

THREATENED SPECIES SCIENTIFIC COMMITTEE

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

The Minister's delegate approved this Conservation Advice on 01/04/2016.

Conservation Advice

Pterostylis cucullata

leafy greenhood

Conservation Status

Pterostylis cucullata (leafy greenhood) is listed as Vulnerable 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 Vulnerable under Schedule 1 of the *Endangered Species Protection Act 1992* (Cwlth).

Pterostylis cucullata (leafy greenhood) is listed as Vulnerable under the *Threatened Species Conservation Act 1995* (New South Wales); listed as Endangered under the *National Parks and Wildlife Act 1972* (South Australia); listed as Endangered under the *Threatened Species Protection Act 1995* (Tasmania); and listed as Threatened under the *Flora and Fauna Guarantee Act 1988* (Victoria). The subspecies *Pterostylis cucullata* subsp. *cucullata* is listed as Endangered under the non-statutory *Advisory list of rare or threatened plants in Victoria – 2014*.

The main factor that causes the species being eligible for listing in the Vulnerable category is its decline in population.

Description

The leafy greenhood is a herbaceous perennial, terrestrial orchid emerging annually from an underground tuber. It has a basal rosette of 5–7 leaves. A greenish flower stem to 25 cm tall bears several large leafy bracts and a single, large white, green and reddish-brown flower. The dorsal sepal and petals are combined to form a galea (hood) which is erect for $\frac{3}{4}$ of its length and then curved forward in a semi-circle, ending in a blunt point. The lateral sepals are erect and joined at the base, the free points embracing the galea. The labellum is brown and just visible above the sinus (Bates & Weber 1990; Backhouse & Jeanes 1995).

Two subspecies of the leafy greenhood have been described: *P. cucullata* subsp. *cucullata* and *P. cucullata* subsp. *sylvicola*. Subspecies *sylvicola* differs from nominate subsp. *cucullata* by its generally taller habit (to 25 cm), leaves usually extending up the scape, and slightly smaller flower on a longer pedicel, with the upper bract well separated from the flower. The habitat of each subspecies is generally distinct, with subsp. *cucullata* occurring in coastal and near-coastal habitats (with the exception of the population at Mt Eccles in western Victoria), whereas subsp. *sylvicola* occurs in foothill and montane habitats well away from the coast (Jones 2006).

Distribution

The leafy greenhood is endemic to south-eastern Australia, where it occurs in South Australia, Victoria and Tasmania. In South Australia the species (subsp. *sylvicola*) is known only from three locations in the Mount Lofty Ranges (Quarmby 2009). In Victoria, subsp. *cucullata* occurs in the coastal strip between Nelson in the west and Bairnsdale in the east (with one population inland at Mt Eccles in the south-west). Subspecies *sylvicola* occurs in the eastern highlands between Eildon and Benambra. In Tasmania, subsp. *cucullata* is known from coastal areas in the north-west and from King, Hunter, Three Hummock and Flinders Islands in Bass Strait (DPIPWE 2009).

The leafy greenhood is known from about 110 populations (3 in SA; approximately 15 in Tas; remainder in Vic) containing an estimated 50 000 plants, with 59 populations being identified as important, based on representativeness across the range, populations at range limits, size, security and tenure of habitat, for both subspecies. While these populations have been assessed as being important to the ongoing survival of leafy greenhood, it should be noted that the other

known populations should not be ignored as they may become important in the future based on location and threats (Duncan 2010).

In Victoria, important populations include 18 populations in the Alpine National Park, eight in Wilsons Promontory National Park, six in Mornington Peninsula National Park, and single populations in Cape Otway National Park, Eildon National Park, Mt Eccles and Point Nepean. Eight populations occur on private property (Cape Schank, Bridgewater Lakes, Cape Otway, Rye and Tootgarook), two on roadsides (unknown land tenure at Cape Schank and Cape Bridgewater) and three on unknown land tenure in the Strathbogie Ranges, Winkie Creek and Tootgarook (Duncan 2010).

In Tasmania, four populations occur in reserves (two in Arthur–Pieman Conservation Area, one in Three Hummock Island Nature Reserve and one in Hunter Island Nature Reserve), and three occur on private land (two on King Island and one on Flinders Island) (Duncan 2010).

In Victoria, one population occurs in Belair National Park, one in Lobethal (Adelaide Hills Council) and one on private property at Cherry Gardens (Duncan 2010).

