

NSW SCIENTIFIC COMMITTEE

Grevillea iaspicula McGillivray (Proteaceae)

Review of Current Information in NSW

December 2008

Current status:

Grevillea iaspicula is currently listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The NSW Scientific Committee recently determined that *Grevillea iaspicula* meets criteria for listing as Critically Endangered in NSW under the *Threatened Species Conservation Act 1995* (TSC Act), based on information contained in this report and other information available for the species.

Species description:

Grevillea iaspicula is described in Makinson (2002) as follows: "Shrub, mostly 1.2–2.5 m high. Leaves light green, narrow-elliptic to -oblong, 1–3.5 cm long, 3–10 mm wide, margins entire and recurved, glabrous. Inflorescences often deflexed and pendant, in ovoid clusters, much branched, 2–3 cm long. Perianth green to cream, pinkish near curve, glabrous outside, bearded usually above the middle inside. Gynoecium 16–18 mm long; stipe inconspicuous, ventrally swollen, usually pilose; ovary glabrous or with isolated hairs; ovary densely hairy and \pm sessile; style pink to red, glabrous. Follicle usually hairy, without dark stripes or blotches."

Taxonomy:

This species was described by D. McGillivray in 1986 from a specimen collected in 1966 from Macphersons Swamp Creek, near Wee Jasper. It was recognised as a unique taxon, characterised by oblong-elliptic (to ovate or oblong) leaves 0.6–3.6 cm long, 4–10 mm wide, margins flat to slightly recurved, upper surface flat and smooth and hairless, lower surface fully exposed and hairless. The ovary is hairless or with a few hairs only; the style is hairless.

Grevillea iaspicula has several close relatives in NSW, which differ in some or all of the following features: leaves are narrower (e.g. linear) (*G. rosmarinifolia*); leaf upper surface is rough (*G. jephcottii*, *G. lanigera*); leaf lower surface is hairy (*G. lanigera*); ovary (and sometimes style) are obviously hairy (*G. baueri*).

Vegetative material was propagated at the Australian National Botanic Garden in 1984 as *Grevillea* sp. aff. *baueri* (Butler *et al.* 1991).

Cultivated *G. rosmarinifolia* subsp. *rosmarinifolia*, on one property at Wee Jasper, are known to have been the pollen parents of hybrids in a nearby (100–200 m) wild population of *G. iaspicula* (expert advice). There are no known wild populations of *G. rosmarinifolia* near to the wild populations of *G. iaspicula*.

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Distribution and number of populations:

Grevillea iaspicula is restricted to the Wee Jasper-Burrinjuck area in south-eastern NSW. It is known from seven small subpopulations; five around Wee Jasper and along the steep cliffs of the Goodradigbee River, and two on the shores of Lake Burrinjuck, near Burrinjuck village.

The species has also been recorded from another location, north-west of Wee Jasper. Information on this site exists only as a specimen lodged with the NSW Herbarium by A. Howard in 1966 with no locality information other than the description of 'Macphersons Swamp Creek'. Briggs & Leigh (1990) conducted two searches along several kilometres of the northern end of this creek but failed to locate any of the species. It has been advised that at the time no suitable habitat was found, but it is thought possible that the area of collection had once been part of a larger Lake Burrinjuck population (expert advice). The area is now over-run by goats.

Prior to November 1986, this species was known from only three small sites at Wee Jasper and only 25 plants were believed to remain. Searches in 1986 conducted by Briggs & Leigh (1990) discovered an additional population near Wee Jasper and two populations near Burrinjuck. Further searches located another two populations along the steep cliffs of Goodradigbee River valley. In 2006 a third patch of the Site 2 subpopulation (2c) was discovered (expert advice).

Most of the hillsides on the western side of the arm of Lake Burrinjuck that extends south are now cleared of native vegetation and so there is little chance that the species persists in this area. The many hillsides to the east of Lake Burrinjuck and the Goodradigbee River, however, retain native vegetation and may support undiscovered populations as there is suitable limestone habitat (Briggs & Leigh 1990; expert advice 2008).

There are seven 'locations' (IUCN 2008) based on fire being the main threat and the likelihood that each site could burn independently of the others (expert advice).

