

## *Pterostylis basaltica* Basalt Rustyhood

### Taxonomy

*Pterostylis basaltica* D.L. Jones & M.A. Clem.

### Current conservation status

Listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1993).

Categorised as Endangered in the 2014 Advisory list of rare or threatened flora (DEPI 2014).

### Proposed conservation status

Critically Endangered in Australia

Criteria A2ace+3ce+4ace; B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv); C1

### Species Information

#### Description and Life History

The taxon is a summer dormant terrestrial orchid, 9-25 cm tall, slender to moderately stout with 3-5 closely sheathing, ovate-lanceolate, acuminate stem leaves. Rosette leaf 8-15 elliptic, 1.5-2.8 cm long, 6-9 mm wide, usually withered by time of flowering. Flowers 1-15, to 1.4 cm long, translucent white with green and brown stripes and suffusions; dorsal sepal straight or up-curved with a filiform point 6-9mm long; lateral sepals deflexed and joined near the base, ovate and shallowly concave with slightly incurved margins having short white basal cilia; lateral sepals narrow to free, points up to 20mm long, deflexed and running nearly parallel, spreading apart at the tips; labellum narrowly ovate, generally 4.5-5.5mm long and about 3 mm wide, brownish green, fleshy and channelled with 6-8 pairs of distinctive coarse white marginal hairs to 3 mm long; basal lobe swollen, whitish, with 4 short hairs about 1.5 mm long. The taxon flowers from November to January (VicFlora 2019).

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 taxon 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. 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 taxon grows in a complex relationship with a specific mycorrhizal fungus *Ceratobasidium* species. 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 taxon requires regular fire to maintain inter-tussock spaces that encourage floristic diversity and provide areas for recruitment and colonisation by *P. basaltica* (Vicek and Pritchard 2010).

## Generation Length

The generation length of *Pterostylis basaltica* is suspected to be 20 to 40 (midpoint 30) years. Generation time for non-colonial terrestrial orchids is estimated to be a nominal 30 years based on the annual replacement of the mother tuber by daughter tubers. Whilst somatically immortal, each individual is susceptible to endogenous exhaustion or environmental causes of mortality at rates likely to result in replacement at intervals of several decades only. Such orchids are classed as obligate seed regenerators as they are reliant on seed-based recruitment for population maintenance.

## Distribution

The taxon has a very localised distribution, being known from only one area near Derrinallum in south western Victoria (Vicek and Pritchard 2010; SAC 1993). Although only two subpopulations have been found since it was first discovered in 1989, suitable habitat may have existed in stony rise country from Colac to Nerrin Nerrin and south west to Port Fairy. The taxon is considered endemic to western basalt plains grassland in south western Victoria (SAC, 1993).

## Habitat

The taxon grows amongst basalt rocks in stony rise grassland (VicFlora 2015). It occupies a very narrow habitat range within the 'stony rise', occurring in shallow soil overlying or surrounding basalt rocks, in the 500 - 700 mm rainfall distribution.

The specific habitat occupied by the orchid is dominated by a mixture of bare soil and a variety of mosses and occasionally small ferns. The vegetation becomes dominated by *Themeda triandra* and *Chrysocephalum apiculatum* further from the edge of the rocks as the soils become slightly deeper. Three other *Pterostylis* species also occur at the main Basalt Greenhood site. These include *P. sp. aff. bicolor* (which is also very significant and threatened), *P. mutica*, *P. cycnocephala* and *P. sp. aff. cycnocephala* (DSE 2003).

The vegetation is characterised as a tussock grassland, shrubland or low open woodland with *Acacia* species, which may include *A. paradoxa*, *A. melanoxylon* and *A. mearnsii*. Other species may include *Allocasuarina verticillata*, *Bursaria spinosa*, *Hymenanthera dentata* and rarely *Banksia marginata* (DSE 2003).

## Threats

The taxon was almost certainly once much more abundant and widespread, but virtually all habitat was historically cleared for agriculture or has been highly degraded, especially from weed invasion, which is an ongoing threat. The decline of the orchid's habitat reflects the overall decline of the Western Basalt Plains Grasslands. No subpopulation of the taxon has been located within conservation reserves and much of the suitable habitat has been lost through agricultural activities including application of fertilisers and sowing introduced pasture species and heavy grazing by stock and rabbits. The threat posed by intensive agricultural activities will increase as aerial sowing of pasture and fertiliser becomes more widespread. Weed invasion poses a serious threat to the survival of the taxon. It occurs in a very restricted and limited ecological niche within the stony rise, which is particularly vulnerable to weed invasion, especially by introduced annuals. Activities that promote weed invasion are a threat, including: road works, road maintenance, droving of stock and spraying for fire-breaks. The taxon also suffers from vertebrate and invertebrate predation. Illegal orchid collection is regarded as a strong potential threat as the location of the site has already been made public. Other ecological processes are also impacting on the taxon's conservation. The taxon exists in such a restricted habitat range that natural pollination is probably an extremely rare event, or its pollinator may not be present in sufficient numbers to ensure adequate pollination rates. Very little natural seed production has been evident over the last few years of monitoring. Natural catastrophes could also spell disaster to the taxon, as the majority of the population is growing in the two small locations (DSE, 2003).

