

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 *Pomaderris gilmourii* var. *gilmourii* N.G.Walsh as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act. Listing of Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that *Pomaderris gilmourii* var. *gilmourii* N.G.Walsh has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method as provided for by Part 4.14 of the Act. After due consideration of DCCEEW (2022), the NSW Threatened Species Scientific Committee has made a decision to list the species as Endangered.

Summary of Conservation Assessment

Pomaderris gilmourii var. *gilmourii* N.G.Walsh was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3 (b) (d) (e, iii) because: (i) *P. gilmourii* var. *gilmourii* has a highly restricted geographic distribution with estimated extent of occurrence (EOO) of 182 km² and area of occupancy (AOO) of 40 km²; (ii) it is considered to occur at 2 or 3 threat-defined locations; and (iii) continuing decline in the quality of habitat is inferred due to the effects of adverse fire regimes, in combination with increased frequency and severity of drought due to climate change.

The NSW Threatened Species Scientific Committee has found that:

1. *Pomaderris gilmourii* var. *gilmourii* N.G.Walsh (Rhamnaceae) is defined by Walsh (1989) as one of two varieties of *P. gilmourii* (the other being var. *cana* N.G. Walsh). Walsh (1989) described the species *Pomaderris gilmourii* (encompassing both varieties) as: "Shrub to 4 m high. Branchlets glabrescent but covered when young by semi-appressed to appressed simple hairs or tufted trichomes, with or without an underlying hoary layer. Petiole 2–8 mm long. Lamina obovate, oblanceolate or narrowly elliptic, 8–30 (rarely to 40) mm long, 4–13 mm wide; apex acute to obtuse or rounded; penninerved with 3–5 pairs of lateral veins which are inconspicuous above; upper surface glabrous or with a line of short hairs above the midvein; lower surface densely covered with fine stellate trichomes, with or without a superficial layer of appressed, shining simple hairs. Stipules subulate, to 4 mm long, soon deciduous. Inflorescences loosely paniculate, pyramidal or rounded, mostly 2–5 cm diam., terminal on the main axis and short lateral branches and rather prolific. Pedicels 1–4 mm long. Sepals oblong, acute at apex, covered with short silver-grey hairs externally, glabrous and cream-coloured on the inner face. Petals absent. Stamens alternating with sepals; filament 1–1.5 mm long; anther c. 0.5–1 mm long. Ovary inferior, trilocular, the summit densely covered by erect simple hairs. Style c. 1 mm long, divided almost to the base into 3 spreading arms." PlantNet (2023)

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additionally describes that *Pomaderris* species have capsular fruits that are septicidal (split open along the sutures between adjacent carpels) and separate into 3 pyrenes that open on the inner face; and in *P. gilmourii* that the capsule and hypanthium bear appressed simple hairs.

- Pomaderris gilmourii* var. *gilmourii* is distinguished from its conspecific variety by having the following features: leaves with margins glabrous and thickened or minutely recurved, appearing from beneath as being bordered; leaf undersurface with a dense layer of appressed, shining, silky, simple hairs overlying the fine stellate trichomic hairs; upper leaf surface quite glabrous; sepals c. 1.5 mm long; anthers oblong; style (sparsely) pubescent only below its point of division, glabrous above (Walsh 1989).
- Pomaderris gilmourii* var. *gilmourii* is endemic to NSW and the South East Coastal Ranges subregion of the Interim Biogeographic Regionalisation of Australia (SEWPaC 2012). The species is currently known to occur at only seven sites in the catchment of the Deua River, in the vicinities of Coondella Trig to Mount Donovan and north of Bendethera, all within Deua National Park. These seven sites are considered to make up six discrete subpopulations, all separated by at least 1 km over which gene flow may be restricted. The species may also occur in other areas within the Mountains of the Moon region of Deua National Park that have been too difficult to access (J Miles 2021, pers. comm. 3 August 2021).
- The geographic distribution of *Pomaderris gilmourii* var. *gilmourii* is highly restricted. The extent of occurrence (EOO) is estimated to be 182 km², based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of assessment recommended (IUCN Standards and Petitions Subcommittee 2022). The area of occupancy (AOO) is estimated to be 40 km², based on 2 x 2 km grid cells, the scale recommended for assessing area of occupancy (IUCN 2022).
- Information about the habitat of *Pomaderris gilmourii* var. *gilmourii* is limited, with most data derived from two localities north of Coondella Trig that have been more frequently visited. Known sites coincide with surface geology derived from volcanic extrusions (Comerong Volcanics) of the middle to late Devonian period (Wyborn and Owen 1983, 1986). Most sites are recorded as exposed rocky outcrops on ridges, cliffs and upper slopes derived from rhyolite, with skeletal to shallow soils, at elevations between 300 and 980 metres above sea level (AVH 2021). In these situations *Pomaderris gilmourii* var. *gilmourii* has been recorded as growing in open to dense shrubland or open woodland with associated species that include *Eucalyptus stenostoma*, *Hakea dactyloides*, *Acacia subtilinervis*, *Allocasuarina littoralis*, *Leptospermum deuense*, *Leptospermum trinervium*, *Astrotricha latifolia*, *Pultenaea daphnoides*, *Acacia ulicifolia*, *A. subtilinervis*, *Boronia ledifolia*, *B. anethifolia*, *Pimelea linifolia*, *Dodonaea rhombifolia*, *Platysace lanceolata*, *Prostanthera porcata*, *Olax stricta*, *Kunzea ambigua*, *Hovea purpurea*, *Westringia saxatilis*, *Melaleuca hypericifolia*, *Rulingia pannosa*, *Philotheca trachyphylla*, *P. myoporoides* subsp. *brevipedunculata* and *Leucopogon setiger*. The conspecific variety *Pomaderris gilmourii* var. *cana* has previously also been recorded at one of these sites (DECC 2005, AVH 2021, DPE 2022a, DCCEEW 2022b). Records of *P. gilmourii* var. *gilmourii* north of Bendethera are noted to be from a more sheltered

