Four rural cemeteries in central western NSW: Islands of Australiana in a European sea?

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Abstract: Vascular plants present in groundstoreys of variously–managed areas in four cemeteries in central western NSW – two on the Central Western Slopes (Garra and Toogong) and two on the Central Tablelands (Lyndhurst and Carcoar) – were recorded over periods of 6–10 years. It was hypothesised that (a) areas of the cemeteries with a history of nil or low disturbance would represent high quality remnant vegetation (i.e. contain a diversity of native species but few naturalised species), and (b) that clearing of woody vegetation, together with similar management (e.g. regular mowing) would result in homogenisation of the groundstoreys such that many species, native and naturalised, would be common to all sites.

344 species (176 native, 154 naturalised and 14 non–naturalised exotics) were recorded across the four cemeteries. Many native species that were rare in the surrounding agricultural lands were present in the cemeteries (enhancing their value as conservation areas) but no cemetery contained areas of groundstorey that would qualify as 'pristine'.

Across all management areas, the proportions of naturalised species in the native + naturalised floras of the cemeteries ranged from 46 to 55 %. Though never dominant, naturalised species also comprised high proportions (42 to 51 %) of the floras of the least disturbed (nil or infrequently mown) areas within each cemetery.

Many (40 %) of the species recorded occurred at only one cemetery. This partly explained why the floras of similarly–managed parts of cemeteries on the Central Western Slopes were, contrary to expectations, markedly different to those on the Central Tablelands. However, within the same botanic subdivision, floras – particularly of naturalised species in regularly mown grasslands – were more similar ('homogenised') than those of nil or infrequently mown grasslands.

Key words: cemeteries, derived grasslands, native and naturalised species, regular v. infrequent mowing, shared species.

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Introduction

Apart from their burial and memorial functions, cemeteries may provide sources of historical and architectural information (e.g. Kerr 1983, Anon. 1992); genebanks of obsolete cultivars of horticultural plants especially *Rosa* spp. (McBarron et al. 1988); sources of native plant seed for use in revegetation activities (Windsor et al. 2000); and remnants of the vegetation at the time of early European settlement (Prober & Theile 1993) including uncommon or locally rare species (McBarron et al. 1988). Unlike formal conservation reserves, which are often confined to the least agriculturally–useful parts of the landscape, cemeteries are often located on more fertile areas with deeper soils that eased the burden of the grave–digger. As with the vegetation, soils in unused parts of cemeteries can be markedly different from those in adjacent cultivated and/or continuously grazed lands. According to soil scientist, Ian Packer (pers. comm., 2005), cemetery soils have higher levels of organic matter, rainfall infiltration, friability and biological activity; and are less dense, less crusted and often less acidic than those outside. Soils at Woodstock cemetery, near Cowra, have been used to demonstrate to local farmers the potential soil condition that could be achieved with the adoption of new land management practices.

Cemeteries range from collections of crowded monuments over which some order is maintained by regular mowing to lawn cemeteries where mown lawns dominate and memorials are subdued. Between these two situations are the cemeteries of many rural towns and villages where, more often than not, the area of land dedicated for burials is much larger than is necessary for the present population sizes. Mowing

frequencies in these cemeteries may range from nil to almost that of their counterparts in the city. Domestic livestock, but not necessarily feral and native animals, are excluded from most rural cemeteries.

The features of some rural cemeteries, viz. long period of exclusion of domestic stock (often exceeding that of many formal conservation reserves) and even of vehicles, their large size relative to the area actually used for burials, a certain local reverence that tends to discourage inappropriate activities, and the presence of soils and vegetation that normally would have been converted to agricultural use, make them potential sites to provide valuable information on the composition of the pre–settlement vegetation of the region. Less attractive features from this point of view are; the severe one-off disturbances associated with a burial (where topsoil is rarely stockpiled separately for replacement in its original position); the custom (less common these days) of planting exotic ornamentals on graves; the removal of most of the indigenous woody plants and their replacement with park-like plantings of non-indigenous trees and shrubs; and regular mowing. The last-mentioned, coupled with the use of herbicides, are particularly modern threats to 'naturalness' because of the availability of larger equipment than was available to earlier generations.

Over a number of years we have compiled species lists for rural cemeteries and other reserves in NSW's central western region to document species that occurred in apparently good quality remnants of grassy woodlands and open forests. It was originally intended that these lists would provide benchmarks for assessing the condition of other areas of native vegetation in the region.

This paper compares species composition in variously managed (e.g. regularly v. infrequently mown) parts of four nearby cemeteries in central western NSW. It was initially hypothesised that:

(a) areas within each cemetery that had a long history of no grazing and nil or infrequent mowing would represent high quality groundstoreys as indicated by low numbers of exotic species; and

(b) the creation of derived grasslands by tree clearing (expected to diminish shade-dependant species) and the imposition of similar management regimes, particularly regular mowing (expected to suppress some native species and encourage invasion by exotics) would result in similar species composition in similarly-managed parts of the four cemeteries. This assumes equal availability of propagules of all species to all sites but it is appreciated that the establishment of some species may be restricted by climatic differences between the two botanic subdivisions.

Methods

Groundstorey (i.e. herbs and subshrubs) data were collected at four cemeteries – two on the Central Western Slopes: Garra and Toogong; and two on the Central Tablelands: Lyndhurst and the general cemetery at Carcoar (Fig. 1, Table 1) – all of which were originally grassy woodlands (or perhaps open forest at Carcoar). The Slopes sites are about 70 km from the Tablelands sites. All cemeteries contained ungrazed areas where native trees had been largely removed and where mowing was regular (generally corresponding to the actual burial areas) and where mowing was infrequent or not at all. Tree stands were present at two of the cemeteries but groundstoreys were far from 'pristine'; e.g. rubbish (including plant cuttings) had been deposited in treed areas at Carcoar (roadside) and Lyndhurst, and recent heavy grazing was evident in the other treed area at Carcoar.

