

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. *cana* N.G.Walsh as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act and, as a consequence, to omit reference to *Pomaderris gilmourii* var. *cana* N.G.Walsh in Part 3 of Schedule 1 (Vulnerable species) of the Act. Listing of Critically Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that *Pomaderris gilmourii* var. *cana* N.G.Walsh has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method (DCCEEW 2022). Acceptance of this assessment is provided for by Part 4.14 of the Act.

The NSW Threatened Species Scientific Committee accepts the assessment outcome of the Commonwealth Threatened Species Scientific Committee in its Conservation Advice for *Pomaderris gilmourii* var. *cana* of Critically Endangered under Criterion 2: B1ab(iii)+2ab(iii) and Criterion 4: D (DCCEEW 2022).

Summary of Conservation Assessment

Pomaderris gilmourii var. *cana* N.G.Walsh was found to be Critically Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause: 4.3 (a)(d)(e)(iii) and 4.5 (a). The main reasons for this species being eligible are: i) the species has a very restricted geographic range with an EOO and AOO of 4 km²; ii) there is a single threat-defined location; iii) there is evidence of continuing decline in the quality and extent of habitat due to too frequent fires, browsing by feral herbivores and disease and; iv) there is an extremely low number of <50 individuals.

The NSW Threatened Species Scientific Committee has found that:

1. *Pomaderris gilmourii* var. *cana* N.G.Walsh (Rhamnaceae) is a shrub to 4 m high. Leaves are elliptical, to 35 mm long by 4–13 mm wide. Leaves alternate up the stem. Leaves are hairless on the upper surface, except for a line of minute hairs along the midvein. The small five lobed flowers are creamish to yellow, lack petals and form in clusters (25 cm diameter at the ends of branchlets). Flowers fall early. The lobes of the flower (sepal) are approximately 1 mm long and the style is divided into three arms shortly above its base. The fruit is unknown, but in other *Pomaderris* species it is capsule-like, splitting longitudinally into three slightly woody segments (Walsh 1989, DEWHA 2008, Wood 2019). *Pomaderris gilmourii* var. *cana* differs from the co-occurring variety, *Pomaderris gilmourii* var. *gilmourii* in having leaves that are dull grey (rather than shining beneath) due to the absence of a layer of fine silky hairs on the lower surface of the leaves, leaf stalks, and branchlets that is found in *P. gilmourii* var. *gilmourii* (Wood 2019). The leaf margins are also not

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thickened which is particularly evident on the under surface of the leaf. Thus, the leaf does not have the apparent 'border' (when viewed from beneath) seen in *P. gilmourii* var. *gilmourii*.

- Pomaderris gilmourii* var. *cana* is known from a single population in Deua National Park, approximately 16 km west-southwest from Moruya NSW, approximately 1.9 km north of Coondella Trig (Walsh 1989). Only two vouchered records of this taxon exist (collected in 1985 and 1987, AVH 2021) and it is likely that both records were from the same locality (N. Walsh pers. comm. 30 July 2021 in DCCEEW 2022).
- The plant was noted as being 'occasional' in 1985 and two individual plants were recorded in 1987 (AVH 2021). The taxon has not been observed since 1987, despite ongoing surveys from 2007 to 2021. Species identification within the genus *Pomaderris* is notoriously difficult. The more common variety, *Pomaderris gilmourii* var. *gilmourii*, is locally abundant within the area and closely resembles *Pomaderris gilmourii* var. *cana* (K. McDougall pers. comm. August 2021 in DCCEEW 2022). However, all surveys have been carried out by experienced botanists familiar with the distinction between varieties. The area within the vicinity of the recorded locality has been observed to contain 'plenty of other rhyolite outcrops', however they are inaccessible because of steep terrain (J. Miles pers. comm. 3 August 2021 in DCCEEW 2022). Therefore, it is possible for the variety to be located on unsurveyed terrain within the same region. The variety is found within the Interim Biogeographic Regionalisation of Australia (IBRA) subregion of the South East Coastal Ranges (OEH 2019).
- The geographic distribution of *Pomaderris gilmourii* var. *cana* is very highly restricted. The most plausible extent of occurrence (EOO) and area of occupancy (AOO) are estimated at 4 km². The AOO was calculated using a 2 x 2 km grid cell method over each spatial data point (total of five points). The EOO is equal to the AOO as it cannot be smaller than the AOO under the IUCN assessment guidelines (IUCN Standards and Petitions Subcommittee 2022).
- The population size of *Pomaderris gilmourii* var. *cana* appears to be in decline based on being "occasionally seen" in 1985, two plants recorded in 1987 and not recorded since, despite surveys being undertaken in 2007, 2012 and 2015. However, accurately quantifying the magnitude of the decline has been challenging due to the likelihood that surveys have been hindered by the inaccessibility of the locality.
- Pomaderris gilmourii* var. *cana* is known from one threat-defined location. Bushfires affected an estimated 100% of the taxon's modelled habitat during the 2019–2020 bushfire season, with an estimated 45% burnt at very high severity (Gallagher 2020). The actual impacts of any particular bushfire on the rocky outcrop supporting the population may be patchy (G. Phillips pers. comm. July 2021 in DCCEEW 2022), however considering the taxon's limited distribution, very limited number of known individuals, and its fire-sensitive reproductive strategies (likely an obligate seeder where all mature individuals could be killed during fire), a single intense bushfire is capable of impacting the entire population.

