

## *Pultenaea densifolia* Dense Bush-pea

### Taxonomy

*Pultenaea densifolia* F. Muell.

### Current conservation status

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

### Proposed conservation status

Vulnerable in Victoria

Criteria A3ce+4ce; D2

### Species Information

#### Description and Life History

The taxon is a spreading, occasionally prostrate shrub to 50 cm high; stems terete, covered with white woolly hairs, often largely obscured by stipules. Leaves broadly ovate, 2-3 mm long, 1-2 mm wide, strongly recurved; apex acute, shortly mucronate; surfaces glabrous, the lower with prominent raised veins, slightly paler than upper; margin flat; stipules c. 2 mm long, pale and papery, margins densely woolly-ciliate. Flowers axillary, clustered towards tips of branches; bracts absent; stipules of floral leaves slightly enlarged; calyx 4-7 mm long, tube glabrous, margins of lobes densely white-woolly; bracteoles attached near centre of calyx tube, lanceolate, 3-6 mm long with a central line of pale hairs, attached at base of calyx tube; standard c. 7.5 mm wide; ovary and base of style covered with pale hairs. Pod turgid, covered with pale, silky hairs, two-thirds enclosed by calyx. The taxon flowers from October to November (VicFlora 2019).

#### Generation Length

The generation length of *Pultenaea densifolia* is estimated to be 35 to 70 years (midpoint 50 years). This is based on the taxon's time to reproductive maturity being estimated at 5 years and a longevity up to 50 years. The taxon is a fire-sensitive obligate seed regenerator, and from congeneric taxa it is inferred that the taxon does not resprout post-fire, has a long-lived seedbank in the soil, with partial germination after fire (DELWP 2015), which at pre-settlement intervals was 35-50 years or more. Hard-seeded *Pultenaea* taxa require fire for germination and recruitment, and periodic fire at intervals of at least ten years is needed to allow for maturity. Although it is killed by intense fire, the taxon may senesce and persist in the seedbank in the prolonged absence of fire.

#### Distribution

The taxon is uncommon in Victoria, occurring mostly in mallee areas in the north-west such as south of Murrayville, Wathe State Forest, and Sunset Plains, with an isolated eastern occurrence on marble cliffs near headwaters of the Tambo River, and possibly also near Beechworth (VicFlora 2019). In the Victorian Mallee, the taxon extends from the south-west Sunset Country south almost to Red Bluff, east to the Rainbow district, at the Wathe Flora and Fauna Reserve, and north to the Bronzewing Flora and Fauna Reserve, with a concentration of records in the Big Desert south of Murrayville and Cowangie. The taxon occurs close to the Victorian border north of Frances in South Australia and is likely to extend into the Little Desert National Park on the Victorian side of the border.



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The Beechworth record is an 1894 Fitzgerald collection at the Tasmanian Herbarium, however there is no indication that the identity of this specimen has been confirmed, and it may be referable to the superficially similar *P. foliolosa* which is one of the most common taxa of *Pultenaea* in the Beechworth district.

## Habitat

In the Victorian Mallee region, the taxon is typically associated with Mallee woodland or shrubland on deep sand dominated by *Eucalyptus leptophylla* (Slender-leaf Mallee) or *E. costata* (Yellow Mallee), often in association with *Callitris verrucosa* (Scrub Cypress-pine), *Gahnia lanigera* (Desert Saw-sedge), *Gyrostemon australasicus* (Wheel Fruit), *Lepidosperma viscidum* (Sticky Sword-sedge), *Leptospermum coriaceum* (Mallee Tea-tree), or *Triodia scariosa* (Porcupine Grass), with some evidence of extending to slightly more fertile loamy sands supporting *Eucalyptus socialis* (Grey Mallee), *Melaleuca lanceolata* (Moonah), and *Myoporum platycarpum* (Sugarwood).

At Marble Gully in the Bindi district in East Gippsland the taxon is associated with Limestone Pomaderris Shrubland, a highly restricted FFG-Listed threatened community, on a steep north-facing slope amongst exposed marble at an elevation of 800 m. This disjunct occurrence shares limestone-derived substrate with occurrences in the north-west of the state. At this site the taxon is associated with *Pomaderris oraria* subsp. *calcicola* (Limestone Pomaderris), *Allocasuarina verticillata* (Drooping Sheoak), *Bursaria spinosa* subsp. *lasiophylla* (Hairy Bursaria), *Ozothamnus adnatus* (Winged Everlasting), *Pimelea flava* subsp. *dichotoma* (Diosma Rice-flower), *Themeda triandra* (Kangaroo Grass), and a highly localised FFG-Listed endemic *Olearia astroloba* (Marble Daisy-bush).