Areas within each cemetery were categorised according to management regimes that are or were practised, e.g. treed/recently-grazed/unmown, cleared/long-ungrazed/regularly mown, cleared/long-ungrazed/occasionally mown. Two classes of management regime receive special mention here – 'mown grasslands,' defined as long-ungrazed, largely cleared areas that are mown regularly, 5 or 6 times per year, and where localised use of herbicides (e.g. around graves)

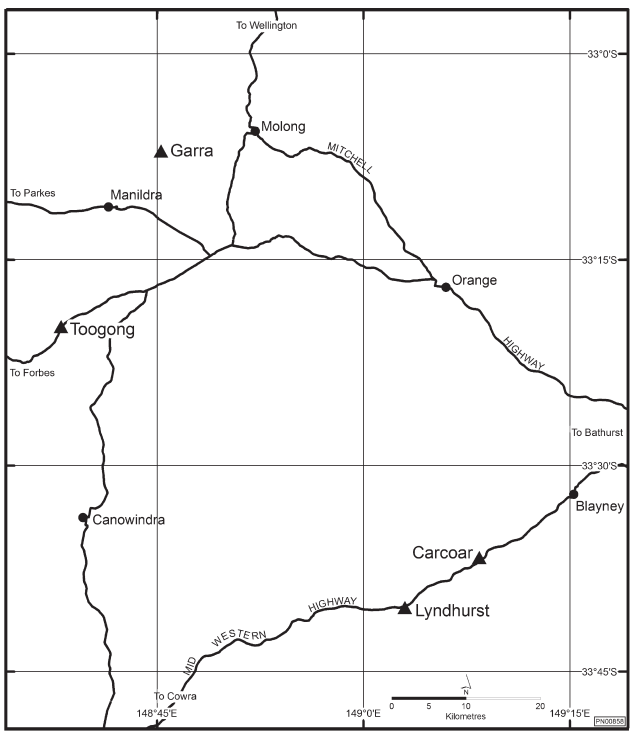

Fig. 1. Cemeteries locations (▲) and nearby towns (●) in part of the central west of NSW.

Fig. 2. Part of the mown area within the Carcoar general cemetery: roses in flower and some ornate monuments. [December 2000; 181/8]

Fig. 3. Part of the Toogong cemetery: mown area in foreground and unused area in the background. [February 2006; 240/20]

may occur, and 'unmown grasslands', long-ungrazed, largely cleared areas that have not been mown for many years or are mown infrequently, e.g. every few years.

Within each cemetery separate species lists were compiled for areas with different disturbance regimes. At least once per year, and usually more often, the designated management areas were searched for species over periods of 6 to 10 years (Table 1). Carcoar (Fig. 2) and Garra were visited over a longer period than Toogong (Fig. 3) and Lyndhurst. Quadrat data were collected in various management areas of three cemeteries in 2000 but as only a proportion of the species present was sampled, the data are not reported here (but are available from the authors).

Similarities between the floras of the mown and unmown grasslands at the four cemeteries were based on presence/absence of individual species and the proportions that were shared, i.e. the Jaccard measure of association (GenStat 2007). Separate similarity matrices were prepared for native species (n = 161 across all sites), naturalised species (n = 150) and native + naturalised species (n = 311). The structure of each matrix was analysed by non-metric multidimensional scaling (MDS). The objective of MDS is to find a low dimensional set of coordinates for each of the eight cemetery x mown or unmown species lists such that when plotted on a graph, will provide a display that can be interpreted in a manner analogous to a map; that is, lists plotted close together on the graphic are more similar than lists plotted further apart.

Botanic nomenclature follows that of Harden (1990–93), Wheeler et al. (2002) and PlantNET. Classification of species as either 'native' or 'naturalised' (in NSW) was based on the same sources but 'non-naturalised', i.e. the species did not occur in a reproducing population in the cemetery, was based on observations at individual cemeteries.

Table 1. Location and details of the four rural cemeteries in central western NSW studied.

	Carcoar	**Lyndhurst**	**Garra**	**Toogong**
Location	~20 km SW of Blayney	~30 km SW of Blayney	~10 km NE of Manildra	~15 km SSW of Manildra
Latitude/ longitude	33°37′S 149°08′W	33°40′S 149°02′W	33°07′S 148°46′W	33°21′S 148°38′W
Botanic subdivision [A]	Central Tablelands	Central Tablelands	Central Western Slopes	Central Western Slopes
Altitude (m a.s.l.)	850	700	500	390
Presumed original dominant species	*Eucalyptus dives* *Eucalyptus goniocalyx*	*Eucalyptus melliodora, Eucalyptus blakelyi*	*Eucalyptus albens*	*Eucalyptus albens, Callitris glaucophylla* (also *Eucalyptus melliodora, Eucalyptus microcarpa*)
Years dedicated	1852, 1900 & 1917	1887 & 1907	1885 & 1886	1877
Area [A] (ha approx.)	2.5	3.2	6.5	3.2
Managed by	Blayney Council	Blayney Council	Cabonne Council	Cabonne Council
Observation period (years inclusive)	1997–2006	1999–2006	1999–2006	2001[B]–2006

[A] including associated areas, e.g. plantation reserves. [B] A partial listing (S. Prober unpublished data, *c*.1993) was also available.

Results

Groundstorey flora across all management areas of all cemeteries

A total of 344 species was recorded across the four sites: 176 native, 154 naturalised and 14 non-naturalised exotics. Many species were recorded at only one cemetery: 45 % of all natives (79 species), 31 % of naturalised (47 species), and 86 % of non-naturalised (12 species). Though some of these one-offs were rare in the local region, e.g. *Stylidium graminifolium* (at Carcoar), *Eriochilus cucullatus* (at Toogong), *Sarga leiocladum* and *Polygala japonica* (at Lyndhurst) or in NSW (*Austrostipa metatoris* at Garra), many were common elsewhere in the region (e.g. the native, *Xerochrysum viscosa,* and the naturalised weed, *Centaurea calcitrapa*) and their presence at only one of the cemeteries was unexpected.

Naturalised species, many from the Poaceae, Asteraceae, Fabaceae and Caryophyllaceae families (Appendix 1), made up 46–55 % of the native + naturalised flora at all cemeteries (Table 2a). Some of the naturalised species in the mown grasslands were apparently deliberately-introduced, e.g. *Myosotis discolor* and *Tritonia lineata*; though not all of them, e.g. *Oenothera stricta* at Carcoar and Lyndhurst, have spread to the unmown parts of the cemeteries. Amongst those that apparently failed to naturalise, i.e. were still restricted to one or a few grave sites, were *Muscari armeniacum* at Carcoar and *Asphodelus fistulosus* (since removed) at Garra. None of the 14 non-naturalised species occurred at all cemeteries though *Lavandula* sp. was shared by Carcoar and Lyndhurst, and *Amaryllis belladonna* by Carcoar and Garra.

For native + naturalised species across all management areas, shared species comprised only 19 % of the joint flora for all sites (Table 3a). Sites within the same botanic subdivision shared the highest proportions of species: 51 % of species at Carcoar/Lyndhurst (Central Tablelands), and 50 % of species at Garra/Toogong (Central Western Slopes). Trends were similar for native and naturalised species (Table 3b, c).