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7. There is very limited information about the ecology of *Pomaderris gilmourii* var. *cana*. The population is located on skeletal soils derived from rhyolite which was formed as part of the Comerang Volcanic Series (DEWHA 2008). The population is located at a single site approximately 480 m above sea level on a prominent rocky rhyolite outcrop. The site slopes steeply east to south-east and occurs in a shrubland environment with associated species (DEWHA 2008; AVH 2021) including *Eucalyptus stenostoma*, *Hakea dactyloides*, *Acacia subtilinervis*, *Hakea macraeana*, *Kunzea ambigua*, *Leptospermum deuense*, *Philotheca trachyphylla*, *Platysace lanceolata*, *Pomaderris gilmourii* var. *gilmourii*, *Prostanthera porcata*, *Westringia saxatilis*, and *Melaleuca hypericifolia*.
8. There is very limited information about the longevity, fecundity, reproductive strategies, soil seedbank dynamics, seed germination requirements and seedling recruitment of *Pomaderris gilmourii* var. *cana*. The generation length and time to reproductive maturity for *Pomaderris gilmourii* var. *cana* are unknown, however, a longevity of 10–25 years has been identified for many *Pomaderris* species (N. Walsh pers. comm. in Benson and McDougall 2000). Time to reproductive maturity is inferred to be 2–6 years based on estimates of other species in the genus (NSW Office of Environment and Heritage 2014). Flowers of *Pomaderris gilmourii* var. *cana* have been recorded in November and December (Walsh, 1989; Harden, 2000). Dense shade is known to reduce flowering and growth in other *Pomaderris* species (Patykowski *et al.* 2014).
9. There is little information on gene flow within *Pomaderris* species, as the vector(s) of pollination and of seed dispersal of the taxon are unknown. Insects are likely to be the primary pollinators of some other *Pomaderris* species (e.g. *Pomaderris vacciniifolia*, Patykowski *et al.* 2014; *Pomaderris adnata*, G. Phillips, pers. comm. November 2021 in DCCEEW 2022; *Pomaderris bodalla*, Le Breton 2016). Other species in the *Pomaderris* genus are known to produce elaiosomes, which are oil-rich structures thought to be an adaptation to dispersal by ants (Berg 1975; Lengyel *et al.* 2010; Patykowski *et al.* 2014), suggestive of short-distance seed dispersal (Patykowski *et al.* 2014). Seed set is highly variable in *Pomaderris*, with asexual reproduction known in some species within the genus, potentially a result of low mate availability, pollinator limitation or stress-induced seed abortion in situ (Chen *et al.* 2019). Although limited information on population genetics exists for *Pomaderris gilmourii* var. *cana*, if asexual seed production (apomixis) is confirmed it may indicate that many individuals in a population may be 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). Apomixis may also facilitate the persistence of small *Pomaderris* populations (Chen *et al.* 2019).
10. The sensitivity of *Pomaderris gilmourii* var. *cana* to fire is unknown but may be inferred from other species in the genus. Most species within the genus are obligate seeders (Falster *et al.* 2021). Post-fire recruitment is likely important for many *Pomaderris* species, with high severity fires resulting in a greater recruitment response in some species immediately following fire (Natale 2016). The longevity of the soil seed bank for the *Pomaderris gilmourii* var. *cana* is unknown, however