Five subpopulations occur on private land, one subpopulation is on Crown Reserve and one subpopulation is located in Burrinjuck Nature Reserve.

Ecology:

Key habitat requirements

This species grows only in skeletal grey-clay loam on rocky outcrops, cave entrances and cliff bases in limestone country. It occurs in low woodland of *Eucalyptus* and *Brachychiton*, generally with an open understorey of shrubs and grasses (Briggs & Leigh 1990).

Life history

Grevillea iaspicula flowers prolifically in July to August (Briggs & Leigh 1990) and is most likely to be bird-pollinated. Honeyeaters have been observed visiting the flowers (Hoebee & Young 2001). The species sets abundant seed and natural recruitment appears to be episodic (expert advice). This species has high levels of genetic diversity within and between populations (Hoebee & Young 2001).

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Wild seedlings are estimated to reach reproductive maturity at three to five years of age (Hoebee *et al.* 2008; expert advice). Olde & Marriott (1995) suggest that many *Grevilleas* live for around 10-30 years. Standing plants of *G. iaspicula* are estimated to live for about 15-20 years (expert advice). The generation length (IUCN 2008) was therefore estimated to be nine to 13 years.

Number of mature individuals:

In 1986, Briggs & Leigh (1990) estimated that the population included approximately 214 plants. At this time however, two of the seven currently known subpopulations (Site 4 and Site 5) and part of Site 2 (2c) had not been discovered. In 2000, Hoebee *et al.* (2008) estimated the population to be less than 250 plants. This estimate excluded Site 5 and Site 2c. In 2003 (the last time most subpopulations were counted) the population was found to include at least 144 mature individuals (expert advice), however Site 4 and Site 2c were not surveyed. When Site 2c was discovered in 2006, approximately 10 mature individuals were found. The current population size is uncertain, but unlikely to include more than 250 mature individuals, despite the lack of recent surveys at some sites (expert advice).

Table 1: Number of mature individuals confirmed by counts in known subpopulations over time

	1986 (Briggs & Leigh 1990)	1993 (expert advice)	1998 (expert advice)	1999 (expert advice)	2000 (Hoebee <i>et al.</i> 2008)	2003 (expert advice)	Trend
Site 1	12 (10 sdl/juv)				17 (37 sdl/juv)	17	increase/stable
Site 2 ²	a	4			15 (18 sdl/juv)	6 ¹	decline
	b	0 (3 sdl/juv)			32 (80 sdl/juv)	10 ¹	decline
	c	-	-	-	-	(~10)	unknown
Site 3	7 (40 sdl/juv)				98 (108 sdl/juv)	98	large increase
Site 4 ³	-	9			9 (4 sdl/juv)	unk	unknown, has been stable
Site 5 ³	-	1			not surveyed	0-1?	unknown
Site 6	21 (40 sdl/juv)		40	15-20 ⁴ (↓ due to drought and goat grazing)	20 (‘many’ sdl/juv)	13 ¹	decline
Site 7	160 (400 sdl/juv)				0 ⁴ (sdl/juv not recorded, but noted as present)	0 ⁵	large decline
Total	204- 214				191-?	144- 164⁶	decline

¹ Decline was a result of fires (expert advice).

² Site 2 includes three small patches. The third patch was discovered between the two other patches. Genetic exchange is believed to occur between these three sites, based on their close proximity (with honeyeaters being the main pollinator) and observations of exchange happening at other sites (expert advice May 2008). Hence, this area is considered to be one subpopulation.

However, when Hoebee & Young (2001) published, the third patch was unknown and they treated the two other known patches as separate populations. By 2006, when the third site was found, it is possible that the plants had grown up as a result of removal of grazing stock from the area. Only 10 plants have been found. It is possible more plants exist, as the area is difficult to access and the plants are difficult to observe among rocky limestone crevasses and a copious cover of blackberries.

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³ These sites are difficult to access, so are not often surveyed. The Site 4 has not been resurveyed since 2000.

⁴ This decline was believed to be due to goat browsing and drought (expert advice).

⁵ Population was fenced after 2000, however a rockslide (as a result of the 2003 fire), fallen trees, and rusted posts have compromised the integrity of the fence and goats have gained access to the population.