Table 2. Numbers of native and naturalised species within (a) all management areas, (b) 'mown derived grasslands, and (c) 'unmown derived grasslands' at four central western NSW cemeteries.

	Carcoar	Lyndhurst	Garra	Toogong	All sites
(a) All management areas					
Native + naturalised spp.	200	168	174	166	330
Native spp	108	75	84	80	176
Naturalised spp.	92	93	90	86	154
Proportion of naturalised spp.	46 %	55 %	52 %	52 %	47 %
(b) 'Mown grasslands'					
Native + naturalised spp.	135	136	137	129	259
Native spp.	55	51	64	59	123
Naturalised spp.	80	85	73	70	136
Proportion of naturalised spp.	59 %	63 %	53 %	54 %	53 %
(c) 'Unmown grasslands'					
Native + naturalised spp.	137	97	118	109	249
Native spp.	79	52	65	54	140
Naturalised spp.	58	45	53	55	109
Proportion of naturalised spp.	42 %	46 %	45 %	51 %	44 %

Table 3. Numbers of species across all management areas at four cemeteries and numbers of species shared by all cemeteries and pairs of cemeteries. Proportions (%) of the joint flora for each pair, or for all sites, shown in parentheses.

	Carcoar		Lyndhurst		Garra		Toogong
(a) Native + naturalised species							
Carcoar	200						
Lyndhurst	124	(51 %)	168				
Garra	96	(35 %)	93	(37 %)	174		
Toogong	96	(36 %)	90	(37 %)	114	(50 %)	166
All sites combined – 330 species of which 63 (19 %) were shared by all sites							
(b) Native species only							
Carcoar	108						
Lyndhurst	55	(43 %)	75				
Garra	41	(27 %)	37	(30 %)	84		
Toogong	43	(30 %)	37	(31 %)	56	(52 %)	80
All sites combined – 176 native species of which 26 (15 %) were shared by all sites							
(c) Naturalised species only							
Carcoar	92						
Lyndhurst	69	(60 %)	93				
Garra	55	(43 %)	56	(44 %)	90		
Toogong	53	(42 %)	53	(42 %)	58	(49 %)	86
All sites combined – 154 naturalised species of which 37 (24 %) were shared by all sites							

Additions to the species lists in the latter part of the observation period were few. Rather than indicating that the species lists were 'complete', it was likely that below-average rainfall from 2002 onwards was a major factor. At Garra, for example, species recorded early in the observation period – particularly annual exotics such as *Datura, Tragopogon* and *Verbascum* spp. – had disappeared by 2006.

Groundstorey flora of the 'mown' v. 'unmown grasslands'

Of the species that occurred in the mown or unmown grasslands of at least two cemeteries, two groups were evident: those that never occurred in the mown areas ('disturbance-avoiders?') and those that never occurred in unmown areas ('disturbance-lovers?') (see Appendix 1). All of the 'disturbance-avoiders' were natives and included *Thysanotus tuberosus* and *Velleia paradoxa*. Amongst the 'disturbance-lovers' were some natives, e.g. *Portulaca oleracea* and *Chamaesyce drummondii*, as well as many common naturalised weeds, e.g. *Polygonum aviculare* and *Tribulus terrestris*. Other species probably fell into one of these categories but because of their restricted occurrence, e.g. at only one of the four cemeteries, it was difficult to generalise. Many species occurred in both mown and unmown areas, e.g. *Themeda australis* (unusual in having a tussock habit in rarely mown areas and a prostrate habit in mown areas).

More important for the long-term conservation of relatively intact native groundstoreys, is the ability of naturalised species to invade the unmown grasslands. Across all sites, these included annual grasses (*Aira, Avena, Briza, Bromus, Vulpia* spp.), annual forbs of Asteraceae (*Cirsium vulgare, Conyza bonariensis*) and Fabaceae (*Trifolium* spp.) and the perennials, *Hypochaeris radicata* and *Hypericum perforatum*. The relative invasiveness of other species tended to vary according to location. For example, *Chondrilla juncea, Petrorhagia nanteuilii* and *Salvia verbenacea* were abundant in unmown grasslands on the Slopes but not on the Tableland sites (Appendix 1).

Naturalised species comprised a high proportion of the native + naturalised flora of the mown grasslands, ranging from 53 to 63 % across the four sites (Table 2b). Unexpectedly, naturalised species also comprised a high proportion of the flora of unmown grasslands: 42 to 51 % (Table 2c).

Shared species comprised only 17 % of the joint native + naturalised flora of the mown grasslands at all cemeteries (Table 4a). As would be expected for regularly disturbed areas, the proportion of naturalised species that was shared (21 % across all sites) was higher than for natives (11 %). Sites in the same botanic subdivision shared the highest proportions of species: 50 % (38 % of native and 59 % of naturalised species) at Carcoar/Lyndhurst and 49 % (50 % of native and 49 % of naturalised species) at Garra/Toogong (Table 4).

In the unmown areas, the most 'natural' grassland areas of the cemeteries, the proportion of shared native + naturalised species was also low (12 %) across all sites. Between sites in