The leafy greenhood remains widely distributed, but has declined or disappeared from many locations within its range. There are historical records of this species from locations where the species no longer occurs in South Australia (Teatree Gully, Fairview Park, McLaren Vale, Hindmarsh Valley, Lake Bonney, Robe and Mt Gambier (ADHERB 2009; NOSSA 2009; Quarmby 2009), Victoria (Frankston, Seaford, Nelson, Queenscliff, Rosebud, Rye and Sorrento) and Tasmania (Circular Head, George Town, Marrawah). In particular, the species must have once been abundant along the eastern side of Port Phillip Bay, between Melbourne and Portsea, with many records from this region, but extensive loss of habitat has occurred in this area as a result of urban development and the species is now very rare. Habitat loss for agriculture and urban development has been the primary cause of the decline of leafy greenhood, especially in coastal areas (Quarmby 2009).

Although there are some important populations reserved in national parks, many populations occur on private property, where their future is not secure. There is a risk of extinction due to small population size at many sites, and the highly fragmented distribution of the known populations, leading to low genetic diversity (Quarmby 2009).

Relevant Biology/Ecology

The two subspecies of leafy greenhood occupy generally different habitats. The lowland subsp. *cucullata* occurs in *Leptospermum laevigatum* or *Melaleuca lanceolata* coastal scrub on stabilised sand dunes, with an open understorey and grassy and herbaceous groundcover on seasonally damp but well-drained, humus-rich sandy loams (Backhouse & Jeanes 1995; Jones et al. 1999; Potts & Wapstra 2000; DPIPWE 2009). In Tasmania, the species typically grows at the interface between coastal tussock grasslands and scrub (DPIPWE 2009). In Victoria, the Mt Eccles population of subsp. *cucullata* occurs in *Eucalyptus baxteri* and *E. viminalis* forest with a grassy groundcover (Duncan 2010).

Victorian populations of subsp. *sylicola* usually occur on montane river banks or alluvial terraces under *Eucalyptus bridgesiana*, *E. melliodora*, *E. macrorhyncha*, *E. viminalis* or *E. globulus*, with scattered shrubs and a grassy and herbaceous groundcover. In South Australia, subsp. *sylicola* occurs in open forest and woodland of *E. leucoxydon*, often with *E. oblique* or *E. camaldulensis* (Quarmby 2009).

Little is known of the ecology of the leafy greenhood. It is dormant during the drier summer months, then dormancy is broken in response to cooler conditions in concert with autumn/winter rains, with leaves emerging and growing throughout the winter and early spring. Flowering occurs from August to December, depending upon altitude, with coastal plants flowering first and mountain plants flowering later. Plants reproduce mainly from seed, with limited vegetative propagation occurring. Pollination is probably by small flying insects such as gnats and most likely involves sexual deception of the pollinator. Fruits usually take 5–8 weeks to mature following pollination. Each mature capsule may contain tens of thousands of microscopic seeds that are dispersed by wind when the capsule dries out and splits (Duncan 2010).

Threats

Table 1 – Threats

Threat factor	Threat type and status	Evidence base
Habitat loss, disturbance and modifications		
Land and housing development	known current	Disturbance to or destruction of plants and habitat from land development remains a major risk throughout the range of leafy greenhood. The private property sites on King Island are at risk of development for housing. All undeveloped private property sites are at risk of accidental disturbance or destruction resulting from property development. There is a risk of the Cape Schanck (private property) site being cleared for development in the future (Duncan 2010).
Road/track/campground maintenance	known current	Disturbance to or destruction of plants and habitats from road maintenance works remains a major risk throughout the range of leafy greenhood. Disturbance caused by track/campground maintenance activities is a threat at two sites in the Alpine National Park, and one site in the Mornington Peninsula National Park. Accidental disturbance by land managers or contractors is a threat at the Cape Otway private property, Cape Bridgewater roadside and Tootgarook sites. Accidental disturbance caused by road/track maintenance is a threat at the two sites in the Wilsons Promontory National Park (Duncan 2010). Road/track maintenance is a threat the Belair National Park and other sites in South Australia (Quarmby 2009).
Accidental trampling/damage by recreational users	known current	Disturbance to or destruction of plants and habitats from recreational users remains a major risk throughout the range of leafy greenhood. Accidental trampling or destruction by people (campers) is a threat at two sites in the Alpine National Park. Accidental trampling by walkers is a threat at one site in the Mornington Peninsula National Park. Rubbish dumping is an ongoing problem at the Cape Schanck roadside and Tootgarook reserve and private property sites (Duncan 2010). Accidental trampling/damage caused by recreational activities is a threat to the Belair National Park population in South Australia (Quarmby 2009).
Invasive species		
Weeds	known current	Weed invasion is a major threat to many populations of leafy greenhood, a reflection of extensive clearing and large edge effects, urban development, garden escapes and invasion from pastures (Duncan 2010). In South Australia all extant populations are threatened by weed invasion by: boneseed (<i>Chrysanthemoides monilifera</i>), Montpellier broom (<i>Genista monspessulana</i>), sweet pittosporum (<i>Pittosporum undulatum</i>), olive (<i>Olea europaea</i>), blackberry (<i>Rubus fruticosus</i>), gorse (<i>Ulex europaeus</i>), tree heath (<i>Erica arborea</i>), sparaxis (<i>Sparaxis bulbifera</i>), three-cornered garlic (<i>Allium</i>