⁶ The maximum is based on assuming: that the Site 5 population had remained the same since last surveyed in 2000 by Hoebee *et al.* (2008) (in which a thorough careful survey of the area was conducted); that the Site 4 population had also remained stable; and that Site 2c was the same prior to its discovery - It was advised that grazing had decreased in the area, which may have lead to an increase in plants, or at least to them reaching a size where they are now conspicuous (expert advice 2008).

Threats:

Threats include:

- Fire – *Grevillea iaspicula* is an obligate seeder, as standing plants are killed by fire and populations must regenerate from seed stored in the soil (Morris 2000). The time taken for seedlings to reach maturity and accumulate a soil seed bank is unknown, but likely to be at least several years based on other *Grevillea* species. Post-fire seedling regeneration is likely to be susceptible to herbivores. Populations of the species have been adversely affected by wild fires. The Site 2 and Site 6 populations have declined as a result of fires between 2000 and 2003. ‘High frequency fire resulting in disruption of life cycle processes in plants and animals and loss of vegetation structure and composition’ is listed as a Key Threatening Process in NSW under the TSC Act.

- Weed invasion (especially blackberry) – weeds are thought likely to inhibit regeneration. Briggs & Leigh (1990) reported that Site 2a was heavily infested with exotic weeds and grasses, in particular blackberry (*Rubus fruticosus* spp. agg.). In addition, Briggs & Leigh (1990) observed one of the four mature plants to have been severely affected by herbicide used to control the blackberries. Other sites affected by blackberries include Site 1, Site 3, and Site 4 (expert advice).

- Browsing by goats – direct impact by browsing on adult plants and seedlings, particularly in times of drought stress. Sites impacted by this threat include Site 5, Site 6 and Site 7 (expert advice). Removal of goats has resulted in an increase in mature plants at some locations (expert advice) ‘Competition and habitat degradation by Feral Goats, *Capra hircus*’ is listed as a Key Threatening Process under the TSC Act.

- Grazing from domestic livestock – All sites, except Site 7, have had some level of grazing (expert advice).

- Drought – is known to inhibit regeneration. Seedlings at Site 7 have desiccated during times of drought (expert advice).

- Small range and population size - makes this species vulnerable to environmental and demographic stochasticity. This species also has low levels of seedling recruitment and low gene flow among populations (Hoebee *et al.* 2008).

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Recovery actions undertaken:

In 1996, 'Site 2' (two known sites at the time), Site 3, Site 4, and Site 6 subpopulations were fenced and Wee Jasper sites were weeded to control Blackberry infestations. The Site 7 subpopulation was fenced after 2000.

Two plantings have been undertaken to reintroduce plants at sites in the Site 7 area. In July 2000, 36 individuals were planted at Site 6 and 15 plants into Site 2b. None of the Site 6 plants survived the following summer and only three survived at Site 2b, which have since been killed by wildfire. In November 2003, 32 plants were added to the Site 6 subpopulation after the 2003 wildfire. This represented 17 clones taken from the site prior to the fire. The site has not been revisited since and so the condition of these plants is unknown (expert advice 2008).

Extreme fluctuations:

There is no information/evidence of this species experiencing extreme fluctuations.

Population reduction and continuing declines:

Clearing for agriculture and grazing pressure may have lead to the loss and degradation of habitat and populations of *G. iaspicula*. For example, Briggs & Leigh (1990) estimated the area of suitable habitat around Site 1 to be several hectares and suggested that there would have been a substantial population at this site prior to grazing by domestic livestock. The construction of Burrinjuck Dam may also have contributed to the destruction of some populations in the early 1900s (Briggs & Leigh 1990).

From 1986 to 2003 the population declined by 29.5%, mainly due to a major decline in the Site 7 subpopulation and partly compensated by an increase in the size of the Site 3 subpopulation.

While some subpopulations are increasing or stable (Site 1 and Site 3), most are decreasing. The largest subpopulation recorded in 1986, Site 7, underwent a decline of 100% of mature individuals by 2000, probably as a result of the combined effects of fire, drought, and goat browsing (Hoebee *et al.* 2008). A protective fence was built around the population in 2000 to protect the plants from goats. This fence, however, was damaged (from a rockslide, as a result of the 2003 fire, and fallen trees) leading to an increase in browsing pressure as well as soil erosion (from the fire) and drought (expert advice).

