National Recovery Plan for the **Basalt Rustyhood** Pterostylis basaltica

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Australian Government



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Summary

The Basalt Rustyhood (*Pterostylis basaltica*) is a terrestrial orchid endemic to south-western Victoria, where it grows in native herb-rich grassland on stony rises near Dundonnell, on the Victorian Volcanic Plain. It is known only from two populations of about 1,000 plants, one on a roadside reserve and the second on private property. The species has almost certainly suffered a major decline in range and abundance due to the almost total loss of its grassland habitat. Current threats to remaining populations include disturbance to or destruction of plants and habitat, herbicide spraying, roadside-related pressures, altered fire regimes, grazing/predation and weed invasion. The Basalt Rustyhood 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*. This recovery plan for the Basalt Rustyhood is a revision of a previous recovery plan for the species (Ingeme & Backhouse 1999), and details its distribution, habitat, threats and recovery objectives and actions necessary to ensure its long-term survival.

Species Information

Description

The Basalt Rustyhood (*Pterostylis basaltica* D.L. Jones & M.A. Clem.) is a deciduous, perennial, terrestrial orchid emerging annually from a spherical underground tuber. The plant produces a single basal rosette of 3–15 ovate, pointed leaves, which have usually withered at the time of flowering. The stocky flower stem grows from the centre of the rosette, is up to 30 cm tall, has several sheathing floral bracts, and bears up to 15 sequentially-opening, transparent, greenish–brown striped flowers. The petals and dorsal sepal form a galea or hood, the dorsal sepal point is 6–9 mm long and curves upwards. The lateral sepals are deflexed, joined in the basal half, flat to shallowly concave, with 12-15 mm long free points. The sensitive labellum is attached to the base of the column by a short curved claw, and in the set position is exposed over the lateral sepals. It is elongate, fleshy and channelled, the basal lobe has four bristles while the margins are fringed with 12–16 bristles (description from Jones & Clements 1993; Backhouse & Jeanes 1995. This Basalt Rustyhood is illustrated in Backhouse & Jeanes (1995, pg. 271) and Jones (2006, pg. 328).

Knowledge of the biology and ecology of the Basalt Rustyhood is limited. New rosettes emerge in autumn following the onset of seasonal rains, and develop over the winter-spring period. Flowering occurs from late November to early January, and flowers open sequentially from the bottom of the spike upwards, with usually no more than three flowers on any plant open at once. Any seed capsules from pollinated flowers dehisce about 4–6 weeks after pollination. Each mature capsule contains thousands of minute seed that are dispersed by wind and rain following the drying and splitting of the seed capsule. The Basalt Rustyhood survives the dry summer as a dormant tuber. Reproduction appears to be solely from seed, with vegetative reproduction not known. The spherical tuber is replaced annually.

The pollinator is not known, although related species of *Pterostylis* are pollinated by tiny flies that are attracted to the flowers by scent (Jones 2006). When the fly lands on the exposed labellum it snaps shut up into the galea, trapping the fly inside the galea. Pollen transfer is effected as the insect struggles to escape from the galea. The Basalt Rustyhood grows in a complex relationship with a specific mycorrhizal fungus *Ceratobasidium* species (Mark Clements CSIRO pers. comm.). This fungus is associated with many related species of *Pterostylis* and is essential for seed germination and nutrient assimilation in the orchid. Plants flower well in the absence of fire, but periodic late-summer fire may be beneficial by reducing the biomass of grass and opening up habitat. The *Themeda* grass-dominated habitat of the Basalt Rustyhood requires regular fire to maintain inter-tussock spaces that encourage floristic diversity (Morgan & Lunt 1999) and provide areas for recruitment and colonisation by *P. basaltica*.

Habitat

The Basalt Rustyhood grows in plains grassland dominated by Kangaroo Grass (*Themeda triandra*), with other grasses including *Austrodanthonia*, *Austrostipa* and *Poa* species, and a rich herbaceous cover with *Bulbine bulbosa* and *Chrysocephalum apiculatum* dominant, and scattered *Acacia paradoxa*. It occurs on stony rises on shallow clay soils derived from basalt, with abundant embedded basalt boulders. This habitat forms part of the 'Natural Temperate Grasslands of the Victorian

Volcanic Plain', a threatened ecological community listed as Critically Endangered under the EPBC Act. Proposed recovery actions include the determination of habitat critical to survival of the species.

Distribution

The Basalt Rustyhood is known only from a small area near Derrinallum in south-western Victoria (Figure 1), in the Victorian Volcanic Plain IBRA bioregion (*sensu* DEH 2000).



Figure 1. Distribution of Pterostylis basaltica

Population Information

Only two populations of *P. basaltica* are known, one growing on a roadside reserve near Dundonnell and containing about 1,000 plants, and the second on private property at Dundonnell, consisting of about 20 plants. The sites will remain confidential to protect the orchid. Specific details of population localities (including GPS data) are held by DSE.

