >10 years (extinct?)
Grampians (roadside)	?	<1 ha	DSE	single plant last seen in 1992
Grampians National Park (Devils Garden)	?	<1 ha	PV	plants not seen for >20 years (extinct?)
Grampians National Park (Golton 2)	?	<1 ha	PV	plants not seen for >20 years (extinct?)

Abbreviations: DEH = Department of Environment and Heritage (South Australia); DSE = Department of Sustainability and Environment (Victoria); FSA = Forestry SA (South Australia); KI = Kangaroo Island; PV = Parks Victoria

Most remaining populations of *T. matthewsii* are small and at high risk of local extinction from stochastic events. It is likely that the conditions for maintenance of the pollinator and fungal activity have been adversely affected at many of the smaller sites. A number of current and potential threats exists at all remaining populations, including:

Disturbance/destruction

While some disturbance seems to enhance seedling establishment, disturbance to or destruction of habitat and plants is a high risk at many sites. Many plants are close to or on track/roadsides and there is a serious risk of accidental trampling by walkers and/or vehicles at the Western River CP, Grampians NP (Assess Ears, Wartook and Crutes sites), Mullundung FFR and Rocklands SF sites, as well as by walkers, vehicles or horses at the Anglesea (Gum Flat) and Nangwarry NFR sites. Similarly, there is also a risk of accidental disturbance being caused by track/road maintenance activities at these sites.

However, *T. matthewsii* appears to favour areas where there has been some soil disturbance, such as around old quarries and gravel pits, and on road and track verges, so the removal of all disturbances may actually be detrimental to this species, and therefore be considered a threat. Slashing of tracks in Nangwarry NFR at appropriate times appears to have promoted flowering there (Troy Horn, Forestry SA, pers comm.). At some sites (e.g. Grampians NP (Serra and Mirranatwa); Genoa 2), the major disturbance factors ceased more than 20 years ago, but these sites have remained naturally open since and the *T. matthewsii* populations have persisted there. However, at other sites (Angahook-Lorne SP site, Grampians NP (Pohlners), Genoa (1) and Rocklands SF), the removal of all disturbance factors has resulted in a gradual closure of the understorey which is likely to reduce flowering and possibly persistence of *T. matthewsii*, and needs to be monitored.

Altered fire regimes

Although flowering is enhanced by fire, *T. matthewsii* is not dependent upon fire to flower, and it can persist at some long-unburnt sites. However, periodic fire is possibly beneficial, especially for sites in dense heath and heathy woodland, as it serves to remove biomass accumulation and provide open sites for seedling establishment. Removal of periodic disturbance factors such as fire may lead to vegetation regrowth that smothers the site or out competes the plants. Frequency and timing of fire are also critical, as the orchid is most adapted to survive fires during its dormancy period (summer/early autumn), while spring fires (when the orchid is above ground) may be quite damaging to populations.

Weed invasion

Weeds are a moderate problem at several sites, and will require active and ongoing management for control. Particular problem weeds include Perennial Veldt Grass *Ehrharta calycina* at Messent CP, and the invasive South African Orchid *Disa bracteata* at the Rocklands SF site.

Grazing/predation

Grazing by invertebrates and/or native and introduced herbivores is an existing or potential threat at most sites. Grazing by introduced herbivores (rabbits, hares) and deer is a problem at the Messent CP site and all Grampians NP sites. Up to 50% of the flowering plants at the Anglesea (Gum Flat) site were grazed in 2004. The cause is unclear, but wallabies or invertebrates are suspected.

Recovery Information

Existing Conservation Measures

A number of initiatives are already in place to conserve the Spiral Sun-orchid. These include:

- Inclusion of *T. matthewsii* in a regional recovery plan prepared for threatened flora on Kangaroo Island, South Australia (Taylor 2003), which protects populations in Flinders Chase NP and Western River CP.
- Fencing of the Angahook-Lorne SP site to protect the area from grazing.
- Realignment of the walking track at the Angahook-Lorne SP site to reduce the risk of accidental trampling by walkers.
- Collection of seed capsules at the Angahook-Lorne SP site. Some seed was placed in storage, some used in germination trials, and the remainder sprinkled around the base of plants.
- Details of the Angahook-Lorne SP site included in regional DSE/PV prescribed burn plans to exclude the site from fire.
- Annual monitoring at the Assess Ears, Mirranatwa Gap, Pohlners, Serra and Wartook sites in the Grampians National Park.
- Annual monitoring of populations near Anglesea by the Matthew Flinders Girls Secondary College and the community groups Friends of Angahook-Lorne State Park, ANGAIR and the Australasian Native Orchid Society (Geelong Group).
- Closing the access track at the Grampians NP Crutes site.
- Management of timing and frequency of slashing at Nangwarry NFR to avoid damaging the *T. matthewsii* population.