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site (or sites) with southerly aspect in open forest with *Eucalyptus smithii*, *Acacia falciformis*, *Grevillea victoriae* and *Pittosporum undulatum*. *P. gilmourii* var. *gilmourii* is likely to occur in the Coondella Rhyolite Shrub Woodland plant community type (PCT 3644 of the Eastern NSW PCT Classification version 1.1; DPE 2022b) but is not necessarily restricted to this.

6. There are insufficient data to ascertain the total population size of *Pomaderris gilmourii* var. *gilmourii*. Most records of the species lack information on the number of individuals observed or estimated. Estimates of the number of mature individuals are available from only two localities within the subpopulation located north of Coondella Trig: 31 plants in one locality (in 2015) and >50 plants in the other (2021). For the other occurrences no quantitative size estimates have been recorded, only descriptive indicators of frequency in some instances, viz. “occasional” in the vicinities of Mount Donovan, Mount Bendethera and north of Bendethera; and “fairly common” in the subpopulation in Diamond Creek catchment.
7. There is very limited information about the longevity, fecundity, reproductive strategies, seed ecology, seedling germination and recruitment of *Pomaderris gilmourii* var. *gilmourii*. The time to reproductive maturity, longevity and generation length of this species and variety are unknown, however, a longevity of 10–25 years has been identified for many *Pomaderris* species (Benson and McDougall 2000, citing N. Walsh pers. comm.). Time to reproductive maturity is inferred to be 2–6 years based on estimates of other species in the genus (NSW OEH 2014). Buds and flowers of *P. gilmourii* var. *gilmourii* have been recorded throughout the year (AVH 2021).
8. Like most *Pomaderris* species, there is little information on gene flow within *Pomaderris gilmourii* var. *gilmourii*, as the vectors of pollination and of seed dispersal are unknown. Insects are likely to be the primary pollinators of some other *Pomaderris* species (Patykowski *et al.* 2014). Though not yet known in *P. gilmourii* var. *gilmourii*, other species in the genus are known to produce seed with elaiosomes, oil-rich structures thought to be an adaptation to facilitate dispersal by ants (Berg 1975; Lengyel *et al.* 2010; Patykowski *et al.* 2014), suggestive of short-distance seed dispersal (Patykowski *et al.* 2014).
9. Asexual reproduction via apomixis is also known in a number of species within the *Pomaderris* genus, potentially a result of low mate availability, pollinator limitation or stress-induced seed abortion *in situ* (Chen *et al.* 2019). Apomixis may facilitate the persistence of small *Pomaderris* subpopulations where the mother plant proves fit for the environment and the environment is relatively stable (van Dijk 2003; Chen *et al.* 2019) Although limited information on population genetics exists for *Pomaderris gilmourii* var. *gilmourii*, if asexual seed production (apomixis) is confirmed it may indicate that many individuals in a population are genetically identical and incapable of adaptive change. However, many apomictic species still possess a normal sexual reproductive pathway which provides opportunity for genetic diversification (Hand and Koltunow 2014).
10. The known localities of occurrence of *Pomaderris gilmourii* var. *gilmourii* are considered to compose six subpopulations, using a separation distance of 1 km based on the presumption that localities within that distance may be close enough to allow exchange of genetic material through pollination or seed dispersal.

