

**Publication date: 1 November 2024**

## **Notice of and reasons for the Final Determination**

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list *Viola improcera* L.G.Adams as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act. Listing of Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that *Viola improcera* L.G.Adams has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method, as provided by Section 4.14 of the Act. After due consideration of DCCEEW (2023), the NSW Threatened Species Scientific Committee has made a decision to list the species as Endangered.

## **Summary of Conservation Assessment**

*Viola improcera* L.G.Adams was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3 (b)(d)(e iii) because: 1) the species has a highly restricted geographic distribution with an area of occupancy of 52 km<sup>2</sup>; 2) the species occurs at 2–4 threat-defined locations; and 3) the species is projected to be undergoing continuing decline in habitat area, extent or quality due to climate change.

The NSW Threatened Species Scientific Committee has found that:

1. *Viola improcera* L.G.Adams (family Violaceae) is a compact, perennial herb that grows to around 2 cm tall with trailing stems that root at the nodes (stoloniferous). Its tufted leaves are green with wavy rounded or toothed (crenate-serrate) edges, and grow to 18–22 mm long, on 40 mm long narrowly-winged stalks (petiole). The flowers have 5 pale blue-violet petals 10–25 mm long, elongating to 4 cm or more when in fruit. The dry fruit (capsule) is 6 mm long and ellipsoid and the seeds are ovoid, 2 mm long, glossy black in colour and smooth or wrinkled (rugulose). The species flowers in December. This description is based on Adams (1982), Entwisle (1996) and VicFlora (2022).
2. *Viola improcera* is known from New South Wales (NSW), the Australian Capital Territory (ACT) and Victoria. All known occurrences are within National Parks (NP) (ARI 2022; ANBG 2022). In NSW, *V. improcera* was previously only known from one recently discovered population on Big Badja Hill in Deua NP which was found in surveys conducted following the 2019-20 bushfires. An additional NSW population has recently been discovered in Coolumbooka Nature Reserve. Such recent discoveries of the species in previously unknown sites suggests the species may be more widespread than is currently documented.
3. The geographic distribution of *Viola improcera* is highly restricted. The Extent of Occurrence (EOO) is estimated at 14,277 km<sup>2</sup>, and the area of occurrence (AOO) is estimated at 52 km<sup>2</sup>. The Extent of Occurrence (EOO) is based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of

## NSW Threatened Species Scientific Committee

---

assessment recommended by IUCN (2022). The AOO is based on 2 x 2 km grid cells, the scale recommended for assessing area of occupancy by IUCN (2022).

4. The number of mature individuals of *Viola improcera* is currently unknown. Due to the stoloniferous nature of the species, exact population counts can be difficult. However, considering one site surveyed in 2021 was observed to have hundreds, maybe thousands of newly germinated plants (N. Walsh pers. comm. March 2022), it is unlikely that the total number of mature individuals is currently less than 1000.
5. *Viola improcera* is considered to occur across eight populations: two populations in NSW, two populations in Victoria, and up to four populations in ACT. The exact number of populations is uncertain because the degree to which some sites are genetically separated is unknown.
6. *Viola improcera* occurs at high altitudes above ca. 1,300 m and up to at least 1,800 m elevation in open shrubland, snow-gum woodland (Entwisle 1996; ALA 2022; ARI 2022). The species is known to grow in open areas on or near summits and upper slopes on rocky soil and is readily seen along tracks (ARI 2022). *Viola improcera* occurs among *Eucalyptus* spp., *Leptospermum* spp., *Stylidium* spp., *Geranium* spp., *Banksia canei*, *Oxylobium ellipticum*, *Daviesia ulicifolia* and *Boronia algida* (ARI 2022; D. Albrecht pers. comm. March 2022).
7. *Viola improcera* is thought to rely on insects for pollination, although the exact pollinator species are unknown (K. Thiele pers. comm. June 2022). The dispersal distance of seeds of many *Viola* species is limited and usually only up to five metres from the parent plants (Beattie and Lyons 1975; Auge *et al.* 2001). *Viola improcera* is likely to have a persistent soil seed bank (ARI 2022). Almost all the known sites for *Viola improcera* were surveyed towards the end of 2021. All sites had been burnt in the 2019-20 bushfires and all populations showed evidence of post-fire regeneration (ARI 2022; ANBG 2022). Almost all individuals were of seedling age, with the exception of those found at Big Badja Hill, NSW, which appeared to be resprouting (ARI 2022; ANBG 2022).
8. *Viola improcera* is threatened by increased drought resulting from climate change, habitat disturbance by humans, feral horses (*Equus caballus*) and feral deer (*Cervidae* spp.) and grazing by feral rabbits (*Oryctolagus cuniculus*). These threats may work in combination with each other in ways that exacerbate the individual threats. 'Anthropogenic Climate Change', 'Competition and grazing by the feral European Rabbit *Oryctolagus cuniculus* (L.)' 'Habitat degradation and loss by Feral Horses (brumbies, wild horses), *Equus caballus* Linnaeus 1758', and 'Herbivory and environmental degradation caused by feral deer' are Key Threatening Processes under the Act.
9. *Viola improcera* is considered to occur across two to four threat-defined locations based on the most plausible serious threat (drought) as per the IUCN Guidelines (IUCN 2022). It is not considered likely that a single drought would cause the extinction of the entire population of the species as regional climate and local factors reduce evaporative loss and likely differ across the species' distribution.

