

Notice 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 the shrub *Philothea papillata* I.Telford & L.M.Copel. as a VULNERABLE SPECIES in Part 3 of Schedule 1 of the Act. Listing of Vulnerable species is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Philothea papillata is eligible for listing as Vulnerable, as the highest threat category met by the taxon across all categories, under Clause 4.5 (c) and Clause 4.7 because: i) there is a low total number of mature individuals, and (ii) the geographic distribution of the species and 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.

The NSW Threatened Species Scientific Committee has found that:

1. *Philothea papillata* is described by Telford and Copeland (2006) as: “Shrub, erect, multistemmed, to 60 cm tall, bearing root suckers. Branchlets pilose, pale green beneath the white indumentum. Leaves incurved, narrow-elliptic, 9–12 mm long, 1–1.5 mm wide, acute, the margins recurved, crenate, verrucose with 4 or 5 glands on each side of lower surface, both surfaces papillate. Stipules minute, dark purple to lack. Flowers solitary, terminal, on pedicels c. 0.5 mm long. Sepals 5, suborbicular, 1.5–2 mm long, pubescent. Corolla of 5 free petals, white to pale pink. Petals elliptic, 7–10 mm long, pubescent on both surfaces, the abaxial surface sparsely verrucose. Stamens 10, 6.5–8 mm long. Filaments fused at base for 4–5 mm. Anthers ovate, apiculate, c. 1.2 mm long, the apicula glabrous or minutely papillate. Gynoecium of 5 basally-fused carpels, the carpels tomentose, pale green; style terete, broadening towards the base, c. 4 mm long, pilose on lower three-quarters; stigma capitate, minutely 5-lobed. Disc obscure. Fruit not seen.” Flowering has been recorded in August (Sheringham 2019) and September (Telford and Copeland 2006).
2. The geographic distribution of *Philothea papillata* is very highly restricted. The species is known only from the type locality of a sandstone cliff escarpment in Sherwood Nature Reserve (NR), east of Glenreagh, northern NSW. This lies within the traditional lands described by Horton (1996), belonging to the Gumbaynggirr First Nations people. The area of occupancy is estimated to be 8 km², based on the species’ occupying two 2 x 2 km grid cells, the spatial scale of assessment recommended by IUCN (2019). The extent of occurrence (EOO) is also estimated to be 8 km². The EOO is reported as equal to AOO, despite the range of the species (estimated to be approximately 1 km²) measured by a minimum convex polygon containing all the known sites of occurrence, being less than AOO. This is to ensure consistency with the definition of AOO as an area within EOO, following IUCN Guidelines (2019).

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3. A detailed population census undertaken by Sheringham (2019) found that there are 328 individuals of *Philotheca papillata* in four patches across cliff top escarpment within Sherwood NR.
4. *Philotheca papillata* exists in a fire-prone landscape and Sherwood NR generally has a history of frequent fires (Telford and Copeland 2006; NSW NPWS 2017; G Hart *in litt.* June 2020). There were large wildfires in 1994, 1996 and 2002 that burnt most of the northern and central sections of the reserve (NSW NPWS 2009), but for the central section of the reserve where *Philotheca papillata* occurs, digital records (NPWS Fire History - Wildfires and Prescribed Burns dataset; SEED 2020) are only available since 2000. Across the known range of *P. papillata*, there were recent fires recorded in 2001, 2006 and 2013 (SEED 2020). The 2001 and 2006 fires burnt different parts of the *P. papillata* population, and the 2013 burnt the entire population. Prior to 2000 the fire frequency where *P. papillata* occurs is unknown. Mapping of the 2019-20 bushfires (SEED 2020) indicates the known range of *P. papillata* was unburnt.
5. *Philotheca papillata* has a root-suckering habit that may enable it to resprout after fire (Telford and Copeland 2006; Sheringham *in litt.* June 2019). The time it takes for regeneration of *P. papillata* following fire from either resprouting individuals or from seedlings is unknown. Sheringham (2019) noted 13% of individuals were flowering at the start of the flowering season in August 2019, six years after the population was burnt. It is likely flowering also occurred in some years prior to 2019 but data are unavailable. A fire-free interval of 6-15 years, based on limited data for other resprouters (some eucalypts and Proteaceae species) (Keith 1996), may be needed to allow juvenile plants to become fire resistant, whereby they develop the ability to resprout after the next fire. If there are fires with greater frequency than this, new recruits to the population will be killed without contributing to future generations and replacing the established plants that die, and hence the population may decline (Keith 1996; Clarke *et al.* 2009).
6. There are currently few active threats to the population of *Philotheca papillata*. Sheringham (2019) reports that the health of the population was good with no sign of mortality, disease or dieback. However, there is a plausible risk to the population if it experiences a regime of high frequency fire. All individuals of *P. papillata* are found in small patches that are likely to be concurrently impacted by a single fire event. The pathogen *Phytophthora cinnamomi* is a possible future threat if *Philotheca papillata* is found to be susceptible. Sheringham *in litt.* (2019) notes that the pathogen is found in other parts of the region, and members of the Rutaceae, such as the closely related taxon *Philotheca myoporoides*, are known to be susceptible (Taylor 1974). Whilst continuing decline is not currently inferred, the species should be reassessed if there is evidence of mortality and a lack of recruitment between fires, or it is found to be susceptible to *Phytophthora cinnamomi*.

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7. *Philothea papillata* I.Telford & L.M.Copel. is not eligible to be listed as an Endangered or a Critically Endangered species.

8. *Philothea papillata* I.Telford & L.M.Copel. is eligible to be listed as a Vulnerable species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a high risk of extinction in Australia in the medium-term future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

Appendix 1

Assessment against Biodiversity Conservation Act criteria

The Clauses used for assessment are listed below for reference.

Vulnerable under Clause 4.5(c) and Clause 4.7.

Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Data Deficient.

(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:			
	(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.
(2) - The determination of that criteria is to be based on any of the following:			
	(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: Not met.

* Although *Philothea papillata* meets the threshold for very highly restricted geographic distribution (EOO and AOO) for Critically Endangered, the species is currently considered to only meet one of the three conditions, i.e. it only meets (d), and not either (e) or (f). Hence for the overall assessment, Clause 4.3 is not met.

The geographic distribution of the species is:			
	*(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or

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	(c)	for vulnerable species	moderately restricted,
and at least 2 of the following 3 conditions apply:			
	(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 C)

Assessment Outcome: Not met.

* Although *Philothea papillata* meets the threshold for low number of mature individuals (Endangered), the species is not currently considered to meet either (d) or (e). Hence for the overall assessment, Clause 4.4 is not met.

The estimated total number of mature individuals of the species is:			
	(a)	for critically endangered species	very low, or
	*(b)	for endangered species	low, or
	(c)	for vulnerable species	moderately low,
and either of the following 2 conditions apply:			
	(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,

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		(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: Vulnerable under Clause 4.5(c).

The total number of mature individuals of the species is:			
	(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

The probability of extinction of the species is estimated to be:			
	(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: Vulnerable.

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.
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Dr Anne Kerle
Chairperson
NSW Threatened Species Scientific Committee

Supporting Document:

Gross CL, Scott J (2020) Conservation Assessment of *Philotheca papillata* I.Telford & L.M.Copel. (Rutaceae). Version 1.0. NSW Threatened Species Scientific Committee.

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