

# THREATENED SPECIES SCIENTIFIC COMMITTEE

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

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

## Conservation Advice

### *Pterostylis gibbosa*

Illawarra greenhood

#### Conservation Status

*Pterostylis gibbosa* (Illawarra greenhood) 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 as on 16 July 2000 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 current 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 limited population size, restricted distribution and continuing decline due to the impact of ongoing threats such as habitat loss and degradation, weed invasion, grazing and fire.

#### Description

This species belongs to a large genus of ground-dwelling orchids. The Illawarra greenhood has a rosette of rounded leaves at the base of the stem, each to 35 mm long. In addition, there are up to six leaves that sheath the flower stem, which grows to 45 cm high and bear up to seven flowers. The flowers are bright glossy green with transparent patches in the hood. The very broad black labellum ('lip' petal) protrudes from the front of the flower (OEH 2016).

#### Distribution

The Illawarra greenhood is known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra) of New South Wales. It is apparently extinct on the Cumberland Plain in western Sydney, where it was first collected in 1803 (OEH 2016). The Office of Environment and Heritage estimates that there are 400 plants at Milbrodale; 400 plants at Yallah; 3000 plants at Croom in Albion Park; and 400 plants in the Shoalhaven region at Worrigeer Nature Reserve (OEH 2016a).

#### Relevant Biology/Ecology

All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by *Eucalyptus tereticornis* (forest red gum), *E. longifolia* (woollybutt) and *Melaleuca decora* (white feather honey-myrtle). Near Nowra, the species grows in an open forest of *Corymbia maculata* (spotted gum), forest red gum and *E. paniculata* (grey ironbark). In the Hunter region, the species grows in open woodland dominated by *E. crebra* (narrow-leaved ironbark), forest red gum and *Callitris endlicheri* (black cypress pine) (OEH 2016).

The Illawarra greenhood is a herbaceous perennial orchid that is only visible above the ground between late summer and spring, and only when soil moisture levels can sustain growth. The leaf rosette grows from an underground tuber in late summer, followed by the flower stem in winter. The species is likely to be pollinated by male fungus gnats of the genus *Mycomya*. After flowering in spring the plant begins to die back and if pollination has taken place the orchid

produces seed capsules (OEH 2016). Under favourable conditions, individuals of the Illawarra greenhood are likely to live for up to 20 years (Clements, cited in Muston & Krusenstierna 1994).

The seeds of the Illawarra greenhood appear to be wind dispersed and can remain dormant for up to two seasons. The seeds require the presence of a specific strain of the mycorrhizal fungus *Ceratobasidium cornigerum* for successful germination. This fungus is widespread and associated with leaf litter. A new tuberoid is produced each year adjacent to the original tuberoid which then withers and dies (Muston & Krusenstierna 1994). The Illawarra greenhood can survive occasional burning and grazing because of its capacity to reshoot from an underground tuber (OEH 2016).

The Illawarra greenhood appears to benefit from some disturbance. Rapid population growth has been observed after fire at Albion Park (Bradburn, cited in Muston & Krusenstierna 1994). In the absence of disturbance, it is possible that populations of the species decline (Muston & Krusenstierna 1994) or that most individuals remain dormant as tubers until a fire stimulates re-emergence. However, the numbers of orchids visible above ground tend to decline with the re-establishment of post-disturbance shrub and grass cover (Muston & Krusenstierna 1994).

### Threats

The Illawarra greenhood is threatened by habitat loss and modification, including from invasive species and too frequent fire. The threats and their effects on the Illawarra greenhood are described in the table below. The threats outlined below have corresponding conservation management priorities.

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

Threat factor	Threat type and status	Evidence base
Habitat loss, disturbance and modification		
Clearing for agriculture and urban development	known current	Habitat loss as a result of urban development and agriculture has reduced the area of available habitat on the Cumberland Plain and Illawarra to isolated remnants (NPWS 2002).
Disturbance from recreational users.	known current	In 2002, trampling or disturbance by vehicles, mountain bikes or walkers was known to occur at Milbrodale and Albion Park (NPWS 2002).
Impacts of domestic species		
Grazing by domestic stock	known current	Grazing can lead to the entire loss of reproductive capacity in that season with the removal of plant parts that are also likely to have a direct effect on growth potential and future reproductive success of the species. If herbivory levels remain high in subsequent seasons this may be detrimental to the long term reproductive success and survival of the species (NPWS 2002). At least two populations of the Illawarra greenhood orchid occur on private land where the primary land use is grazing of domestic stock (NPWS 2002). In the Hunter Region, the southern part of the low plateau on which Illawarra greenhood is found is already completely cleared and grazed. The orchid population is found adjacent to the fenceline, but not beyond it on grazing land (NPWS 2002),