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seeds of *Pomaderris vacciniifolia* have been estimated to survive for at least 20 years in the soil (Patykowski *et al.* 2014). Seeds of other *Pomaderris* species are physically dormant and germination may be cued by heat shock (Le Breton 2020). Post-fire responses of *Pomaderris adnata* and *Pomaderris walshii* show that both species require high temperatures to break seed dormancy, indicating that higher severity fires would produce the greatest germination response (Natale 2016). Dormant seeds in the soil were also shown to be exhausted following rainfall after a single fire event for those two species (Natale 2016). Species with exhaustible seed banks are likely to be susceptible to declines under too frequent fire regimes (Keith 1996).

11. Although most *Pomaderris* species are thought to be obligate seeders (Falster *et al.* 2021), *Pomaderris adnata* was found to resprout after fire, although the presence of resprouting was positively correlated with trunk diameter at breast height and only occurred in 34 percent of mature individuals (Natale 2016). This could indicate a low (but not negligible) level of resilience to low severity fire among adult plants. Limited fire resistance of *Pomaderris adnata* to low-severity fires has been shown elsewhere (Le Breton *et al.* 2020). Other *Pomaderris* species have also been shown to resprout following fire (*Pomaderris paniculosa*, *Pomaderris oraria*, *Pomaderris oblongifolia*, and some forms of *Pomaderris lanigera*) (N. Walsh pers. comm. November 2021 in DCCEEW 2022). However, *Pomaderris gilmourii* var. *cana* and *Pomaderris gilmourii* var. *gilmourii* are not suspected to resprout (N. Walsh pers. comm. November 2021 in DCCEEW 2022).
12. The main identified threats to *Pomaderris gilmourii* var. *cana* are adverse fire regimes, low genetic diversity and herbivory (DEWHA 2008). *Pomaderris gilmourii* var. *cana* is restricted to a single small population, placing the population at risk of local extinction from a single threatening event, despite its reservation within a national park.
13. Adverse fire regimes (high fire frequency) are a suspected future threat to *Pomaderris gilmourii* var. *cana*. There have potentially been up to seven fires that have occurred in the region where the taxon occurs, including four wildfires (1968–69, 1980–81, 2001–02 and 2019–2020) and three prescribed burns (1977–78, 1985–86 and 1993–94) (DPIE 2010). However, it is unknown if the exact location where the species has been found was burnt during any of these fire events, or the 2019–20 bushfires. It is possible that all soil-stored seed could have already been exhausted. However, it is also possible that the taxon has evaded previous burns and soil-stored seed remains intact and viable. Nonetheless, future frequent fires in rapid succession could exhaust soil-stored seed reserves (Natale 2016) and prevent plants from reaching maturity (DEWHA 2008). ‘High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition’ is listed as a Key Threatening Process under the Act.
14. The interaction between climate change and the fire regime (prescribed burns and bushfire) could lead to significant impacts on the population. Future climate change predictions that could lead to significant impacts in the temperate forested region of south-east Australia, where *Pomaderris gilmourii* var. *cana* occurs, include an increase in the number of days of elevated temperatures and an increase in the

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Forest Fire Danger Indices (FFDI) (Clarke 2015; Dowdy *et al.* 2019; BOM & CSIRO 2020). These indicate an increased risk of fire and a potential reduction in the fire-free interval in the future. Climate change can also affect the landscape moisture levels, increasing the risk of a fire event and reducing the species resilience by interacting with natural hydrological cycles. This is particularly important for a species that depends on specific conditions for reproduction and germination. The two climate associated threat pathways can also 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). 'Anthropogenic Climate Change' is listed as a Key Threatening Process under the Act.