Decline and Threats

There is no information on the previous distribution and abundance of the Basalt Rustyhood, as the species has only ever been known from the two sites at Dundonnell. However, given its preference for grassy habitats, it is reasonable to assume that *P. basaltica* was once much more widespread across the basalt plains of south-western Victoria. There has been the almost total loss of native grasslands from the Victorian Volcanic Plain, mostly for agriculture, and less than 1% remains (Lunt *et. al.* 1998; DEWHA 2009), so the species has almost certainly suffered a precipitous decline in range and abundance. Remaining populations exist in tiny, isolated remnants of habitat in a highly fragmented landscape, and are highly vulnerable to local extinction through stochastic processes. It is likely that the conditions for maintenance of essential ecological functions such as pollinator and mycorrhizal fungal activity have also been adversely affected due to the extensive loss of habitat. Remaining populations of Basalt Rustyhood are at risk from a number of current and potential threats including the following.

Weed invasion

Weeds are a moderate problem at both sites, and require active and ongoing management for control. Problem weeds include the perennial Phalaris grass (*Phalaris aquatica*), Wild Oats (*Avena* sp.) and the invasive flatweed (*Hypochaeris radicata*), which is a particular problem at the private property site where it has colonized all available niches around the rocks where *P. basaltica* prefers to grow.

Disturbance/destruction

Disturbance to or destruction of habitat and plants is a high risk at both sites. The major population grows on a roadside and there is a serious risk of accidental trampling by orchid enthusiasts visiting the site, stock or vehicles/machinery moving through the site. The structure of the sites is fragile and easily disturbed, particularly the rocky outcrop component. Similarly, there is also a risk of accidental disturbance being caused by track/road maintenance activities at the sites or spray drift from herbicides.

The private property site is expected to change ownership as the land has been advertised for sale, and the future landholders may be unsympathetic to continued maintenance of *P. basaltica* at that site. The new landholders will need to be contacted and educated about the location and significance of the *P. basaltica* population on their property to ensure its ongoing protection.

Altered fire regimes

Although flowering may be enhanced by fire, *P. basaltica* is not dependent upon fire to flower. However, periodic fire is possibly beneficial, especially for sites in dense *Themeda* grassland, as it serves to remove biomass accumulation and provide open sites for seedling establishment and may assist in controlling weeds. Removal of fire may lead to vegetation growth that smothers the site or outcompete the plants. Frequency and timing of fire are also critical, as the orchid is most adapted to survive fires during its dormancy period (mid summer to early autumn). Spring fires, when the orchid is above ground, may be quite damaging to populations, and fires too early in summer would destroy flowering and seed capsule development, inhibiting recruitment.

Grazing/predation

Grazing by invertebrates and/or native and introduced herbivores is an existing or potential threat at both sites. Very little grazing evidence has been observed but escaped stock could quickly decimate the population and flowering orchids appear to be particularly palatable to stock. Flowers and sometimes seed capsules are often damaged or destroyed by invertebrates, inhibiting reproductive success. Rosettes are often severely damaged by a Red-legged Earth Mite which causes rust-like discoloration on the leaves and may inhibit flowering and re-emergence as well as establishment of new recruits, and can lead to death of the affected plants.

Recovery Information

Recovery Objectives

The Overall Objective of recovery is to minimise the probability of extinction of the Basalt Rustyhood in the wild and to increase the probability of populations becoming self-sustaining in the long term. Within the duration of this Recovery Plan, the Specific Objectives for the recovery of the Basalt Rustyhood are to:

- 1. Monitor the distribution, abundance and structure of populations.
- 2. Determine habitat and vital attribute requirements.
- 3. Ensure that all populations and their habitat are protected and managed.
- 4. Manage threats to populations.
- 5. Establish the species in cultivation.
- 6. Increase numbers of plants and populations in the wild.
- 7. Build community support for conservation of the species.

Program Implementation and Evaluation

This Recovery Plan guides recovery actions for the Basalt Rustyhood and will be implemented and managed by the Department of Sustainability and Environment (DSE), supported by other agencies, educational institutions, regional natural resource management authorities and community groups as appropriate. Technical, scientific, habitat management or education components of the Recovery Plan will be referred to specialist groups on research, *in situ* management, community education and cultivation as required. The Recovery Plan will run for five years from the date of its adoption under the EPBC Act, and will be reviewed within five years of the date of its adoption.

