

Mr Avtar Singh
The Natural Resources Commission

**Re: Proposed amendments to the Environmental Outcomes Assessment
Methodology - wilga (*Geijera parviflora*) as an Invasive Native Species**

I refer to recent proposed amendments to the Environmental Outcomes Assessment Methodology relating to wilga (*Geijera parviflora*). The proposal states the following:

Usually found as well-spaced trees in mixed woodland communities, however, it is now commonly found growing under a major portion of trees and/or shrubs where birds have perched and distributed the seeds in their droppings. This results in a dense understorey of wilga under the major portion of trees/shrubs, changing the structure of the vegetation community. This species is already listed for other Western IBRA regions.

In my view there is insufficient evidence to justify extending the status of *Geijera parviflora* as an ‘Invasive Native Shrub’ to the BBS bioregion. Indeed, I believe that there is sufficient evidence, overall, to justify the removal of wilga as an Invasive Native Shrub under the Native Vegetation Act (2003). My view is based on the following arguments.

1. There are no empirical evidence to suggest that *Geijera parviflora* is invasive or is invading

I have been working in the western Division of NSW since 1978 and have not seen any evidence that *Geijera parviflora* is likely to exist in stands sufficient to justify its inclusion as an ‘Invasive Native Shrub’. I can appreciate that land managers in the semi-arid woodlands of eastern Australia have some legitimate management concerns about the effects of shrub/tree encroachment on the viability of their enterprises. However, if the purpose of the NVA 2003 is to end broad-scale clearing, except in cases where condition can be ‘maintained or improved’, then removal of this species by any means must not be made easier unless there is adequate evidence to show that such removal will meet the requirements of the Act. It is my personal view that the increase in density of this, and many woody shrubs in arid woodlands, is an indication of a natural levels of recovery after many years of degradation.

A submission to the Natural Resources Commission by Russell Grant (Western CMA; previously DLWC Western Region) included data on changes in shrub cover and density from 265 sites in western NSW since 1989. The data were collected under the Rangeland Assessment Program (RAP, Grant 2004). While there was some suggestion of both increases and decreases in cover of some species (*Eremophila mitchellii*, *Eremophila sturtii*, *Callitris glaucophylla*, *Dodonaea viscosa*, *Senna* spp.) between 1990 and 1999, there was NO evidence of any change in *Geijera parviflora*. Apart from the RAP

program and some research described below, I am unaware of any empirical data on changes in *Geijera parviflora* for any areas of the semi-arid woodlands that might justify the proposal to list or expand the listing for this species.

2. *Geijera parviflora* facilitates the growth of understorey plants and is important for promoting a diverse and productive plant community

Under the Native Vegetation Act (NVA 2003), an ‘Invasive Native Species’ (INS) is defined as 1) a species that invades plant communities where it has not been known to occur previously OR a species that regenerates densely following natural or artificial disturbance, and 2) the invasion and/or dense regeneration of the species results in change of structure and/or composition of a vegetation community, and 3) the species is within its natural geographic range or distribution (OEAM 2005). In the case of *Geijera parviflora*, the relevant section in the legislation is that the invasion and/or dense regeneration of the species results in change of structure and/or composition of a vegetation community.

Geijera parviflora is a bird-dispersed species that normally grows beneath trees or other shrubs, forming multi-species patches (Santiago Solideres, Rey Juan Carlos University, Madrid, Spain, unpublished data). There is strong evidence that these multi-species patches facilitate the presence of some plant species and act as refugia for grazing-sensitive species. Thus *Geijera parviflora* and other shrubs may represent the only potential reserves for natural recolonization grazing-sensitive species under moderate grazing pressure. *Geijera parviflora* promotes the growth of species that differ from those present in the open interspaces, such as those requiring fertile soils (e.g. *Cenchrus ciliaris*, *Solanum ferocissimum*) or grasses such as *Paspalidium constrictum* that are grazing-intolerant. It may also exhibit a “perch effect”, promoting the recruitment of other bird-dispersed species thereby increasing the number of species and the productivity of these patches. The combination of higher levels of soil carbon beneath the canopy of *Geijera parviflora* and its perch effect, which results in increases in organic matter from bird droppings, enhance the productivity and diversity of these patches.

Below I refer to three studies showing that *Geijera parviflora* facilitates the growth of understorey plants, contrary to what is claimed in this proposed amendment.

2.1 *Geijera parviflora* in the West Darling

The following text, taken from an abstract of peer-reviewed research by Professor Martin Westbrooke and colleagues from Ballarat University and published in the Australian ecological journal *Austral Ecology* (Warnock *et al.* 2007), provides strong evidence for that *Geijera parviflora* facilitates the growth of understorey plants.