15. Increased frequency and severity of drought due to climate change is considered an ongoing threat to *Pomaderris gilmourii* var. *cana*. Predictions for an increase in the number of days of elevated temperatures and an increase 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. Increased incidence of extreme temperatures could also limit population viability through attrition of physically dormant seeds (Ooi *et al.* 2004).
16. Limited long-term adaptive capacity due to allee effects and low genetic diversity is an inferred threat to *Pomaderris gilmourii* var. *cana*. Many small, isolated subpopulations are subject to the effects of low genetic diversity (Frankham *et al.* 2014). A predominance of asexual reproduction is also likely to limit the long-term adaptive ability of the taxon and may also limit translocation success (Chen *et al.* 2019). There is only one known subpopulation of *Pomaderris gilmourii* var. *cana* with likely few individuals and asexual seed production may occur in the taxon. Therefore, despite species with restricted distributions and specific habitat requirements persisting for long periods, their ability to adapt to future changing conditions associated with climate change, is limited by low genetic exchange and recombination. As a consequence of a single small, isolated population limiting broad-scale gene transfer and the possibility of asexual seed production, the single subpopulation of *Pomaderris gilmourii* var. *cana* is likely to be at risk of the negative consequences associated with low genetic diversity in a future changing climate.
17. Browsing by feral herbivores is a potential threat to the *Pomaderris gilmourii* var. *cana*. Browsing by feral goats and feral deer is identified as a threat to other *Pomaderris* species (DPIE 2020) and can lead to considerable impacts to *Pomaderris* in some areas. Populations of *Capra hircus* (feral goats) are known occur in other reserves connected to Deua National Park (DPIE 2019) and anecdotal sightings exist within Deua National Park (C. Howard pers. comm. August 2021 in DCCEE 2022). Feral deer numbers are increasing yearly in some areas within Deua National Park (C. Howard pers. comm. August 2021 in DCCEE 2022). If future fire events are followed by herbivory (Mackenzie and Keith 2009) that impact seedling recruitment, then the population could be at risk of extinction. Feral deer have been listed as an emerging threat in the Far South Coast

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Escarpment Parks Plan of Management which includes Deua National Park (NPWS 2019). 'Competition and habitat degradation by feral goats (*Capra hircus*)' and 'herbivory and environmental degradation caused by feral deer' are listed as Key Threatening Processes under the Act.

18. Dieback caused by *Phytophthora cinnamomi* is a suspected threat to *Pomaderris gilmourii* var. *cana* as other *Pomaderris* species have been found to be moderately susceptible to the pathogen (Kueh *et al.* 2012). *Pomaderris gilmourii* var. *cana* is not currently considered to be at risk to *P. cinnamomi* infestation according to NSW Government (DPIE 2019). However, susceptibility of the species has not been tested and observations of dead *Xanthorrhoea australis* during site visits to the area in 2012 (J Miles 2021. pers comm 5 August) suggest that *P. cinnamomi* may have infected the locality of *Pomaderris gilmourii* var. *cana*, although the presence of the pathogen is yet to be confirmed. 'Infection of native plants by *Phytophthora cinnamomi*' is listed as a Key Threatening Process under the Act.
19. *Pomaderris gilmourii* var. *cana* N.G.Walsh is eligible to be listed as a Critically Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing an extremely high risk of extinction in Australia in the immediate future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

Assessment against *Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome: Critically Endangered under Clause 4.3 (a)(d)(e iii) and Clause 4.5 (a)

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.	

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Clause 4.3 – Restricted geographic distribution of species and other conditions (Equivalent to IUCN criterion B)

Assessment Outcome: Critically Endangered under Clause 4.3 (a)(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.

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

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			(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: Critically Endangered under Clause 4.5 (a).

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.
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Senior Professor Kristine French
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

DCCEEW (Department of Climate Change, Energy, the Environment and Water) (2022). Conservation Advice for *Pomaderris gilmourii* var. *cana* (grey deua pomaderris). Australian Government, Canberra, ACT.

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