

# Action Statement

Flora and Fauna Guarantee Act 1988

No. 246

## Enigmatic Greenhood

### *Pterostylis aenigma*

This Action Statement is based on the Recovery Plan prepared for this species by DSE under contract to the Commonwealth Department of the Environment, Water, Heritage and the Arts.

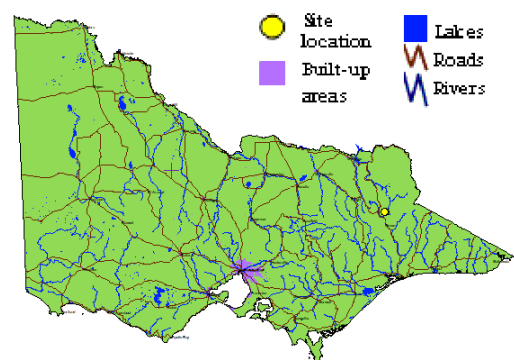
#### Description

The Enigmatic Greenhood (*Pterostylis aenigma* D. L. Jones & M. A. Clem.) is a terrestrial, deciduous herb. It grows to 30 cm in height, with a loose rosette of three or four leaves and a large, leafy floral bract. The single, terminal flower is white with green and brown stripes and olive brown erect lateral sepals. The galea is erect for three quarters of its length before curving forward with an obliquely deflexed tip. It flowers in November and December (Jones and Clements 1993, Backhouse and Jeanes 1995; Bishop 1996). The Enigmatic Greenhood is easily distinguished from the closely related species, Leafy Greenhood (*P. cucullata*), by its generally taller scape, smaller stem leaves and narrower flower with longer sepal points (Backhouse and Jeanes 1995).



Enigmatic Greenhood (Photo: DSE/Duncan)

There is some debate as to the correct taxonomic status for *P. aenigma*. Some believe that it is a natural hybrid between Leafy Greenhood (*P. cucullata*) and Sickie Greenhood (*P. falcata*), both of which occur with or nearby known Enigmatic Greenhood populations (Backhouse and Jeanes 1995; Bishop 1996; Jeanes and Backhouse 2000). Plant characters tend to lie in between the two putative parent taxa. The taxonomic status of the Enigmatic Greenhood requires clarification.



Distribution in Victoria  
(Flora Information System DSE 2007)

#### Distribution

The Enigmatic Greenhood is endemic to Victoria, where it is known from one wild population in the Australian Alps bioregion (Environment Australia 2000). Little is known about the historical distribution of this species. It is likely to be naturally rare because, although suitable habitat is relatively widespread throughout the Victorian Alps, it has only been recorded from the one population.

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## Abundance

The species is only known from one wild population. The population size appears to fluctuate: approximately 50 plants were recorded in November 2003, no plants were observed in November 2004, and five plants were located in 2005.

## Important populations

The Enigmatic Greenhood is known from only a single location in the Alpine National Park.

## Habitat

The Enigmatic Greenhood occurs on a seasonally waterlogged, alluvial flat within grassy open forest, on grey to brown clay loam soil. The overstorey is dominated by Mountain Swamp Gum (*Eucalyptus camphora* subsp. *humeana*) with an understorey of Blackwood (*Acacia melanoxylon*). The ground layer is dominated by grasses, lilies and sedges; major species include Tall Mountain Tussock-grass (*Poa helmsii*), Fen Sedge (*Carex gaudichaudiana*), Tasman Flax-lily (*Dianella tasmanica*) and Mother Shield-fern (*Polystichum proliferum*). Inter-tussock species include Forest Buttercup (*Ranunculus plebeius*), Prickly Starwort (*Stellaria pungens*), Alpine Cotula (*Cotula alpina*), Kidney-weed (*Dichondra repens*), Self-heal (*Prunella vulgaris*), Ivy-leaf Violet (*Viola hederacea*) and Rough Cranesbill (*Geranium* sp. 4). Exotics, such as English Broom (*Cytisus scoparius*), Sweet Briar (*Rosa rubiginosa*), Blackberry (*Rubus fruticosus* spp. agg.), Thistle (*Cirsium* sp.), Yorkshire Fog Grass (*Holcus lanatus*) and White Clover (*Trifolium repens* var. *repens*), are moderately common (Coates 2001).

