

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 *Grevillea wilkinsonii* Makinson as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act and, as a consequence, to omit reference to *Grevillea wilkinsonii* Makinson from Part 2 of Schedule 1 (Endangered species) of the Act. Listing of Critically Endangered species is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Grevillea wilkinsonii was found to be eligible for listing as Critically Endangered under Clause 4.3(a)(d)(e)(i)(iii) and Clause 4.4(a)(e)(i)(ii)(B). The main reasons for the species being eligible are: i) the species has a very highly restricted geographic range; ii) the species is severely fragmented; (iii) there are a number of threats leading to continuing decline; (iv) the number of mature individuals is very low; and (v) >90% of mature individuals occur in a single population.

The NSW Threatened Species Scientific Committee has found that:

1. *Grevillea wilkinsonii* has been listed as Endangered on the NSW BC Act since its inception (formally *NSW Threatened Species Conservation Act*) in 1995. In 1995, 'Endangered' was the highest threat category available; there was no 'Critically Endangered' category at the time of listing. A review of the Schedules indicated that *G. wilkinsonii* required reassessment as there was evidence of continuing decline.
2. *Grevillea wilkinsonii* is described by PlantNET 2019 as an "ascending or erect to spreading shrub to 2 m high. Leaves narrow-oblong or oblong-elliptic mostly 10–17 cm long, 8.5–21 mm wide, margins flat, regularly toothed with teeth to 4 mm long, terminating in a weak spine 1–2 mm long, upper surface glabrous or with a sparse inconspicuous indumentum of appressed hairs, lower surface sericeous. Conflorescences usually deflexed, secund. Perianth brownish to reddish pink or purple, loosely subsericeous outside, glabrous inside. Gynoecium 14–15 mm long; ovary sericeous, subsessile to very shortly stipitate; style lilac pink, glabrous; pollen presenter broadly and obliquely conical. Follicle subsericeous with reddish blotches". *Grevillea wilkinsonii* flowers in October and November (PlantNET 2019).
3. *Grevillea wilkinsonii* is endemic to New South Wales (NSW) where it is known from two populations separated by approximately 40 km. The largest population occurs in fragments of riparian vegetation along the Goobarragandra River, east of Tumut, and a small population occurs on a hillside near Gundagai on the NSW south-west slopes (Makinson 1993; Taws 2013; OEH 2018). The majority (approximately 80%) of the *G. wilkinsonii* population along the Goobarragandra River occurs on private freehold land, with the remainder occurring on two Crown Land sites (NSW NPWS 2001), and one site just within the boundary of Kosciuszko National Park. One of the Crown Land sites is now a reserve for Environmental Protection and the second is a Travelling Stock Reserve. The population at Gundagai is very small (in habitat of <1 ha) and is located on two adjoining private properties.
4. *Grevillea wilkinsonii* has a very highly restricted geographic distribution. The extent of occurrence (EOO) was estimated to be 40 km², based on a minimum convex polygon enclosing

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all mapped occurrences of the species, the method of assessment recommended by IUCN (2017). The area of occupancy (AOO) was estimated to be 16 km² based on the species occupying four (2km x 2km) grid cells, the spatial scale of assessment recommended by IUCN (2017).

5. In the Goobarragandra River population *Grevillea wilkinsonii* occurs along a 5-6 km stretch of the river on rocky riverbanks and terraces that may be flooded, and on adjacent slopes. Most plants grow near the river, often within the flood zone and almost always within the surviving belt of native riparian vegetation. Where the riparian vegetation extends further upslope *G. wilkinsonii* may also occur outside the flood zone and up to about 40 m from the river (B Makinson *in litt.* November 2016). Much of the surrounding land is cleared, and in some places the vegetation has been cleared up to the riverbank. There are areas above the flood zone that have been planted with *G. wilkinsonii* (material sourced from within the population) to augment the natural population. The Goobarragandra population occurs on a variety of substrates including granitic and granodioritic rocks (e.g. in crevices and between outcrops) and at a couple of places on loams derived from serpentinite, but also in sand and sand/silt pockets and flood terraces that are unlikely to be derived from the local substrates but have instead been deposited from upstream. As most of the serpentinite areas have been cleared for grazing, the present distribution of the species may not reflect a preference for granitic substrates but rather represents a local refuge following European colonisation (Makinson 1993). *Grevillea wilkinsonii* occurs within remnant riverine shrub communities adjacent to open forest where the most common tree species are *Eucalyptus blakelyi*, *E. bridgesiana*, *E. melliodora* and *E. macrorhyncha*, with *Brachychiton populneus* growing in nearby paddocks (Makinson 1993; NSW NPWS 2001). Taller shrubs of the lower slopes and riverbanks include *Leptospermum brevipes*, *L. obovatum*, *Lomatia myricoides*, *Hakea microcarpa*, *Kunzea ericoides*, *Acacia melanoxylon*, *A. pravissima*, *Bursaria lasiophylla*, *Callistemon sieberi*, *Pomaderris angustifolia*, *Dodonaea viscosa* subsp. *spatulata* and *Xanthorrhoea glauca* subsp. *angustifolia* (NSW NPWS 2001). Smaller shrubs include *Grevillea lanigera*, *Calytrix tetragona*, *Correa reflexa* and *Crowea exalata* (NSW NPWS 2001). The Gundagai population occurs in a small remnant of <1 ha of grassy White Box (*Eucalyptus albens*) woodland with scattered shrubs of *Ricinocarpos bowmanii* and *Dodonaea viscosa*, and a groundcover dominated by *Themeda triandra* and *Poa sieberiana* (OEH 2018). It occurs on the upper slope of a steep hill on serpentinite geology (OEH 2018) and is surrounded by cleared land.
6. The population structure of *Grevillea wilkinsonii* covers a wide range of size classes suggesting that recruitment is reasonably frequent (NSW NPWS 2001) and numerous seedlings have been observed in the Goobarragandra population (Taws 2018). *Grevillea wilkinsonii* is likely to be fire sensitive, regenerate from seed, and have a life span of approximately 10-20 years (Makinson 1993), although some plants may live for more than 30 years. Flowering is prolific, being concentrated in October and November, with a weak second flush in autumn (Makinson 1993). The peak of flower and seed production is most likely to occur in plants aged between about 8 and 15 years. Fruit and seed set in *G. wilkinsonii* is reportedly high, however, predation of ripening fruits by parrots may also be high. Fruit predation, combined with the possible loss of seeds to rodents after seed release (as occurs in other grevilleas, Auld and Denham 1999), may be limiting input to the soil seed bank and hence recruitment (B. Makinson *in litt.* November 2016; Makinson 1993; NSW NPWS 2001; OEH n.d.). Ants may play a role in seed dispersal as the seeds have an elaiosome (c.f. Auld and Denham 1999) and are quickly taken by ants. In one instance, seedlings have been found emerging from an ant nest (Makinson 1993; NSW NPWS 2001).

