The Minister's delegate approved this Conservation Advice on 16/12/2016.

Conservation Advice

Caladenia amoena

Charming Spider-orchid

Conservation Status

Caladenia amoena (Charming Spider-orchid) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act effective from the 16 July 2000). The species was eligible for listing under the EPBC Act at that time as, immediately prior to the commencement of the EPBC Act, it was listed as Endangered under Schedule 1 of the preceding Act the *Endangered Species Protection Act 1992* (Cwlth).

Species can also be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

The main factors that are the cause of the species being eligible for listing in the Endangered category are its restricted extent of occurrence that is continuing to decline due to disturbance of habitat and small population size.

Description

The Charming spider-orchid is belongs to the family Orchidaceae. It is a flowering orchid 5 -12 cm tall, with Leeves 3 - 8 cm long, 7 - 9 mm wide, sometimes dotted purplish at the base. Flowering usually with 1, rarely 2; perianth segments 1.5 - 2.5 cm long, yellowish-green with red stripes; dorsal sepal linear to linear-lanceolate, 2 - 2.5 cm long, 2.5 - 3 mm wide, narrowed to a linear-involute section just before the osmophore; osmophore1.5 - 2.5 mm long with uncrowded sessile dark brown cells; lateral sepals oblong-lanceolate, 1.7 - 2.3 cm long, slightly falcate, more or less parallel or crossed, involute section terminated by an osmophore similar to that on the dorsal sepal; petals linear-lanceolate, 1.5 - 1.8 cm long, acuminate. Labellum curved forward, flattish to concave in middle region, cordate, 3-lobed, 9 - 12 mm long and 8 - 11 mm wide (when flattened), yellowish green with a recurved reddish mid-lobe; margins entire in basal portion, lateral lobes toothed towards mid-lobe, mid-lobe with 6 - 8 pairs of broad teeth; lamina calli in 4 irregular rows ending at the mid-lobe, foot-shaped, fleshy, reddish, c. 3 mm long at base of lamina, diminishing in size toward apex (RBGV 2016).

Distribution

The Charming spider-orchid occurs to the north east of Melbourne in the Greensborough-Plenty-Hurstbridge area within the Victorian Midlands interim bioregion (Todd 2000). In 2000 Todd (2000) recorded two populations at Plenty (public land) and Wattle Glen (private land). It was estimated that 45 plants were remaining in these two populations (Todd 2000). There are five records of the species dating from 1996 to 1998 in Atlas of Living Australia observed in the Greensborough-Plenty-Hurstbridge area (ALA 2016).

Relevant Biology/Ecology

The charming spider-orchid is typically found in grassy dry forest; *Eucalyptus melliodor* (Box Ironbark) Forest on sandy loams derived from sandstone and mudstone (Todd 2000).

The charming spider-orchid has a summer dormancy period, which commences when temperatures increase and soils dry out in late spring. The orchid shoot in response to soaking rains in late autumn, initially producing only a single green leaf. Growth of the charming spider-

orchid occurs during late autumn, winter and spring and flowering occurs in August and early September (Entwisle 1994; Backhouse & Jeanes 1995).

The following general information applies to the biology and ecology of spider-orchids.

Spider-orchids are generally pollinated by sexual deception through a process called pseudocopulation (Jones 1988; Bishop 2000). The usual pollinator for spider-orchids is male wasps from the family Thynnidae. A scent that mimics female thynnid wasp pheromone is produced by the glandular tips of the sepals and acts as a sexual attractant for the pollinators (Backhouse & Jeanes 1995; Bishop 2000). Once the pollinator reaches the flower, it attempts to copulate with the labellum of the flower, mistaking it for the female wasp, and effects pollination (Todd 2000).

For most spider-orchids reproduction is only possible from seed (Backhouse & Jeanes 1995). Fruits of spider-orchids normally take five to eight weeks to reach maturity following pollination and each mature capsule may contain tens of thousands of microscopic seeds that are dispersed by the wind when the capsule dries out (Todd 2000). Most spider-orchids grow in a complex relationship with mycorrhizal fungi (Warcup 1981). The fungus assimilates some nutrients for the orchid, but the degree of dependence upon the fungus by spider-orchids is not known (Todd 2000). Longevity of most spider-orchids is not known but there are examples of individuals of one species having survived for at least 17 years in the wild (Carr 1999).

Hybrids in the *Caladenia* genera may only persist for the life of an individual plant, the hybrid being sterile and eventually dying (Backhouse & Jeanes 1995). Hybridisation in the *Caladenia* genus may occur at an increased rate at disturbed sites, where factors that would normally limit cross-pollination are altered or removed (Backhouse & Jeanes 1995).