## NSW Threatened Species Scientific Committee

---

10. *Viola improcera* is restricted to high elevations in open shrubland or snow gum woodland (Entwisle 1996). Given the species' altitudinal range and its widespread but highly disjunct population, the species' current distribution may be relictual from Pleistocene climate fluctuations (D. Ingwersen pers. comm. September 2022). Future climate scenarios predict increasing temperatures, increasing drought conditions, and decreasing rainfall across the species' range (OEH 2014a, 2014b; DELWP 2019). A decrease in rainfall during the species' flowering period may result in lower levels of recruitment, and a particularly dry year following fire could cause widespread seedling mortality. Similarly, decreased rainfall would likely alter the water balance of the species' habitat, potentially rendering it unsuitable.
11. *Viola improcera* is found at high elevations in cold environments, and it may rely on cold stratification to break seed dormancy, similar to other species within the genus (Gehring *et al.* 2013; Kilgore *et al.* 2022). Increasing temperatures may therefore affect recruitment and may result in further declines to seedlings and mature individuals. Furthermore, competitive displacement from lowland species migrating to higher altitudes with a warming climate has the potential to cause extinctions to high altitude species (Pickering *et al.* 2004; Hughes 2011). Higher temperatures and increased fire frequency have been shown to increase the growth rate and recruitment of shrubs (Camac *et al.* 2017; Milla and Encinas-Viso 2020), which could likely result in reduced dispersal, recruitment, and survival of *V. improcera*, leading to its competitive exclusion.
12. The available evidence suggests that a decline in area, extent, and quality of habitat of *Viola improcera* due to climate change is occurring and will likely continue. Furthermore, the continuing decline of area, extent, and quality of habitat could result in the species becoming locally extinct in some areas, leading to a decline in AOO. The species may be unable to move to higher elevations under future climate scenarios as temperatures and drought conditions increase, and precipitation decreases.
13. *Viola improcera* L.G.Adams is not eligible to be listed as a Critically Endangered species
14. *Viola improcera* L.G.Adams is eligible to be listed as an Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a very high risk of extinction in Australia in the near future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

### **Assessment against *Biodiversity Conservation Regulation 2017* criteria**

The Clauses used for assessment are listed below for reference.

### **Overall Assessment Outcome: Endangered under Clause 4.3 (b)(d)(e iii).**

### **Clause 4.2 – Reduction in population size of species (Equivalent to IUCN criterion A)**

# NSW Threatened Species Scientific Committee

---

**Assessment Outcome: Data Deficient.**

<b>(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:</b>			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
<b>(2) - The determination of that criteria is to be based on any of the following:</b>			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

**Clause 4.3 – Restricted geographic distribution of species and other conditions**

**(Equivalent to IUCN criterion B)**

**Assessment Outcome: Endangered under Clause 4.3 (b)(d)(e iii).**

<b>The geographic distribution of the species is:</b>			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted.
<b>and at least 2 of the following 3 conditions apply:</b>			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,
		(iv)	the number of locations in which the species occurs or of populations of the species.
	(f)	extreme fluctuations occur in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

**Clause 4.4 – Low numbers of mature individuals of species and other conditions**

**(Equivalent to IUCN criterion Clause C)**

**Assessment Outcome: Data Deficient.**

## NSW Threatened Species Scientific Committee

---

<b>The estimated total number of mature individuals of the species is:</b>			
	(a)	for critically endangered species	very low, or
	(b)	for endangered species	low, or
	(c)	for vulnerable species	moderately low.
<b>and either of the following 2 conditions apply:</b>			
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):	
		(i)	for critically endangered species very large, or
		(ii)	for endangered species large, or
		(iii)	for vulnerable species moderate,
	(e)	both of the following apply:	
		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and
		(ii)	at least one of the following applies:
		(A)	the number of individuals in each population of the species is:
			(I) for critically endangered species extremely low, or
			(II) for endangered species very low, or
			(III) for vulnerable species low,
		(B)	all or nearly all mature individuals of the species occur within one population,
		(C)	extreme fluctuations occur in an index of abundance appropriate to the species.