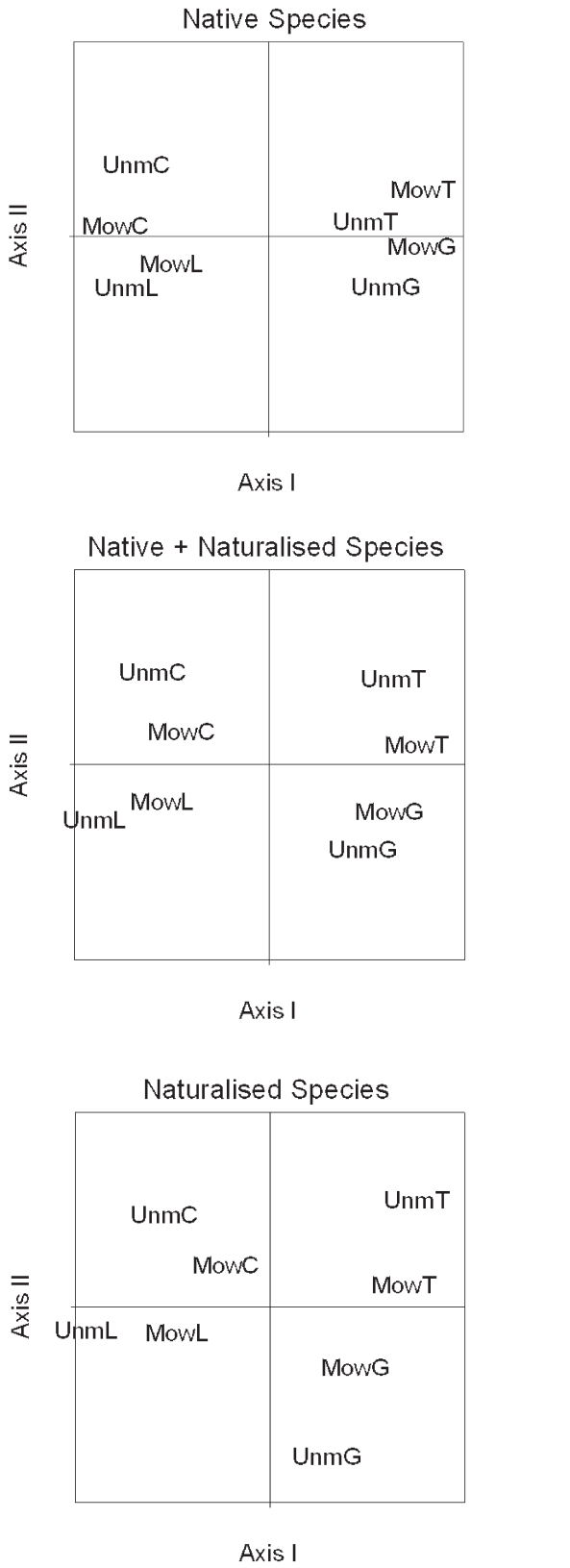

Fig. 4. Representation of the similarity of species profiles from eight environments: 4 cemeteries by 'mown' (Mow) and 'unmown' (Unm) management areas. Central Tablelands sites: C = Carcoar, L = Lyndhurst; Central Western Slopes sites: T = Toogong, G = Garra.

Table 4. Similarity statistics (% of joint flora) for each pair of site/management ('mown' v. 'unmown' derived grasslands) combinations for (a) all native + naturalised species, (b) native species, and (c) naturalised species only. Similarity within the rectangle that delimits between-region comparisons (Slopes and Tablelands) tends to be lower than within-region comparisons that are outside the rectangle. M = 'mown grasslands', Un = 'unmown grasslands' (see text for explanations).

(a) Native + naturalised

Carcoar	M	100 %							
	Un	49 %	100 %						
Lyndhurst	M	50 %	37 %	100 %					
	Un	37 %	39 %	47 %	100 %				
Garra	M	31 %	26 %	35 %	26 %	100 %			
	Un	30 %	30 %	31 %	29 %	59 %	100 %		
Toogong	M	33 %	24 %	33 %	23 %	49 %	36 %	100 %	
	Un	29 %	32 %	27 %	23 %	38 %	40 %	43 %	100 %
		M	Un	M	Un	M	Un	M	Un
		Carcoar		Lyndhurst		Garra		Toogong	

17 % of species in 'mown' and 12 % of species in 'unmown' grasslands were shared by all sites

(b) Native only

Carcoar	M	100 %							
	Un	41 %	100 %						
Lyndhurst	M	38 %	31 %	100 %					
	Un	35 %	35 %	43 %	100 %				
Garra	M	20 %	21 %	29 %	23 %	100 %			
	Un	21 %	24 %	26 %	24 %	65 %	100 %		
Toogong	M	23 %	20 %	25 %	21 %	50 %	36 %	100 %	
	Un	22 %	29 %	27 %	26 %	37 %	42 %	41 %	100 %
		M	Un	M	Un	M	Un	M	Un
		Carcoar		Lyndhurst		Garra		Toogong	

11 % of species in 'mown' and 11 % of species in 'unmown' grasslands were shared by all sites

(c) Naturalised only

Carcoar	M	100 %							
	Un	57 %	100 %						
Lyndhurst	M	59 %	42 %	100 %					
	Un	39 %	45 %	49 %	100 %				
Garra	M	40 %	31 %	40 %	30 %	100 %			
	Un	39 %	39 %	35 %	34 %	54 %	100 %		
Toogong	M	42 %	29 %	38 %	26 %	49 %	37 %	100 %	
	Un	35 %	36 %	27 %	20 %	39 %	38 %	45 %	100 %
		M	Un	M	Un	M	Un	M	Un
		Carcoar		Lyndhurst		Garra		Toogong	

21 % of species in 'mown' and 14 % of species in 'unmown' grasslands were shared by all sites

the same botanic subdivision, proportions of shared native + naturalised species were higher (though not as high as in the mown areas): 39 % (35 % of native and 45 % of naturalised species) at Carcoar/Lyndhurst and 40 % (42 % of native and 38 % of naturalised species) at Garra/Toogong (Table 4).

Results of non-metric multidimensional scaling (Fig. 4) indicated that the greatest distance (dissimilarity) between the cemeteries was based on geographic region: Slopes v. Tablelands. Mowing decreased the represented distance (increased the similarity) between the cemeteries of the same region, albeit marginally in the case of native species at Garra and Toogong, but geographic regions remained disparate.

Discussion

We confirmed previous findings that rural cemeteries are important for conserving populations of a surprising number of local native species. They represent a valuable repository of native species that, though not necessarily rare in the region, are very uncommon in the surrounding area. For example, *Microseris lanceolata* (Yam Daisy), was once widespread in grasslands and woodlands and was an important aboriginal food source (e.g. Gott 2008). Rated as 'only dandelions' by one mowing contractor, it is locally common in all cemeteries except Lyndhurst, but does not occur in the surrounding grazed and/or cropped land. It survives regular mowing though did become more prolific when mowing ceased on a small area at Garra.

Other native species that survive regular mowing, though not necessarily performing well, include species of *Dichopogon, Bulbine, Burchardia, Lomandra, Dianella*, most grasses and some orchids. They are probably uncommon outside the cemeteries because of their susceptibility to repeated defoliation by selective grazing, rather than to an intolerance of the limited defoliation resulting from mowing. Nevertheless some native species, e.g. *Thysanotus tuberosus*, appear to be intolerant of any defoliation except at rare intervals.

Some species, e.g. *Portulaca oleracea*, thrive under a regular mowing regime – not necessarily because of their tolerance to mowing but probably because of their need for

a competitor-free bare patch in which to establish, and in many cases a prostrate habit. These species are common outside the cemeteries and are often agricultural weeds that are avoided by grazing animals.

We are unlikely to have underestimated the number of native species in regularly mown areas, as was reported following cessation of regular mowing in a Sydney reserve (James 1994), as our period of observation (6–10 years) was much longer and the numbers of native species in the mown grasslands were similar to those in unmown grasslands at all sites except Carcoar.