## Life history and ecology

The Enigmatic Greenhood is a terrestrial, deciduous herb emerging annually from spherical subterranean tubers that are dormant during the drier summer months. When dormancy is broken in response to soaking rains in early autumn, the plants produce a loose rosette of 3-4 leaves that grows throughout the winter and early spring. Flowering occurs in late spring. Plants reproduce from seed and also from daughter tubers. Pollination is probably facilitated by small flying insects such as gnats, flies or mosquitoes. Following pollination, fruits usually take 5-8 weeks to mature. Each mature capsule may contain tens of thousands of microscopic seeds, which are dispersed by the wind when the capsule dries out.

The foliage and fruits of the Enigmatic Greenhood are likely to be highly palatable and frequently lost to predation. The Enigmatic Greenhood is unknown in cultivation but, like many *Pterostylis*

species, it is likely to be relatively easy to maintain in cultivation.

The role of fire in the ecology of greenhoods is variable and not well understood, but is likely to be an important factor. The site of the known Enigmatic Greenhood population was severely burnt during a wildfire in January 2003, while the plants were dormant. Fire is an integral part of the physical environment of most vegetation types in southern Australia (Gill *et al.* 1999), and is required to maintain plant diversity (Wark 1996). Fire removes the surrounding vegetation, thereby increasing light levels and temperature at ground level; increased moisture levels possibly also result as a consequence of reduced plant competition for water (Purdie 1977). The soil ecology changes and mycorrhizal fungal symbionts become more prevalent. Allelopathic inhibition by the surrounding vegetation may be reduced or removed (Gill *et al.* 1981). Seedling establishment may be critically dependent on fire.

Detailed investigations of the ecology of the Enigmatic Greenhood are urgently required for recovery and management of the known population. The precise details of its life history and seasonal variations in flowering and fruiting are not known. Plant longevity, length of dormancy, population structure and demography have not been determined. The species' pollination biology, mycorrhizal relationships and response to fire are also unknown. Similarly, the long-term consequences of predation are poorly understood. Conditions for seed germination and seedling establishment also require investigation.

## Conservation status

The Enigmatic Greenhood is listed as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The Enigmatic Greenhood is listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988* (DSE 2005).

It is considered endangered in the Department of Sustainability and Environment's *Advisory List of Rare or Threatened Vascular Plants in Victoria - 2005* (DSE 2005).

## Potentially threatening processes

The processes listed below are considered to have the potential to threaten populations or habitat. They may or may not be listed as potentially threatening processes under the *Flora and Fauna Guarantee Act 1988*.

### Grazing

The restricted distribution of this species increases its vulnerability to grazing pressure. Herbivores at the site location include kangaroos, wallabies and invertebrate species.

### Weed invasion

Weeds such as Sweet Briar (*Rosa rubiginosa*), Blackberry (*Rubus fruticosus* spp. agg.), Thistle (*Cirsium* sp.), Yorkshire Fog Grass (*Holcus lanatus*), and White Clover (*Trifolium repens* var. *repens*) are moderately common. In particular, regeneration of English Broom (*Cytisus scoparius*) is a significant threat at the site. The dense cover of eucalypt seedling regeneration following the wildfire may lead to site changes such as increased interspecific competition for light and moisture, which disfavour the persistence of *P. aenigma*.

### Site disturbance

Site disturbance caused by the movement of large volumes of silt onto the site is a serious potential threat to this species. There is also potential for trampling by cattle and orchid enthusiasts at this site. A huge volume of silt (1 m deep in places) was deposited onto the site following a freak rainstorm event a month after the wildfire. Tonnes of soil were washed off the surrounding hills onto the flat containing the Enigmatic Greenhood population. The presence of this soil, just metres upstream from the Enigmatic Greenhood colony, represents a serious ongoing threat to the population.

### Ecology / biology

There is a high risk of extinction due to the small number of individuals, all of which occur in a single population. The conditions for seedling recruitment and maintenance of the pollinator / mycorrhiza are unknown.

### Cinnamon Fungus (*Phytophthora cinnamomi*)

It is unknown whether Cinnamon Fungus is present at the site or in surrounding areas. Its current or future presence may pose a potential threat to the population.

