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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 remove *Xanthosia scopulicola* J.M.Hart & Henwood from the Schedules of the Act by omitting reference to this species from Part 3 of Schedule 1 (Vulnerable species). The omission of species from the Schedules is provided for by Part 4 of the Act.

Summary of Conservation Assessment

The NSW Threatened Species Scientific Committee has found that:

1. *Xanthosia scopulicola* J.M.Hart & Henwood (family Apiaceae) was described by Hart and Henwood (2000) as an "ascending perennial subshrub to 20 cm high. Taproot woody with a flaky or corky surface. Plants stellately tomentose on young stems and leaves; the mature stems excorticating. Leaves grey-green, cauline, juvenile leaves trifoliolate, adult leaves simple. Petiole 2–15 mm long, angular, grooved above, sheathing shortly at the base, sheaths 1–2 mm long. Leaflets of the trifoliate leaves ovate, the terminal leaflet longer than the lateral leaflets, terminal leaflet 5–20 mm long, 5–25 mm wide, lateral leaflets 3–5 mm long, 3–4 mm wide, petiolulate or sessile. Simple leaves ovate, 5–20 mm long, 5–25 mm wide. Leaf margins flat to slightly recurved, crenate; apex obtuse. Inflorescence a compound umbel with 2 or 3 rays, 1–4 flowers per ray; flowers bisexual or rarely male. Rays terete, 2–4 mm long. Involucral bracts 2 or 3, triangular, foliaceous, green, longer or shorter than the rays, 2–3 mm long, *c.* 1 mm wide, apex acute. Bracteoles 3, elliptic to obovate, petaloid, yellow, shorter or longer than flowers, 3–5 mm long, 1–3 mm wide, apex acuminate or obtuse. Inflorescences pedunculate; peduncles 5–25 mm long. Flowers pedicellate; pedicels 1–2 mm long. Sepals ovate, 1–1.2 mm long, *c.* 0.7 mm wide, green or yellow, base truncate, apex obtuse, glabrous. Petals longer than sepals, 1.0–1.2 mm long, *c.* 0.5 mm wide, white, midrib adaxially keeled and bridged with the inflexed appendage, apex obtuse, appendage smooth. Nectaries raised and prominent, *c.* 0.9 mm high, white or yellow, hirsute. Styles 1.3–2.3 mm long. Ovary hirsute. Male flowers having an undeveloped inconspicuous ovary, with the styles barely protruding above the nectaries. Fruit brown, ovate, 2.0–2.2 mm long, 2.0–2.2 mm wide, *c*. 0.5 mm deep. Monocarps hirsute on the summit, elliptic in transverse section, 7–9-ribbed; ribs keeled."

2. *Xanthosia scopulicola* is restricted to sandstone cliff faces or rocky outcrops of the upper Blue Mountains. It is found along approximately 25 km of escarpment in the Jamison and Kedumba Valleys between Kings Tableland in Wentworth Falls and the Megalong Cleft in Katoomba, and on the northern side of the Grose Valley. In 2019, the species was recorded for the first time from the northern escarpment of the Grose Valley, where it has now been found at three sites with a linear extent of 10 km. Most of the population is located within Blue Mountains National Park.

3. The geographic distribution of *Xanthosia scopulicola* is highly restricted. The Extent of Occurrence (EOO) is estimated at 183 km^2, and the Area of Occupancy (AOO) is estimated at 52 km^2. The EOO is based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of assessment recommended

by IUCN (2024). The AOO is based on 2 x 2 km grid cells, the scale recommended for assessing area of occupancy by IUCN (2024).

4. The total population size of *Xanthosia scopulicola* is estimated to be a minimum of 2,000. The population estimate is based on an extrapolation of counts from surveys along walking tracks targeting known records (V. Wong pers. obs. October 2022). Based on the potential for gene exchange between individuals, there are considered to be two populations of *X. scopulicola*: one in the Grose Valley, and one in Jamieson/Kedumba Valleys.

5. *Xanthosia scopulicola* grows in skeletal soils in cracks and crevices of sandstone cliff faces, on ledges, under overhangs or in clay bands in the rockface, or (less commonly) on rocky outcrops above the cliffs (ALA 2024; National Herbarium of New South Wales collections database accessed 20 February 2024). Known occurrences are predominantly on south-facing cliffs along the northern escarpments of the Grose and Jamieson Valleys in the Blue Mountains NP, at altitudes of (550–)750–1000 m elevation. Where aspect is included in occurrence records, south facing is the most commonly given, although aspect varies, presumably due to undulations in the cliff face. Mean annual rainfall at Katoomba (the nearest weather station, 1017 m a.s.l.) is 1410 mm (Bureau of Meteorology 2024). Associated species include *Alania cunninghamii*, *Amperea xiphoclada*, *Baeckea linifolia*, *Blandfordia cunninghamii*, *Dracophyllum secundum*, *Empodisma minus*, *Epacris rigida*, *Eucalyptus oreades* and *E. piperita*, *Gleichenia dicarpa, G. rupestris,* and *Sprengelia monticola* (ALA 2024; National Herbarium of New South Wales collections database accessed 20 February 2024).

