

THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

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

Conservation Advice

Pterostylis despectans

lowly greenhood

Conservation Status

Pterostylis despectans (lowly greenhood) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act). The species is eligible for listing as prior to the commencement of the EPBC Act, it was listed as Endangered under Schedule 1 of 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 and fragmented distribution; and its declining population due to continuing threats.

Description

The lowly greenhood (Orchidaceae) is a herbaceous perennial geophyte that remains dormant underground as a tuber from late summer into early winter. In late winter (May to June) it develops a rosette of six to ten basal leaves and three or four stem-sheathing bract-like leaves above (DSE 2014; OEH 2014; Quarmby 2010). The rosette leaves are 10 - 20 mm long and 6 - 9 mm wide. The flower stem is produced between late October and December and the leaves shrivel up by the time the flowers mature. The flower stem is up to 80 mm tall, though often only reaching 20 - 30mm, with scaly bracts. There are 1 to 6 flowers, usually with up to four open at a time (OEH 2014). Flowers are pale, grey green to brownish, up to 15 mm long on relatively long, slender, curved pedicels spreading widely from the stalk (DSE 2014; OEH 2014; Quarmby 2010). The pollinated flowers develop into seed capsules from late October to late December (Quarmby 2010).

Distribution

The species occurs as very small fragmented populations in NSW, central Victoria and SA (OEH 2014).

In NSW, the only known population is restricted to a small area within the Yellow Water Hole to Barnes Crossing Travelling Stock Reserve (TSR Riverina 120) approximately 10 km north-east of Moama (just across the border from Echuca, Victoria). The Barnes Crossing TSR is approximately 200 ha in area and the population's area of occupancy estimated to be 2500 m² in 2014 (OEH 2014).

In Victoria, the lowly greenhood is known from the western goldfields in the vicinity of Maryborough and Talbot in the Midlands Natural Region (Conn 1993). The orchid was also recorded in the Terrick Terrick National Park, approximately 50 km west-south-west of Moama (OEH 2014). There are insufficient data to estimate the area of occupancy and extent of occurrence for this species in Victoria.

In SA, records of this species have been from Hallet, Yacka and an area of less than 1 ha near Mount Bryan. These three sites all occur in the Northern Lofty Flora Region (Bickerton & Robertson 2000).

The extent of occurrence of SA populations is approximately 60 km² with an area of occupancy of less than 32 km² owing to uncolonised habitat between populations.

Relevant Biology/Ecology

The lowly greenhood is a winter active geophyte with emergence occurring in concert with cooler conditions and onset of winter rainfall. Flowering in the lowly greenhood is followed by summer dormancy.

The pollinator for this species is likely to be a *Mycetophilidae* spp. fly or fungus gnat (Rees 2016). The level of pollination is extremely low (Quarmby 2010). Greenhood orchid species vary from clonal to non-clonal with all species relying on seed for long-distance dispersal. The average longevity of the lowly greenhood is not known but is assumed to be more than fifteen years (Quarmby 2010). It does not require fire to flower but it is unknown how it responds to fire (Quarmby 2010). The lowly greenhood seed requires inoculation by a symbiotic fungus (*Ceratobasidium cornigerum*) in order to ensure successful germination.

The NSW population occurs in natural forb-rich grassland on flat alluvial plains in *Acacia pendula* (weeping myall) woodland. The grassland is dominated by *Austrodanthonia* sp. (wallaby grasses) and *Austrostipa aristiglumis* (plains grass) and *Austrostipa scabra* (corkscrew grasses) (OEH 2014).

In Victoria, all recorded populations occur in flat or undulating woodland or open forest of *Eucalyptus leucoxylon* (yellow gum), *E. microcarpa* (grey box) and *E. melliodora* (yellow box), with an understorey of *Acacia genistifolia* (spreading wattle) and *A. acinacea* (gold-dust wattle). The soils are generally well-drained, shallow sandy loams with sparse litter and sparse ground cover (70 per cent bare ground) (Backhouse & Jeanes 1995; DSE 2014). Preferred habitat is a narrow ecotone, adjacent to *E. camaldulensis* (red gum) woodland on lower elevations and *E. goniocalyx* (long-leaf box) or *E. polyanthemus* (red box) open forests on higher slopes (DSE 2014).

In SA, the lowly greenhood occurs on gently sloping land north of Mount Bryan in grassy *E. odorata* (peppermint box), *E. pruinosa* (silver-leaved box), and *E. microcarpa* (grey box) woodland. The understorey is sparse and typically includes *Austrostipa* spp. (spear-grasses), *Austrodanthonia* spp. (wallaby-grasses), *Lomandra effusa* (scented mat-rush) and *Plantago gaudichaudii* (narrow-leaved plantain). The species usually grows in hard, clay loam over rock outcrops, covered with microphytic crust (Bickerton & Robertson 2000; Quarmby 2010).

