



# Conservation Advice for *Thelymitra matthewsii* (Spiral Sun-orchid)

In effect under the *Environment Protection and Biodiversity Conservation Act 1999* from 23 November 2021.

This document provides a foundation for conservation action and further planning.



Spiral Sun-orchid (cultivated plants) © Copyright, Marc Freestone (2020)

## Conservation status

*Thelymitra matthewsii* (Spiral Sun-orchid) is listed in the Vulnerable category of the threatened species list under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act) effective from 16 July 2000. The species is eligible for listing because prior to the EPBC Act, it was listed as Vulnerable under the *Endangered Species Protection Act 1992* (Cwlth).

The main factors that make the species eligible for listing in the Vulnerable category are the small number of individuals and estimated decline of the species over the last three generations.

Species can also be listed as threatened under state and territory legislation. For information on the current listing status of this species under relevant state or territory legislation, see the [Species Profile and Threat Database](#).

## Species information

### Taxonomy

Conventionally accepted as *Thelymitra matthewsii* Cheeseman (1911).

### 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).

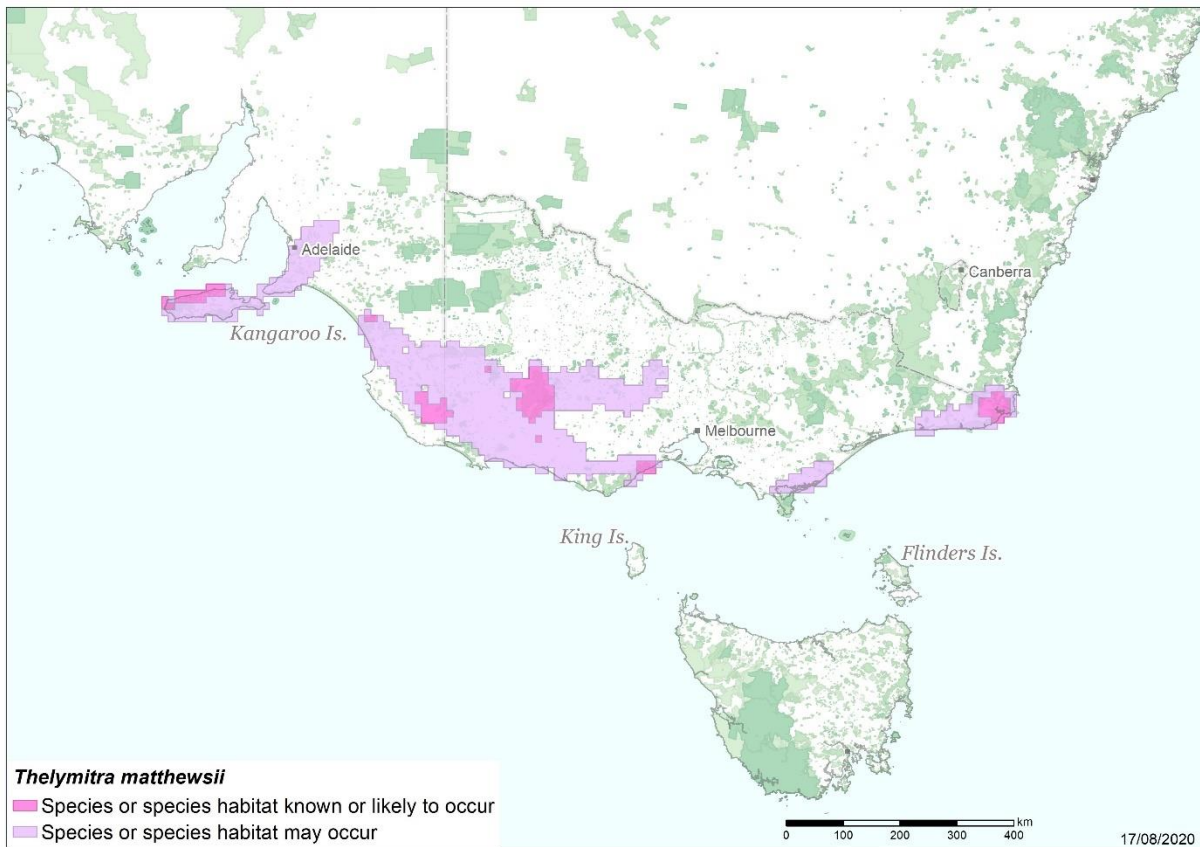
### Distribution

The Spiral Sun-orchid occurs in Victoria and South Australia, with records from Western Australia being misidentifications of a related species (Backhouse et al. 2019). At least 15 subpopulations of Spiral Sun-orchid have been recorded in the last approximately 10 years, probably containing about 750 plants (Table 1). The 2010 recovery plan reported about 30 subpopulations with around 1500 plants (Duncan 2010), indicating a continuing decline in the number of subpopulations and number of plants of this species. Specific details of population localities (including GPS data) are held by DELWP and DEW (Duncan 2010).

There is little information on the historic distribution and abundance of the Spiral Sun-orchid, although it appears the species has suffered a decline in the number of subpopulations. In South Australia there are historic herbarium records from Willalooka, Meningie and Adelaide Hills on the mainland and Snug Cove, off the Playford Highway and Western River Conservation Park on