		indicating that the grazing is impacting on the orchid's growth and/or recruitment.
<b>Invasive species</b>		
Invasive weeds	potential current	The species habitat is affected by blackberries ( <i>Rubus fruticosus</i> ), lantana ( <i>Lantana camara</i> ), privet ( <i>Ligustrum</i> spp.), <i>Senna</i> spp., prickly pear ( <i>Opuntia</i> spp.) and invasive grasses such as Yorkshire fog ( <i>Holcus</i> spp.). These species have the potential to outcompete the Illawarra greenhood (OEH 2016; NPWS 2002). In the Hunter Valley and the Shoalhaven sites, invasive weeds are less of a threat to the species (NPWS 2002).
<b>Fire</b>		
Too frequent burning	potential current	Fires between March and November will destroy the above ground parts of the plant. A single fire at this time of year is unlikely to kill individuals but repeated fires are likely to eliminate populations, as there is no opportunity for plants to replenish tuber reserves or to flower and set seed (NPWS 2002). Too frequent fires may also encourage fire tolerant species which could outcompete the Illawarra greenhood such as blady grass <i>Imperata cylindrical</i> and lantana (NPWS 2002).
Absence of fire	potential current	The absence of fire or infrequent fires may also be a threat to the species. Many perennial plants may have a competitive advantage under these circumstances. A denser understory or a build-up of leaf litter may limit available light and space for the Illawarra greenhood. In the long term, the light levels under a dense canopy of plants may be too low for the Illawarra greenhood to survive (NPWS 2002).
<b>Other threats</b>		
Illegal collection	potential current	The Illawarra greenhood is of value to orchid collectors and in 2002, collection was considered to pose a potential threat to the species (NPWS 2002).

## **Conservation Actions**

### **Conservation and Management priorities**

#### Habitat loss, disturbance and modification

- Ensure public and private land managers are aware of the presence and location of the Illawarra greenhood on their land and provide protection measures against known and potential threats to the species, including vegetation clearance.
- Prevent habitat disturbance to mitigate known grazing and trampling by stock, vehicles, mountain bikes and walkers. Control access routes by installing signage, fencing and gates to suitably constrain stock, vehicles, mountain bikes and walkers access to known sites on public land and manage access on private land and other land tenure.
- In order to prevent further habitat clearance, liaise with relevant authorities to complete voluntary conservation agreements for known occurrences of the Illawarra greenhood (NPWS 2002).

## Impacts of domestic species

- If livestock grazing occurs in the area, ensure land owners/managers use an appropriate management regime and density that does not detrimentally affect the Illawarra greenhood (e.g. summer grazing only), to allow regeneration from seedlings outside the growing season and manage total grazing pressure at important sites through exclusion fencing or other barriers. Note however, that the effects of grazing on the Illawarra greenhood depend on its timing and intensity. The removal of adjacent vegetation cover may benefit the orchid by increasing light levels and allowing the growth of the Illawarra greenhood where vegetation cover is dense. The extensive removal of adjacent vegetation cover may be unfavourable as it reduces moisture and increases exposure of the orchid to heat and wind (NPWS 2002).

## Invasive species

- Identify and control weeds such as blackberries, lantana, privet, *Senna* spp., prickly pear and invasive grasses such as velvetgrass in the local area that could become a threat to the Illawarra greenhood. Consult with local experts in determining the most appropriate control methods for these weeds without having a detrimental effect on the Illawarra greenhood.
- Restore degraded habitat using bush regeneration techniques.