Threats

The lowly greenhood is threatened by habitat loss and fragmentation, invasive species and low fecundity and recruitment. These threats and their effects on the species are described in the table below. The threats outlined below have corresponding conservation managements.

Table 1 – Threats impacting the lowly greenhood in approximate order of severity of risk, based on available evidence.

Threat factor	Threat type and status	Evidence base
Habitat loss and fragmentation		
Land clearing and other human activities	known current and potential	<p>Habitat throughout the known and potential range of the lowly greenhood is fragmented and degraded. Specific disturbances include clearing, agriculture, timber harvesting, heavy machinery disturbance, mining and prospecting (DSE 2014). Other human activities that threaten colonies include substrate disturbance and soil dumping during track maintenance (DSE 2014). Gravel mining, gold prospecting and soil removal are particular threats in Victoria (OEH 2014).</p> <p>The NSW population is relatively close to the Cobb Highway which forms the eastern boundary of the travelling stock route. This population is also threatened by infrastructure development, such as pipelines or telecommunication (OEH 2014).</p>
Illegal collection	suspected current	Illegal collection is thought to have resulted in the extinction of the former population near Talbot in Victoria. Collection also threatens extant populations (DSE 2014; Coates et al., 2002).
Invasive species		
Competition from exotic grasses and shrubs	known current, potential and past	<p>The main threats are bearded oats (<i>Avena sativa</i>), brome (<i>Bromus</i> sp.), perennial ryegrass (<i>Lolium perenne</i>), salvation jane (<i>Echium plantagineum</i>), horehound (<i>Marrubium vulgare</i>), onion grass (<i>Romulea rosea</i>) and African boxthorn (<i>Lycium ferocissimum</i>) (Quarmby 2010). African boxthorn, annual grasses and broadleaf weeds are a problem at the Peppermint Gully (SA) populations with the impacts including smothering and displacement of established plants, changes to understorey composition, litter cover, soil moisture and soil properties (Rees 2016).</p>
Encroachment of iris weed (<i>Romulea</i> spp.)	potential current	Cockatoo (family <i>Cacatuidae</i>) diggings and major visitation by cattle (<i>Bos taurus</i>) leads to intensive soil disturbance and subsequent spread of <i>Romulea</i> bulbs which compete with the lowly greenhood for resources (OEH 2014).
Rabbit browsing	known current	Browsing by rabbits (<i>Oryctolagus cuniculus</i>) is thought to be a major factor in limiting the regeneration of some Victorian populations of the lowly greenhood. The flower stems are particularly vulnerable to browsing (DSE 2014). Similarly, monitoring of the SA population near Mount Bryan found eleven percent of plants having been browsed and over 50% of plants observed on the first visit were not found on subsequent visits (Bickerton & Robertson 2000). Similar observations have been made in Victoria (Backhouse & Jeanes 1995; Rees 2016)

Grazing by domestic stock	known current	Stock grazing may have been a contributing factor in the localised extinction of this species from most of its former range in Victoria (DSE 2014). In NSW, this species occurs on travelling stock routes and populations may be frequently/intensively grazed depending on the time of year and conditions (OEH 2014). Grazing by cattle and sheep (<i>Ovis aries</i>) appears to be affecting the SA population near Mount Bryan (Bickerton & Robertson 2000). Cattle trampling may also cause damage to plants, especially near watering points (OEH 2014). However, it is noted that moderate stock grazing at non-flowering times may be beneficial to orchids if it reduces competition from introduced grasses and native perennials (DSE 2014; OEH 2014). Stock has been removed from the Peppermint Gully (SA) but occasional incursion may occur (Rees 2016).
Harvesting by <i>Corcorax melanorhamphos</i> (white-winged choughs)	potential current	White-winged choughs dig up soil with their beaks and eat orchid tubers (I. Temby <i>pers. comm.</i>). Their numbers are not high in the area of the lowly greenhood of Victoria, but a chance visit by a group of birds could decimate a population (DSE 2014).
Breeding, propagation and other ex situ recovery action		
Very low pollination rate	known current	Pollination occurs through insects and the pollinator for this species is likely to be a <i>Mycetophilidae</i> spp. fly or fungus gnat (DSE 2014). Pollination failure has been observed at a number of threatened orchid populations in Victoria (Todd 2000). Although the reasons are not clear, it is widely believed by orchid enthusiasts that pollinators are absent from these populations. Explanations for the absence of pollinators include loss of habitat vital to invertebrate life history stages, pesticide drift, and the general consequences of habitat disturbance. A lack of natural pollination has also been observed in the SA populations (Coates et al. 2002; Rees 2016).
Changes in available leaf litter	potential current	The lowly greenhood seed requires inoculation by a symbiotic fungus (<i>Ceratobasidium cornigerum</i>) in order to ensure successful germination. A reduction in leaf litter and decaying grass roots, on which the fungus is likely to feed (it may also feed on depleted supplies of fallen timber), may reduce the viability of the lowly greenhood. Conversely, a build-up of litter where an orchid is growing appears to suppress growth by excluding light to the plant (Rees 2016).
Fire		
Impact of frequent fire	potential current	The effect of fire on the lowly greenhood is unknown, though some <i>Pterostylis</i> spp. appear to be adversely affected (Backhouse & Jeanes 1995). The SA populations may also be subject to a lack of fire disturbance leading to a decline in preferred habitat such as open space (Coates et al. 2002; Rees 2016). However all <i>Pterostylis</i> spp. rely on leaf litter build up to support the mycorrhizal fungus. Too frequent fire will lead to loss of this litter and potential negative impacts on the species. Too frequent fire may negatively impact on pollinators.