Kangaroo Island in South Australia, but these subpopulations have not been seen for many years (ALA 2020; Table 1). In Victoria, there are historic records from near Ararat and numerous sites in and around the Grampians, Anglesea and Genoa (ALA 2020; Table 1). This patchy current distribution across a very large area of apparently suitable habitat suggests that the species was likely patchily distributed prior to European arrival. 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.

The Spiral Sun-orchid appears to be able to disperse fairly widely. The species occurs in New Zealand and was first described in that country (Cheeseman 1911). Four subpopulations have been recorded since 1990 from the far northern tip of the North Island (ALA 2020). It is possible that its establishment in New Zealand was from wind-blown seed from Australia (Duncan 2010).

**Map 1 Modelled distribution of Spiral Sun-orchid**



**Source:** Species distribution data [Species of National Environmental Significance](#) database, base map Geoscience Australia

**Caveat:** The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein.

**Species distribution mapping:** The species distribution mapping categories are indicative only and aim to capture (a) the specific habitat type or geographic feature that represents to recent observed locations of the species (known to occur) or preferred habitat occurring in close proximity to these locations (likely to occur); and (b) the broad environmental envelope or geographic region that encompasses all areas that could provide habitat for the species (may occur). These presence categories are created using an extensive database of species observations records, national and regional-scale environmental data, environmental modelling techniques and documented scientific research.

**Table 1 Known subpopulations of Spiral Sun-orchid**

Location	Size in 2010 RP (Duncan 2010)	Most recent estimate (year)	Manager	Comments
<i>South Australia</i>				
Nangwarry Native Forest Reserve	~600	125+ (2013) >0 (2017)	FSA	Largest known subpopulation, discovered in 2008 (Duncan 2010). 2013: J Guerin 2020 pers comm 9 Nov 2017: ALA 2020
Western River Conservation Park, KI	<20 (2007)	0 (2020)	DEW	D Duval 2020 pers comm 9 Nov
Off Playford Hwy, KI	-	0 (2020)	private	D Duval 2020 pers comm 9 Nov
Off Snug Cove Road, KI	-	0 (2020)	private	D Duval 2020 pers comm 9 Nov