### Trampling and Collection

The population may be at risk from inadvertent damage or trampling by orchid enthusiasts who may visit the site. An additional risk exists from people seeking financial gain from collection of a rare orchid species. The collection of native orchids has been recognised as a potentially threatening process.

### **Previous Management Action**

- In the past, some plants have been caged to protect them from kangaroo / wallaby grazing.
- All cattle grazing has been ceased in the National Alpine Park, in which the Enigmatic Greenhood population occurs.
- Friends of the Mitta Mitta have periodically been involved in weed control (physical removal of English Broom) at the site.
- Parks Victoria (Omeo) had funding for an English Broom control program following the 2003 wildfire.
- DSE, Parks Victoria staff and members of the Bairnsdale and District Field Naturalists Club control weeds at the site annually (including English Broom and Blackberry).
- Roadworks near the Enigmatic Greenhood site have been conducted with consideration of any continuing erosion effects caused by soil movement from the surrounding hills.
- Each November, the Bairnsdale and District Field Naturalists Club undertakes an annual search and count of flowering Enigmatic Greenhood individuals at the site.
- Searches of nearby suitable habitat have been conducted. No new Enigmatic Greenhood populations have been found.
- Parks Victoria has surveyed the species' known habitat, and collected and analysed information on floristics and environment relevant to the community ecology and condition.
- To minimise the risk of trampling by enthusiasts and the likelihood of collection, the precise locations of the orchid populations has remained confidential.

## Conservation Objectives and Intended Management Actions

The intended management actions listed below are further elaborated in DSE's Actions for Biodiversity Conservation (ABC) system. Detailed information about the actions and locations, including priorities, is held in this system and will be provided annually to land managers and other authorities.

### Long term objective

To ensure that the Enigmatic Greenhood can survive, flourish and retain its potential for evolutionary development in the wild.

### Specific Objectives, Actions and Targets

#### Objective I To improve knowledge of biology, ecology and management requirements

| Action  | Targets  | Responsible                                    |
|---|--|--|
| 1. Clarify taxonomy using genetic analysis to determine if the Enigmatic Greenhood is a species or natural hybrid, to enable a more accurate conservation status assessment.  | <ul style="list-style-type: none"> <li>▪ Taxonomy clarified (including molecular assessment of hybrid status).</li> </ul>  | Royal Botanic Gardens (RBG), CPBR <sup>1</sup> |
| 2. Acquire baseline population data by conducting detailed field and desk top surveys including (a) identification of population ranges; (b) estimates of the number, size and structure of populations, and (c) inference or estimation of population change.                  | <ul style="list-style-type: none"> <li>▪ Baseline data collected.</li> <li>▪ Conservation status reassessed.</li> <li>▪ Population accurately mapped.</li> </ul>   | DSE, Parks Victoria                            |
| 3. Assess habitat characteristics and/or condition. Accurately survey known habitat in late spring and collect floristic and environmental information relevant to community ecology and condition.   | <ul style="list-style-type: none"> <li>▪ Habitat data collected and analysed.</li> <li>▪ Important habitat mapped.</li> </ul>  | DSE, Parks Victoria                            |
| 4. Conduct survey to identify and search suitable habitat. Identify and survey potential habitat using ecological and bioclimatic information that may indicate habitat preference.   | <ul style="list-style-type: none"> <li>▪ Predictive model for potential habitat developed and tested.</li> <li>▪ Potential habitat searched.</li> </ul>  | DSE, Parks Victoria                            |
| 5. Undertake research to identify key biological functions.   | <ul style="list-style-type: none"> <li>▪ Critical life history stages identified.</li> <li>▪ Recruitment and dispersal identified at known site.</li> <li>▪ Age at reproductive maturity determined.</li> <li>▪ Seed bank/regenerative potential quantified for population.</li> <li>▪ Stimuli for recruitment/regeneration identified.</li> </ul> | DSE  |
| 6. Undertake detailed population monitoring and collect demographic information. Measure population trends and responses against recovery actions by collecting demographic information including recruitment, mortality, timing of life history stages and morphological data. | <ul style="list-style-type: none"> <li>▪ Techniques for monitoring developed and established.</li> <li>▪ Census data collected.</li> </ul>   | DSE, Parks Victoria                            |

<sup>1</sup> Centre for Plant Biodiversity Research, Australian National Botanic Gardens, Canberra.

