Threatened Species Assessment

Goodenia connata
Cup Goodenia

Taxonomy

Goodenia connata (F. Muell.) K.A. Sheph.

This taxon was previously known as *Velleia connata.*

Current conservation status

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

Proposed conservation status

Endangered in Victoria

Criterion B2ac(iv)

Species Information

Description and Life History

The taxon is a rosetted, somewhat fleshy, glabrous annual, with ascending to erect flowering scapes to 1 m high, often glaucous. Leaves shortly petiolate, obovate to oblanceolate, 5-20 cm long (including petiole), 2-8 cm wide, obtuse, lyrate-pinnatipartite or margins denticulate, green to glaucous. Inflorescence a dichasium; bracteoles fused into a cup, 2-6 cm diam., usually toothed. Sepals 5, usually 8-11 mm long, connate into a tube at base, glabrous; corolla 15-17 mm long, usually glabrous outside, bearded inside, yellow, brownish or white, usually with purplish markings, wings to 1 mm wide; indusium depressed-ovate, with scattered long hairs around base, orifice more or less glabrous towards middle. Capsule compressed-ovoid, c. 8 mm long, c. glabrous; seeds orbicular, 5-6 mm diam., punctate, wing to 2.5 mm wide. The taxon flowers mainly in spring or throughout the year (VicFlora 2020).

Although longevity is inferred to be one year or less, one collector, Jeff Jeanes, described the taxon as a taprooted perennial up to 50 cm tall.

Generation Length

The generation length of *G. connata* is estimated to be 15 to 30 (midpoint 25) years. The taxon is a terrestrial annual herb which is often regarded as a short-lived fire-follower (VicFlora 2020), implying that it recruits episodically from a soil-stored seedbank in response to intense fire events at pre-settlement intervals of 35-70 years. Like other members of the Goodeniaceae, however, seed viability is likely to be less than 70 years, implying that the seedbank is replenished at intervals shorter than the upper end of the pre-settlement fire interval to ensure survival of the population. The taxon is therefore likely to also rely on at least a low level of trickle or continuous recruitment in the absence of fire, presumably in response to optimal seasonal conditions or localised site disturbance events (or both).

Distribution

This taxon is occasionally found in dunefields in the far north-west of Victoria (e.g. Hattah, Nowingi, Bambill areas), and is also found in WA, NT, SA, Qld and NSW (VicFlora 2020). The Victorian stronghold of the taxon is in the Sunset Country, extending east to Nowingi, Hattah, Annuello, Kulwin and Wandown, with southern outliers in Wyperfeld National Park. Historic collections from the Murrayville, Walpeup and Ouyen districts suggest the taxon was more widespread in these long-settled districts at the time of European settlement.

Habitat

The taxon is associated with dunefields where it is generally a short-lived fire-follower (VicFlora 2020). It is regarded as a key fire response species with single age-class cohorts promoted by intense fire, and is restricted to sites of low fertility and low organic content in the free-draining sandy substrate. As such, they are not particularly susceptible to weed invasion.

Victorian collectors describe the habitat as recently burnt mallee scrub on brown or red-brown sandy loam or red sand, in both dune crests and swales.

The dune mallee habitat of the taxon is typically dominated by *Eucalyptus costata* (Yellow Mallee), *E. dumosa* (Dumosa Mallee), *E. leptophylla* (Slender-leaf Mallee), and *E. socialis* (Grey Mallee), less frequently by *E. calycogona* (Red Mallee), and sometimes by *Acacia brachybotrya* (Grey Mulga), *A. wilhelmiana* (Dwarf Nealie), *A. rigens* (Nealie), *Dodonaea viscosa* subsp. *angustissima* (Slender Hop-bush), *Myoporum platycarpum* subsp. *perbellum* (Sugarwood), *Triodia scariosa* (Porcupine Grass), *Westringia rigida* (Stiff Westringia), and a wide range of annual and perennial understorey plants.

Threats

The taxon may have suffered some historic decline through habitat loss to agriculture since historic collections from the Murrayville, Walpeup and Ouyen districts suggest the taxon was more widespread in these long-settled districts at the time of European settlement. However, the strength of this inference is unclear since these early records are likely to be of poor locational accuracy and may represent district records taken in mallee habitats some distance from these farming settlements.

Current and future threats are equally difficult to identify with confidence. The taxon is restricted to sites of relatively low fertility which are not particularly susceptible to weed invasion. As a short-lived key fire response taxon, it is unlikely to be threatened by the projected increase in frequency, intensity, and landscape scale of both bushfires and imposed planned burns, and may even be promoted by these anthropogenic fire regimes at the expense of more fire-sensitive plants. It is also unclear whether the taxon is threatened by climatic drying since the short life span reduces the impact of intense drought stress on recruitment success and seed sets, since any adult mortality or recruitment failure is likely to be compensated by increasing fire frequency which guarantees seedbank replenishment before seedbank viability is compromised by age since fire. The taxon may be threatened by browsing of both native and exotic herbivores, including domestic stock, rabbits, goats, and kangaroos, although stock is no longer a threat within national parks and other reserves. As a potential threat, even herbivory is equivocal since at least one congener, *Goodenia discophora* (Cabbage Poison), is a plant of bitter and disagreeable taste, not readily eaten by stock and potentially implicated in cases of sheep poisoning in Western Australia (Gardner and Bennetts 1955).

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%

A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.

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.

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*]

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.

based on any of the following:

(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.

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 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
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 B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 80 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas.

The taxon is estimated to be severely fragmented naturally at the subregional and landscape scales. Evidence to suggest that the taxon is also severely fragmented anthropogenically at the landscape scale is equivocal. The only plausible vectors are likely to be ants (myrmecochory) which operate at the metre scale only.

It is estimated to have 1 location. It is estimated to have extreme fluctuations in (iv) above, since the population density of each cohort at any one site is likely to reflect the intensity and landscape scale of the most recent fire, as well as seasonal conditions at the time of mass recruitment. At other times population size is likely to reflect trickle recruitment which is likely to reflect seasonal conditions determined by El Niño and La Niña cycles.

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:

Ineligible under Criterion C as Data Deficient

There is no available estimate of population size for the taxon in Victoria. Estimates of population size would have no relevance for detecting long-term trends since population density of each cohort at any one site is likely to reflect intensity and landscape scale of the most recent fire, as well as seasonal conditions at the time of mass recruitment. At other times, population size is likely to reflect trickle recruitment which is likely to reflect seasonal conditions determined by El Niño and La Niña cycles.

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 km2 or number of locations ≤5

Evidence:

Ineligible under Criterion D as Data Deficient

There is insufficient evidence to determine the number of mature individuals.

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

Gardner, C.A. and Bennetts, H.W. (1955) Poison Plants of Western Australia - Cabbage poison (*Velleia discophora* F. Muell.). *Journal of the Department of Agriculture, Western Australia, Series 3*: Vol. 4: No. 2, Article 13.

VicFlora (2020) Flora of Victoria, Royal Botanic Gardens Victoria: *Godenia connata*. Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/ba6a2265-0503-4940-b9a5-d70eef05f9e4