Department of
Sustainability and
Environment

National Recovery Plan for the Purple Eyebright *Euphrasia collina* subspecies *muelleri*

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Australian Government

Victoria
The Place To Be

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This is a Recovery Plan prepared under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, with the assistance of funding provided by the Australian Government.

This Recovery Plan has been developed with the involvement and cooperation of a range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the plan due to changes in knowledge.

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Cover photograph: Purple Eyebright *Euphrasia collina* subspecies *muelleri*, by Oberon Carter.

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Summary

The Purple Eyebright *Euphrasia collina* subspecies *muelleri* is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, and is listed as threatened under the Victorian *Flora and Fauna Guarantee Act* 1988. It is endemic to south-eastern Australia, where it was once widely distributed from northern NSW through Victoria to the southern portion of the Flinders Ranges in South Australia. However, the Purple Eyebright has suffered a substantial decline in range and abundance, and has become extinct throughout a substantial proportion of its range. It now survives in only a few widely separated localities in Victoria, where there are fewer than 1,500 plants remaining in about 10 wild populations. Major threats include altered fire regimes, weed invasion and grazing. This national Recovery Plan for the Purple Eyebright details the species' distribution and biology, conservation status, threats, and recovery objectives and actions necessary to ensure its long-term survival.

Species Information

Description

The Purple Eyebright *Euphrasia collina* subspecies *muelleri* is a semi-parasitic, short-lived, perennial herb growing to 40 cm in height and branching at or slightly above ground level. The upper leaves are 6–14 mm in length, with cuneate bases and up to four pairs of marginal teeth. Flowers are lilac, pink or white, occasionally with a yellow spot behind the lower lobe. The corolla fused at the base and divided into five lobes. Eglandular hairs cover the external surface of the calyx and sometimes the corolla. Anthers are 1.4–1.9mm in length, and seeds are 0.8–1.35 long. Flowering occurs from July to November (description from Barker 1999).

Euphrasia species generally have poor seed dispersal capabilities, usually within only 20–30 cm of the parent plant. As a result species tend to form dense isolated stands when population numbers are high, thus flourishing when environmental variables are most favourable (Potts 1999). Germination is suspected to be triggered by fire (Barker 1999).

Distribution

Euphrasia collina subsp. *muelleri* was once widespread across south-eastern Australia, ranging from northern NSW through Victoria to the southern parts of the Flinders Ranges in South Australia. The species has become extinct throughout a substantial proportion of its range and now survives in only a few widely separated localities in Victoria (Figure 1), including the Mornington Peninsula, Jamieson, Little River, Benambra, Deep Lead and Maryborough, although three of these populations may have become extinct in recent years. There is some doubt about the correct identity of several populations including Little River, Benambra and the Mornington Peninsula, which may further reduce the range of extant populations of this taxon.

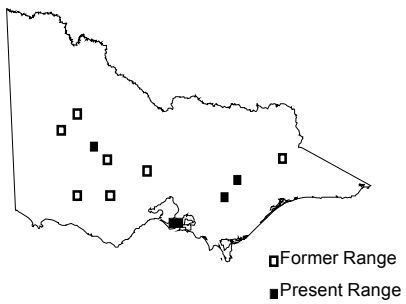

Figure 1. Former and current distribution of the *Euphrasia collina* subsp. *muelleri* in Victoria

Currently, the Purple Eyebright occurs in the following IBRA Bioregions (DEH 2000) in Victoria: Victorian Midlands, South East Coastal Plain and South Eastern Highlands. It is presumed extinct in the following IBRA Bioregions: New South Wales – South Eastern Highlands, NSW South Western Slopes, Riverina, Sydney Basin; South Australia – Flinders Lofty Block.

Maps showing the detailed distribution of the Purple Eyebright in Victoria are available from the Department of Sustainability and Environment Flora Information System (DSE-FIS). The FIS is a state-wide repository for flora grid and site distribution data, photographs and text descriptions. This information is available on request in a variety of formats for natural resource management purposes.