		<p><i>triquetrum</i>), ivy (<i>Hedera helix</i>), plantain (<i>Plantago lanceolata</i>), cleavers (<i>Galium aparine</i>), and soursob (<i>Oxalis pes-caprae</i>) (Quarmby 2010).</p> <p>In Victoria, the following weeds are threats at specific sites (Duncan 2010):</p> <ul style="list-style-type: none"> • blackberry at three sites in the Alpine National Park. • introduced grasses – quaking grass (<i>Briza maxima</i>), panic Veldt grass (<i>Ehrharta erecta</i>) and buffalo grass (<i>Stenotaphrum secundatum</i>) plus other annual grasses at two sites in the Mornington Peninsula National Park, three sites at Tootgarook (two private property and unknown land tenure). • myrtle-leaf milkwort (<i>Polygala myrtifolia</i>) at one site in the Mornington Peninsula National Park and Cape Schanck roadside. • boneseed and/or bridal creeper (<i>Asparagus asparagoides</i>) at Tootgarook and private property (Bridgewater Lakes, Cape Schanck, Rye and Tootgarook). • freesia (<i>Freesia alba</i> X <i>F. leichtlinii</i>) at Rye private property. • ivy and sweet pittosporum at Cape Schanck roadside. • Scotch thistle (<i>Cirsium vulgare</i>) and chickweed (<i>Cerastium holosteoides</i>) at one site in the Alpine National Park. • periwinkle (<i>Vinca major</i>) at Point Nepean National Park. <p>In Tasmania, the Three Hummock Island Nature Reserve site is being overgrown by successional coastal scrub and invaded by pasture grasses (Duncan 2010).</p>
Invasive species grazing	known current	<p>Flowers and fruits of leafy greenhood are likely to be highly palatable and are frequently lost to predation. Grazing by introduced herbivores (rabbits, hares) or invertebrates (snails) is a serious threat at many sites. In Victoria, the introduced Mediterranean snail (<i>Microxeromagna vestita</i>) and rabbits threaten many populations. Grazing is considered a significant threat to all South Australian populations (Duncan 2010). In particular, the Belair National Park population is threatened by rabbits (Quarmby 2009).</p>

Impacts of domestic species		
Grazing/trampling	known current	Disturbance to or destruction of plants and habitats from trampling by stock remains a major risk throughout the range of leafy greenhood. The Cape Otway private property sites are threatened by grazing and/or trampling by stock (Duncan 2010). Many Tasmanian populations are threatened by grazing and trampling by cattle (DPIPWE 2009).
Fire		
Fire frequency	Potential and known past and future	Too-frequent or poorly timed fires are thought to be detrimental to the leafy greenhood (Quarmby 2009). The Tasmanian populations were historically threatened by land clearing/habitat removal/modification of habitat due to fire (Duncan 2010).

Conservation Actions

Conservation and Management priorities

Habitat loss, disturbance and modifications

- Prevent habitat disturbance. Continue to control access routes by installing fencing, barriers and gates to suitably constrain stock, vehicle and public access to known sites on public land and manage access on private land and other land tenure, to prevent accidental trampling and damage to leafy greenhood plants and habitat.
- Any protection measures required at these sites (e.g. fencing, signage, track closures) should have minimal impact on current recreational and commercial activities. Continue to negotiate with the relevant land managers of public land to protect populations.
- Continue to negotiate with the relevant land owners/managers of private land to protect populations, through voluntary agreements.
- Install signposting at high-risk locations such as roadside populations.
- Identify and protect current and potential habitat through development and/or implementation of planning scheme overlays and restrict clearance of native vegetation to avoid damage to or destruction of populations.
- Continue to manage rubbish removal at Tootgarook site.
- Maintain barriers at the Cape Schanck (roadside) population to prevent trampling.