Because mowing creates bare ground where weeds can establish, and eliminates some native species (e.g. those shown as 'disturbance-avoiders?' in Appendix 1), it was expected that similarly-managed parts of each cemetery, particularly the mown derived grasslands, would have similar species composition, but this was not the case. The proportions of shared naturalised species were relatively high in the mown grasslands: 49–59 % between cemeteries in the same botanic subdivision and 21 % across all cemeteries (Table 4c). But at the other end of the spectrum, native species in the least disturbed unmown grasslands, the proportions of shared species were 35–42 % between cemeteries in the same botanic subdivision and only 11 % across all cemeteries (Table 4b). The results suggested that although the floras of mown and unmown grasslands at each cemetery were distinct, those in the same botanic subdivision were the most similar. And within each subdivision, floras of mown grasslands tended to be more similar than those of unmown ones – an effect that was particularly evident for naturalised species.

The high number of species that occurred at only one cemetery contributed to the surprisingly low proportions of shared species between cemeteries. The highest proportions of shared species occurred between cemeteries in the same botanic subdivision where not only climate, but also management and to some extent soils, were similar. Blayney Council's management of its two Tablelands cemeteries tends to be more conservation-oriented than that of Cabonne Council on the Slopes. Blayney Council has restricted mowing height to no less than 6.5 cm, has fenced off areas with a history of minimal disturbance and maintains an infrequent mowing regime in other currently unused areas. Nevertheless Cabonne Council raised its recommended mowing height recently (supposedly to reduce wear on mower blades rather than for environmental reasons), refenced Garra cemetery and has induced disturbance in the 'unmown' part of Toogong cemetery by burning or slashing it twice in the last ~15 years.

Apart from management factors, higher rainfall and impeded drainage (particularly in parts of the Lyndhurst cemetery) may have contributed to the abundance of native Cyperaceae and Juncaceae species in the Tableland cemeteries; though species typical of well-drained sites, e.g. subshrubs of Ericaceae and Fabaceae, were also restricted to the Tablelands, particularly at Carcoar. As none of these species are restricted to the Central Tablelands subdivision, soils/drainage factors may be more important than those associated with climate.

Species geographically restricted to either botanic subdivision (13 native and 13 naturalised species – indicated by superscripts 'A' or 'B' in Appendix 1) also contributed to differences between Tableland and Slopes cemeteries. But our results include the first records of *Dactylis glomerata* and *Taraxacum officinale* for the Slopes (previously reported to be restricted to the Tablelands), and *Wahlenbergia gracilenta* and *Petrorhagia velutina* for the Tablelands (previously reported to be restricted to the Slopes).

Despite the high proportions of naturalised species in the unmown grasslands (42–51 %) and in the cemeteries as a whole (46–55 %), the presence of exotics did not necessarily mean they were dominant components of the vegetation. They were variously infrequent, common but of small stature (contributing only a small proportion of vegetative cover), localised, or most obvious in spring (e.g. naturalised grasses such as *Avena* and *Bromus* spp.). In terms of vegetative cover or plant numbers, naturalised species were generally more abundant in mown areas, e.g. *Salvia verbenaca* at Garra.

As the proportion of shared native species between cemeteries was low, 15 % of all species across all cemeteries, albeit higher (43–52 %) between cemeteries in the same botanic subdivision (Table 3b), no single cemetery can be considered 'more important' than another. If retention of native species in the local environment is considered to be important, then all four cemeteries are important. It should also be noted that the cemeteries have a range of other values, cultural, historical, architectural (e.g. Fig. 2) and aesthetic, and no vandalism of monuments is evident. Though the use of herbicides around monuments and frequent close-to-the-ground mowing could be considered vandalism of the native vegetation, it is considered 'good management' by the managing councils and local communities. Nevertheless native vegetation in the unused areas is managed sympathetically, albeit benignly neglectful in the case of a large area at Garra, and appears to be conducive to the retention of native species and in most cases, relatively intact communities.

In the regularly mown areas, a case could be made for reducing the frequency of mowing (and of herbicide application) and for increasing the height of mowing as recommended by McBarron et al. (1988) and possibly for the removal of clippings (Verrier and Kirkpatrick 2005). In the unused areas, occasional disturbances may be necessary but as Lunt et al. (2007) note, areas that have been long-ungrazed should not be subjected to future grazing. Further, if biomass reduction is required then occasional mowing may be less damaging, at least to dominant grasses such as *Themeda australis*, than burning on the Central Western Slopes (Prober et al. 2007).

Conclusions

From a strict point of view, hypothesis (a) was rejected. Despite various levels of management within the four cemeteries, the floras of all management areas contained a high proportion of naturalised species and none would be considered 'pristine'. Though the flora of the cultivated and/or grazed areas surrounding the cemeteries was a 'European sea', albeit spiced with some species from other continents, the overall flora of the cemeteries was only about 50 % native. Nevertheless the dominance of native grasses and the low abundance/cover of exotics provided an appearance of 'Australiana' to many parts of the cemeteries. Moreover, due to the rarity of many of the native species in the local environment, the four cemeteries can be considered a valuable repository of native species for the central west of NSW.

Hypothesis (b) was accepted in part. Clearing followed by either regular or nil/infrequent mowing did not result in homogenisation of species composition in similarly managed areas across all cemeteries. The floras of each cemetery were distinct regardless of mowing regime though those in the same botanic subdivision shared more species than those in different subdivisions. However, within each subdivision, floras of regularly mown areas tended to be more similar than those of unmown areas due to an increase in shared naturalised species and possibly the demise of some native species.

Cemeteries in the central west of NSW are slowly being recognised as important conservation areas as evidenced by changed management in recent years, e.g. the acceptance of grants for subdivisional fencing. Local communities and cemetery managers have accepted changes such as increased heights of mowing in regularly mown areas and occasional biomass removal in unused areas – albeit not always for conservation purposes (e.g. to reduce fire hazard). They are also likely to accept more benign (non-herbicide) means of weed removal and controls on the disposal of 'rubbish' (e.g. plant cuttings and soil) but acceptance of less frequent mowing in burial areas may be a long way off.

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Appendix 1. Four rural cemeteries in central western NSW, Carcoar and Lyndhurst on the Central Tablelands, and Garra and Toogong on the Central Western Slopes showing species recorded in variously managed areas M = occurs in the regularly mown derived grassland at the cemetery; **U** = occurs in unmown or infrequently mown derived grasslands at the cemetery; **E** = occurs elsewhere (e.g. timbered areas) at the cemetery(not recorded at Toogong).