Recovery Objectives

The Overall Objective of recovery is to minimise the probability of extinction of the Spiral Sun-orchid 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 Spiral Sun-orchid are to:

1. Determine distribution, abundance and population structure
2. Determine habitat requirements
3. Ensure that all populations and their habitat are protected and managed
4. Manage threats to populations
5. Identify key biological characteristics
6. Determine life history and viability of populations
7. Establish an *ex situ* population
8. Build community support for its conservation

Program Implementation and Evaluation

This Recovery Plan guides recovery actions for the Spiral Sun-orchid and will be implemented and managed by the Department of Sustainability and Environment (for Victoria) and the Department for Environment and Heritage (for South Australia), 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 conservation of the Spiral Sun-orchid. The Recovery Plan will run for a maximum of 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 Objective 1: Determine distribution, abundance and population structure		
1.1	Undertake surveys to determine the area and extent of populations, the number, size and structure of populations, and inference or estimation of population change. **Responsibility: DSE, PV, DEH**	• All current population sites searched during flowering season. • If plants detected, sites mapped for population size, condition, habitat, land tenure.
Specific Objective 2: Determine habitat requirements		
2.1	Survey known habitat and collect floristic and environmental information relevant to community ecology and condition. **Responsibility: DSE, PV, DEH**	• Species/habitat specific survey design prepared. • Habitat critical to survival mapped for any extant populations.
2.2	Identify and survey potential habitat, using ecological and bioclimatic information that may indicate habitat preference. **Responsibility: DSE, PV, DEH**	• Potential habitat surveyed at five sites. • Predictive model for potential habitat developed & tested at five sites.
Specific Objective 3: Ensure that all populations and their habitat are protected and managed appropriately		
3.1	Protect unreserved populations on public land. **Responsibility: DSE**	• Public Authority Management Agreements or similar in place for populations at Anglesea (Gum Flat), Genoa (1) and Genoa (2) sites; Special Protection Zone for the Rocklands SF site. • Actions to protect species incorporated in relevant management plans.
3.2	Protect populations on private land. **Responsibility: DEH**	• Voluntary conservation agreement in place for Private Property (Meningie) population.
Specific Objective 4: Manage threats to populations		
4.1	Control threats from pest plants, especially at the Messent CP site. **Responsibility: PV, DSE, DEH**	• Significant reduction in cover of weeds at and near all sites.
4.2	Control threats from pest animals; in particular, flowering plants at the Anglesea (Gum Flat) site require caging. **Responsibility: PV, DSE, DEH**	• Reduction in damage by pest animals (notably rabbits) at and near all sites.
4.3	Control the threat of direct damage by human activities –	• Impact of vehicle and visitor activity monitored and

	most track/roadside populations require protection (e.g. Rocklands SF and Anglesea (Gum Flat) sites), and the slashing of tracks in Nangwarry NFR will require appropriate timing. **Responsibility: PV, DSE, DEH, FSA**	
4.4	Manage microhabitat for seedling recruitment, collect seed and restock populations with seed. **Responsibility: DSE, PV, DEH**	• Measurable increase in recruitment at three treated sites.
Specific Objective 5: Identify key biological characteristics		
5.1	Evaluate current reproductive status, seed bank status, longevity, fecundity and recruitment levels. **Responsibility: DSE, PV, DEH**	• Reproductive ecology and regenerative potential quantified for four representative sites. • Seed bank potential quantified for six representative sites.
5.2	Identify key stimuli for seed germination requirements. **Responsibility: DSE, DEH, RBG**	• Stimuli for recruitment identified. • Management strategies identified to maintain, enhance or restore processes fundamental to reproduction and survival.
5.3	Identify optimal fire/disturbance regimes to maintain habitat. **Responsibility: DSE, PV, DEH**	• Management prescriptions for ecological burning/disturbance at six sites prepared and implemented.
Specific Objective 6: Determine life history and viability of populations		
6.1	Measure population trends and responses against recovery actions by collecting demographic information including recruitment, mortality, timing of life history stages and morphological data. **Responsibility: DSE, DEH**	• Techniques for monitoring developed and implemented. • Population growth rates determined and Population Viability Analysis completed for five populations.
Specific Objective 7: Establish an ex situ population		
7.1	Establish plants in cultivation to provide a research collection and potentially for reintroductions. **Responsibility: DSE, RBG, NOGN**	• Effective propagation and cultivation techniques developed. • At least 150 healthy, genetically diverse, mature plants in cultivation.
7.2	Establish a seed bank and determine seed viability. **Responsibility: DSE, RBG, DEH**	• Seed from six populations in storage.
Specific Objective 8: Build community support for its conservation		
8.1	Identify opportunities for community involvement in the conservation of the Spiral Sun-orchid and implement them. **Responsibility: DSE, PV, DEH**	• Community nature conservation and Landcare groups aware of the species and support its conservation.