## Threats

The taxon is potentially at risk of seedbank depletion through repeat fire events at intervals approaching the tolerable fire interval (TFI) for the taxon, which is likely to be 10-15 years. This risk may be exacerbated for stands on more fertile sites at lower elevations in the dune-swale toposequence, by the increasing risk of extreme drought stress which can lead to recruitment failure. Some occurrences in closer proximity to areas of cropping or grazing may also be threatened by exotic herbivores such as rabbits or goats, or even unnaturally high local densities of macropods such as Western Grey Kangaroos (*Macropus fuliginosus*). Incremental habitat loss through agricultural intensification may affect some stands in marginal sites.

The highly disjunct occurrence at Marble Gully near Bindi is at increasing risk of recruitment failure in response to climatic drying, particularly in combination with targeted browsing by Sambar Deer (*Rusa unicolor*) during early stages of post-fire recruitment. Stands on steep slopes at Marble Gully are at particular risk of substrate instability given the poorly-structured, friable limestone-derived loams, and the increasing risk of extreme weather events.

Since all records are for extensive stands of relatively intact native vegetation on public land, there is no direct evidence that the taxon has suffered any significant historic decline through habitat loss to agriculture, consistent with the association of the taxon with vegetation on relatively inert sandy profiles or, in the case of the occurrence at Marble Gully, its association with shallow skeletal soil equally unsuitable for agriculture.

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 style="text-align: center;"><i>based on any of the following:</i></p> <p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p>			

**Evidence:**

**Eligible under Criterion A3 as Vulnerable**

The population reduction over the next 100 years is projected to be 15 to 35% (midpoint 25%), based on (c) and (e) above.

Future reduction is based on the likelihood that at least some of the identified threats will operate with increasing intensity in the coming decades.

**Eligible under Criterion A4 as Vulnerable**

The population reduction over any 105 to 210 year period, including both past and future (up to 100 years in the future), is estimated to be 15 to 45% (midpoint 30%), based on (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

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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:

#### Ineligible under Criterion B

The Extent of Occurrence (EoO) across the taxon's range, based on accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA), is estimated to be 34,980 km<sup>2</sup> which exceeds the threshold for criterion B.

The Area of Occupancy (AoO) across the taxon's range, based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA), is estimated to be 44 km<sup>2</sup> but other thresholds under this criterion have not been met.

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				

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## Evidence:

### Ineligible under Criterion C as Data Deficient

There is no available estimate of population size for the taxon in Victoria, although it is likely to exceed 1,000 mature individuals since an estimated 200 plants have been reported at a single site at Marble Gully, and the taxon is recorded with a projective foliage cover of 5-25% at the quadrat scale at one site in the Big Desert west of Pella.

Criterion D - Very small or restricted population <sup>Ⓜ</sup>			
<sup>Ⓜ</sup>	Critically Endangered <sup>Ⓜ</sup>	Endangered <sup>Ⓜ</sup>	Vulnerable <sup>Ⓜ</sup>
Number of mature individuals (observed or estimated) <sup>Ⓜ</sup>	<50 <sup>Ⓜ</sup>	<250 <sup>Ⓜ</sup>	<1,000 <sup>Ⓜ</sup>
D2 - Only applies to the VU category <sup>¶</sup> 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. <sup>Ⓜ</sup>	- <sup>Ⓜ</sup>	- <sup>Ⓜ</sup>	D2 - Typically: <sup>¶</sup> AoO < 20 km <sup>2</sup> or number of locations ≤ 5 <sup>Ⓜ</sup>

## Evidence:

### Eligible under Criterion D2 as Vulnerable

The taxon is estimated to be very restricted. The taxon has a restricted distribution, occurring in two locations, such that this restriction makes the taxon capable of becoming Critically Endangered or Extinct within a time frame of one or two generations. This is in response to the impact of the identified long-term threats, notably repeat fire events, drought stress, grazing by herbivores, climatic drying, and extreme weather events.

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

## References

DELWP (2015). *Victorian Flora Vital Attributes dataset*. Department of Environment, Land, Water and Planning, Victoria.

DEPI (2014). *Advisory list of rare or threatened plants in Victoria - 2014*. Department of Environment and Primary Industries, Melbourne. Retrieved from: [https://www.environment.vic.gov.au/\\_\\_data/assets/pdf\\_file/0021/50448/Advisory-List-of-Rare-or-Threatened-Plants-in-Victoria-2014.pdf](https://www.environment.vic.gov.au/__data/assets/pdf_file/0021/50448/Advisory-List-of-Rare-or-Threatened-Plants-in-Victoria-2014.pdf)

VicFlora (2019) Flora of Victoria, Royal Botanic Gardens Victoria: *Pultenaea densifolia*. Retrieved from: <https://vicflora.rbg.vic.gov.au/flora/taxon/0867d2a9-4497-4331-93b5-3de56313838b>