Population Information

Euphrasia collina subsp. *muelleri* has only been recorded at eleven sites since the mid 1980s, all in Victoria. Eight sites are on crown land; two populations in a National Park, two in State Parks, two in State Forest, two in a Flora and Fauna Reserve; while one site is on private land and the remaining two sites are on roadsides. The total population consists of about 1,500 plants, with most plants (about 1,300) occurring in one population at Deep Lead in western Victoria. Current population information is summarised as follows:

National Parks
Mornington Peninsula NP (Green's Bush, Mornington Peninsula).
Snowy River NP (Little River - possibly extinct).

State Parks
Arthurs Seat SP (McKellar Flora Reserve, Mornington Peninsula)
Paddys Ranges SP (taxonomy uncertain)

State Forest

Nunniong Plains NFSR (Nunniong Plateau, Bowen Mountains)
Special Protection Zone established along Tambo River – zone no. 629
Williams Creek NFSR (roadside, Wren's Flat)

Flora and Fauna Reserves
Deep Lead FFR

Roadsides (Mornington Peninsula Shire Council)
Merricks North (Junction Rd A - possibly extinct)
Main Ridge (Purves Rd)

Private Land
Merricks North (Junction Rd B - possibly extinct).

The taxon was also historically recorded from several other locations in Victoria including Mt Rouse, Skipton, several locations in the Wimmera, Castlemaine, Point Nepean, Benambra, Jamieson, Little River and Woods Point.

In New South Wales, populations were recorded from Tumbarumba, Wagga Wagga, Cootamundra, Upper Macquarie River, Upper Murray and Mt Corang. In South Australia, populations were recorded near Mt Remarkable in the Flinders Ranges.

Habitat

The genus *Euphrasia* in Australia occurs frequently in environments where light levels are very high, either as a result of environmental extremes or frequent disturbance such as fire (Potts 1999). Habitats suitable for *Euphrasia collina* subsp. *muelleri* tend towards those more prone to fire or periodic inundation by water, including open grassland, grassy woodland, heath in perched swamps and heathy woodland. The pre-1750 habitat for the taxon in Victoria was thought to be Kangaroo Grass *Themeda triandra* dominated communities in grasslands, woodlands and forests (N. Scarlett La Trobe University, pers. comm.). Associated communities currently include *Xanthorrhoea australis* dominated sandy heath on the Mornington Peninsula, *Eucalyptus cephalocarpa–Eucalyptus obliqua* open forest at Merricks North, *Eucalyptus pauciflora* grassy woodland near Benambra, *Eucalyptus radiata–Eucalyptus rubida* grassy open forest near Jamieson, and *Eucalyptus macrorhyncha* heathy woodland at Deep Lead (Barker 1982; JCVRFASC 1999; N. Scarlett pers. comm.; Williams & Molnar 1997). Recovery actions

include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Threats

The Purple Eyebright was once much more widespread and abundant in south-eastern Australia, but it has suffered an extensive reduction in range and abundance, and is now extinct throughout much of its historical range. Remaining populations have been substantially fragmented and depleted, and virtually all are small and under major threat. Much of the early decline was undoubtedly brought about by habitat disturbance and land clearance for agriculture and settlement. The grassy vegetation communities that the taxon once occupied are now significantly depleted as a result of grazing and clearing. This decline is almost certainly continuing, with several populations not being able to be relocated in recent years. Given that many *Euphrasia* species are known to increase after fire, it is likely that changes to historical fire regimes have also led to decline at those sites where disturbance is a requirement. *Euphrasia* species that are dependent on disturbance tend to be more vulnerable to extinction due to the unpredictability of these environmental variables (Potts 1999). The main threats to remaining populations of Purple Eyebright are summarised as follows:

Altered fire regimes: The Purple Eyebright is highly dependent on open environments, either on a permanent or intermittent basis. In long unburnt areas, fire frequency may now be too low to support populations, and it is not known how long seed remains in the soil seed bank. Conversely, regular burning may also deplete populations by killing plants before maturity is reached and seed set.