The rarity of this taxon makes it susceptible to unpredictable environmental catastrophes. The only currently known colonies of this taxon are confined to narrow roadside verges in sheep grazing country. Threats to this site include invasion by pasture grasses and other weeds, disturbance by stock grazing and trampling, disturbance by human activities including road maintenance and movement of farming machinery, application of herbicides and fertilisers, as well as trampling and collection by visiting naturalists (SAC, 1993). The taxon is at extremely high risk of extinction from ongoing threats and stochastic events and, if not already extinct, will only survive through active and sustained management at the site for many years to come.

The taxon exists in such a restricted habitat range that that taxon's pollinator may not be present in sufficient numbers to ensure adequate pollination. Very little natural seed production has been evident (DSE 2003).

### IUCN Criteria

Criterion A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p>			
<p><i>based on any of the following:</i></p> <ul style="list-style-type: none"> <li>(a) direct observation [except A3]</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</li> </ul>			

### Evidence:

#### Eligible under Criterion A2 as Critically Endangered

The population reduction over the past 60 to 120 years is inferred to be 90 to 99%, based on (a), (c) and (e) above.

Past decline is based on historic habitat loss and decline. It is almost certain that the taxon was once much more abundant and widespread, but virtually all likely habitat has been long since been cleared or is highly degraded.

The causes of the reduction may not have ceased, be understood or be reversible.

#### Eligible under Criterion A3 as Critically Endangered

The population reduction over the next 60 to 100 years is projected to be 90 to 99%, based on (c) and (e) above.

Future decline is based on the impact of the identified threats. Specifically, the taxon is at extremely high risk of extinction from ongoing threats and stochastic events and will only survive through active and sustained management at the site for many years to come.

#### Eligible under Criterion A4 as Critically Endangered

The population reduction over any 60 to 120 year period, including both past and future (up to 100 years in the future), is inferred to be 90 to 99%, based on (a), (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

# *Pterostylis basaltica* Basalt Rustyhood

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy)			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

## Evidence:

### Eligible under Criterion B1 as Critically Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 8 km<sup>2</sup>, based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA). The EoO has been made equal to the AoO to ensure consistency with the definition of AoO as an area within EoO.

The taxon is estimated to be severely fragmented. Individual occurrences are considered severely fragmented based on the taxon's limited dispersal ability, the barriers to dispersal and/or the lack of habitat separating them. Such fragmentation precludes the possibility of recolonisation in the event of local extinction.

It is estimated to have one location, as both subpopulations are extremely high risk of extinction from the same ongoing threats, such as disturbance, weed invasion and drying conditions, and stochastic events.

It has a continuing decline in (i), (ii), (iii) and (iv) above.

### Eligible under Criterion B2 as Critically Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 8 km<sup>2</sup>, based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, the taxon is severely fragmented, is estimated to have 1 location and has a continuing decline in (i), (ii), (iii) and (iv) above.

# Pterostylis basaltica

## Basalt Rustyhood

Criterion C. Small Population size and decline		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND least 1 of the following 3 conditions:			
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b)	Extreme fluctuations in the number of mature individuals			

### Evidence:

#### Eligible under Criterion C1 as Critically Endangered

It is estimated that there are 55 to 210 mature individuals. The taxon is extremely rare and is known from two small subpopulations about 1.4 km apart, with about 200 plants in total, growing in tiny habitat remnants.

There is estimated to be a continuing decline of 30 to 60% within one generation.

Criterion D. Very small or restricted populations		Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)		< 50	< 250	< 1,000
D2. Only applies to the VU category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time.		-	-	D2. Typically: AoO < 20 km <sup>2</sup> or number of locations ≤ 5

### Evidence:

#### Eligible under Criterion D as Endangered

It is estimated that there are 55 to 210 mature individuals.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

### References

Backhouse, G., Kosky, B., Rouse, D., and Turner, J. (2016). *Bush Gems: A Guide to the Wild Orchids of Victoria, Australia*. Melbourne, Victoria: EBook.



# *Pterostylis basaltica* Basalt Rustyhood

DSE (2003). Action Statement - Basalt Greenhood *Pterostylis basaltica* (No. 137). Department of Sustainability and Environment, Melbourne. Retrieved from:  
[https://www.environment.vic.gov.au/\\_\\_data/assets/pdf\\_file/0025/32569/Basalt\\_Greenhood\\_Pterostylis\\_basaltica.pdf](https://www.environment.vic.gov.au/__data/assets/pdf_file/0025/32569/Basalt_Greenhood_Pterostylis_basaltica.pdf)

DEPI (2014). *Advisory list of rare or threatened plants in Victoria - 2014*. Department of Environment and Primary Industries, Melbourne.

SAC (1993). Flora and Fauna Guarantee Scientific Advisory Committee: Final Recommendation on a Nomination for Listing. Flora and Fauna Guarantee, Nomination No. 265 *Pterostylis basaltica*.

Vicek, K., and Pritchard, A. (2010). National Recovery Plan for the Basalt Rustyhood *Pterostylis basaltica*. East Melbourne: Department of Sustainability and Environment. Retrieved from:  
<http://www.environment.gov.au/system/files/resources/51419550-5232-4870-a724-59e0a0542da3/files/pterostylis-basaltica.pdf>

VicFlora (2015). Flora of Victoria, Royal Botanic Gardens Victoria: *Pterostylis basaltica*. Retrieved from:  
<https://vicflora.rbg.vic.gov.au/flora/taxon/2d70ee00-1d88-4cd1-805e-db55f9250f98>