Most terrestrial orchids have evolved under conditions of hot summer fires, generally when the plants have been dormant (Backhouse & Jeanes 1995). Some *Caladenia* species flower vigorously following hot summer fires, including *C. australis* (southern spider orchid), *C. fragrantissima* (sented spider orchid)and *C. insularis* (French Island spider orchid) (Backhouse & Jeanes 1995; Todd 2000). However, this may be as much the result of the removal of surrounding vegetation and reduced competition as any chemical effect of the fire (Backhouse & Jeanes 1995). The timing of fire for orchids is important, with the best time during late summer or early autumn, after seed dispersal but prior to new shoot growth. The variation in seasonal climatic conditions, most notably rainfall and temperature also influences flowering. Flowering is often aborted when periods of sustained hot, dry weather follow flower opening (Todd 2000).

Threats

The charming spider-orchid is threatened by habitat loss and fragmentation, invasive species and land tenure that places the orchid at risk. These threats are their effects on the species are described in the table below. The threats outlined below have corresponding conservation managements.

Table 1 – Threats impacting the charming spider-orchid in approximate order of severity of risk, based on available evidence

Threat factor	Threat type and status	Evidence base
Habitat Disturbance		
Trampling by recreational activities	known current	The distribution of the charming spider-orchid is in urban areas in Melbourne (Todd 2000). Proximity to populated areas on land that is not managed as a nature reserve, exposes the charming spider orchid to trampling as a result of recreation activities (Todd 2000).

Habitat loss and fragmentation		
Land clearing	known past	Habitat of the charming spider-orchid, *Caldenia audasii* (McIvor spider-orchid) and *C. rosella* (Rosella spider-orchid) has been severely reduced and altered by historic mining activities and urban development (Todd 2000).
Invasive species		
Invasive weeds	known current	Invasive weeds compete with Orchid species for resource and overtime change the species composition of invaded areas (Duncan et al., 2005). Over time this may result in the elimination of native species as they are out competed. Duncan et al., (2005, 2010) listed the following weed species as a significant threat to Victorian orchids include bridal creeper (*Asparagus asparagoides*), golden wattle (*Acacia longifolia*), common olive (*Olea europaea*), perennial veldt grass (*Erharta calycina*) and African weed orchid (*Disa bracteata*).
Grazing		
Grazing by rabbits	known current	Grazing by rabbits (*Oryctolagus cuniculus*) causes damage to the charming spider-orchid.
Grazing by kangaroos	known current	Grazing by *Macropus giganteus* (eastern grey kangaroos) causes damage to the charming spider-orchid in the urban reserve areas in the Plenty Gorge Parklands as a result of highly of fragmented remnant bushland available for grazing (Duncan et al., 2005).
Fire		
Timing and frequency	potential	The role of fire for the charming spider-orchid is unknown (Todd 2000). The charming spider-orchid occur in urban environment on land that is unreserved managed by Parks Victoria. Fires that occur in autumn, winter and spring, after the species shoots but before seed is set, may pose a threat. Too frequent fire may pose a threat by killing any growth stimulated by initial summer fires.

Conservation Actions

Conservation and Management priorities

Habitat Disturbance and Habitat loss and fragmentation

- Ensure public and private land managers are aware of the presence and location of the charming spider-orchid on their land and provide information based of best available scientific evidence on the habitat requirements of the charming spider-orchid.
- Ensure that local recreational groups are aware of the presence of the charming spider-orchid and the impacts that trampling and disturbance of habitat have on the species.
- Manage access to known locations of the charming spider-orchid to prevent the accidental trampling of plants through protective fencing or signage.
- Assess the status land tenure of unreserved areas where populations of the charming orchid are known to occur.

Invasive species

- Collaborate with public and private land managers to control and reduce the spread of invasive species, particularly bridal creeper, golden wattle, common olive, perennial veldt grass and African weed orchid. Consult with local experts in determining the most appropriate physical, chemical or other control methods for these weeds that will not have a detrimental effect on the charming spider-orchid.

Grazing

- Manage total grazing pressure by herbivores such as rabbits and kangaroos through exclusion fencing and other barriers.
- Control rabbits using appropriate methods in accordance with the threat abatement plan for competition and land degradation by rabbits (DEWHA 2008), which may include undertaking a range of control techniques (for example, poisoning and warren destruction).

Fire

- Fires must be managed to ensure that prevailing fire regimes do not disrupt the life cycle of the charming spider-orchid, that they support rather than degrade the habitat necessary to the charming spider-orchid, they do not promote invasion of exotic species, and they do not increase impacts of grazing.
- Ensure that prescribed fires occur only within the habitat during the dormant phase of the charming spider-orchid's life cycle (summer to late autumn).
- Physical damage to the habitat and individuals of the charming spider-orchid must be avoided during and after fire operations. Ensure retention of surface soil organic material and leaf litter on soil as it is important for many terrestrial orchids that rely on these materials for regeneration from seed.
- Fire management authorities and land management agencies should use suitable maps and install field markers to avoid damage to the charming spider-orchid.