Recovery Actions and Performance Criteria

Action	Description			
Specific Objective 1: Monitor distribution, abundance and structure of populations				
Performa	nce Criterion: All current populations monitored and censused annually			
1.1	Conduct annual surveys at known populations to determine the distribution and abundance of populations and identify the size, health and structure of populations.			
	Responsibility: DSE			
1.2	Develop and undertake a population viability analysis for the Derrinallum roadside population.			
	Responsibility: DSE			

Specific	Objective 2: Determine habitat and vital attribute requirements
Performa	ance Criterion: Habitat critical to survival determined and mapped for all populations
2.1	Survey known habitat and gather descriptive environmental, floristic and bioclimatic information.
	Responsibility: DSE
2.2	Identify and survey potential habitat, using ecological & bioclimatic information to indicate habitat preference.
	Responsibility: DSE
2.3	Identify the pollinator and determine its ecological requirements.
	Responsibility: DSE
Specific	Objective 3: Ensure that all populations and their habitat are protected and managed
Performa	ance Criterion: Conservation agreements in place for both populations
3.1	Initiate a Public Authority Management Agreement under the FFG Act for the Derrinallum roadside population.
	Responsibility: DSE, Moyne Shire
3.2	Initiate a voluntary conservation agreement with new owners of the Derrinallum private land population.
	Responsibility: DSE
Specific	Objective 4: Manage threats to populations
Performa	ance Criterion: Measurable reduction in weed cover, loss of plants and damage to habitat from threatening es
4.1	Control threats from pest plants at all sites, in particular from <i>Phalaris aquatica, Avena</i> spp. and <i>Hypochaeris</i> radicata.
	Responsibility: DSE
4.2	Reduce grazing threat from domestic sock at Derrinallum private property site.
	Responsibility: DSE
4.3	Monitor Derrinallum roadside site for inadvertent damage by visitors/machinery and manage (e.g. fencing and/or signposting) if required.
	Responsibility: DSE, Moyne Shire
4.4	Identify optimal fire regimes to maintain open grassland habitats.
	Responsibility: DSE
4.5	Implement biomass reduction though ecological burning (using optimal fire regime from 4.4), targeted grazing or mowing.
	Responsibility: DSE
Specific	Objective 5: Establish the species in cultivation
Performa	ance Criterion: At least 20 plants from each population growing in cultivation
5.1	Collect and isolate mycorrhizal fungi from all populations, determine diversity and store and use for symbiotic germination of seed and establishment of an <i>ex-situ</i> population.
	Responsibility: DSE
5.2	Establish a seed bank and determine seed viability.
	Responsibility: DSE, RBG
5.3	Establish and maintain a population of at least 40 plants in cultivation, to provide a seed source and plants for reintroduction to the wild.
	Responsibility: DSE, RBG, ANOS
Specific	Objective 6: Increase numbers of plants and populations in the wild
Performa 50 plants	ance Criterion: Derrinallum private property population with at least 50 plants and at least one new wild population of s is established at a secure location
6.1	Manage microhabitat, hand-pollinate plants, collect and sow seed on prepared beds, and supplement wild population with plants from cultivation (Action 5.3) for Derrinallum private land population.
	Responsibility: DSE, ANOS
6.2	Find a suitable and secure site for the establishment of a new population, following procedures in Vallee et al. (2004).
	Responsibility: DSE
6.2	Propers hebitat, now mycorrhized fungi, introduce plants from sultivision to the new site and monitor establishment

6.3 Prepare habitat, sow mycorrhizal fungi, introduce plants from cultivation to the new site and monitor establishment. Responsibility: DSE, ANOS

Specific Objective 7: Build community support for conservation of the species

Performance Criterion: Local landowners, community Landcare and nature conservation groups aware of the species and support its conservation

7.1 Inform local communities where the orchid grows and its conservation, targeting neighbouring landowners and especially those who might have suitable habitat on their properties.
Responsibility: DSE
7.2 Identify and manage opportunities for community involvement in the conservation of the Basalt Rustyhood, while maintaining confidentiality of site locations.

Responsibility: DSE

Abbreviations: ANOS = Australasian Native Orchid Society; DSE = Department of Sustainability and Environment (Victoria); RBG = Royal Botanic Gardens, Melbourne

Management Practices

The philosophy of the strategy for recovery is habitat conservation, restoration and management combined with the utilisation of *ex situ* techniques and an understanding of the ecological and biological requirements of *P. basaltica* necessary for specific population management. 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 structured to acquire baseline data and information, assess habitat condition, including ecological and biological function, and maintain or improve population growth through protection and management.

On-ground site management will aim to mitigate threatening processes and thereby insure against extinction. Major threats requiring management include accidental destruction, competition from pest plants, inappropriate fire regimes and grazing. A range of strategies will be necessary to mitigate these threats including weed control, caging/fencing, control of grazing animals, and fire management. Protection measures applicable to all populations include legal protection of sites, habitat retention and liaison with land managers and private landholders. In addition, searches of potential habitat should continue in an attempt to find new populations.