Weed invasion: Weeds at sites where the Purple Eyebright occurs include *Pittosporum undulatum*, *Pinus radiata*, *Sollya heterophylla*, *Crysanthemoides monilifera* (a Weed of National Significance)and *Acacia longifolia* subsp. *sophorae*.

Grazing: Most populations subjected to grazing by stock, especially on private land, have probably been extirpated. Populations on public land are subjected to grazing by rabbits and macropods. Such damage would be most deleterious after germination has taken place and after biomass reduction.

Recovery Information

As overall population sizes are now critically low for *Euphrasia collina* subsp. *muelleri*, all efforts must be made to restore populations at all known sites. Given the difficulty in establishing Eyebrights in cultivation, management should be directed at protection of all known sites despite their lack of reservation status. This includes the unreserved sites listed above. To date, the taxon has managed to survive at Purves Road. There remains a possibility that viable seed is still stored in the seed bank at the Merricks North sites, recovery efforts will also be focussed on re-establishing the plant at the above sites.

The taxonomy of the subspecies at the Deep Lead sites requires revision. Such determinations have significant implications for the conservation status of the subspecies, as the total population size would be reduced from 1,526 to 226 if the Deep Lead populations are excluded. However, currently the Deep Lead population appears to be reasonably well protected. Potential threats could include visitor impact and rubbish dumping. If visitor related activities begin to threaten the populations, tracks into these areas will be closed.

The Wren's Flat population extends to the road reserve. It appears, from recent observations that the population has migrated away from its original position. In the mid 1980's, most plants were found above the road cutting at a site that offered significantly more protection than at present. Currently those plants above the road are protected from logging activities through a 200m Special Protection Zone. Plants on the roadside are far less protected from human activity and protection measures will be implemented through this Recovery Plan. The reason for the decline of the population above the road has not yet been determined. Biomass reduction episodes such as fire may have been responsible, yet little data is available. Further investigation into the ecology of *Euphrasia collina* subsp *muelleri* is required. Currently most plants are found on the road verge, and may be advantaged at this site as a result of disturbance caused by road grading. The plants at this site are potentially highly threatened by

traffic such as logging vehicles. Fire control activities may seriously threaten this population in the event of a major wildfire in the area. Further assessment as well as experimentation into appropriate biomass reduction options will be undertaken for this population. Monitoring will take place at all sites until the populations return to sustainable sizes.

One explanation for the decline of the population at Wren's Flat may be a result of the gradual senescence of individuals. The exact location of individual plants or sub-populations will be mapped at the Wren's Flat site and will provide detail into the status of individual plants and their progeny. This will provide more accurate records of the locations of plants. Photo points will also be constructed at most sites.

These sites are generally well protected although a reassessment of on-ground management actions is required for those populations that require biomass control.

Further population and habitat assessment is required for the Paddy's Ranges, Nunniong Plateau and Snowy River National Park populations. Recovery efforts will focus on the collection of baseline data that will assist in the development of informed management actions.

Overall Objective

The **overall objective** of recovery is to minimise the probability of extinction of the *Euphrasia collina* subsp. *muelleri* in the wild and to increase the probability of important populations becoming self-sustaining in the long term.

Within the life span of this Recovery Plan, the **specific objectives** of recovery for the *Euphrasia collina* subsp. *muelleri* are to:

- Acquire accurate information for conservation status assessments.
- Identify habitat that is critical, common or potential.
- Ensure that all populations and their habitat are protected and managed appropriately.
- Manage threats to populations.
- Identify key biological functions.
- Determine the growth rates and viability of populations.
- Establish a seed bank.
- Build community support for conservation.