Species recorded from at least two cemeteries that were never recorded in: (a) regularly mown derived grasslands are indicated by '**DA?' (= 'disturbance-avoiding species?)**' or (b) unmown or infrequently mown derived grasslands are indicated by '**DL?' (= 'disturbance-loving species?'**) respectively.
Species recorded (PlantNET) as being native or naturalised in one but not the other botanic subdivision are indicated by: [A] (Central Tablelands but not Central Western Slopes) or [B] (Central Western Slopes but not Central Tablelands).
'v' indicates that a voucher specimen (identified by the Royal Botanic Gardens, Sydney) from one or more cemeteries is located at the Department of Environment and Climate Change, Cowra.
'?' following a site entry indicates that a species of the genus was present in the management area and was presumed to be the species indicated (though it is possible that it may have been another species of that genus).

	Central Tablelands		**Central Western Slopes**	
Observation period (inclusive)	**Carcoar** 1997–2006	**Lyndhurst** 1999–2006	**Garra** 1999–2006	**Toogong** 2001–2006
NATIVE SPECIES				
FERNS				
SINOPTERIDACEAE				
Cheilanthes sieberi	U,E	–	M,U,E	M,U
MONOCOTYLEDONS				
ANTHERICACEAE				
Dichopogon fimbriatus (v)	U,E	U,E	M	M,U
Dichopogon strictus (v)	M,E	–	U,E?	–
Thysanotus patersonii (v)	U,E	–	–	–
Thysanotus tuberosus (v) DA?	U,E	–	–	U
Tricoryne elatior	M,U,E	U,E	–	M,U
ASPHODELACEAE				
Bulbine bulbosa (v)	M,U,E	M,U,E	M,U,E	M,U
COLCHICACEAE				
Burchardia umbellata (v)	M,U,E	M,U,E	–	–
Wurmbea biglandulosa (v)	U,E	–	–	–
Wurmbea dioica DA?	U,E	U	–	–
CYPERACEAE				
Carex appressa	E	–	–	–
Carex breviculmis (v)	M	U,E	–	–
Carex inversa (v)	M,U,E	M,E	–	–
Isolepis hookeriana (v)	M,U	U	–	–
Schoenus apogon	M,U	M,U,E	–	–
HYPOXIDACEAE				
Hypoxis hygrometrica	U	–	–	–
JUNCACEAE				
Juncus homalocaulis (v)	M,U	–	–	–
Juncus subsecundus (v)	M,U,E	U,E	–	–
Juncus vaginatus (v)	M,U	–	–	–
Luzula densiflora (v)	–	–	–	U
Luzula flaccida form B (v)	U,E	–	–	–
Luzula ovata (v) [A]	–	U	–	–
LOMANDRACEAE				
Lomandra filiformis (v)	M,U,E	M,U,E	M,U,E	M,U
Lomandra multiflora (v)	U,E	M,U,E	U,E	M,U
ORCHIDACEAE				
Diuris dendrobioides (v)	U	U	M,U,E	–
Diuris punctata	–	–	–	U
Eriochilus cucullatus	–	–	–	U
Microtis unifolia	M,U,E	U	M,U,E	M,U
Prasophyllum campestre (v) [B]	–	–	M,U,E	–
Pterostylis sp. (v) DL?	–	–	M,E	M

	Carcoar	**Lyndhurst**	**Garra**	**Toogong**
PHORMIACEAE				
Dianella longifolia (v)	M,U,E	M,U,E	M,U,E	M,U
Dianella revoluta (v)	M,U,E	M,U,E	U,E	U
POACEAE				
Amphibromus nervosus (v)	M	–	–	–
Aristida behriana	–	–	M,E	–
Austrodanthonia auriculata (v) [B]	–	–	–	M
Austrodanthonia bipartita (v)	E	–	–	–
Austrodanthonia caespitosa (v)	M,U	M,U	–	–
Austrodanthonia eriantha (v)	U,E	–	M,U,E	–
Austrodanthonia fulva (v)	U	–	–	–
Austrodanthonia laevis (v)	M	–	–	–
Austrodanthonia pilosa (v) DA?	U,E	U	–	–
Austrodanthonia racemosa (v)	E	–	–	M,U
Austrodanthonia setacea (v)	–	–	M,U,E	–
Austrostipa bigeniculata (v)	–	M	M,U,E	–
Austrostipa metatoris (v) [B]	–	–	E	–
Austrostipa nodosa (v)	U	–	–	–
Austrostipa scabra (v)	–	–	M,U,E	M,U
Bothriochloa ?*macra*	M	M,U	M,U,E	M
Chloris truncata	M	M	M,U,E	M,U
Dichanthium sericeum	–	–	M,U,E	–
Dichelachne crinita (v)	E	M,U,E	M,U,E	–
Dichelachne micrantha (v)	–	–	–	M,U
Dichelachne rara (v)	M?,U,E	–	–	M
Digitaria brownii [B]	–	–	E	–
Digitaria divaricatissima (v)	–	–	E	M,U
Elymus scaber	M,U,E	M,U,E	M,U,E	M,U
Enteropogon acicularis [B]	–	–	–	M
Eragrostis alveiformis (v)	M,U	–	–	–
Eragrostis brownii (v)	–	M	–	–
Eragrostis parviflora (v)	–	M	–	U
Eragrostis trachycarpa (v) [A]	M	–	–	–
Lachnagrostis aemula (v)	M,U,E	M,U,E	–	–
Lachnagrostis filiformis (v)	M,E	–	–	–
Microlaena stipoides	M,U,E	–	E	–
Panicum effusum (v)	M,U	M	M	M,U
Paspalidium jubiflorum	–	–	E	M
Poa ?*sieberiana*	M,U,E	U,E	M,U,E	M,U
Sorghum leiocladum [*Sarga leiocladum*]	–	U,E	–	–
Sporobolus creber DL?	M	M	–	M
Themeda australis	M,U,E	M,U,E	M,U,E	M,U
DICOTYLEDONS				
AMARANTHACEAE				
Alternanthera sp. A (v)	–	–	M,U,E	–
APIACEAE				
Daucus glochidiatus	–	–	M,U,E	M
Eryngium rostratum	M,U,E	–	–	–
Hydrocotyle laxiflora (v)	U,E	–	M,U,E	M,U
ASTERACEAE				
Calotis lappulacea	–	–	M,U,E	M
Chrysocephalum apiculatum	M,U,E	M,U	M,U,E	M,U
Chrysocephalum semipapposum	–	–	U,E	–
Cotula australis (v) DL?	–	M	M	M
Craspedia variabilis (v)	–	M,U,E	–	–
Cymbonotus lawsonianus	M,U,E	M,U	M,U,E	M,U
Euchiton gymnocephalus (v)	M,U,E	M,U	–	–
Euchiton involucratus (v)	U	–	–	–

