

Goodenia heterophylla subsp. *heterophylla* Variable Goodenia

Taxonomy

Goodenia heterophylla subsp. *heterophylla* Sm.

Current conservation status

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

Proposed conservation status

Vulnerable in Victoria

Criterion D2

Species Information

Description and Life History

The taxon is an erect or ascending perennial to 40 cm high, with glandular and simple hairs. Leaves sessile, mainly cauline, more or less ovate, 1-3 cm long, 2-10 mm wide, base cuneate to truncate, apex acute, both surfaces pubescent, margins usually toothed or lobed, sometimes with 2 large lobes or teeth near base; basal leaves ephemeral. Inflorescences terminal leafy racemes or thyrses to 30 cm long; peduncles 6-15 mm long; pedicels non-articulate, 4-7 mm long; bracteoles linear, 1.5-4 mm long. Sepals linear to lanceolate, 2-4 mm long; corolla to 12 mm long, pubescent outside, c. glabrous inside, yellow, abaxial lobes to 5 mm long, wings c. 1.5 mm wide; indusium oblong, often grooved above and below; ovules 4-12. Fruit broad-ovoid, to 4 mm long, valves entire and spreading; seeds oblong, 1.5-2.5 mm long, minutely papillose, yellow, wing vestigial. The taxon flowers mainly from August to May (VicFlora 2017).

Generation Length

The generation length of *Goodenia heterophylla* subsp. *heterophylla* is estimated to be 35 to 50 years. This is based on a plausible longevity of 25-40 years, and an inference that the taxon recruits episodically in response to major bushfire events, at an estimated pre-settlement interval of (35-) 45-70 years or up to 80 years or more at the scale of individual plants, since fire is likely to be patchy within stony habitats. This is likely to be supplemented by more or less continuous or sporadic and opportunistic recruitment in response to seasonal conditions, drought-induced mortality or small-scale localised site disturbance events. It is unclear whether the taxon can resprout, or is a strict obligate seed regenerator (OSR).

Distribution

The taxon is rare in Victoria, where it is known by a few collections from the Licola, Omeo and upper Snowy River areas. It also occurs in NSW (VicFlora 2017).

Habitat

The taxon usually occurs in open-forest on stony ridges (VicFlora 2017).

Threats

Historic habitat loss to agriculture is likely to have been relatively insignificant since the habitat of the taxon is unsuitable for grazing or cropping.

Goodenia heterophylla subsp. heterophylla

Variable Goodenia

Recently identified emerging threats to the taxon include extreme drought stress associated with climatic warming and drying, and the potential impact of targeted browsing by Sambar Deer *Rusa unicolor*. White Box Woodlands dominated by *Eucalyptus albens* in the Upper Snowy, have been recently observed to suffer heavy mortality of trees and understorey, apparently in response to extreme drought stress. The taxon is also threatened by increasing local density and browsing impacts of Sambar, which have targeted a very wide range of tree and understorey taxa, particularly during their recruitment phases.

Recent monitoring of a stand along the Tullach Ard Road west of the Snowy River identifies road works and forestry operations as possible short-term threats to this small occurrence of only 20 individuals.

Spatial analysis of likely habitat on all land tenures for the taxon indicates that 74% occurs within the CAR reserve system, including parks and reserves and special protection zones. Further areas are excluded from harvesting by prescription under the Victorian Code of Practice for Timber Production 2014 (the Code).

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>based on any of the following:</p> <ul style="list-style-type: none"> (a) direct observation [except A3] (b) an index of abundance appropriate to the taxon (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat (d) actual or potential levels of exploitation (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites 			

Evidence:

Ineligible under Criterion A

There is insufficient evidence to determine whether there has been or will be a reduction in population sufficient to meet any threshold for Criterion A.

Goodenia heterophylla subsp. heterophylla

Variable Goodenia

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 ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
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 across the taxon's range is estimated to be 1,015 km² and the Area of Occupancy (AoO) is estimated to be 28 km², 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 <u>C1</u> or <u>C2</u>				
<u>C1</u>	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)
<u>C2</u>	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:

Ineligible under Criterion C as Data Deficient

Goodenia heterophylla subsp. heterophylla

Variable Goodenia

There is insufficient evidence to determine the number of mature individuals. Very few reports of population size are available, and range from 20-370 mature individuals at individual sites. Most occurrences are in remote, rarely visited sites and the total number of stands is likely to greatly exceed the number of reported occurrences.

Criterion D - Very small or restricted population [Ⓜ]			
[Ⓜ]	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 ² or number of locations ≤ 5 [Ⓜ]

Evidence:

Eligible under Criterion D2 as Vulnerable

The taxon is estimated to be very restricted. It has a restricted distribution, with a single location and an estimated AoO of 28 km², such that this restriction makes the taxon capable of becoming Critically Endangered within a time frame one or two generations, in response to the impact of the identified threats, notably extreme drought stress associated with climatic warming and drying, and the impact of targeted browsing by Sambar.

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

References

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

VicFlora (2017). Flora of Victoria, Royal Botanic Gardens Victoria: *Goodenia heterophylla* subsp. *heterophylla*. Retrieved from: <https://vicflora.rbg.vic.gov.au/flora/taxon/2e89915b-86b9-4abe-adb7-ef6bbde1b1da>