Program Implementation

The Recovery Plan will run for five years from the time of implementation and will be managed by the Department of Sustainability and Environment. A Threatened Flora Recovery Team, consisting of scientists, land managers and field naturalists will be established to oversee threatened flora recovery in Victoria in general. Technical, scientific, habitat management or education components of the Recovery Plan will be referred to specialist sub-committees on research, *in situ* management, community education and cultivation. Regional Recovery Teams will be responsible for preparing work plans and monitoring progress toward recovery.

Program Evaluation

The Recovery Team will be responsible for annual assessments of progress towards recovery. This Recovery Plan will be reviewed within five years of the date of adoption.

Recovery Actions and Performance Criteria

Action	Description	Performance Criteria
Specific objective 1		
Acquire accurate information for conservation status assessments		
1.1	Clarify the taxonomy of populations to enable an accurate conservation status assessment. **Responsibility: RBG**	• Updated records on all State databases (FIS, VrotPop and Herbaria).
1.2	Acquire baseline population data by conducting detailed field and desk top surveys including (a) identification of the area and extent of populations; (b) estimates of the number, size and structure of populations and (c) estimation of population change. **Responsibility: DSE**	• Determination or update of conservation status for inclusion on state and national threatened species lists. • Identify target populations.
Specific objective 2		
Identify habitat that is critical, common or potential		
2.1	Accurately survey known habitat and collect floristic and environmental information relevant to community ecology and condition. **Responsibility: DSE**	• Completion of requirements for essential life history stages, recruitment and dispersal identified at known sites. • Habitat critical to the survival of the species is mapped.
2.2	Identify and survey potential habitat, using ecological, historical and anecdotal information that may indicate habitat preference. **Responsibility: DSE**	• Sites of potential habitat identified and surveyed.
Specific objective 3		
Ensure that all populations and their habitat are legally protected		
3.1	Establish a public land protected area network for threatened taxa. **Responsibility: DSE / Mornington Peninsula Shire**	• Negotiate Public Authority Management Agreements under the *FFG Act* 1988 and protect with Victorian Planning Provisions and municipal initiatives at Merricks North and Main Ridge. • Erect “Significant Roadside Vegetation” signs on roadside sites.
3.2	Initiate private land management agreements in consultation with private land owners under the Victorian Conservation Trust Act 1972, The Conservation, Forests and Lands Act 1987 and the Wildlife Act 1975 at Merricks North. **Responsibility: DSE**	• Establish a private land protected area network for threatened taxa at Merricks North.

Action	Description	Performance Criteria
Specific objective 4 **Manage threats to populations**		
4.1	Identify disturbance regimes to maintain habitat. **Responsibility: DSE / PV**	• Preparation of management prescriptions for ecological burning or slashing at Snowy River NP, Arthurs Seat SP, Paddys Ranges SP, Nunniong Plains NFSR, Williams Creek NFSR, Merricks North roadside, Main Ridge roadside & Merricks Nrth.
4.2	Control threats from pest plants and high visitor numbers by using broadscale application of herbicide, hand removal of weeds, preventing access, re-routing tracks, fencing sites, caging plants if required. **Responsibility: PV / DSE / Mornington Peninsula Shire**	• Measurable seedling recruitment and /or vegetative regeneration at Mornington Peninsula NP, Snowy River NP, Arthurs Seat SP, Paddys Ranges SP, Nunniong Plains NFSR, Williams Creek NFSR, Deep Lead FFR, Merricks North and Main Ridge. • A measurable reduction in plant mortality at Mornington Peninsula NP, Snowy River NP, Arthurs Seat SP, Paddys Ranges SP, Nunniong Plains NFSR, Williams Creek NFSR, Deep Lead FFR, Merricks North and Main Ridge.
Specific objective 5 **Identify key biological functions**		
5.1	Evaluate current reproductive/regenerative status by determining seed bank status and longevity, fecundity and recruitment levels. **Responsibility: DSE**	• Seed bank/regenerative potential quantified for target populations.
5.2	Determine seed germination requirements by conducting laboratory and field trials aimed to identify key stimuli. **Responsibility: DSE**	• Stimuli for recruitment/regeneration identified. • Management strategies identified to maintain, enhance or restore processes fundamental to reproduction and survival.
Specific objective 6 **Determine the growth rates and viability of populations**		
6.1	Measure population trends and responses against recovery actions by collecting demographic information including recruitment and mortality, timing of life history stages and morphological data. **Responsibility: DSE**	• Techniques for monitoring developed and implemented. • Annual census data for target populations.
6.2	Collate, analyse and report on census data and compare with management histories. **Responsibility: DSE**	• Population growth rates determined and Population Viability Analysis completed for target populations. • Determine whether *ex situ* germplasm conservation is required.

