

Thelypteris confluens Swamp Fern

Taxonomy

Thelypteris confluens (Thunb.) C.V. Morton

The erect, almost 2-pinnate fronds bearing relatively large scales and kidney-shaped, glandular hairy indusia make this a distinctive fern (VicFlora 2021).

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1996).

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

Proposed conservation status

Critically Endangered in Victoria

Criteria B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C2a(i); D

Species Information

Description and Life History

The taxon is a perennial terrestrial fern with subterranean rhizome long-creeping, slender and branched, growing tips covered in broad scales. Fronds erect, 30-100 cm tall; stipe longer or shorter than lamina, dark brown at base, paler and flattened above, shallowly grooved, glabrous with few broad scales at base. Lamina oblong-lanceolate, almost 2-pinnate, dull-green, herbaceous; rachis and pinnae mid-rib deeply grooved, grooves not connecting; lower surface of rachis and veins with papery, pale brown, ovate-orbicular scales and small scattered hairs. Lower pinnae slightly shorter than middle pinnae (pinnae of fertile fronds narrower), sessile, oblong to linear-oblong, lobed almost to midrib; lobes oblong, margins slightly wavy and strongly recurved on fertile fronds; veins free. Sori small, round but often coalescing; indusium kidney-shaped, papery, with short glandular hairs; spores brown.

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Generation Length

The generation length of *Thelypteris confluens* is estimated to be 100 to 200 years. The long-creeping, slender and branched subterranean rhizome confers indefinite longevity on the taxon which is likely to be represented by no more than a single clonal genet at each site. Generation time is therefore indeterminate and limited only by exceedingly rare environmental events. At the time of European settlement the very low but finite risks of peat fire and exceptional drought were possibly the only plausible causes of clone mortality. An equally plausible potential cause of clonal mortality is geomorphological change, resulting in a change in surface flow precluding inundation. For example, the first known Victorian occurrence, the Tawonga Valley subpopulation, is located on a former stream course of the Kiewa River which is responsible for maintenance of site conditions.

Distribution

The taxon is known from only three sites near Tawonga in the Kiewa Valley in north-eastern Victoria. All three occurrences are on freehold land or road reserve. It also occurs in Queensland, New Zealand, North America, west and south Africa, New Guinea, Sumatra, India (VicFlora 2021).

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Habitat

The taxon occurs in peaty subalpine swamps and bogs dominated by *Sphagnum cristatum* (Peat Moss) on drainage lines at an unusually low elevation of only 300 m above sea level for this community. Associated species include *Baloskion australe*, *Carex fascicularis*, *Cyperus sanguinolentus*, *Comesperma retusum*, *Epacris paludosa*, *Hakea microcarpa*, *Imperata cylindrica*, *Isachne globosa*, *Phragmites australis* and *Rynchospora brownii*. The taxon is locally common at each known site although it may be represented by no more than a single clonal genet at each site.

Threats

Key threats to the taxon are pugging of the fragile subalpine bog habitat by cattle, weed invasion from adjacent farmland, climatic warming and drying and the increasing risk of peat fires which have the capacity to eliminate the highly organic substrate supporting peat bog communities.

The habitat of the taxon is plugged by cattle, as a private property is owned by mountain cattlemen who have until recently agisted stock annually on the high plains. Cattle pugging has already broken peat continuity thereby reducing the likelihood of fire extending through entire clonal substrate. Naturally low pH associated with peaty swamp habitat precludes most wetland exotics. Blackberry (*Rubus anglocandicans*) infestations occur nearby but precise habitat is probably too wet for Blackberry dominance. *Salix* (Willow) is naturalised on the Kiewa River nearby but showing no signs of spread into the habitat of the taxon. Drying of the habitat risks invasion by these aggressive exotic weeds. Increasing drought stress may result in clonal mortality and preclude successful recruitment and recolonisation.

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:

Ineligible under Criterion A

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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 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 B1 as Critically Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 16 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA). The taxon may be locally extinct at the Dederang Gap Roadside site.

The taxon is estimated to be severely fragmented naturally and anthropogenically at the landscape scale with the known occurrences isolated at distances likely to exceed the effective dispersal range of the taxon. Although the taxon is wind-dispersed, with the potential also for downstream dispersal by floodwaters, successful recruitment and recolonisation through spore germination is likely to have been an extremely rare event under pre-European settlement conditions and now highly compromised by habitat loss and degradation.

It is estimated to have 1 location. It has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based on the current and projected impact of the identified threats.

Eligible under Criterion B2 as Critically Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 12 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above it is severely fragmented, has 1 location and has a continuing decline in (i), (ii), (iii), (iv) and (v) above.

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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 C2 as Critically Endangered

It is estimated that there are 3 to 50 (likely 15) mature individuals. The clonal nature of the plant suggests that the Victorian population may comprise no more than three or very few genets. The taxon is long-rhizomatous and estimation of clone or genet number is problematic in the absence of excavation or genetic analysis.

The number of mature individuals is estimated to continue to decline, and the number of mature individuals in each subpopulation is 50 or fewer.

Criterion D. Very small or restricted population ^a		Critically Endangered ^a	Endangered ^a	Vulnerable ^a
Number of mature individuals (observed or estimated) ^a		< 50 ^a	< 250 ^a	< 1,000 ^a
D2. Only applies to the VU category ^b 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. ^a		- ^a	- ^a	D2. Typically: ^b AoO < 20 km ² or number of locations ≤ 5 ^a

Evidence:

Eligible under Criterion D as Critically Endangered

The taxon is estimated to have 3 to 50 (midpoint 15) 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.



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SAC (1996). Flora and Fauna Guarantee Scientific Advisory Committee: Final Recommendation on a Nomination for Listing. Nomination No. 373 *Thelypteris confluens*. Department of Environment and Primary Industries, Victoria.

VicFlora (2021). Flora of Victoria, Royal Botanic Gardens Victoria: *Thelypteris confluens*. Retrieved from: <https://vicflora.rbg.vic.gov.au/flora/taxon/96853a83-daaf-44c0-ae15-26010057320e>