*Thelymitra matthewsii* (Spiral Sun-orchid) Conservation Advice

Location	Size in 2010 RP (Duncan 2010)	Most recent estimate (year)	Manager	Comments
Flinders Chase National Park, KI	<10	20 (2020)	DEW	D Duval 2020 pers comm 9 Nov
Messent Conservation Park	<10	122 (2011)	DEW	T Bridle 2020 pers comm 2 Dec
Meningie (private property)	?	?	private	Not seen recently (Duncan 2010; ALA 2020)
<i>Victoria</i>				
Angahook-Lorne State Park	~30	1 (2017)	PV	M MacDonald 2020 pers comm 9 Nov
Anglesea (Gum Flat)	~180	~180 (2020)	DELWP	M MacDonald 2020 pers comm 9 Nov
Anglesea Foreshore Reserve	~15	~15 (2020)	DELWP	M MacDonald 2020 pers comm 9 Nov
Anglesea (Messmate)	2	?	PV	
Anglesea (roadside)	?	?	DELWP	Plants not seen for >20 years
Eumerella Flora Reserve (2)	6	Not seen recently	PV	M MacDonald 2020 pers comm 9 Nov
Eumerella Flora Reserve (1)	<5	Not seen recently	PV	M MacDonald 2020 pers comm 9 Nov
Anglesea (Denham)	-	2 (2020)	PV	50 plants about 5 years ago (M MacDonald 2020 pers comm 9 Nov)
Black Range State Park		1 (2020)	PV	W Bedggood 2020 pers comm 9 Nov
Grampians National Park (Wartook)	~150		PV	
Grampians National Park (Asses Ears)	~110	72 (2008)	PV	P Rudolph 2020 pers comm 12 Nov
Grampians National Park (Serra)	~110	~40 (2020)	PV	W Bedggood 2020 pers comm 9 Nov
Grampians National Park (Mirranatwa Gap)	~50	0 (2018/19) ~150 (2010)	PV	W Bedggood 2020 pers comm 9 Nov P Rudolph 2020 pers comm 12 Nov
Grampians National Park (Pohlner)	~30	25 (2009)	PV	P Rudolph 2020 pers comm 12 Nov
Grampians National Park (Crutes)	~15	0 (2010–2011)	PV	P Rudolph 2020 pers comm 12 Nov
Grampians National Park (Henham)	<10		PV	Plants not seen for >20 years
Grampians National Park (Golton 1)	1	0 (2010–2011)	PV	P Rudolph 2020 pers comm 12 Nov
Grampians (roadside)	?		DELWP	Single plant last seen in 1992
Grampians National Park (Devils Garden)	?	0 (2011)	PV	P Rudolph 2020 pers comm 12 Nov
Grampians National Park (Golton 2)	?	0 (2010–2011)	PV	Plants not seen for >30 years
Rocklands State Forest	~60	15 (2020)	DELWP	W Bedggood 2020 pers comm 9 Nov
Mirranatwa (private property)	~25		private	
Wartook (private property)	<10	Not seen recently	private	W Bedggood 2020 pers comm 9 Nov
Jilpanger		? 1 record (2015)		ALA (2020)
Mullundung Flora and Fauna Reserve	2	?	PV	Not recorded since late 1990s (ALA 2020)
Cann River – Princes Hwy	<10	64 (2020)	DELWP	Thomson & Kosky (2020)

Location	Size in 2010 RP (Duncan 2010)	Most recent estimate (year)	Manager	Comments
Genoa (1) (Site 4 in Thomson & Kosky 2020)	<5	?	DELWP	Site burnt in 2019–20 fires, affected by a new roadside culvert diverting water and soil run-off across the site (Thomson & Kosky 2020)
Genoa (2) (Site 1 in Thomson & Kosky 2020)	~70	64 (2020) 315 (2011)	DELWP	Main site at Genoa, only one flowering plat postfire in 2020, with the remainder present with very small leaves only (Thomson & Kosky 2020)
Genoa (3) (Sites 2 & 3 in Thomson & Kosky 2020)	2	0	DELWP	Not seen for a decade (Thomson & Kosky 2020)
Genoa (other sites) (Sites 5, 6, 7 in Thomson & Kosky 2020)	-	0 (2020)	DELWP	Two other sites (5 and 6) near Genoa (1) where less than 10 plants have been seen over the past decade and a complex of 4 sites south of Genoa (2) where no plants have been seen for over 10 years (Thomson & Kosky 2020).

**Abbreviations:** RP = Recovery Plan; DEH = Department of Environment and Heritage (South Australia); DELWP = Department of Land, Water and Planning (Victoria); FSA = Forestry SA (South Australia); KI = Kangaroo Island; PV = Parks Victoria

## Cultural and community significance

Although little is known of the cultural significance of Spiral Sun-orchid, other orchid species are culturally significant plants for Indigenous Australians, with their tubers used as a food source (Australian National Botanic Gardens 2007). The patchy distribution of Spiral Sun-orchid suggests this species may have been an occasional food source.

## Relevant biology and ecology

### *Habitat ecology*

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 (Duncan 2010). Most sites tend to have a relatively open ground layer.