6. *Xanthosia scopulicola* is a perennial subshrub with a deep taproot and a compact and much-branched habit (Hart and Henwood 2000; PlantNET 2024). There is no information available on longevity or time to maturity. However, the slow development of the excoriating bark over at least several years (V. Wong pers. obs. July 2023) suggests that the subshrub can live for many years. Pollination mechanisms of eastern Australian *Xanthosia* are unknown but, as the flowers of *X. scopulicola* are inconspicuous it is inferred they may be largely self-pollinated. The fruit dehisces into two single-seeded indehiscent mericarps, which are the unit of dispersal.

7. *Xanthosia scopulicola* at Narrow Neck was observed to resprout after fire and to have very limited recruitment from seed post-fire, contrasting with the co-occurring *X. pilosa*, which was observed to have mass recruitment from seed after the same fire in late 2019 (V. Wong pers. obs. December 2021). Resprouting individuals have been observed to have flowers two years after fire but are likely to flower in the first year after fire (V. Wong pers. obs. December 2021).

8. All known individuals of *Xanthosia scopulicola* occur within two expanses of habitat, along the (predominantly northern) escarpments of the Jamison and Kedumba Valleys and along the northern escarpment of the Grose Valley. These two areas constitute two threat-defined locations, based on the most serious plausible threat of adverse fire regimes. The Jamieson/Kedumba Valleys and the Grose Valley are geographically separated and their different fire histories indicate they are unlikely to be affected by the same fire event.

9. Previously documented threats to *Xanthosia scopulicola* include habitat disturbance from track maintenance, disturbance by walkers, urban runoff and weed encroachment. Most of these threats are associated with walking tracks and urban drain outflows within known habitat, which is strongly suspected to be a very small proportion of the total extent of this species. Other plausible threats to *X. scopulicola* include adverse fire regimes, and increased frequency and intensity of both drought and extreme rainfall events due to climate change.

10. Continuing decline is not evident in the known populations of *Xanthosia scopulicola*. Due to the preferred habitat of largely unvegetated, high, south-facing cliffs that the species occupies, neither high frequency or high severity fire are considered to be causing declines. The species' ecology and habitat preference also mean the species is resilient to the effects of drought and extreme rainfall events, and no evidence of these mechanisms causing non-trivial declines is known. All other threats, including anthropogenic disturbance, urban runoff and weed invasion are considered to be trivial in nature. Field observations and other available data do not demonstrate an observed, estimated, inferred, or projected continuing decline in EOO, AOO, area, extent and/or quality of habitat, number of locations or populations, or number of mature individuals for *X. scopulicola*.

11. The identified plausible threats to *Xanthosia scopulicola* are considered unlikely to rapidly drive the species to extinction in a very short time (1-2 generations) across its full distribution.

12. In view of the above, the NSW Threatened Species Scientific Committee is of the opinion that *Xanthosia scopulicola* J.M.Hart & Henwood is not eligible to be listed as a threatened species in any category under the Act.

Assessment against *Biodiversity Conservation Regulation* 2017 criteria
The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome: *Xanthosia scopulicola* J.M.Hart & Henwood was found to be ineligible for listing as a threatened species as none of the criteria were met.

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

The geographic distribution of the species is:						
	(a)	for critically endangered species	very highly restricted, or			
	(b)	for endangered species	highly restricted, or			
	(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 Clause C)
Assessment Outcome: 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,
			(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: Not met

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: Not met

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.

Professor Caroline Gross
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

Wong, V, Gibbons K.L. (2024) Conservation Assessment of *Xanthosia scopulicola* J.M.Hart & Henwood (Apiaceae). NSW Threatened Species Scientific Committee.

References:

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Hart JM, Henwood MJ (2000) Systematics of the *Xanthosia pilosa* complex (Apiaceae: Hydrocotyloideae). *Australian Systematic Botany* **13(2)**,245–66.

IUCN Standards and Petitions Subcommittee (2024) Guidelines for Using the IUCN Red List Categories and Criteria Version 16 (March 2024). Available at: http://www.iucnredlist.org/documents/RedListGuidelines.pdf (accessed on 18 April 2024).

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