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11. There is scant evidence available regarding the fire response of *Pomaderris gilmourii* var. *gilmourii*. While up to seven prescribed fires or wildfires are recorded as having occurred in the past 55 years in the areas where *Pomaderris gilmourii* var. *gilmourii* is distributed (DPIE 2021), in most cases it is unknown if the subpopulations were burnt. Only a single observation of post-fire response of the species has ever been recorded, in January 2007 of “good regeneration” probably from the large 2001–2002 fire (K. McDougall, pers. comm. 5 August 2021). At the one site investigated since the extensive 2019–2020 wildfires, north of Coondella Trig, *P. gilmourii* var. *gilmourii* plants were found not to have been affected because the fire had petered out at the rocky outcrop despite the adjacent slopes having been heavily burnt (G Phillips, pers. comm. July 2021).
12. Many species of *Pomaderris* that occur in fire-prone environments have seeds with inherent physical dormancy that allow them to remain dormant and accumulate in the soil (‘seed bank’). Heat from high intensity fires kills standing plants and breaks the dormancy of seed in the soil, allowing for germination once one or more environmental conditions (e.g. moisture, seasonal temperature, light) subsequently become suitable (Pausas and Lamont 2022; Lamont and Pausas 2023). That this occurs in many *Pomaderris* species is supported by data in AusTraits (Falster *et al.* 2023), by field observations of mass seedling emergence after fire (e.g. Patykowski *et al.* 2014; Natale 2016; Le Breton *et al.* 2020) and by evidence from experiments in which germination was maximised after treatments at high temperatures (60–120°C) (e.g. Warcup 1980; Ooi *et al.* 2014; Patykowski *et al.* 2016; Natale 2016; Liyanage and Ooi 2018; Le Breton *et al.* 2020; Chan *et al.* 2022). The longevity of *Pomaderris gilmourii* var. *gilmourii* seed in the soil seed bank is unknown, however the seeds of many other *Pomaderris* species are estimated to be persistent (up to 5 years) or long-persistent (>5 years) (Falster *et al.* 2023). However, it is possible the whole of the viable seed bank might be exhausted by a single such fire, as suggested by Natale (2016) for *P. adnata*. Although some *Pomaderris* species have been observed to exhibit resprouting following fire (Falster *et al.* 2023; Le Breton *et al.* 2020), *Pomaderris gilmourii* var. *gilmourii* is not suspected to resprout (N. Walsh pers. comm. November 2021).
13. The main threat to *Pomaderris gilmourii* var. *gilmourii* is adverse fire regimes (high fire frequency) and interactions between fire and drought and between fire and herbivory. The taxon has a restricted geographic distribution meaning that a single bushfire can impact the entire range of the taxon, as occurred in 2019–2020, however its habitat in rocky areas affords its subpopulations some protection from fire and it is unlikely that a single fire event would affect all individuals of the taxon. In consideration of this the number of threat-defined locations is estimated to be two or three.
14. High frequency fire is an inferred future threat to *Pomaderris gilmourii* var. *gilmourii* that may cause decline in habitat area and quality. Currently, it is possible that given the frequent fire history in the region, soil-stored seed could have already been utilised in some subpopulations or sites. However, it is equally possible that the taxon has evaded previous burns in some/all subpopulations and soil-stored seed remains intact and viable. Surveys since the 2019/20 fire season have not observed any mortality of mature plants, with outcrops harbouring *P. gilmourii* var. *gilmourii* remaining largely unburnt and harbouring healthy, reproductively mature plants

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despite the ridges around them being heavily affected by fire (G. Phillips pers. obs. June 2021). The risk of this threat may increase into the future however, given the likelihood of more frequent fires and potential consequent reduction in the fire-free interval in the future is indicated by predicted increases in the number of days of elevated temperatures and in the forest fire danger indices (FFDI) under climate change models for south-east Australia (Clarke 2015; Dowdy *et al.* 2019; Bureau of Meteorology and CSIRO 2020). Use of prescribed burns, which are incorporated into fire management strategies to reduce fuel loads and minimise the spread of bushfire in Deua National Park (DPIE 2011), may also increase the frequency of fire affecting subpopulations of *P. gilmourii* var. *gilmourii*. Future multiple fires in close succession could exhaust soil-stored seed reserves and prevent plants from reaching maturity (DEWHA 2008, citing DECC 2005; Gallagher *et al.* 2021). 'Anthropogenic Climate Change' 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 a Key Threatening Processes under the Act.

15. Increased frequency and severity of drought due to climate change is considered a plausible future threat to *Pomaderris gilmourii* var. *gilmourii*. Predictions for an increase in the number of days of elevated temperatures and in the FFDI are useful indicators of drought. Conditions which contribute to successful germination and seedling establishment post-fire, such as sufficient rainfall (Vickers *et al.* 2021), may be negatively affected by increased post-fire droughts due to climate change (Clark 2015, Dowdy *et al.* 2019). Pre-fire droughts, as occurred in 2019, could also limit population persistence by reducing health and reproductive output of standing plants (Enright *et al.* 2015). Increased incidence of extreme temperatures could also limit population viability through attrition of physically dormant seeds (Ooi *et al.* 2014). Drought and increased frequency of fire may act in concert through processes such as the 'interval squeeze' whereby climate drives increased pressure via higher fire frequency, while also reducing resilience via slower rates of maturation and lower fecundity (Enright *et al.* 2015; Henzler *et al.* 2018).
16. *Pomaderris gilmourii* var. *gilmourii* N.G.Walsh is not eligible to be listed as a Critically Endangered species.
17. *Pomaderris gilmourii* var. *gilmourii* N.G.Walsh is eligible to be listed as an Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a very high risk of extinction in Australia in the near future, as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

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Assessment against *Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome: Endangered under Clause 4.3 (b) (d) (e, iii)

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: Endangered under Clause 4.3 (b) (d) (e, iii).

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.

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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 deficient.

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

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(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.
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Senior Professor Kristine French
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022a) Conservation advice for *Pomaderris gilmourii* var. *gilmourii*. Australian Government, Canberra, ACT. Available at:
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