|   |  |                        |
|---|--|------------------------|
| 7. Analyse population trends. Collate, analyse and report on census data and compare with management histories. | <ul style="list-style-type: none"> <li>Population growth rate determined and Population Viability Analysis completed for known population.</li> <li>Management assessed and prescriptions revised if necessary.</li> </ul> | DSE,<br>Parks Victoria |
| 8. Investigate the species' fire ecology and apply ecological burning if required.                              | <ul style="list-style-type: none"> <li>Fire ecology of the Enigmatic Greenhood investigated.</li> <li>Ecological burns applied to population if required.</li> </ul>   | Parks Victoria         |

**Objective II To secure populations or habitat from potentially incompatible land use or catastrophic loss.**

| <i>Action</i>  | <i>Targets</i>   | <i>Responsible</i> |
|--|--|--------------------|
| 9. Incorporate management actions in relevant park or reserve management plan.         | <ul style="list-style-type: none"> <li>Park management plan identifies the Enigmatic Greenhood and provides for the species' protection and active management.</li> <li>Fire protection plans identify the species and provide for its protection</li> </ul> | Parks Victoria     |
| 10. Establish cultivated plants <i>ex situ</i> to safeguard against catastrophic loss. | <ul style="list-style-type: none"> <li>Effective propagation and tissue culture techniques developed.</li> <li>At least 15 mature plants in cultivation.</li> </ul>  | RBG                |

**Objective III To improve the extent and/or condition of habitat**

| <i>Action</i>  | <i>Targets</i>  | <i>Responsible</i>     |
|--|---|------------------------|
| 11. Identify disturbance regimes to maintain habitat.  | <ul style="list-style-type: none"> <li>Management strategies are identified to maintain, enhance or restore habitat.</li> </ul>   | DSE,<br>Parks Victoria |
| 12. Manage environmental weeds. Control pest plants using herbicide application and / or hand removal.   | <ul style="list-style-type: none"> <li>Achieve measurable seedling recruitment in affected population.</li> <li>Achieve a measurable reduction in cover/abundance of weeds at population and adjacent roadsides.</li> </ul>   | Parks Victoria         |
| 13. Managing impact of browsing animals. Control predators / herbivores and investigate grazing impacts by fencing sites and / or caging plants.   | <ul style="list-style-type: none"> <li>Achieve a measurable seedling recruitment/vegetative regeneration.</li> <li>Achieve a measurable reduction in plant mortality.</li> </ul>  | Parks Victoria         |
| 14. Control site disturbance by protecting site and modifying management activities.   | <ul style="list-style-type: none"> <li>Achieve a measurable reduction in damage to plants in affected population.</li> </ul>  | Parks Victoria         |
| 15. Conduct testing to establish whether habitat at and surrounding the known Enigmatic Greenhood population is suitable for Cinnamon Fungus ( <i>Phytophthora cinnamomi</i> ) management. If habitat is considered suitable, explore ongoing management options for <i>P. cinnamomi</i> . Control its potential introduction and / or spread. Ensure users of the site and adjacent roads are aware of measures to reduce risk of introduction. | <ul style="list-style-type: none"> <li>Tests establish if areas at or near the site of the Enigmatic Greenhood population represent suitable <i>P. cinnamomi</i> habitat.</li> <li>The potential threat of <i>P. cinnamomi</i> is managed.</li> <li>The risk of <i>Phytophthora cinnamomi</i> introduction at the site is minimised.</li> </ul> | Parks Victoria         |