### *Reproductive ecology*

The Spiral Sun-orchid has a single leaf that emerges in autumn, following the onset of seasonal rains. The species is one of the earliest 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 (VicFlora 2020). Flowers generally only open in sunny conditions, and, in some subpopulations, may not open at all in some seasons if the weather remains cloudy and cool. 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 open they are often visited by small native bees that transfer small pollen from flower to flower, probably as a result of a food deceptive pollination strategy with the rewardless orchid mimicking other plants that offer nectar rewards (Jones 2006).

The natural cross-pollination rate of the Spiral Sun-orchid 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 (Duncan 2010). By mid-late spring the leaf has shrivelled and the seed capsule is ripening, and seed dispersal occurs soon after. The Spiral Sun-orchid survives the dry summer as a dormant tuber, which is replaced annually. Reproduction appears to be solely from seed. Recruitment appears to require some soil disturbance (Backhouse & Jeanes 1995), as plants are often found in open areas including old gravel pits and along track edges. 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 and generation length is suggested to be around 30 years (DELWP 2020). The seeds are minute and readily dispersed by wind and rain (Jones 2006). The species associates with at least two species of orchid mycorrhizal fungi from the genus *Tulasnella*, on which it is dependent for germination and adult growth in the wild (N Reiter 2020. pers comm 9 Nov). The Spiral Sun-orchid has been propagated by the Royal Botanic Gardens Victoria where a small ex situ subpopulation of Grampians provenance currently exists (N Reiter 2020. pers comm 9 Nov).

### *Fire ecology*

The Spiral Sun-orchid does not require fire to stimulate flowering or for reproduction and, although its underground tuber is capable of surviving fire, recent observations suggest it can be adversely impacted by intense fire, possibly due to tubers being located at a relatively shallow depth in the soil. Observations following the 2019–20 fires in eastern Victoria suggest that burnt subpopulations in this area did not display a vigorous post-fire response (that was observed in many other species of orchids burnt in these fires), with a higher emergence rate of plants in the small, unburnt Cann River subpopulation compared to the large burnt subpopulation Genoa (2) (Thomson & Kosky 2020). However, post-fire response was more vigorous after fires in the Grampians National Park (P Rudolph 2020 pers comm 10 Nov). This suggests the impacts of high intensity fire are variable and possibly specific to the site or fire conditions. The heathy woodland or mixed eucalypt forest communities in which the Spiral Sun-orchid grows are likely to have minimum recommended fire intervals of 15–25 years (Cheal 2010), although minimum tolerable fire intervals for the Spiral Sun-orchid are not well understood.

### **Habitat critical to the survival**

New data suggests that since this species was last assessed, it is likely to be eligible for listing as Endangered when reassessed. Due to the species eligibility for listing, all habitat is considered critical to the survival of the species.

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

### **Important populations**

In this section, the word population is used to refer to subpopulation, in keeping with the terminology used in the EPBC Act and state/territory environmental legislation.

New data suggests that since this species was last assessed, it is likely to be eligible for listing as Endangered when reassessed. There is sufficient evidence through the species eligibility for



listing, to declare all populations/the national population as important populations of this species under particular pressure of survival and which therefore require protection to support the recovery of the species.

## Threats

The main threats to the Spiral Sun-orchid are habitat loss, disturbance and modifications and invasive species (Table 2).

**Table 2 Threats impacting the Spiral Sun-orchid**

Threat	Status and severity <sup>a</sup>	Evidence
Habitat loss, disturbance, modification		
Track, road and fuel break maintenance and earthworks associated with fire fighting	<ul style="list-style-type: none"> <li>• Timing: current</li> <li>• Confidence: known</li> <li>• Consequence: major</li> <li>• Trend: static</li> <li>• Extent: across part of its range</li> </ul>	<p>While some disturbance seems to enhance seedling establishment, destruction of habitat and plants is a high risk at many sites. Many subpopulations are close to or on tracks and roadsides and there is a serious risk of accidental disturbance as a result of track/road maintenance activities at these sites. A subpopulation at the Grampians National Park (Serra) was damaged by grading of roadside drains (W Bedgood 2020 pers comm 9 Nov). Realignment of a walking track threatened a subpopulation near Anglesea, although the new alignment was moved to avoid the subpopulation when markers were observed prior to the commencement of construction (DELWP 2021).</p> <p>Several sites near Genoa in Victoria were burnt in the 2019–20 bushfires, which burnt approximately 5% of the species' modelled range (DAWE 2020), and although many plants were relocated post-fire (particularly at the main Genoa 2 site), associated earthworks during or after the fires badly damaged some sites, some of which may not recover (Thomson &amp; Kosky 2020).</p> <p>Mechanical mulching of wide fuel breaks is a new threat to this species around Anglesea and Airey's Inlet, as thick mulch appears to impede the emergence of orchids (DELWP 2021).</p>
Lack of disturbance	<ul style="list-style-type: none"> <li>• Timing: current</li> <li>• Confidence: known</li> <li>• Consequence: moderate</li> <li>• Trend: static</li> <li>• Extent: across its entire range</li> </ul>	<p>The Spiral Sun-orchid 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. Therefore, the removal of all disturbances may be detrimental to this species by allowing vegetation regrowth to outcompete the Spiral Sun-orchid, and in some cases could be considered a threat. At some sites (e.g. Angahook-Lorne State Park,</p>