Seed collection, propagation and other ex-situ recovery action

- Establish plants in cultivation in appropriate institutions such as the Royal Botanic Gardens Victoria.
- To manage the risk of losing genetic diversity, undertake appropriate seed and mycorrhizal fungi collection and storage in appropriate institutions, such as the Victorian Conservation Seedbank, Royal Botanic Gardens Victoria, and determine viability of stored seed. Best practice seed storage guidelines and procedures should be ahered to, to maximise seed viability and germinability. Seeds from all natural populations to be collected and stored.

Stakeholder Engagement

- Identify partners including traditional owners, landholders, community-based organisations and conservation management organisations that may be associated with recovery of the charming spider-orchid.
- Promote opportunities for partners to participate in recovery of the charming spider-orchid, as appropriate.
- Determine objectives for any public engagement to improve management on private land to raise awareness of its presence on land that is not currently managed as native

reserve land and ensure recent scientific knowledge is incorporated into this public land management. Separate engagement processes will likely be required where there are different objectives.

- Prepare a management strategy with the input and from local experts. Actions should be stated for each engagement process identified e.g. Indigenous consultation, a specific community consultation, or land manager consultation.

Survey and Monitoring priorities

- Undertake survey work, when plants are flowering in August and September, in suitable habitat and potential habitat to locate any additional occurrences.
- Undertake survey work, when plants are flowering in August and September, of previously identified known and potential populations to establish baselines where required to identify changes (if any) in population size, distribution, ecological requirements and relative impacts of threatening processes.
- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Monitor the size, structure and reproductive status of populations of charming spider-orchids at different stages in the fire cycle. Opportunities to monitor after planned and unplanned fires should be undertaken where they occur in order to improve understanding of the fire response of this species.
- Precise fire history records must be kept for the habitat and extant populations (confirmed and suspected) of the charming spider-orchid.

Information and research priorities

- Investigate options for linking, enhancing or establishing additional populations.
- Investigate reproductive status, longevity, fecundity and recruitment levels for this species in order to form a view on the resilience of this species to known and potential threats and adjust conservation actions as required.
- Continue to undertake seed germination and/or vegetative propagation trials to determine the requirements for successful establishment, including disturbance and mycorrhizal fungi requirements.
- Improve understanding of the mechanisms of response to different fire regimes and identify appropriate fire regimes for conservation of this species by undertaking appropriately designed experiments in the field and/or laboratory.
- Where appropriate, use understanding and research on fire response among related (e.g. congeneric) or functionally similar species to develop fire management strategies for conservation.
- Identify optimal fire regimes for regeneration (vegetative regrowth and/or seed germination), and response to other prevailing fire regimes.

References cited in the advice

Backhouse, G. & Jeanes, J. (1995). The orchids of Victoria. Melbourne University Press, Melbourne, Victoria.

Bishop, T. (2000). Field guide to the orchids of New South Wales and Victoria. Second Edition. UNSW Press, Sydney, New South Wales.

Carr, G.W. (1999). Mellblom's Spider-orchid. *Nature Australia* 26, 18-19.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). Threat abatement plan for competition and land degradation by rabbits. Department of the Environment, Water, Heritage and the Arts, Canberra, Australia.

Duncan, M., Pritchard, A., Todd, J. (2010). National Recovery Plan for Twelve Threatened Spider-orchids (*Caladenia* R. Br.) in South-eastern Australia. DRAFT for public comment. Department of Sustainability and Environment, Melbourne, Victoria.

Entwisle, T.J. (1994). Orchidaceae. In 'Flora of Victoria Vol. 2, Ferns and Allied Plants, Conifers and Monocotyledons' (eds N G Walsh & T J Entwisle). Inkata Press, Melbourne, Victoria.

Jeanes, J. & Backhouse, G. (2006). Wild orchids of Victoria, Australia. Aquatic Photographics, Seaford, Australia.

Jones, D.L. (1988). Native Orchids of Australia. Reed, Melbourne, Victoria.

Todd, J.A. (2000). Recovery Plan for Twelve Threatened Spider-orchids *Caladenia* taxa of Victoria and South Australia 2000 - 2004. Department of Natural Resources and Environment, Melbourne, Victoria.

Warcup, J.H. (1981). The mycorrhizal relationships of Australian orchids. *New Phytology* 87, 371-381.

Other sources cited in the advice

ALA (2016). Atlas of Living Australia Records provided for *Caladenia amoena,* accessed through the Atlas of Living Australia website.
Viewed 21 May 2016. Available on the Internet at:
http:www.ala.org.au

RBGV (2015) Royal Botanic Gardens Victoria, VicFlora Flora of Victoria, Caladenia amoena.

Viewed: 21 May 2016. Available on the Internet at:

http://data.rbg.vic.gov.au/vicflora/flora/taxon/620d8e67-d483-443e-b991-31896db449f6