The recovery plan also advocates strategies to fill some of the major gaps in our knowledge to date. These include an understanding of seed bank dynamics, recruitment and the pollinator. Successful *in situ* population management will be founded on understanding the obligate relationships between the species and its pollinator and mycorrhizal fungus, as well as its response to environmental processes. These are directly linked to seed production, recruitment and regeneration 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 and will include seed storage and plant cultivation. Increasing the size of the population in cultivation will also help to increase the amount of seed and plants available for reintroduction to sites. Community participation in recovery actions will be encouraged, particularly in regard to implementation of on-ground works.

Affected Interests

Pterostylis basaltica occurs on roadside land managed jointly by Moyne Shire and DSE, and on private property. Community groups involved in orchid conservation and the Royal Botanic Gardens Melbourne are also involved in recovery actions for this species, while the local Country Fire Authority brigade assist in ecological burning of the site.

Role and Interests of Indigenous People

Indigenous communities on whose traditional lands the Basalt Rustyhood occurs have been advised, through the relevant regional Indigenous facilitator, of the preparation of this Recovery Plan and invited to provide comments and be involved in the implementation of the plan.

Biodiversity Benefits

The recovery plan includes a number of potential biodiversity benefits for other species in Victoria. Principally, this will be through the protection and management of habitat. The ecological community in which the Basalt Rustyhood occurs is severely depleted and management actions are designed to protect and maintain the precious remnants that remain. The habitat of *P. basaltica* occurs within the

'Natural Temperate Grasslands of the Victorian Volcanic Plain', an ecological community listed as Critically Endangered under the EPBC Act (DEWHA 2009). The adoption of broad-scale management techniques and collection of baseline data could also benefit a number of other plant species growing in association with *P. basaltica*, particularly those species with similar life forms and/or flowering responses. Four other threatened orchid species occur within the range of *P. basaltica*. The recovery plan will also provide an important public education role as orchids have the potential to act as 'flagship species' for highlighting broader nature conservation and biodiversity issues such as land clearing, grazing, weed invasion and habitat degradation. Germination and cultivation techniques developed during the recovery phase will be of use for other threatened orchids elsewhere in southeast Australia. The mycorrhizal fungus associated with *P. basaltica* has been found to effectively germinate seed of the nationally threatened Gorae Leek-orchid (*Prasophyllum diversiflorum*), representing a major breakthrough in *Prasophyllum* ex situ propagation and cultivation techniques.

Social and Economic Impacts

Implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. The majority of plants occur on a road reserve which is currently being managed for their conservation, and any protection measures required will have minimal impact on current recreational and commercial activities. Protection of the population on private land will be negotiated with the new landowner.

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Action	Description	Priority	Feasibility	Responsibility	Cost estimate					
					Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Population information									
1.1	Surveys	1	100%	DSE	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$10,000
1.2	PVA	2	75%	DSE	\$0	\$0	\$0	\$0	\$5,000	\$5,000
2	Habitat requirements									
2.1	Known habitat	1	100%	DSE	\$3,000	\$3,000	\$3,000	\$0	\$0	\$9,000
2.2	Potential habitat	2	75%	DSE	\$0	\$0	\$5,000	\$5,000	\$5,000	\$15,000
2.3	Pollinator ecology	3	50%	DSE	\$0	\$0	\$0	\$10,000	\$10,000	\$20,000
3	Habitat protection									
3.1	Public land	1	100%	DSE	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
3.2	Private land	1	75%	DSE	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
4	Threat management									
4.1	Pest plants	1	100%	DSE	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$10,000
4.2	Grazing animals	1	50%	DSE	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
4.3	Monitoring	2	90%	DSE	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
4.4	Fire regimes	1	75%	DSE	\$10,000	\$10,000	\$0	\$0	\$0	\$20,000
4.5	Biomass management	1	90%	DSE	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$25,000
5	Cultivation									
5.1	Fungi isolation	2	100%	DSE	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
5.2	Seed bank	2	100%	DSE	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
5.3	Cultivated plants	2	90%	DSE, RBG, ANOS	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$10,000
6	Plant/population increase									
6.1	Microhabitat management	1	100%	DSE, ANOS	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$25,000
6.2	Site selection	2	75%	DSE	\$0	\$5,000	\$5,000	\$0	\$0	\$10,000
6.3	Reintroduction	2	75%	DSE, ANOS	\$0	\$0	\$0	\$10,000	\$10,000	\$20,000
7	Community support									
7.1	Community information	3	75%	DSE	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
7.2	Community involvement	3	100%	DSE	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
				TOTALS	\$37,000	\$42,000	\$37,000	\$49,000	\$54,000	\$219,000

Priority, Feasibility and Estimated Costs of Recovery Actions

Abbreviations: ANOS = Australasian Native Orchid Society; DSE = Department of Sustainability and Environment (Victoria); RBG = Royal Botanic Gardens, Melbourne