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7. The currently known abundance of mature individuals of *Grevillea wilkinsonii*, as estimated in 2018, ranges from 105 to 547 (Taws 2018). The lower bound only includes the naturally occurring plants along the Goobarragandra River and the eight naturally occurring plants in the Gundagai population, whilst the upper bound includes additional plants that were planted prior to 2013 (Taws 2018) and hence may possibly be considered as mature plants *sensu* IUCN (2017). The population along the Goobarragandra River was first surveyed in 1988 and by 2017 the total number of naturally occurring mature individuals had declined from 298 to 97 (Taws 2018). This represents a 67% decrease in the number of mature individuals over 19 years. The largest declines were the result of flood events in 2010 and 2012. *Grevillea wilkinsonii* populations have been augmented within the known range of the species using material from both cuttings and seed since 1993 (NSW NPWS 2001). In 2017, the total number of mature and immature individuals, both naturally occurring and translocated, was 1517 with one site being entirely comprised of translocated individuals and containing 62% of the total population (Taws 2018).
8. Loss and degradation of habitat by clearing for agriculture has been a threat in the past and continues to threaten some patches of *Grevillea wilkinsonii* (OEH 2018). The main threats currently affecting *G. wilkinsonii* include grazing and erosion caused by stock, weed invasion, severe flooding events and localised disturbances (Makinson 1993; NSW NPWS 2001; OEH n.d.). The combined threats of land clearing and habitat disturbance (grazing, weed invasion and severe flooding) have led to severe fragmentation of *G. wilkinsonii*.
9. *Grevillea wilkinsonii* plants in the Goobarragandra population are subject to various degrees of browsing damage and habitat degradation associated with domestic stock (NSW NPWS 2001). Weeds are also invading much of the habitat along the river, with the main species including *Rubus fruticosus* (Blackberry), *Salix* sp. (Willow), *Populus nigra* (Lombardy Poplars), *Paspalum dilatatum* (Paspalum), *Phalaris aquatica* (Phalaris), *Rosa rubiginosa* (Briar Rose), *Verbena* sp. (Verbena), *Malus* and *Prunus* shrubs, and *Hypericum perforatum* (St John's Wort) (NSW NPWS 2001; OEH 2018; B. Makinson *in litt.* May 2016). These weeds cause loss and degradation of habitat by smothering and shading *G. wilkinsonii* individuals. Exotic grasses can outcompete *G. wilkinsonii* seedlings thereby limiting recruitment (Taws 2018; B. Makinson *in litt.* November 2016). A longer-term problem is the proliferation of *Populus nigra* (Lombardy Poplar) trees along the river, as they may adversely affect *G. wilkinsonii* survival and recruitment (B. Makinson *in litt.* May 2016). 'Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants' and 'Invasion of native plant communities by exotic perennial grasses' are listed as a Key Threatening Processes under the Act.
10. The Goobarragandra River has a regime of regular flooding (B. Makinson *in litt.* November 2016). The newly exposed soil created from a flood may provide opportunities for seedling emergence and establishment for *Grevillea wilkinsonii* and co-occurring weed species (B. Makinson *in litt.* November 2016). Following damage from flooding, adult *G. wilkinsonii* plants have been observed to resprout from branches and their bases. However, a severe flood event in 2012 stripped much of the banks back to bedrock and approximately 50% of the natural population and 75% of translocated individuals (that had been planted since 2000) and much of the soil seed bank were swept away (Taws 2013; Briggs and Hunter 2018; J Briggs pers. comm. May 2019). The flood altered the river bank morphology and removed much of the riparian vegetation within the distribution of *G. wilkinsonii* (Taws 2018). With the loss of a significant amount of habitat, regeneration in many areas may not be possible (J Briggs pers.

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comm. May 2019). The recovery of the natural population after the 2012 flood has been very poor (J. Briggs *in litt.* April 2016) with three small sites showing no signs of regeneration (Taws 2018).

11. Localised disturbances such as spraying of herbicides, or addition of fertilisers in nearby cleared paddocks pose a threat to *Grevillea wilkinsonii* plants (Taws 2013; OEH 2018). Trampling by pets or domestic stock and landscaping activity may be a potential threat to patches of *G. wilkinsonii* (OEH 2018).

12. *Grevillea wilkinsonii* Makinson 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*:

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: Critically Endangered under Clause 4.3 (a) (d) (e i, 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,	

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	(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: Critically Endangered under Clause 4.4 (a) (e i, ii B)

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: Endangered under Clause 4.5 (b).

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.

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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 under Clause 4.7.

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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Supporting Documentation:

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