**Clause 4.5 – Low total numbers of mature individuals of species  
(Equivalent to IUCN criterion D)**

**Assessment Outcome: Clause 4.5 is not met.**

<b>The total number of mature individuals of the species is:</b>			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

**Clause 4.6 – Quantitative analysis of extinction probability  
(Equivalent to IUCN criterion E)**

**Assessment Outcome: Data Deficient.**

<b>The probability of extinction of the species is estimated to be:</b>			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

**Clause 4.7 – Very highly restricted geographic distribution of species–  
vulnerable species**

**(Equivalent to IUCN criterion D2)**

**Assessment Outcome: Clause 4.7 is not met.**

# NSW Threatened Species Scientific Committee

---

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.
-------------------------	--

Senior Professor Kristine French  
Chairperson  
NSW Threatened Species Scientific Committee

## Supporting Documentation:

DCCEEW (Department of Climate Change, Energy, the Environment and Water) (2023) Conservation Advice for *Viola improcera* (dwarf violet). Australian Government, Canberra.

## References:

Adams LG (1982) Violaceae (appendix). In 'Flora of Australia Vol. 8' (Ed. AS George) p. 387. (Australian Biological Resources Study, Canberra)

ALA (Atlas of Living Australia) (2022) *Viola improcera*. Available at: <https://bie.ala.org.au/species/https://id.biodiversity.org.au/node/apni/2894167> (accessed 24 February 2022)

ANBG (Australian National Botanic Gardens) (2022) Survive and Thrive: Fire recovery and climate change resilience for threatened plants in sub alpine south-eastern Australia. Project report 1 – February 2022. Australian National Botanic Gardens, Canberra.

ARI (Arthur Rylah Institute for Environmental Research) (2022) Responses of threatened plant species to the 2019-20 fire in eastern Victoria. Arthur Rylah Institute for Environmental Research. Heidelberg, Victoria.

Auge H, Neuffer B, Erlinghagen F, Grupe R, Brandl R (2001) Demographic and random amplified polymorphic DNA analyses reveal high levels of genetic diversity in a clonal violet. *Molecular Ecology* **10**, 1811–1819.

Beattie AJ, Lyons N (1975) Seed dispersal in *Viola* (Violaceae): Adaptations and strategies. *American Journal of Botany* **62**, 714–722.

Camac JS, Williams RJ, Wahren CH, Hoffmann AA, Vesik PA (2017) Climatic warming strengthens a positive feedback between alpine shrubs and fire. *Global Change Biology* **23**, 3249–3258.

## NSW Threatened Species Scientific Committee

---

- DELWP (Department of Environment, Land, Water and Planning) (2019) Victoria's Climate Science Report 2019. Department of Environment, Land, Water and Planning, Victoria.
- Entwisle TJ (1996) *Viola*. In 'Flora of Victoria Vol. 3, Dicotyledons Winteraceae to Myrtaceae' (Eds NG Walsh and TJ Entwisle) (Inkata Press, Melbourne)
- Gehring JL, Cuasc T, Shaw C, Timian A (2013) Seed germination of *Viola pedata*, a key larval host of a rare butterfly. *Native Plants Journal* **14**, 205–212.
- Hughes L (2011) Climate change and Australia: key vulnerable regions. *Regional Environmental Change* **11**, 189–195.
- IUCN 2022 IUCN (International Union for Conservation of Nature) Standards and Petitions Subcommittee (2022) Guidelines for using the IUCN Red List Categories and Criteria. Version 15.1. Available at: [https://nc.iucnredlist.org/redlist/content/attachment\\_files/RedListGuidelines.pdf](https://nc.iucnredlist.org/redlist/content/attachment_files/RedListGuidelines.pdf)
- Kilgore S, Havens K, Kramer A, Lythgoe A, MacKechnie L, De Vitis M (2022) Seed collection, storage, and germination practices may affect *Viola* reintroduction outcomes. *Native Plants Journal* **23**, 40–55.
- Milla L, Encinas-Viso F (2020) Plant-pollinator communities in the Australian Alps. *Australasian Plant Conservation* **28**, 13–16.
- OEH (Office of Environment and Heritage) (2014a) Australian Capital Territory, Climate Change snapshot. Office of Environment and Heritage, New South Wales.
- OEH (Office of Environment and Heritage) (2014b) South East and Tablelands, Climate Change snapshot. Office of Environment and Heritage, New South Wales.
- Pickering *et al.* 2004;
- Pickering CM, Good R, Green K (2004) Potential effects of global warming on the biota of the Australian Alps. Australian Greenhouse Office, Canberra.
- VicFlora (2022) *Viola improcera*. Flora of Victoria. Royal Botanic Gardens Victoria. Available at: <https://vicflora.rbg.vic.gov.au/flora/taxon/8058ff63-df15-45d0-9e4b-ff13a48d8424> (accessed 24 February 2022)