	Carcoar	**Lyndhurst**	**Garra**	**Toogong**
Euchiton sphaericus (v)	M,U,E	M	U,E	U
Helichrysum scorpioides (v)	E	–	–	–
Iseotopsis graminifolia	–	–	M	M,U
Leptorhynchos squamatus	U	M,U	–	M,U
Microseris lanceolata	U,E	–	M,U,E	M,U
Podolepis jaceoides (v)	–	–	–	U
Pseudognaphalium luteoalbum (v)	M,U	M	–	–
Senecio quadridentatus	M,U,E	U,E	U,E	U
Solenogyne bellioides (v)	–	–	M,U,E	M
Solenogyne dominii (v)	–	M,U	M,U,E	M
Stuartina muelleri DL?	–	–	M	M
Triptilodiscus pygmeus	M,U	M,U	M,U,E	M
Vittadinia cuneata (v)	–	–	M,U,E	M
Vittadinia gracilis (v)	–	–	M,U,E	–
Vittadinia muelleri (v)	–	–	M,U,E	M
Xerochrysum viscosa	–	–	E	–
BORAGINACEAE				
Cynoglossum suaveolens (v)	U,E	–	M,U,E	M,U
CAMPANULACEAE				
Wahlenbergia gracilenta (v) [B] DA?	–	E	U,E	U
Wahlenbergia gracilis (v)	E	–	–	–
Wahlenbergia graniticola (v) DA?	–	–	U,E	U
Wahlenbergia luteola (v)	E	U	M,U,E	M,U
Wahlenbergia ?*multicaulis* (v) [A]	E	E	–	–
Wahlenbergia planiflora (v)	–	M,U	M	–
Wahlenbergia stricta (v)	U,E	–	–	–
CHENOPODIACEAE				
Chenopodium desertorum ssp. *microphyllum* (v) [B]	–	–	M,E	–
Chenopodium pumilio	M	M	–	M,U
Einadia nutans	–	–	M,U,E	M,U
Maireana enchylaenoides (v) [B]	–	–	U	–
Maireana microphylla [B]	–	–	E	–
CLUSIACEAE				
Hypericum gramineum (v)	M,U,E	U,E	–	–
Hypericum japonicum	–	–	–	U
CONVOLVULACEAE				
Convolvulus erubescens	–	M,U	M,U,E	M,U
Dichondra repens	–	–	M,U,E	–
CRASSULACEAE				
Crassula ?*decumbens* (v)	–	M	–	–
Crassula sieberiana (v)	M	–	M,U,E	M
DILLENIACEAE				
Hibbertia obtusifolia (v)	E	–	–	–
Hibbertia riparia (v)	M,U,E	M,U,E	–	–
DROSERACEAE				
Drosera auriculata (v)	M,E	–	–	–
Drosera peltata (v)	U	M,U,E	–	U
ERICACEAE				
Acrotriche serrulata (v)	U,E	–	–	–
Brachyloma daphnoides	E	–	–	–
Leucopogon fraseri (v)	U	–	–	–
Melichrus urceolatus (v)	M,U,E	–	–	–
EUPHORBIACEAE				
Chamaesyce drummondii (v) DL?	M	M	M	M
FABACEAE				
Daviesia genistifolia	–	U,E	–	–
Daviesia leptophylla (v)	U	–	–	–
Desmodium ?*varians*	U,E	M,E	M,U,E	U
Dillwynia phylicoides	U,E	–	–	–

	Carcoar	**Lyndhurst**	**Garra**	**Toogong**
Glycine clandestina (v) DA?	U,E	–	U	–
Glycine tabacina (v)	–	M	M,U,E	M,U
Gompholobium huegelii (v)	E	–	–	–
Hardenbergia violacea	U,E	–	–	–
Templetonia stenophylla (v)	–	–	M,U	U
GERANIACEAE				
Erodium crinitum (v)	–	–	–	M
Geranium homeanum (v)	U,E	–	–	–
Geranium ?*potentilloides* (v)	U	–	–	–
Geranium retrorsum (v)	U,E	–	M,U,E	M,U
Geranium solanderi (v)	E	M,U,E	–	–
Geranium sp. 2 (Flora Victoria) (v) [A?]	–	M,U	–	–
GOODENIACEAE				
Goodenia hederacea (v)	M,U,E	–	–	M
Goodenia pinnatifida (v)	–	–	M,U,E	M,U
Velleia paradoxa (v) DA?	U	–	–	U
HALORAGACEAE				
Gonocarpus tetragynus (v)	M,U,E	U,E	–	–
Haloragis heterophylla	–	U,E	–	–
LAMIACEAE				
Mentha satureioides (v)	–	–	E	–
LINACEAE				
Linum marginale	–	–	M,U,E	U
LYTHRACEAE				
Lythrum hyssopifolia	M,U	M	–	–
MALVACEAE				
Sida corrugata (v)	–	–	M,U,E	M
MYOPORACEAE				
Eremophila debilis	–	–	–	M
NYCTAGINACEAE				
Boerhavia dominii	–	–	–	M
ONAGRACEAE				
Epilobium billardiereanum (v) DA?	–	–	U,E	U
Epilobium hirtigerum (v)	M,U,E	M,E	–	–
OXALIDACEAE				
Oxalis exilis (v)	–	E	–	–
Oxalis perennans (v)	U,E	M,U	M,U,E	–
PLANTAGINACEAE				
Plantago gaudichaudii (v)	M,U	–	–	–
Plantago varia (v)	E	–	M,U,E	M,U
POLYGALACEAE				
Polygala japonica (v)	–	U,E	–	–
POLYGONACEAE				
Rumex brownii (v)	M,U,E	M,U,E	M,U,E	M,U
PORTULACACEAE				
Portulaca oleracea DL?	M	M	M	M
RANUNCULACEAE				
Ranunculus lappaceus	–	M,U	–	–
Ranunculus sessiliflorus (v)	–	–	U,E	M?
RHAMNACEAE				
Cryptandra amara (v)	U	M,U,E	–	–
ROSACEAE				
Acaena agnipila (v)	U,E	–	–	–
Acaena ovina (v)	M?,U,E	M,E	M,U,E	–
Aphanes australiana (v)	–	–	M,U,E	–
RUBIACEAE				
Asperula conferta (v)	M,U,E	M,U,E	M,U,E	U
Opercularia diphylla (v)	E	–	–	–
Opercularia hispida (v)	E	–	–	–