Hoebee & Young (2001) predicted that the species "will disappear from natural environments within 10-20 years if present land use and other threats, such as grazing and competition with invasive exotics, persist". Hoebee *et al.* (2008) found that extremely low establishment rates (based on measuring recruitment at Site 1, Site 2a and Site 2b) were the "most critical factor influencing the persistence of *G. iaspicula* populations and indicated that the extant populations are at serious risk unless this is altered by, at the very least, an order of magnitude higher".

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Extent of Occurrence (EOO) & Area of Occupancy (AOO):

The AOO of *G. iaspicula* is estimated to be 44 km² (based on occupancy of eleven 2 x 2 km grid cells, the scale recommended by IUCN (2008) for assessment of AOO). The EOO of *G. iaspicula* is estimated to be no more 56 km², based on the distance between the most widely separated occurrences and the linear alignment of locations.

Severe fragmentation:

The few remaining populations have become fragmented due to land clearing for agriculture and grazing (Hoebee & Young 2001; expert advice).

Hoebee & Young (2001) found that the gene flow was limited, even among populations separated by only a few kilometres.

References:

- Briggs JD, Leigh JH (1990) 'Delineation of important habitats of threatened plant species in south-eastern New South Wales.' Australian Heritage Commission, Canberra.
- Butler G, Richardson M, Ganter W (1991) 'Recovery plan for *Grevillea iaspicula* McGillivray (Wee Jasper Grevillea) 1991–2000.' Australian National Botanic Gardens, Canberra.
- Hoebee SE, Thrall PH, Young AG (2008) Integrating population demography, genetics and self incompatibility in a viability assessment of the Wee Jasper Grevillea (*Grevillea iaspicula* McGill., Proteaceae). *Conservation Genetics* **9**, 515-529.
- Hoebee SE, Young AG (2001) Low neighbourhood size and high interpopulation differentiation in the endangered shrub *Grevillea iaspicula* McGill (Proteaceae) *Heredity* **86**, 489–496.
- IUCN (2008) 'Guidelines for using the IUCN Red List Categories and Criteria. Version 7.0.' (Standards and Petitions Working Group of the IUCN Species Survival Commission Biodiversity Assessments Sub-committee: Switzerland)
(<http://intranet.iucn.org/webfiles/doc/SSC/RedList/RedListGuidelines.pdf>).
- Makinson RO (2000) *Grevillea*. In: 'Flora of New South Wales. Volume 2. Revised Edition'. (Ed. GJ Harden) pp 32-66 (University of NSW Press: Kensington, NSW)
- Morris EC (2000) Germination response of seven east Australian *Grevillea* species (Proteaceae) to smoke, heat exposure and scarification. *Australian Journal of Botany* **48**, 179–189.
- Olde PM, Marriott NR (1995) 'The Grevillea book: Volume 2'. (Kangaroo Press: Kenthurst, NSW)

Explanatory note

Between 2007 and 2009 the NSW Scientific Committee undertook a systematic review of the conservation status of a selection of plant and animal species listed under the Threatened Species

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Conservation Act. This species summary report provides a review of the information gathered on this species at the time the Review was undertaken.

The Scientific Committee's report on the Review of Schedules project and final determinations relating to species that were either delisted or had a change in conservation status can be found on the following website: www.environment.nsw.gov.au.

The Committee gratefully acknowledges the past and present Committee members and project officers who ably assisted the Committee in undertaking the Review of Schedules Project. Information on the people involved in the project can be found in the Acknowledgement section of the project report entitled "Review of the Schedules of the Threatened Species Conservation Act 1995. A summary report on the review of selected species" which is available on the abovementioned website.

This species summary report may be cited as:

NSW Scientific Committee (2008) *Grevillea iaspicula* Review of current information in NSW. December 2008. Unpublished report arising from the Review of the Schedules of the Threatened Species Conservation Act 1995. NSW Scientific Committee, Hurstville.