		Grampians National Park (Pohlner's) and Rocklands State Forest), 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 Spiral Sun-orchid, and needs to be monitored (Duncan 2010). At other sites (e.g. Grampians National Park – Serra), the major disturbance factors ceased more than 20 years ago, but these sites have remained naturally open and the Spiral Sun-orchid subpopulations have persisted there. Slashing of tracks in Nangwarry Native Forest Reserve at appropriate times appears to have promoted flowering there (Troy Horn, Forestry SA, pers comm. in Duncan 2010).
Recreational activities	<ul style="list-style-type: none"> <li>• Timing: current</li> <li>• Confidence: known</li> <li>• Consequence: minor</li> <li>• Trend: static</li> <li>• Extent: across its entire range</li> </ul>	There is a risk of accidental trampling by walkers and/or vehicles at the Western River Conservation Park, Grampians National Park National Park (Assess Ears, Wartook and Crutes sites), Mullundung Nature Conservation Reserve and Rocklands State Forest sites, as well as by walkers, vehicles or horses at the Anglesea (Gum Flat) and Nangwarry Native Forest Reserve sites (Duncan 2010).
Climate change		
Increased frequency and severity of bushfires	<ul style="list-style-type: none"> <li>• Timing: current</li> <li>• Confidence: suspected</li> <li>• Consequence: moderate</li> <li>• Trend: increasing</li> <li>• Extent: across the entire range</li> </ul>	<p>Climate projections for south-eastern Australia include reduced rainfall, increased average temperatures, and more frequent bushfires (CSIRO &amp; Bureau of Meteorology 2015).</p> <p>Analysis by the Wildlife and Threatened Species Bushfire Recovery Expert Panel, based on intersecting the modelled distribution of the Spiral Sun-orchid and the National Indicative Aggregated Fire Extent Dataset, indicates that approximately 5 % of the range of the species was within the extent of the 2019-20 bushfires (Gallagher 2020).</p> <p>The sensitivity of the Spiral Sun-orchid to high intensity bushfires is unknown. Observations following the 2019–20 bushfires in eastern Victoria suggest that burnt subpopulations did not display a vigorous post-fire response and may have been adversely affected (Thomson &amp; Kosky 2020). However, post-fire responses were more vigorous after fires in the Grampians National Park (P Rudolph 2020 pers comm 10 Nov).</p>



Increasing severity and frequency of drought	<ul style="list-style-type: none"> <li>• Timing: current</li> <li>• Confidence: known</li> <li>• Consequence: moderate</li> <li>• Trend: increasing</li> <li>• Extent: across its entire range</li> </ul>	<p>Climate projections for south-eastern Australia include reduced rainfall, increased average temperatures, and more frequent droughts (CSIRO &amp; Bureau of Meteorology 2015).</p> <p>In drought years sun orchids often do not flower (Bates 2010) and it is likely that an increasing frequency of droughts will have a negative impact on orchids generally (Coates et al. 2006).</p>
Invasive species		
Competition with introduced weeds	<ul style="list-style-type: none"> <li>• Timing: current</li> <li>• Confidence: known</li> <li>• Consequence: moderate</li> <li>• Trend: static</li> <li>• Extent: across part of its range</li> </ul>	<p>Weeds are a moderate problem at several sites, and will require active and ongoing management for control. Particular problem weeds include Perennial Veldt Grass (<i>Ehrharta calycina</i>) at Messent Conservation Park, and the invasive South African Weed Orchid (<i>Disa bracteata</i>) at the Rocklands State Forest site (Duncan 2010).</p>
Browsing by feral herbivores	<ul style="list-style-type: none"> <li>• Timing: current</li> <li>• Confidence: known</li> <li>• Consequence: minor</li> <li>• Trend: static</li> <li>• Extent: across part of its range</li> </ul>	<p>Grazing by invertebrates and/or native and introduced herbivores is an existing or potential threat at most sites. Grazing by introduced herbivores, particularly Rabbits (<i>Oryctolagus cuniculus</i>) and Hares (<i>Lepus europaeus</i>) and deer is a problem at the Messent Conservation Park site and all Grampians National Park 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 were suspected (Duncan 2010). The regular use of cages with care taken to avoid biomass buildup, ensures some seed set (DELWP 2021).</p>