## Fire

- Ensure that prescribed fires occur only within the habitat during the dormant phase of the Illawarra greenhood's life cycle.
- Fires must be managed to ensure that prevailing fire regimes do not disrupt the life cycle of the Illawarra greenhood; that they support rather than degrade the habitat necessary for the Illawarra greenhood; that they do not promote the invasion of exotic species; and that they do not increase the impacts of grazing.
- Physical damage to the habitat and individuals of the Illawarra greenhood must be avoided during and after fire operations. Ensure the retention of the surface soil organic material and leaf litter 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 Illawarra greenhood.
- Avoid use of fire research and other activities that impact upon the persistence of the population unless there is evidence to show the impact would have a positive and enduring effect on the Illawarra greenhood's persistence.

## Illegal collection

- Ensure confidentiality of the known locations of the Illawarra greenhood are maintained to reduce the potential threat from illegal collection.
- Provide signage in publically accessible areas to encourage the public to not collect plants or damage plants in any way.

## Seed collection, propagation and other ex situ recovery action

- Establish artificially propagated plants in cultivation in appropriate institutions such as the Royal Botanic Garden, Sydney.

- To manage the risk of losing genetic diversity, undertake appropriate seed and mycorrhizal fungi collection and storage in appropriate institutions, such as the Australian PlantBank and the Sydney Royal Botanic Garden. Curate the collection to ensure sustained viability of stored seed. Seeds from representative populations to be collected and stored.

### Stakeholder Engagement

- Identify who the relevant stakeholders are e.g. traditional owners, local members of the public, private landowners, public land managers, industry, non-government organisations, developers. Provide advice to private land owners in regards to appropriate management for the protection of populations of the Illawarra greenhood occurring on or adjacent to their properties including information about the conservation status and management issues affecting the orchid.

### Survey and Monitoring priorities

- More precisely assess population size, distribution, ecological requirements and the relative impacts of threatening processes.
- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Undertake surveys of known populations as well as potential habitat to locate any additional populations to more precisely assess population size and distribution. Use predictive modelling techniques to identify suitable potential habitat for future surveys if required (NPWS 2002). In undertaking surveys for new Illawarra greenhood populations, seek to involve volunteers and community groups in the survey effort (NPWS 2002).
- Implement an annual census to monitor emergence and resprouting success.
- Monitor the size, structure and reproductive status of populations at different stages in the fire cycle, taking opportunities to monitor after planned and unplanned fires (where they occur) and improve understanding of the fire response of the Illawarra greenhood.

### Information and research priorities

- Investigate options for establishing in situ and/or translocated populations of the Illawarra greenhood.
- If new populations are identified, establish representative genetic stock in cultivation in appropriate institutions such as botanic gardens and investigate the reproductive status, longevity, fecundity and recruitment levels for the Illawarra greenhood in order to form a view on the resilience of this species to known and potential threats and adjust conservation actions as required.
- Assess the Illawarra greenhood's ecological requirements relevant to the persistence of the species. Continue research into the population dynamics of the Illawarra greenhood, including monitoring permanent quadrats for survivorship, flowering, capsule and seed production (NPWS 2002).
- Undertake seed germination and/or vegetative propagation trials to determine the requirements for successful establishment, including disturbance and mycorrhizal fungi requirements.
- Undertake research into pollinator activity and the ecological requirements to support pollinator communities of the Illawarra greenhood.

- Investigate options for linking, enhancing or establishing additional populations.
- Improve understanding of the mechanisms of response to different fire regimes and identify appropriate fire regimes for the conservation of the Illawarra greenhood by undertaking appropriately designed experiments in the field and/or laboratory.
- Where appropriate, use understanding and research on fire responses among related (e.g. congeneric) or functionally similar species to develop fire management strategies for conservation.
- Precise fire history records must be kept for the habitat and extant populations (confirmed and suspected) of the Illawarra greenhood.
- Identify optimal fire regimes for regeneration (vegetative regrowth and/or seed germination) of the species, and the species' response to other prevailing fire regimes.
- Research the effects of public access where this is likely and where the effects are unknown.

### **References cited in the advice**

Muston, R. & Krusenstierna, A. (1994). Conservation Research Statement and Species Recovery Plan for *Pterostylis gibbosa*. NSW NPWS, Hurstville, NSW.

NPWS (National Parks and Wildlife Service) (2002). *Pterostylis gibbosa* (R.Br.) Illawarra Greenhood Orchid Recovery Plan. NSW National Parks and Wildlife Service, Hurstville, NSW.

### **Other sources cited in the advice**

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