

## *Westringia crassifolia* Whipstick Westringia

### Taxonomy

*Westringia crassifolia* N.A. Wakef.

### Current conservation status

Listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1991).

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

### Proposed conservation status

Endangered in Australia

Criteria A3ce+4ce; B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C1

### Species Information

#### Description and Life History

The taxon is an erect spindly shrub growing to 2 m high, with slender, longitudinally ribbed branchlets sparsely covered with short soft hairs. Leaves are dark green, 5-15 mm long and 1.5-2.5 mm wide, narrowly elliptic to slightly oblong and arranged in whorls of three. Leaf margins are entire, the leaf blades are sparsely to moderately hairy and rather thick, and the apex is obtuse with a slight callose point. The upper surface is concave and both surfaces are slightly rough from the presence of minute tubercles. The pink, blue to lavender flowers are borne freely towards the ends of the branches, in August and September. The cup-shaped calyx is about 5 mm long, has five equal teeth and is covered externally with minute greyish hairs, and the corolla is externally hairy and 12-14 mm long (Cameilleri and Nevill 2010).

The fruit is dry, splitting at maturity into four one-seeded nutlets, and enclosed by the persistent calyx. The biology and ecology of the taxon is poorly known. The lifespan may only be 10-25 years. Plants are killed by fire, although germination appears to be dependent upon or is enhanced by some disturbance. In the Little Desert, germination has been observed after fire, successive flooding and after soil disturbance by road grading (Diez et al. 1999). Some shading from neighbouring plants such as Broombush (*Melaleuca uncinata*) may also assist germination (O'Keefe 2003). Some seed appears to remain viable for several years (Diez et al. 1999), although the overall viability of seed may be quite low (O'Keefe 2003). The level of genetic variation within and between populations is unknown, and pollinators have not been identified (Cameilleri and Nevill 2010).

#### Generation Length

The generation length of *Westringia crassifolia* is estimated to be 15 to 30 years. This is based on the observation that plants reach maturity at approximately 5 years, depending on environmental conditions and threats, and may live for over 25 years. However, recruitment events are not continuous, and successful recruitment relies on suitable habitat and weather conditions.

#### Distribution

The taxon is endemic to Victoria and is only recorded from two areas. The first is near Bendigo in north-central Victoria, within the Victorian Midlands Bioregion. This consists of multiple small pockets, one in north-east Huntly

and the other in the north of the Whipstick National Park. The second area is in the western part of the Little Desert in Western Victoria, in the Murray-Darling Depression Bioregion (Cameilleri and Nevill 2010), and all records are clustered relatively closely together. The localities in the Little Desert National Park are all located west of the reserve.

## Habitat

The currently known populations are all found within the Broom-bush Mallee Ecological Vegetation Class, an open scrub to low open forest that occurs on gentle rises with shallow, infertile, and stony soils derived from Ordovician sediments. This community occupies areas adjacent to drainage lines or areas subject to seasonal inundation. North of Bendigo, Whipstick Westringia is found on gully flats, fringing lower slopes and in shallow gullies. Overstorey taxa include Red Ironbark (*Eucalyptus tricarpa*), Yellow Gum (*E. leucoxyton*), Blue Mallee (*E. poybractea*), Bull Mallee (*E. behriana*) and Green Mallee (*E. viridis*). Understorey taxa include Totem Poles (*Melaleuca decussata*), Drooping Cassinia (*Cassinia arcuata*), Gold-dust Wattle (*Acacia acinacea*), and occasionally Broombush.

In the Little Desert, the taxon occurs on seasonally inundated flats, and on a low buckshot gravel ridge. Overstorey taxa are mallee eucalypts including Green Mallee, Slender-leaved Mallee (*E. leptophylla*) and Yellow Mallee (*E. incrassata*). The understorey taxa include Broombush, Violet Honey-myrtle (*Melaleuca wilsonii*), Desert Hakea (*Hakea muelleriana*), Mint-bush (*Prostanthera aspalathoides*) and Gold-dust Wattle. Recovery actions include mapping of habitat that is critical to survival of the taxon (Cameilleri and Nevill 2010).

## Threats

The two locations where the taxon occurs are within national parks, and therefore secure from threats such as habitat clearing. However, excessive browsing, erosion/siltation, changed fire regimes, and potentially bushfire suppression measures, are current threats. There also appears to be insufficient regeneration from seed at most, if not all, sites to maintain populations.

Specifically, the taxon is highly palatable to herbivores and is currently threatened by browsing by native mammals including the Eastern Grey Kangaroo (*Macropus giganteus*), Western Grey Kangaroo (*M. fuliginosus*) and Swamp Wallaby (*Wallabia bicolor*), and introduced mammals including Brown Hare (*Lepus capensis*), European Rabbit (*Oryctolagus cuniculus*), and feral Goat (*Capra hircus*). Excessive levels of browsing by Swamp Wallaby on the Bendigo populations has had a severe impact on vigour and reproductive capacity, resulting in plants that are stunted and bear few, if any, flowers. Prior to 2000, the Bendigo populations had declined to the point where it is believed that the soil seed bank contained little or no seed. Five populations are now fenced, but all unprotected sites still suffer browsing pressure. Many of the Little Desert populations were also reported to be heavily browsed.