Status—identify the temporal nature of the threat;

Confidence—identify the extent to which we have confidence about the impact of the threat on the species;

Consequence—identify the severity of the threat;

Trend—identify the extent to which it will continue to operate on the species;

Extent—identify its spatial content in terms of the range of the species.

Each threat has been described in Table 2 in terms of the extent that it is operating on the species. The risk matrix (Table 3) provides a visual depiction of the level of risk being imposed by a threat and supports the prioritisation of subsequent management and conservation actions. In preparing a risk matrix, several factors have been taken into consideration, they are: the life stage they affect; the duration of the impact; and the efficacy of current management regimes, assuming that management will continue to be applied appropriately. The risk matrix and ranking of threats has been developed in consultation experts and using available literature.

**Table 3 Spiral Sun-orchid risk matrix**

Likelihood	Consequences				
	Not significant	Minor	Moderate	Major	Catastrophic
<b>Almost certain</b>	Low risk	Moderate risk	Very high risk <b>Increasing frequency and severity of bushfires</b> <b>Increasing frequency and severity of drought</b>	Very high risk	Very high risk
<b>Likely</b>	Low risk	Moderate risk	High risk <b>Lack of disturbance</b>	Very high risk	Very high risk
<b>Possible</b>	Low risk	Moderate risk <b>Browsing by feral herbivores</b> <b>Recreational activities</b>	High risk <b>Competition with invasive weeds</b>	Very high risk <b>Track and road maintenance and earthworks associated with fire fighting</b>	Very high risk
<b>Unlikely</b>	Low risk	Low risk	Moderate risk	High risk	Very high risk
<b>Unknown</b>	Low risk	Low risk	Moderate risk	High risk	Very high risk

Priority actions have then been developed to manage the threat particularly where the risk was deemed to be ‘very high’ or ‘high’. For those threats with an unknown or low risk outcome it may be more appropriate to identify further research or maintain monitoring.

## Conservation and recovery actions

### Primary conservation objective

By 2030, the population of Spiral Sun-orchid will have increased in abundance and viable subpopulations are sustained in habitats where very high risk threats are managed effectively.

### Conservation and management priorities

#### Habitat loss disturbance and modifications

- Install physical markers around sites threatened by road or track maintenance activities.
- Ensure locations of subpopulations are kept updated on state databases, particularly on databases used during fire fighting, planned burning/strategic fuel breaks and infrastructure projects. Agencies should have access to precise location details of sensitive records to avoid accidental impacts. The Cann River – Princes Highway subpopulation does not appear on the Victorian Biodiversity Atlas (DELWP 2020b) and should be added.
- Prevent access by machinery into fire affected subpopulations around Genoa.
- Restore original hydrology at the Genoa (1) subpopulation where fire remediation earthworks done following the 2019-20 bushfires modified the hydrology within the site (Thomson & Kosky 2020).

- Subpopulations occurring near public access tracks should be protected from damage by recreational activities.
- If there is evidence of a decline of a Spiral Sun-orchid subpopulation due to lack of disturbance, investigate the potential for introducing an appropriate disturbance (e.g. planned burn) to recover the subpopulation. If planned fire is used to maintain habitat for Spiral Sun-orchid, careful attention should be given to frequency and timing of fire, as orchids are generally best adapted to survive fires during their dormancy period in late spring to early autumn, while fires from late autumn to early spring (when the orchid is above ground) may be damaging to plants (Jasinge et al. 2018). Any use of fire should take into account impacts on other species that may be impacted by its use.