Invasive species

- Manage sites by fencing and poisoning to identify, control and reduce the spread of invasive species, particularly rabbits, hares and snails.
- Identify and undertake weed control in the local area that could become a threat to the leafy greenhood, using appropriate methods including hand removal and herbicide spraying. Care is required as hand removal may lead to disturbance recruitment of weeds. Also chemical control must have care to avoid overspray of the orchid.

Impacts of domestic species

- If livestock grazing occurs in the area, ensure that land owners/managers use an appropriate management regime and density that does not detrimentally affect this species outside the growing season that includes eliminating trampling of or near the

orchids, and manage total grazing pressure at important sites through exclusion fencing or other barriers.

- Develop and implement a stock management plan for leafy greenhood for road side verges. Distribute this information to councils and graziers in the area to increase awareness of the species requirement.
- Maintain cattle exclusion from the Three Hummock Island Nature Reserve site.
- Maintain the fence at the Bridgewater Lakes (private property) and Lobethal (SA) sites to protect it from stock grazing.

Fire

- Implement an appropriate fire management regime for protecting key habitat that includes buffers to prevent wildfire or managed fire from impacting the habitat, unless prescribed fire is being used following sound scientific evidence of the critical need for such a prescribed fire.
- Critically, any use of prescribed or experimental fires must be very well justified, and is typically an action of last resort. There must be a carefully planned weed management strategy and demonstrated funding to ensure post-fire monitoring and control actions occur (e.g. weed control based on sound scientific evidence). Fire should not be used during the growth and seeding phases of the orchid.
- 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.

Breeding, propagation and other *ex situ* recovery actions

- Undertake seed germination and/or vegetative propagation trials to determine the requirements for successful establishment. Translocation of cultivated plants should be considered only where there is a high chance of success and where secure sites exist.
- Continue the long term storage of seed and mycorrhiza from ten Victorian and three South Australian populations plus secure seed and mycorrhiza from Tasmanian populations.

Stakeholder Engagement

- Provide land managers and landholders with detailed location, distribution, habitat and ecology data about leafy greenhood to protect existing populations against inadvertent damage, and raise awareness that may lead to the discovery of new populations.
- Initiate and/or maintain private land management agreements at the Bridgewater Lakes, Cape Otway, Cape Schanck, Rye, and Tootgarook private property sites.
- Encourage community involvement in the conservation of leafy greenhood, including creating, fostering, maintaining and upgrading links with local community groups.
- Continue to seek community participation in recovery actions, particularly in regard to recovery team membership and implementation of on-ground works.

Survey and Monitoring priorities

- Undertake surveys of priority sites to determine the area and extent of populations, the number, size and structure of populations, and inference or estimation of population change.

- Measure population trends and responses against recovery actions by collecting demographic information including recruitment and mortality, timing of life history stages and morphological data.
- Survey known habitat at priority sites and collect floristic and environmental information relevant to community ecology and condition.
- Identify and survey potential habitat, using ecological and bioclimatic information that may indicate habitat preference.
- Establish monitoring quadrats at four sites in the Alpine National Park, Cape Otway National Park, Tootgarook, two sites in the Mornington Peninsula National Park and Belair National Park sites.
- Monitoring of the plants that underwent translocation in 1998 and 2006 from private property sites in the Mornington Peninsula National Park due to risk of destruction.

Information and research priorities

- Investigate soil seed bank persistence and natural recruitment.
- Investigate options for linking, enhancing or establishing additional populations.
- Fire trials should only be undertaken as a last resort when all other means of regeneration of the species has been investigated and, in addition, when all weed management and fire impacts (including the timing of fire impacts to avoid burning plants in their growth or seeding phase) are fully understood.
- Research the effects of public access where this is likely and the effects are unknown.
- Implement and/or continue an annual census to monitor emergence and resprouting success and to monitor the success of particular management actions.

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Available on the internet at: <http://www.environment.gov.au/system/files/resources/14e1ae30-5cf7-4be6-8a35-2c752886c14f/files/pterostylis-cucullata.pdf>