Conservation Actions

Conservation and Management priorities

Habitat loss disturbance and modifications

- Exclude firewood collection and other forest production activities from public land sites where the lowly greenhood is known to occur.
- Thinning of trees, with the specific purpose of aiding the survival of lowly greenhood, must be carefully planned and implemented.
- Reduce the potential for off-road vehicle damage by rationalising the track network on the public land sites and ensuring that tracks that remain open are well maintained. Provision of appropriate parking areas would also be beneficial.
- Erect explanatory signs at suitable locations without revealing the precise location of the orchid.
- Protect sites supporting lowly greenhood from mining, intrusive exploration activities and gravel collection.
- Cage plants at locations where populations are screened by shrubs. Cages would need to be checked frequently and cleared of litter build up and weed growth.
- Avoid excessive trampling of the vegetation, especially during winter and spring. Limit foot traffic through orchid populations to avoid damaging orchids and compacting paths.
- Avoid dragging pruning material through the site - it is preferable to cut up and scatter seed-free pruning material over site, but not over orchid populations.
- Ensure that all footwear, tools, planting stakes and vehicles are free of soil, mud and plant root material before entering or leaving the site, or moving to a new location within the site to prevent the spread of weeds and disease.

Breeding, propagation and other ex-situ recovery action

- Hand-pollinate some plants within populations and compare rates of seed-set of hand-pollinated plants with naturally insect-pollinated plants. If hand-pollinated plants were significantly more productive, then low activity by pollinators would be indicated as a factor in the orchids' apparent decline.
- Improve habitat quality for pollinator species and thus provide more food sources for the pollinator, and to increase habitat connectivity and thus improve the viability of pollinator populations.
- Conduct *ex-situ* cultivation under strictly quarantined conditions to avoid infecting wild populations with a virus transmitted by aphids and common in cultivated plants.

Collect and preserve seed and mycorrhizal fungi to preserve genetic variability

- Maintain the storage of seed collected from the Peppermint Gully (SA) and Mount Bryan (SA) populations in 2004 and 2005 at the Botanic Gardens of Adelaide (Rees 2016), and curate the collection to ensure sustained viability of stored seed.
- Identify sites for establishment of lowly greenhood. Commence the establishment of new populations at these sites where feasible.
- Prepare and implement translocation proposals.

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

- Grazing, fire and other management regimes for conservation have not been fully determined however heavy grazing should be avoided.
- Investigate the best option for controlling rabbits. The national Threat Abatement Plan for competition and land degradation by rabbits (DEWHA 2008) provides advice on research, management and other actions needed to ensure the long term maintenance of native species affected by competition and land degradation caused by rabbits.
- Continue minimum-disturbance weed control measures throughout the site. Herbicide should not be used in the immediate vicinity of orchid populations unless by an appropriately skilled and experienced operator or a grass-specific herbicide. . Commence weeding activities in the immediate vicinity of the orchid areas, taking care not to damage any emerging orchids. When using herbicides, shield native plants with cardboard or similar.
- Control of *Lycium ferocissimum* (African boxthorn) should be carried out to prevent heavy infestation among the orchid populations. For example African Boxthorn has been controlled at the Peppermint Gully populations in 2004 and 2013, and in 2004, 2012 and 2013 at the Mount Bryan populations as per Rees (2016).
- Annual grasses can be carefully spot-sprayed in heavily degraded areas, away from the orchids, during the same period. Care should be taken at all times to minimise any off-target damage to native herbs and grasses. For example in 2012, slashing of grasses within and around monitoring quadrats (selected quadrats at Peppermint Gully and Mt Bryan subpopulations) was carried out to determine whether grass cover may have affected decline in numbers. No apparent effect was reported (Rees 2016).
- A number of other broadleaf weeds occur in parts of the SA sites, particularly where native vegetation has been cleared, modified or disturbed. While of less immediate concern, all weed flora should be continually monitored to prevent the development of more serious weed problems. Management needs to be adaptive and respond by controlling other weeds should they become a more serious threat to the orchid.