“This study examined zones of vegetation composition and soil physiochemical parameters associated with *Geijera parviflora* Lindl. The importance of shade, rainfall redistribution, seed bank and soil moisture were examined. Species abundance, soil moisture, seed bank composition, rainfall redistribution and soil nutrient concentration were measured under five randomly selected mature *G. parviflora* trees in south-western New South Wales,

Australia. To complement the findings from this study, artificial shade plots were constructed in a canopy-free area and species abundance measured seven months after shade construction. The study demonstrated that *G. parviflora* was associated with zonation of understorey vegetation. Two zones of understorey vegetation were found in relation to *G. parviflora*: (i) under the tree canopy with high species diversity, and (ii) beyond the canopy, this community being dominated by *Dissocarpus paradoxus* throughout the year with *Crassula colorata* appearing after rainfall. The zone beyond the canopy also had lower soil nutrient concentrations. Soil moisture, nutrient concentration and the seed bank density were significantly higher under the canopy. However, the canopy reduced precipitation reaching the soil surface. The effects of the canopy on understorey species composition and soil moisture were enhanced after winter rainfall. Artificial shade increased species abundance and richness under a 90%-shading treatment. The results indicated that *G. parviflora* generated spatial heterogeneity over the broader plant community increasing species richness, abundance and diversity under the canopy. This emphasises the importance of arid zone trees in conserving understorey plant diversity. Shading, soil nutrient concentration and increased seed bank density and soil moisture appeared to be key influences on the plant communities under the canopy”.

2.2 Studies of *Geijera parviflora* from the Cobar Pediplain

EPES is a large co-operative project that aims to establish a network of monitoring sites in semi-arid areas Spain, the Americas, Eurasia and Australia in order to study the relationships between ecosystem structure and functioning (www.cyted.org). Research conducted by Spanish scientists near Cobar as part of that study (Soliveres and Maestre, unpublished data) demonstrates a similar scenario in relation to *Geijera parviflora*. In four study areas located on the Cobar Peneplain, Soliveres and colleagues recorded substantially more species beneath the canopies of wilga than in open areas (34 vs. 16; 27 vs. 9; 29 vs. 22 and 21 vs. 17).

Rarefaction curves of one of the sites are given below (Figure 1). These curves show the potential species richness of each sampled microsite (bare soil, shrubs such as *Eremophila mitchellii* and other shrubs, and tree-wilga patches). Confidence intervals are presented as dashed lines. The results indicate substantially (significantly) more species under both *Geijera parviflora* and shrub patches than open interspaces.

2.3 Studies of plant diversity and composition under trees and shrub in the southern belah woodlands

Preliminary data on plant dynamics across a degradation gradient (currently grazed, conservation reserves, long ungrazed National Park) indicate substantially more perennial native plant species under shrub and tree canopies than in the open. A total of 484 perennial plants of 18 species were recorded under a patch of two *Geijera parviflora* trees occupying an area of about 110 m² (Figure 2). This value of 4.4 plants per m² compares with about 2.7 plants per m² for the open, non-timbered areas (Eldridge and James unpublished data).

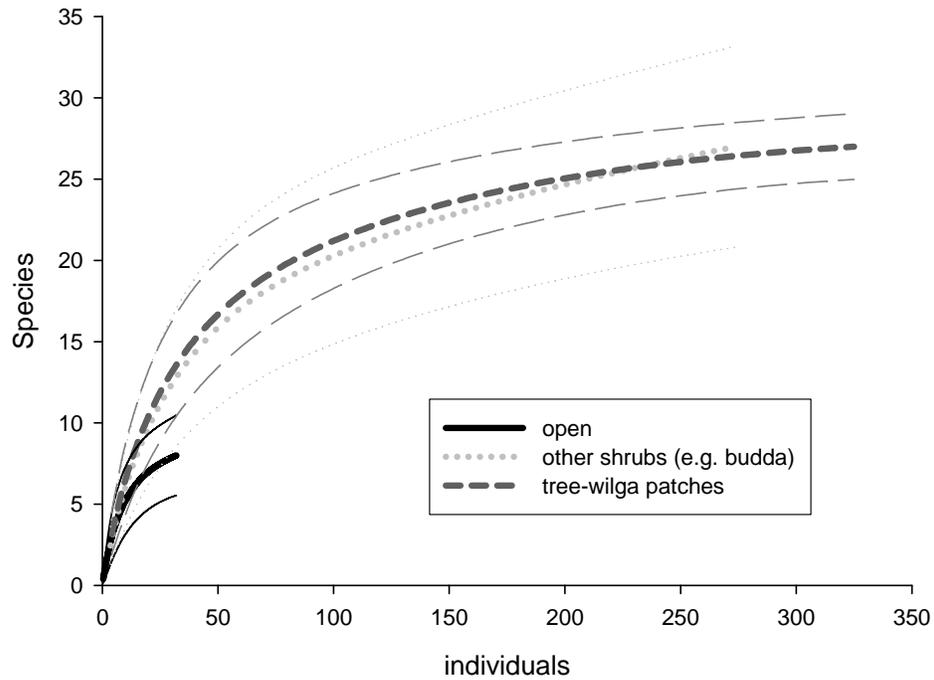


Figure 1. Rarefaction curves for a site on the Cobar Pediplain dominated by three microsites, open bare soil, shrubs such as budda and tree-wilga patches.



Figure 2. Enhanced plant cover and composition under *Geijera parviflora* in southern NSW belah (*Casuarina cristata*) woodlands.