The taxon is threatened by inappropriate fire regimes as little is known regarding the taxon's response to fire, although fire seems to generally kill plants. However, fire may also be an important stimulus for seed germination, so periodic fires may be required to stimulate regeneration of populations, through removing senescent or dead plants and temporarily reducing competition from surrounding vegetation. Where seedling regeneration has been observed in the Bendigo populations, it has been on bare ground or amongst dead vegetation, indicating that reduced competition may be an important factor in recruitment. However, too frequent fires may deplete the soil seed bank, and kill young plants before they have flowered and set seed, potentially eliminating populations. Likewise, the complete absence of fire may also lead to population decline and eventual extinction, as plants age and die, and are not replaced because of little or no seedling establishment.

Erosion and siltation are threats due to the fact that many populations within the Greater Bendigo National Park occur in gullies that are actively eroding, or near roads/tracks where erosion and siltation continue to degrade the sites and threaten the future viability of these populations. Furthermore, several of the Bendigo populations grow close to roads and tracks, and could potentially be at risk from road maintenance, and visitor impacts such as prospecting activities and illegal off-road driving. There has been at least one recent instance of a vehicle being driven off-track and through a population of Whipstick Westringia. One of the Little Desert populations (Ridge Site) is on the edge of a main road and may be at risk from road-widening or maintenance activities. The plants are also quite visible when flowering, increasing the risk of illegal collection.

Finally, the taxon is restricted to just two localities and most populations are small. Therefore, the taxon may be at risk from a range of stochastic events. The level of genetic variation within and between populations is not known, but may be reducing through isolation and reduced regeneration of populations.

### 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"> <li>(a) direct observation [except A3]</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</li> </ul>			

### Evidence:

#### Eligible under Criterion A2 as Vulnerable

The population reduction over the last 45 to 90 years is inferred to be 30 to 45%, based on (c) and (e) above.

Past decline is based on land management activities, loss of pollinators in reserves surrounded by agricultural lands, and the impacts of climate change. It is also based on habitat clearing and degradation, such that currently there are very small patches of habitat remaining. It is very conservative to assume that this taxon has suffered from a population loss of around 30% in the last 90 years, hence an upper bound of 45%.

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

#### Eligible under Criterion A3 as Endangered

The population reduction over the next 45 to 90 years is suspected to be 30 to 50%, based on (c) and (e) above.

Future decline is based on the last round of monitoring conducted in 2011, in the central Victorian population. Specifically, populations within the Bendigo region were looking extremely unwell, and dry conditions and a lack of recruitment was evident. The populations did not appear that they would hold on with continuing drought, and the identified threats have not ceased.

#### Eligible under Criterion A4 as Endangered

The population reduction over any 45 to 90 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 <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:**

**Eligible under Criterion B1 as Endangered**

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 3,347 km<sup>2</sup>, based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA).

The taxon is suspected to be severely fragmented because of its limited dispersal ability, the barriers or lack of habitat separating the occurrences, and the reduced probability of recolonisation should occurrences become extinct.

It is estimated to have 2 locations, has a continuing decline in (i), (ii), (iii), (iv) and (v) above based on the identified threats, particularly browsing pressure, inappropriate fire regimes, and habitat degradation.

**Eligible under Criterion B2 as Endangered**

The Area of Occupancy (AoO) across the taxon's range is estimated to be 64 km<sup>2</sup>, based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

As above, the taxon is severely fragmented, has 2 locations, and has a continuing decline in (i), (ii), (iii), (iv) and (v) above.

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:**

**Eligible under Criterion C1 as Endangered**

It is estimated that there are 550 to 1,000 mature individuals. This is based on the taxon only occurring in two subpopulations and being highly endemic to these sites. Furthermore, the localities in the Bendigo region have been well-documented and a great deal of search and conservation efforts have occurred in the past.

There is estimated to be a continuing decline of 20 to 30% within two generations.

**Eligible under Criterion C2 as Vulnerable**

It is estimated that there are 550 to 1,000 mature individuals, this number is estimated to continue to decline, and fewer than 1,000 mature individuals occur within each subpopulation.

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 <sup>2</sup> or number of locations ≤ 5

**Evidence:**

**Eligible under criterion D as Vulnerable**

It is estimated that there are 550 to 1,000 individuals, and 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

- Cameilleri, M., and Nevill, G. (2010). *National Recovery Plan for the Whipstick Westringia*. Melbourne, Victoria: Department of Sustainability and Environment. Retrieved from: <https://www.environment.gov.au/system/files/resources/8b227f56-0278-448a-a7a7-55777e888bd5/files/westringia-crassifolia.pdf>
- DEPI (2014). *Advisory list of rare or threatened plants in Victoria - 2014*. Department of Environment and Primary Industries, Melbourne.
- Diez, S., Beasley, K., Downs, M., Milikins, A., Orr, R., Price, R. and Venn, D. (1999). *Recovery Plan for the Whipstick Westringia (Westringia crassifolia) 1999-2001*. Department of Natural Resources and Environment, Victoria.
- O'Keefe, M. (2003). *The Ecology and Conservation of Whipstick Westringia (Westringia crassifolia) in the Little Desert National Park, Victoria*. University of Ballarat, Victoria.
- SAC (1991). Flora and Fauna Guarantee Scientific Advisory Committee: Final Recommendation on a Nomination for Listing. Nomination No. 155 *Westringia crassifolia*.
- VicFlora (2019). Flora of Victoria, Royal Botanic Gardens Victoria: *Westringia crassifolia*. Retrieved from: <https://vicflora.rbg.vic.gov.au/flora/taxon/d83b1abc-a268-498a-83a6-7f51941f2d3f>