Impacts of domestic species

- Ensure land owners/managers use a grazing management regime and density that does not detrimentally affect this species in the growing season. Manage total grazing pressure at important sites through exclusion fencing or other barriers. The Peppermint Gully and Mount Bryan populations were fenced to exclude sheep in 2001 (Rees 2016).

Fire

- Provide maps of known occurrences to local and state Rural Fire Services and seek inclusion of mitigation measures in bush fire risk management plan(s), risk register and/or operation maps.
- Ensure that prescribed fires occur only within the habitat during the dormant phase of the threatened species life cycle.
- Leaf litter is a critical component needed to support *Pterostylis* species. Too frequent fire that results in a depletion of the leaf litter needs to be carefully controlled to avoid adverse impacts upon the plant.

Stakeholder Engagement

- Determine objectives for any public engagement to improve management.
- Inform, encourage and support landholders and the community about the lowly greenhood orchid. Since 2011, a Threatened Flora Officer from the SA Government has been available for assistance, advice and on-site threat abatement work.
- Damage to orchid populations by visitors and illegal collection has occurred in Victoria, SA and NSW and for this reason community involvement should be restricted to groups and individuals having demonstrated ability and commitment to orchid conservation.
- Train land managers and community groups in monitoring orchid populations. Extreme care should be taken searching for plants, as they are so well camouflaged when flowering that even orchid experts have accidentally crushed hidden plants while searching for them.
- Landholders should be encouraged to protect and manage populations of lowly greenhood where these occur on private land.
- Install road side signs where appropriate. Such signs were installed on Banbury Rd (Mt Bryan subpopulation), and on Peppermint Gully Track and Mt Bryan East Road (Peppermint Gully subpopulation) in 2013.
- Continue to consult and involve key stakeholders in the management of sites through the implementation of site action plans such as the SA Mt Bryan and Peppermint Gully populations. The key stakeholders include: current property owners or managers, Regional Council of Goyder, Northern and Yorke NRM Board, Native Orchid Society of SA, Trees for Life, and Department of Environment, Water and Natural Resources (Rees 2016). Update the site action plan on a regular basis.
- Maintain liaison with key stakeholders and current landholders interested in the site.
- Work with stakeholders to achieve sympathetic management of adjoining land such as:
 - where possible, reducing the impacts of adjoining land uses through negotiation with relevant land managers, and coordinating threat abatement and site actions with the management of remnant vegetation on land adjoining the site;
 - consulting with landholders regarding management of invasive weeds in paddocks surrounding this area;
 - consulting with the landholders regarding herbicide spray-drift on adjoining land; and
 - maintaining fencing to restrict stock incursions.
- Consult with the Council regarding road maintenance practices – grading, chemical use and dumping. Maintain lowly greenhood signs on roadside reserves. Roadside vegetation surveys should be undertaken in this area and Roadside Marker System signage should be installed (Rees 2016).
- Recommend a cross-jurisdictional recovery team to coordinate the implementation of conservation actions and share outcomes of conservation actions across NSW, SA and Victoria.

Survey and Monitoring priorities

- Survey intact areas suitable habitat for lowly greenhood rosettes in winter. As the lowly greenhood is very hard to detect, unrecorded populations may still exist. However given the

previous search efforts of orchid enthusiasts and the disturbed state of much of the potentially suitable habitat, it is unlikely that there will be many new plants discovered.

- Monitor populations annually, including measurement of natural rates of seed set and plant numbers. If possible it would be beneficial to monitor populations three times a year in order to count the number of rosettes that first appear in autumn, the number of flowers that come up, the number of flowers per plant, natural pollination rates and reproduction success. Natural rates of seed set amongst similar orchids are recorded at between 10 to 20 percent.
- Monitor all known sites in order to gauge the effectiveness of management actions, to assess population stability and trends. The Mount Bryan population was monitored in 1993, 1995, 1997 and 1999 including the establishment of permanent monitoring quadrats. Surveys of the number of rosettes have occurred each year until 2008, resuming in 2013 (Rees 2016).
- It is important to monitor the lowly greenhood populations to provide an indication of whether the prescribed management actions are having the desired effect. Accurate records should be kept of the actions undertaken (methods, number of people, hours etc). An adaptive approach to management is recommended if the prescribed actions are not having the desired effect, or if more effective methods are available.