Table 1. Species recorded under the *Geijera parviflora* patch shown in Figure 2.

Species	Common name	No. of plants	Cover (%)
<i>Enchylaena tomentosa</i>	ruby saltbush	194	55
<i>Chenopodium curvispicatum</i>	cottony saltbush	35	5
<i>Sclerolaena diacantha</i>	grey copperburr	32	5
<i>Zygophyllum aurantiaceum</i>	shrubby twinleaf	38	4
<i>Zygophyllum apiculatum</i>	gall weed	79	2
<i>Stipa scabra</i>	rough speargrass	44	2
<i>Einadia nutans</i>	climbing saltbush	13	1
<i>Eremophila glabra</i>	tar bush	1	1
<i>Maireana sclerolaenoides</i>	woolly-fruit copperburr	20	1
<i>Chenopodium desertorum</i>	desert goosefoot	9	0.5
<i>Pimelea microcephala</i>	shrubby rice-flower	3	0.5
<i>Psilocaulon tenue</i>	match-head plant	1	0.5
<i>Stipa elegantissima</i>	feather speargrass	1	0.5
<i>Senna artemisioides subsp. filifolia</i>	punty bush	1	0.5
<i>Dissocarpus paradoxus</i>	cannon-ball	2	0.5
<i>Atriplex stipitata</i>	bitter saltbush	5	0.5
<i>Hakea leucoptera</i>	needlewood	1	0.5
<i>Austrodanthonia caespitosa</i>	white-top	5	0.5

Listings need to be based on empirically-based science

While ‘Invasive Native Scrub’ has been demonstrated to have substantial ecological benefits (e.g. Eldridge *et al.* 2001), the general environmental consequences of shrub invasion are not universally known nor accepted by the wider community. The broader issue of the balance between competitive and facilitatory effects of woody plants, which is clearly the essence of the application to amend the OEAM (on the assumption that it will increase plant cover), is well known in the scientific literature.

As documented above, woody plants have been shown, in many resource-limited environments such as semi-arid woodlands, to exhibit substantial facilitatory qualities (e.g. see Facelli and Temby 2002) i.e. they have a positive effect on understorey species under appropriate levels of grazing utilisation. In the case of *Geijera parviflora*, the evidence is clear; these trees/shrubs have a positive effect on understorey plants. Further, the case to list *Geijera parviflora* as an ‘invasive native shrub’ seems perplexing given that it is known to be highly palatable to stock and likely very important during droughts (Cunningham *et al.* 1992).

In summary, removal of small regenerating plants under mature trees would not be consistent with the notion of ‘improve or maintain’ environmental outcomes, the test under the NSW Native Vegetation Assessment (2003) legislation. Best available evidence suggests that *Geijera parviflora* is NOT a plant that suppresses understorey plants, should not have been listed as an ‘Invasive Native Shrub’ and consequently, the

EOAM should NOT be amended to include small plants under mature trees. The most likely cause of putative reductions in diversity, cover and composition under *Geijera parviflora* is overgrazing by domestic livestock, rabbits and goats.

This listing also raises the important issue of involving the wider community, particularly the scientific community, in any plans to add species to the INS list, and to provide a transparent process to remove species from the list. Rather than increase the number of listings of INS with inadequate information, more effort should be placed on increasing the level of scientifically defensible science to justify the inclusion, removal, or continuation of species listed as putative 'invasive native species'. Until this is done, a large body of the scientific community will remain skeptical about the real purpose of the INS tool.

Recommendations

After brief discussions with the CMA staff in the Western Region, it seems that there are very few landholders, over a small area, who would actually be disadvantaged by regrowth *Geijera parviflora*. Rather than list the species as 'invasive' or expand its listing to other areas, it would seem more prudent to either 1) allow the CMA more discretion in allowing the management of tree/shrub species that occur over small areas or, more appropriately, 2) require landholders that claim to have problems with non-listed INS species to apply for a clearing permit under the current PVP process. It is only then that experts can formally decide whether in fact the species is acting invasively, or it is recovering (regenerating) in response to former episodes of overgrazing.

References cited

- Cunningham, G. M. Mulham W. E. Milthorpe P. L. and Leigh J. H. (1992) Plants of Western New South Wales. Melbourne: Inkata Press.
- Eldridge, D. J., Wilson B. R. and Oliver I. (2001) Regrowth and erosion in the semi-arid woodlands of New South Wales. Sydney, NSW: Department of Land & Water Conservation.
- Facelli, J.M. and Temby, A.M. (2002). Multiple effects of shrubs on annual plant communities in arid lands of South Australia. *Austral Ecology* 27, 422-432.
- Grant, R. (2004). Clearing / thinning of native vegetation known as invasive scrub under the Native Vegetation Act 2003. Comments on the INS Discussion Paper. Submission to Natural Resources Commission.
- Warnock, A.D., Westbrooke, M.E., Florentine, S.K. and Hurst, C.P. (2007). Does *Geijera parviflora* Lindl. (Rutaceae) facilitate understorey species in semi-arid Australia? *The Rangeland Journal* 29, 207-216

David J. Eldridge
Principal Research Scientist
January 21, 2009