Abbreviations: DEH = Department of Environment and Heritage (South Australia); DSE = Department of Sustainability and Environment (Victoria); FSA = Forestry SA (South Australia); 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 *T. matthewsii* 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 information, and maintain or improve populations through protection and management.

On-ground site management will aim to mitigate threatening processes and thereby ensure 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 fire management. Protection measures applicable to all populations include legal protection of sites, habitat retention and liaison with land managers and private landholders. 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 *T. matthewsii* 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. Demographic censusing 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. The establishment of a collection in cultivation will also help 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

Extant populations of *T. matthewsii* occur in National Parks, Conservation Parks, Native Forest Reserves, State Parks, State Forests, flora reserves and on crown land, roadsides and private property. Consequently, their management is variously the responsibility of the Department for Environment and Heritage South Australia, Forestry SA, Department of Sustainability and Environment Victoria and Parks Victoria, plus other owners and managers of leasehold land and private land sites. 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 of this species.

Role and Interests of Indigenous People

Indigenous communities on whose traditional lands the Spiral Sun-orchid 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 and South Australia. 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 *T. matthewsii*, particularly those species with similar life forms and/or flowering responses. 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

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 the few 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 and Estimated Costs of Recovery Actions

Action	*Description*	*Priority*	*Feasibility*	*Responsibility*	*Cost estimate*					
					Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	**Distribution, abundance**									
1.1	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	$0	$0	$0	$30,000
2.2	Potential habitat	2	75%	DSE, PV, DEH	$0	$0	$15,000	$15,000	$0	$30,000
3	**Habitat protection**									
3.1	Public land	2	100%	DSE	$0	$5,000	$5,000	$0	$0	$10,000
3.2	Private land	2	75%	DEH	$0	$0	$5,000	$5,000	$5,000	$25,000
4	**Threat management**									
4.1	Pest plants	1	90%	DSE, PV, DEH	$10,000	$10,000	$10,000	$10,000	$10,000	$50,000
4.2	Pest animals	1	90%	DSE, PV, DEH	$7,000	$7,000	$7,000	$7,000	$7,000	$35,000
4.3	Human damage	1	90%	DSE, PV, DEH, FSA	$10,000	$10,000	$8,000	$6,000	$6,000	$40,000
4.5	Microhabitat management	2	50%	DSE, PV, DEH	$12,000	$12,000	$12,000	$12,000	$12,000	$60,000
5	**Biological characteristics**									
5.1	Reproductive status	2	75%	DSE, PV, DEH	$8,000	$8,000	$8,000	$8,000	$8,000	$40,000
5.2	Seed germination	2	75%	DSE, DEH, RBG	$5,000	$5,000	$5,000	$5,000	$5,000	$25,000
5.3	Disturbance regimes	1	50%	DSE, PV, DEH	$5,000	$5,000	$5,000	$5,000	$5,000	$25,000
6	**Population viability**									
6.1	Censusing	1	100%	DSE, DEH	$12,000	$12,000	$12,000	$12,000	$12,000	$60,000
7	***Ex situ* Cultivation**									
7.1	Cultivated plants	3	75%	DSE, RBG, NOGN	$5,000	$5,000	$5,000	$5,000	$5,000	$25,000
7.2	Seed bank	3	100%	DSE, RBG, DEH	$2,000	$2,000	$2,000	$2,000	$2,000	$10,000
8	**Community support**									
8.1	Community extension	3	75%	DSE, PV, DEH	$2,000	$2,000	$2,000	$2,000	$2,000	$10,000
				TOTALS	$108,000	$108,000	$111,000	$104,000	$89,000	$525,000

Abbreviations: DEH = Department of Environment and Heritage (South Australia); DSE = Department of Sustainability and Environment (Victoria); FSA = Forestry SA (South Australia); NOGN = Native Orchid Growers Network; PV = Parks Victoria; RBG = Royal Botanic Gardens, Melbourne