### **Climate change and fire**

- Develop and implement a fire management strategy that optimises the survival of the Spiral Sun-orchid.
  - Avoid planned burns in all recently burnt habitat.
  - Implement occasional disturbance (e.g. fire) in long-unburnt habitat where there is evidence that subpopulations of the Spiral Sun-orchid are declining due to lack of disturbance.
  - Take the likelihood of increasingly frequent bushfires into account when developing planned burning programs, to avoid excessively frequent burning of any subpopulations.
- Identify current and future habitat modelled as likely to remain or become suitable habitat due to climate change.
- Implement an ongoing monitoring program that will provide data capable of addressing the link between population dynamics and drought.

### **Invasive species (including threats from grazing, trampling, predation)**

- If grazing is having a significant impact on a subpopulation and likely to cause a decline of the subpopulation, consider caging, fencing or herbivore control. Any use of caging or fencing must ensure that biomass does not build up inside the fenced area that would be detrimental to the orchid.
- Undertake weed control where weeds are considered a serious threat and are suspected of causing a decline in plant numbers;

### **Breeding, seed collection, propagation and other ex situ recovery action**

- To manage risk of losing genetic diversity, undertake seed collection and store at Botanic Gardens or other appropriate institutions. Seed collections should include all regions (Genoa, Grampians, Nangwarry Native Forest Reserve, Kangaroo Island). Seed collections should be sensitive to the likely importance of post-fire germination in maintaining wild subpopulations.
- Maintain current ex situ collections at the Royal Botanic Gardens Victoria.
- If deemed appropriate (e.g. if there is a significant loss of subpopulations), undertake conservation translocations in suitable habitat with secure land tenure and ongoing management, to increase the number of subpopulations of the Spiral Sun-orchid, in

accordance with the *Guidelines for the Translocation of Threatened Plants in Australia* (Commander et al. 2018).

### **Stakeholder engagement/community engagement**

- Engage and involve Traditional Owners in conservation actions, including survey, monitoring and management actions.
- Engage with agencies undertaking planned burning operations to ensure they are aware of the locations of these subpopulations and have access to sensitive or restricted records on relevant databases.
- Liaise with the local community and government agencies to ensure that up-to-date population data and scientific knowledge inform the implementation of conservation actions for this species.
- If appropriate, engage nature conservation groups in participating in surveys for the species in areas of suitable habitat. Volunteers, including but not limited to the Australasian Native Orchid Society (Vic branch), have recently undertaken essential post-fire monitoring for this species, and their involvement should be encouraged wherever possible.

### **Survey and monitoring priorities**

- Conduct targeted surveys throughout the range of the Spiral Sun-orchid to better determine its population size (DSEWPAC 2021).
- Survey known subpopulations to monitor impacts from the 2019–20 bushfires.
- Determine the impact of grazing on subpopulations, e.g. through monitoring and use of camera traps.
- Establish and maintain a monitoring program to:
  - document post-fire recovery;
  - determine minimum and maximum tolerable fire intervals;
  - determine trends in population size and distribution;
  - determine threats and their impacts; and,
  - monitor the effectiveness of management actions and the need to adapt them if necessary.

### **Information and research priorities**

- Survey suitable habitat and potential habitat to locate any additional subpopulations to assess population size and distribution more precisely.
- Investigate the ecological requirements of the Spiral Sun-orchid, that are relevant to persistence and recruitment:
  - population genetic structure, levels of genetic diversity and minimum viable subpopulation size.
  - the effect of the season and frequency of fire.
  - optimal disturbance regime to promote the persistence of subpopulations, e.g. when Spiral Sun-orchid plants disappear in overgrown subpopulations, do the plants die or are they dormant and able to recover when a disturbance (e.g. fire) reopens the vegetation structure?

- the identity and ecology of pollinators.

## Links to relevant implementation documents

[Draft survey guidelines for Australia's threatened orchids \(2013\)](#)

[National Recovery Plan for the Spiral Sun Orchid \*Thelymitra matthewsii\* \(2010\)](#)

[Threat abatement plan for competition and land degradation by rabbits \(2016\)](#)

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