



Gratiola pumilo Dwarf Brooklime

Taxonomy

Gratiola pumilo F. Muell.

Current conservation status

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

Proposed conservation status

Endangered in Victoria

Criteria A2ce+3ce+4ce; B2ab(i,ii,iii,iv,v)c(iv)

Species Information

Description and Life History

The taxon is an erect, rarely decumbent perennial herb 4-18 cm high, sessile glands obscure, otherwise glabrous or on all parts but the corolla with scattered, minute to coarse hairs, some possibly eglandular; branches erect to shortly prostrate and possibly rooting near base. Leaves narrow-ovate to -elliptic, 0.5-2.5 cm long, 3-7 mm wide, base cuneate to stem-clasping, margins toothed to entire. Flowers single in bract axils, sometimes only 1 at a node; pedicels 0.5-7(-9) mm long; bracteoles 1.5-4.5 mm long. Sepals unequal, 2-5.5 mm long; corolla to 7-9 mm long, white, sparsely hairy; staminodes 2. Capsule broad-ovoid, 2.7-6 mm long; style 1.3-2 mm long. The taxon flowers in summer (VicFlora 2017).

Field observations suggest the taxon behaves as a functionally annual plant in some circumstances and as a perennial in others, depending on the hydrological regime operating in each habitat.

Generation Length

The generation length of *Gratiola pumilo* is estimated to be 5 to 25 years (midpoint 7 years). This is based on a plausible longevity of 1-5 (-15) years, and episodic recruitment from a soil-stored seedbank in response to seasonal conditions or receding floodwaters at pre-settlement intervals of 5-7 (-25) years. Field observations suggest that in some habitats, such as gilgai depressions on basalt or northern plains and on the fringes of billabongs, the taxon behaves as a functional annual since these habitats dry out completely following temporary inundation. In other habitats with more persistent moisture availability the taxon behaves as a facultative perennial. Depending on the landscape context, recruitment may occur opportunistically in any season with suitable rainfall, whereas in sites dependent on infrequent flood events the interval between episodic recruitment may extend to 10-15 or even to 25 years.

Distribution

The taxon is mainly confined in Victoria to the north and west of the State, but also with a few isolated records to the south and east (e.g. Pomborneit near Camperdown, the shores of Lake Eildon, and upper Snowy River). It is reliably recorded from the far south-west to the far north-west corner of the state, and from the Murray River along the length of the northern border to scattered sites near the southern coastline, extending to the rain shadow districts of the Upper Snowy on the NSW border in the east. It is also found in SA and NSW (VicFlora 2017), and is reliably recorded in the ACT, Tasmania, and Queensland. Victoria represents the stronghold of the taxon in Australia, surpassed only by New Zealand in the number of herbarium specimens collected for any jurisdiction.

Habitat

The taxon is mainly confined in Victoria to damp and drying mud beside lakes, watercourses and seasonally inundated depressions (VicFlora 2017). It occurs on seasonally inundated alluvial soils, usually on lowland river flats, extending to gilgai depressions on the Basalt Plains, on the Northern Plains, and to the margins of swamps and wetlands across a wide range of landscape settings.

Threats

The taxon has undoubtedly suffered significant historic decline through habitat loss to agriculture with most records taken from highly fragmented rural landscapes. Most sites have also been subject to habitat degradation through stock grazing, cropping, wetland drainage and other intensive agricultural practices.

Current and future threats include incremental habitat loss, agricultural intensification, weed invasion, hydrological modification, and climate change. Cumulatively, these threats result in reduced reliability of flood events, seasonal inundation of moist depressions across a wide range of landscape contexts, contraction or elimination of the local extent of suitable habitat, and increasing risk of seedbank depletion, exhaustion, and local extinction.

Most sites are on highly arable soils targeted for cropping or other intensive agricultural practices, and the increasingly intensive use of all available freehold land for cropping is identified as the greatest current and future threat to the persistence of the taxon across its wide Victorian range.

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>	<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 A2 as Endangered

The population reduction over the past 15 to 75 years is estimated to be 40 to 60%, based on (c) and (e) above.

The taxon is likely to have suffered at least 80% historic decline in response to habitat loss and degradation through intensive agricultural activity. The proportion of this decline which has occurred within the last three generations is likely to exceed 50% decline, particularly in response to cropping of freehold land.

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

Eligible under Criterion A3 as Endangered

The population reduction over the next 15 to 75 years is projected to be 20 to 50%, based on (c) and (e) above.

Future decline is difficult to estimate with confidence since the impact of climatic drying and warming remains speculative. However, the continuing intensification of agricultural activity for cropping in particular shows no signs of abating and is projected to result in at least a further 20% decline in the next three generations even without the added impact of climate change.

Eligible under Criterion A4 as Endangered

The population reduction over any 15 to 75 year period, including both past and future is estimated to be 30 to 50%, based on (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

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:

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 210 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 regional and landscape scales, and anthropogenically at the landscape scale. Geographically isolated occurrences occur at separations likely to exceed the dispersal range of the taxon, which has no specialised mechanism for long-distance dispersal although seed may be locally dispersed by floodwaters. This precludes the opportunity for recolonisation in the event of local extinction within any sub catchment unit.

It is estimated to have 5 locations, and has a continuing decline in (i), (ii), (iii), (iv) and (v) based on the current and projected impact of the identified threats.

It is estimated to have extreme fluctuations in (iv) above, in response to seasonal conditions and the duration and extent of flooding.

Gratiola pumilo Dwarf Brooklime

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

In the absence of any longitudinal monitoring data, there is no available estimate of population size for the taxon in Victoria.

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 ² or number of locations ≤ 5

Evidence:

Eligible under criterion D2 as Vulnerable

The taxon is estimated to be very restricted.

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



Gratiola pumilo
Dwarf Brooklime

VicFlora (2017) Flora of Victoria, Royal Botanic Gardens Victoria: *Gratiola pumilo*. Retrieved from:
<https://vicflora.rbg.vic.gov.au/flora/taxon/141e0908-f5d9-4f25-842d-d01c8b235097>