Research

- Grazing has an impact on the population directly and also indirectly through influencing its habitat. Trials are needed to investigate the impact of grazing on weed competition, litter levels and lichen crust, and determine appropriate grazing regimes. Known populations in SA will be enclosed within a fence and management trials conducted in collaboration with land managers. The trials will examine the effects of grazing, crust and litter levels, weed invasion and hand pollination on population size, area of occupancy and recruitment.
- In order to gauge the effectiveness of management actions, and also to assess the stability, increase or decline of the populations, systematic monitoring should continue. Factors to be monitored include number of mature plants, number of pollinated flowers, number of flowers forming pods, extent of weed invasion and evidence of herbivory.
- Investigate the effect of fire on life, history and population/recruitment of the species.
- Research natural pollination levels in general and between populations.
- Liaise with researchers in order to recover the species across its entire range and to clarify its taxonomy.

References cited in the advice

Backhouse, G. N.. & Jeanes, J. A. (1995). *The Orchids of Victoria*. Carlton: Miegunyah Press, Melbourne University Press.

Bickerton, D., & Robertson, M. (2000). Recovery Plan for *Pterostylis despectans* "Mt Bryan" (Lowly greenhood). Endangered Species Program Project ID 6115 Lofty Block Threatened Orchid Project National Parks and Wildlife, Government of South Australia.

Coates, F., Jeanes, J., & Pritchard, A. (2002). Recovery Plan for Twenty-five Threatened Orchids of Victoria, South Australia and New South Wales 2003 - 2007. Department of Natural Resources and Environment, Melbourne.

Conn, B. J. (1993). Natural Regions and Vegetation of Victoria. In: Foreman, D.B. and N.G. Walsh, eds. *Flora of Victoria: Volume One*. Page(s) 79-153. Inkata Press, Melbourne.

DEWHA (Australian Government Department of the Environment, Water, Heritage and the Arts (2008) *Threat abatement plan for competition and land degradation by rabbits*. Commonwealth of Australia, Canberra. Available on the Internet at:

<http://www.environment.gov.au/biodiversity/threatened/publications/tap/competition-and-land-degradation-rabbits> Viewed: 14 April 2016.

Australian Government Department of the Environment (2010). *Pterostylis despectans* in Species Profile and Threats Database, Department of the Environment, Canberra. Available on the Internet at: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl> Viewed 14 April 2016.

Quarmby, J. P. (2010). Recovery Plan for Twelve Threatened Orchids in the Lofty Block Region of South Australia, 2010. Department for Environment and Heritage, South Australia.

Rees, E. (2016). Site Action Plan for the Peppermint Gully (Hallett) population of the Nationally Endangered Lowly Greenhood (*Pterostylis despectans*). Department of Environment, Water and Natural Resources, Australian Government and Trees for Life.

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

Other sources cited in this advice

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

DEWNR (South Australian Department of Environment, Water and Natural Resources. Threatened Flora of South Australia Fact Sheet – Lowly Greenhood *Pterostylis despectans*. Available on the Internet at: http://www.environment.sa.gov.au/managing-natural-resources/Plants_Animals/Threatened_species_ecological_communities/Threatened_species/Threatened_plant_species/Orchids/Pterostylis_despectans Viewed: 18 April 2016.

DSE (Victorian Department of Sustainability and Environment (2014). Action Statement 123: Lowly Greenhood *Pterostylis despectans*. Flora and Fauna Guarantee Act 1988. Available on the Internet at: http://www.depi.vic.gov.au/_data/assets/pdf_file/0009/250389/Lowly_Greenhood_Pterostylis_despectans.pdf Viewed 18 April 2016

NSW Scientific Committee (2008). *Pterostylis despectans* (terrestrial herb) - critically endangered species listing. Final determination Viewed 18th April 2016. Viewed: 18 April 2016. Available on the Internet at:

<http://www.environment.nsw.gov.au/determinations/PterostylisDespectansNichollsMAClemDLJonesCriticallyEndangered.htm>

OEH (Office of Environment and Heritage) (2014). *Pterostylis despectans* Profile. Viewed: 18 April 2016. Available on the Internet at:

<http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20086>