Action	Description	Performance Criteria
Specific objective 7 **Establish seed bank**		
7.1	Determine seed viability and place seed in storage (pending seed availability). **Responsibility: DSE/RBG**	• Seed from target populations in long term storage. • Seed from target populations in short term storage. • Long-term storage facility identified
Specific objective 8 **Build community support for conservation**		
8.1	Identify opportunities for community involvement in the conservation of the Purple Eyebright. **Responsibility: DSE**	• Presentation to community nature conservation groups, notably Catchment Management Authority implementation committee, and Landcare groups.

Abbreviations

DSE	Department of Sustainability and Environment
MPS	Mornington Peninsula Shire
PV	Parks Victoria
RBG	Royal Botanic Gardens, Melbourne

Management Practices

The philosophy of the strategy for recovery is habitat conservation, restoration and management combined with an understanding of the ecological and biological requirements of *Euphrasia collina* subsp. *muelleri.* The emphasis is on using knowledge to better implement *in situ* management techniques that protect populations and promote regeneration and recruitment. To achieve this, recovery actions are primarily structured to (i) acquire baseline data, (ii) assess habitat condition including ecological and biological function, (iii) protect populations to maintain or improve population growth and (iv) to engage the community in recovery actions.

On-ground site management will aim to mitigate threatening processes and thereby ensure against extinction. Major threats requiring management include accidental destruction, competition from pest plants, inappropriate fire regimes and grazing by pest animals. A range of strategies will be necessary to alleviate these threats including weed control, fire management, fencing, and control of pest animals.

Broadscale protection measures applicable to all populations include legal protection of sites, habitat retention and liaison with land managers including private landholders. In addition, searches of known and potential habitat should continue to better define the distributions and size of populations.

The Recovery Plan also advocates strategies to fill some of the major gaps in our knowledge to date. These include an understanding of the mechanisms underlying recruitment and regeneration. Successful *in situ* population management will be founded on understanding the relationships between *Euphrasia collina* subsp. *muelleri* and associated flora, and its response to environmental processes. These are directly linked to biological function and are thus vital to recovery. Demographic censusing will be necessary to gather life history information and to monitor the success of particular management actions.

In addition to the above, *ex situ* conservation measures will be required in the form of seed storage. Reintroduction of seed stock will be considered if there is a high chance of success and populations are in decline.

Community participation in recovery actions will be sought, particularly in regard to recovery team membership and implementation of on-ground works.

To reduce the likelihood of unforseen development activities negatively impacting upon *Euphrasia collina* subsp. *muelleri*, the threatened flora team should seek relevant information on it's distribution, ecology and/or habitat to relevant land managers. Such increased awareness should allow new populations to be found if they exist, and improve the likelihood of adequate searches being made during environmental impact assessments.

Affected interests

Actions associated with the recovery of *E. collina* subsp. *muelleri* are unlikely to affect any existing industry or private party. Almost all populations fall under the jurisdiction of Parks Victoria, the Department of Sustainability and Environment and the Mornington Peninsula Shire. The taxon was also found at three populations in the 1980's, within the Snowy River National Park and on a roadside and a private land site in Merricks North. Brief searches conducted during the development of this Recovery Plan did not locate any of these populations, and they may be extinct. However, there is a small chance the taxon may persist in the seed bank. The above management agencies including the Mornington Peninsula Shire have been contacted and have approved the actions as outlined in this Recovery Plan.