**Objective IV To increase number of populations or individuals**

| <i>Action</i>   | <i>Targets</i>   | <i>Responsible</i>                    |
|---|--|---------------------------------------|
| 16. Manage microhabitat for seedling recruitment.   | ▪ Measurable increase in recruitment.  | DSE,<br>Parks Victoria                |
| 17. Hand pollinate plants and collect seed.   | ▪ Seed from known site in short term storage.  | DSE,<br>Parks Victoria                |
| 18. Test seed viability and restock population with seed.   | ▪ Measurable increase in recruitment.  | DSE<br>Parks<br>Victoria,<br>RBG      |
| 19. Collect and store reproductive material for reintroduction. Establish a threatened orchid seed bank and determine seed viability.                                 | ▪ Seed from known population in long term storage.<br>▪ Seed viability tested.                   | DSE<br>Parks<br>Victoria,<br>RBG      |
| 20. Prepare a plan for reintroduction. Select and evaluate a site that is ecologically / biologically suitable, has secure land tenure, and is managed appropriately. | ▪ Criteria for site suitability identified and sites selected.<br>▪ Translocation plan prepared. | DSE,<br><br>Parks<br>Victoria,<br>RBG |
| 21. Establish a minimum population size of cultivated plants / accumulate seed stock.   | ▪ At least 50 vigorous and disease free plants in cultivation.                                   | RBG                                   |
| 22. Prepare site to achieve maximum survival of plants / germination of seed, using fungal baiting techniques.  | ▪ Successful fungal baiting, direct seeding, and translocation techniques developed.             | DSE                                   |
| 23. Introduce and monitor plants / seed stock.  | ▪ Measurable increase in population size at the site.  | DSE                                   |

**Objective V To increase community awareness and support**

| <i>Action</i>   | <i>Targets</i>  | <i>Responsible</i>             |
|---|---|--------------------------------|
| 24. Involve community groups and volunteers in recovery activities. | ▪ Opportunities for involvement identified, promoted and supported. | DSE, Parks<br>Victoria,<br>RBG |



## References

- Australian and New Zealand Environment and Conservation Council and Biological Diversity Advisory Committee (2001) *Biodiversity Conservation Research: Australia's Priorities*. Environment Australia, Canberra.
- Backhouse, G. N. and Jeanes, J. A. (1995) *The Orchids of Victoria*. The Meigunyah Press, Melbourne.
- Bishop, T. (1996) *Field Guide to the Orchids of New South Wales and Victoria*. University of New South Wales Press, Sydney.
- Coates, F. (2001) *Rare Species Monitoring Pterostylis aenigma - Enigmatic Greenhood*. Department of Natural Resources and Environment, Heidelberg.
- DSE (2003) *Advisory List of Rare or Threatened Plants in Victoria - 2003*. Department of Sustainability and Environment, Victoria, East Melbourne, Victoria.
- DSE (2004) *Flora Information System 2004*, Department of Sustainability and Environment.
- DSE (2005) *Advisory List of Rare or Threatened Vascular Plants in Victoria - 2005*. Department of Sustainability and Environment, East Melbourne, Victoria.
- Environment Australia (2000) *Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1. - Summary Report*. Department of Environment and Heritage, Canberra.
- Fire Ecology Working Group (1999) *Interim Guidelines for Ecological Burning on Public Land*. Department of Natural Resources and Environment / Parks Victoria, Melbourne.
- Gill, A. M., Groves, R. H. and Noble, I. R. (1981) *Fire and the Australian biota*. Australian Academy of Science, Canberra.
- Gill, A. M., Woinarski, J. C. Z. and York, A. (1999) *Australia's Biodiversity - Responses to Fire: Plants, Animals and Invertebrates*. Biodiversity Technical Paper No. 1. Department of Environment and Heritage, Canberra.
- IUCN (2001) *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, United Kingdom.
- Jeanes, J. A. and Backhouse, G. N. (2000) *Pictorial Guide to Wild Orchids of Victoria Australia*. Zoonectics, Seaford, Victoria.
- Jones, D. L. and Clements, M. A. (1993) New species of *Pterostylis* R. Br. (Orchidaceae) from Victoria and New South Wales. *Muelleria* 8(1): 73-83.
- NRE (1997) *Victoria's Biodiversity - Directions in Management*. Department of Natural Resources and Environment, East Melbourne, Victoria.
- Purdie, R. W. (1977) Early stages in regeneration after burning in dry sclerophyll vegetation. 1: Regeneration of understorey of vegetative means. *Australian Journal of Botany* 25(1): 21-34.
- Ross, J. H. and Walsh, N. G. (2003) *A Census of the Vascular Plants of Victoria*. Seventh Edition. Royal Botanic Gardens, South Yarra, Victoria.
- Wark, M. C. (1996) Regeneration of heath and heathy woodland in the north-eastern Otway Ranges three to ten years after wildfire of February 1983. *Proceedings of the Royal Society of Victoria* 108(2): 121-142.

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