Proposed Publication date: 31/05/19

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 the shrub *Persoonia mollis* subsp*. revoluta* S.Krauss & L.A.S.Johnson 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

Persoonia mollis subsp. *revoluta* is eligible for listing as Vulnerable, as the highest threat category met by the taxon across all categories, under Clause 4.3(c) (d) (e i iii) because: i) the distribution of the species is highly restricted with an area of occupancy of 104 km^2 and an extent of occurrence of 1100 km^2; ii) the species is known from only seven locations; and iii) there is a continuing decline inferred in the abundance, geographic distribution and number of locations of the species.

The NSW Threatened Species Scientific Committee has found that:

1. *Persoonia mollis* subsp. *revoluta* S.Krauss & L.A.S.Johnson (family Proteaceae) is a prostrate to decumbent shrub, 10-50 cm high, up to 4 m diameter; leaves glossy-green, pliable but not soft, almost fleshy, elliptical to oblong-ovate to oblong-lanceolate, obtuse (to rarely acute), 2.5–4 cm long, 4–10 (–15) mm wide, sparsely silky-pubescent to glabrous on the undersurface when young, the longest hairs c. 0.7 mm long, the midvein obscure or (rarely) prominent, the margins revolute; buds sparsely silky pubescent to ± glabrous, the hairs 0.3–1 mm long, pale (Krauss and Johnson 1991; PlantNET 2019).

2. *Persoonia mollis* subsp. *revoluta* is endemic to New South Wales where it is currently known to occur in seven populations, primarily in the area between Mittagong, Paddys River and High Range with an outlying population in the Bindook Highlands. Most of the populations are in the Burragorang sub-region of the Sydney Basin bioregion (SEWPaC 2012) between 600 and 800 m a.s.l., and with an average annual rainfall across the range of between 700 and 900 mm.

3. *Persoonia mollis* subsp. *revoluta* occurs mainly on relatively deep sandy soils and has been recorded predominantly from flat areas on broad ridgetops and upper slopes. The surface geology mapped at most locations is Hawkesbury Sandstone and most records are in areas mapped as the Soapy Flat or Sandy Flat soil landscapes (OEH 2017).

4. The distribution of *Persoonia mollis* subsp. *revoluta* is moderatly restricted. The area of occupancy (AOO) is estimated to be 104 km^2, based on 2 x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2017). The extent of occurrence is estimated to be 1100 km^2.

5. The primary threat to *Persoonia mollis* subsp. *revoluta* is inappropriate fire regimes. *Persoonia mollis* subsp. *revoluta* is a fire-sensitive shrub (Krauss 1997) and its seedlings are likely to establish in greatest numbers after fire from the soil seedbank (Auld *et al*. 2007). *Persoonia mollis* subsp. *revoluta* has poorly understood dormancy mechanisms and low germination rates in fresh seeds (Krauss 1994), however germination is probably promoted

by chemical cues associated with smoke or ash. Most records of *P. mollis* subsp. *revoluta* are from areas which appear not to have been burnt in many years (OEH 2018). The species appears to persist in these areas only along the margins of vegetation where seedlings are likely to experience less competition from established plants. Factors causing this long absence of fire include the fragmentation of highly inflammable wooded areas by historical clearing for agriculture, increased vigilance and active fire suppression in these cleared areas. These factors may be operating synergistically throughout parts of the range of *P. mollis* subsp. *revoluta* such that the threat of low frequency of fire is ubiquitous in those areas. Conversely, populations of *P. mollis* subsp. *revoluta* close to urban areas are likely to be threatened by frequent fires in the future due to hazard reduction burns, defensive back-burns and arson. Frequent fires may cause local extinctions of the species if the interval between fires is less than the primary juvenile period.

6. Other ongoing threats to the survival of *Persoonia mollis* subsp. *revoluta* include land clearing for agriculture, mining and urban expansion. Approximately 40% of the vegetation on the Soapy Flat and Sandy Flat soil landscapes, the main habitat for *P. mollis* subsp. *revoluta*, has been cleared, predominantly for agriculture (Tozer *et al.* 2010). Less than 10% of remaining vegetation in these areas is reserved for conservation with the remainder on Crown or Freehold land (LPI 2012). The effect of invasive species on *P. mollis* subsp. *revoluta* is unknown, although it is expected that dense weed growth, especially immediately after fire, will be detrimental to its germination and persistence. 'Clearing of native vegetation' and 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' are listed as Key Threatening Processes under the Act.

7. *Persoonia mollis* subsp. *revoluta* S.Krauss & L.A.S.Johnson is not eligible to be listed as an Endangered or Critically endangered species.

8. *Persoonia mollis* subsp. *revoluta* S.Krauss & L.A.S.Johnson 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*:

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: Vulnerable via Clause 4.3(c) (d) (e i ii iii iv)

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)	number of locations in which the species occurs or of populations of the 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

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: Data defficient

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.~~

Dr Marco Duretto
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

Simpson C (2019) Conservation Assessment of *Persoonia mollis* subsp. *revoluta* S.Krauss & L.A.S.Johnson (Proteaceae). NSW Threatened Species Scientific Committee.

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