Role and interests of indigenous people

Indigenous communities on whose traditional lands occurs will be

Indigenous communities on whose traditional lands *E. collina* subsp. *muelleri* occurs will be advised, through the relevant DSE Regional Indigenous Facilitator, of the preparation of this Recovery Plan and invited to provide comments if so desired. Indigenous communities will be invited to be involved in the implementation of the Recovery Plan.

Benefits to other species/ecological communities

The Recovery Plan includes a number of potential biodiversity benefits for other species and vegetation communities in Victoria. Principally, this will be through the protection and management of habitat. The adoption of broad-scale management techniques and collection of baseline data will also benefit a number of other plant species growing in association with *E. collina* subsp. *muelleri*, particularly those with similar life forms and/or flowering responses.

The Recovery Plan will also provide an important public education role as threatened flora have the potential to act as 'flagship species' for highlighting broader nature conservation and biodiversity issues such as land clearing, grazing, weed invasions and habitat degradation.

Social and economic impacts

The implementation of this Recovery Plan will not cause significant adverse social and economic impacts. Most populations occur on public land, either crown land reserved for various public purposes, or on road reserves, managed by a variety of local and State government agencies. Protection of these populations has been negotiated with the relevant land manager. Protection of any populations still extant on private land will be achieved through voluntary agreements with landowners.

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Priority, Feasibility and Estimated Costs of Recovery Actions

Action	*Description*	*Priority*	*Feasibility*	*Responsibility**	*Cost estimate*					
					Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	**Conservation status**									
1.1	Clarify taxonomy	2	100%	RBG	$4,000	$0	$0	$0	$0	**$4,000**
1.2	Collect baseline data	1	100%	DSE	$15,000	$0	$0	$0	$0	**$15,000**
2	**Habitat requirements**									
2.1	Survey known habitat	1	100%	DSE	$20,000	$20,000	$0	$0	$0	**$40,000**
2.2	Identify and survey potential habitat	1	100%	DSE	$0	$0	$20,000	$0	$0	**$20,000**
3	**Legal protection of habitat**									
3.1	Protect public land habitat	3	75%	DSE/MPS	$5,000	$5,000	$5,000	$5,000	$5,000	**$25,000**
3.2	Protect private land habitat	3	50%	DSE	$2,000	$2,000	$2,000	$2,000	$2,000	**$10,000**
4	**Manage threats**									
4.1	Identify disturbance regimes	1	75%	DSE/PV	$0	$15,000	$15,000	$0	$0	**$30,000**
4.2	Control threats	1	75%	DSE/PV/MPS	$30,000	$10,000	$10,000	$10,000	$10,000	**$70,000**
5	**Identify key biological functions**									
5.1	Evaluate reproductive status	2	100%	DSE	$12,000	$12,000	$12,000	$10,000	$0	**$46,000**
5.2	Seed germination	1	75%	DSE	$12,000	$12,000	$12,000	$10,000	$0	**$46,000**
6	**Growth rates and population viability**									
6.1	Conduct censusing	1	100%	DSE/PV	$15,000	$15,000	$15,000	$15,000	$15,000	**$75,000**
6.2	Collate, analyse & report	2	100%	DSE	$0	$0	$0	$0	$10,000	**$10,000**
7	**Establish seed bank**									
7.1	Establish a seed bank	1	75%	DSE	$4,000	$2,000	$2,000	$2,000	$2,000	**$12,000**
8	**Education and communication**									
8.1	Community extension	3	100%	DSE	$2,000	$2,000	$2,000	$2,000	$2,000	**$10,000**
					$121,000	**$95,000**	**$95,000**	**$56,000**	**$46,000**	**$413,000**

Abbreviations: DSE: Department of Sustainability and Environment; MPS: Mornington Peninsula Shire; PV: Parks Victoria; RBG: Royal Botanic Gardens, Melbourne.