	Carcoar	**Lyndhurst**	**Garra**	**Toogong**
SCROPHULARIACEAE				
Veronica serpyllifolia (v)	–	–	–	M
STACKHOUSIACEAE				
Stackhousia monogyna	M,U,E	M,U,E	M,U,E	U
STYLIDIACEAE				
Stylidium graminifolium (v)	U	–	–	–
THYMELAEACEAE				
Pimelea curviflora (v)	M,U,E	U,E	M,U,E	U
Pimelea glauca (v)	–	U,E	–	–
Pimelea stricta (v)	–	–	U,E	–
Total native species: 176 (all sites)	**108**	**75**	**84**	**80**
NATURALISED EXOTIC SPECIES				
MONOCOTYLEDONS				
ALLIACEAE				
Nothoscordum borbonicum (v)	–	–	–	M,U
ASPARAGACEAE				
Asparagus officinalis	–	M,U,E	–	–
HYACINTHACEAE				
Ornithogalum thyrsoides (v) [A]	M,U,E	M,U	–	–
Ornithogalum umbellatum (v)	E	–	M	–
IRIDACEAE				
Gladiolus undulatus (v)	M,U,E	–	–	–
Iris germanica	M,U,E	–	–	U
Romulea rosea (v)	M,U,E	M,U,E	M,U,E	M
Sparaxis bulbifera (v) [A]	M	–	–	–
Tritonia lineata (v)	M,U,E	M,U,E	–	M
JUNCACEAE				
Juncus bufonius	M,U	M,U,E	U	–
Juncus capitatus (v)	–	E	–	U
POACEAE				
Agrostis capillaris (v)	U,E	–	–	–
Aira cupaniana (v)	–	–	U	–
Aira elegantissima (v)	M,U,E	M,U,E	M,U,E	M,U
Anthoxanthum odoratum	M,U,E	M,U	–	–
Avena ?fatua	M,U,E	M,U,E	M,U,E	M,U
Briza maxima	M,U,E	M,U,E	U,E	–
Briza minor	M,U,E	M,U,E	M,U,E	M,U
Bromus cartharticus (v)	M,U,E	M,U,E	M,E	M,U
Bromus diandrus	M,U,E	M,U,E	M,U,E	M,U
Bromus molliformis	M,U,E	M,U,E	M,U,E	M,U
Cynodon dactylon DL?	M,E	M	E	–
Cynosurus echinatus (v) [A]	U,E	U,E	–	–
Dactylis glomerata [A]	M,U,E	M,U,E	M,U,E	–
Digitaria sanguinalis	M	M	U	M
Echinochloa crusgalli DL?	M	M	M	–
Eleusine tristachya DL?	M	M	–	M
Eragrostis cilianensis	M	M	E	M,U
Eragrostis pilosa (v) [A]	–	M	–	–
Hainardia cylindrica (v)	–	M	–	–
Holcus lanatus	M,U,E	M,U,E	–	–
Hordeum leporinum DL?	–	–	M,E	M
Lolium rigidum	M,U,E	M,E	M,U,E	M,U
Nassella trichotoma (v)	M,E	–	–	–
Panicum capillare DL?	M	M,E	–	–
Paspalum dilatatum	M,U,E	M,U,E	M,U,E	M
Pennisetum clandestinum DL?	–	M	–	M
Phalaris aquatica	M,U,E	M,E	M,E	U
Poa annua	M	M,U	M	–

	Carcoar	**Lyndhurst**	**Garra**	**Toogong**
Poa bulbosa (v)	M,E	M	M,U,E	M
Poa pratensis (v)	–	M,U	–	–
Rostraria cristata (v)	–	–	M,E	M,U
Setaria gracilis	M,U	–	–	M
Setaria pumila	–	–	–	M
Setaria verticillata	M	M	–	U
Vulpia myuros &/or *V. bromoides*	M,U,E	M,U,E	M,U,E	M,U
DICOTYLEDONS				
AMARANTHACEAE				
Alternanthera pungens [B] DL?	–	–	M	M
Amaranthus retroflexus	–	M	–	–
APIACEAE				
Ciclospermum leptophyllum (v)	–	M,U	–	–
APOCYNACEAE				
Vinca major (v)	M,U,E	M	–	–
ASTERACEAE				
Arctotheca calendula DL?	M,E	M	M	M
Carduus pycnocephalus	E	–	–	–
Carthamus lanatus	M,E	–	M,U,E	M,U
Centaurea calcitrapa	–	–	M,E	–
Centaurea solstitalis	–	–	M,U,E	–
Chondrilla juncea	M,E	M,E	M,U,E	M,U
Cirsium vulgare	M,U,E	M,U,E	M,U,E	M,U
Conyza bonariensis	M,U,E	M,U,E	M,U,E	M,U
Gamochaeta americana (v)	M,E	M	–	–
Gamochaeta calviceps (v)	M,U,E	E	U	U
Gamochaeta spicata (v)	–	M,U	–	–
Hedypnois rhagodioloides [B] DL?	–	–	M	M
Hypochaeris glabra (v)	M,U,E	–	M,U,E	M,U
Hypochaeris radicata	M,U,E	M,U,E	M,U,E	M,U
Lactuca saligna (v)	–	–	–	U
Lactuca serriola	M,U,E	M,E	M,U,E	M,U
Silybum marianum	M	–	M,U,E	M,U
Soliva sessilis (v)	–	M	–	–
Sonchus asper (v)	–	M,U,E	U	–
Sonchus oleraceus (v)	M,U,E	M,U,E	M,E	M,U
Taraxacum officinale [A]	M,E	–	E	–
Tolpis umbellata	–	–	M,U	–
Tragopogon porrifolius	E	E	M,U,E	M
Xanthium spinosum	–	–	–	M,E
BORAGINACEAE				
Amsinckia intermedia (v)	M	–	–	–
Echium plantagineum	M,U,E	M	M,U,E	M,U
Echium vulgare (v)	U,E	M,E	M,U,E	U
Heliotropium europaeum	–	–	–	U
Myosotis discolour (v)	M	M,U	–	–
BRASSICACEAE				
Capsella bursa–pastoris DL?	–	–	M,E	M
Hirshfeldia incana	–	–	M,E	–
Lepidium africanum (v)	–	–	E	M,U
Lunaria annua (v)	U,E	–	–	–
Raphanus raphanistrum (v)	U	–	–	–
Sisymbrium ?*orientale*	–	–	–	M
CARYOPHYLLACEAE				
Arenaria serpyllifolia	–	M	M	M,U
Cerastium glomeratum	M,U,E	M,U,E	M,U,E	M,U
Moenchia erecta (v)	–	–	M,U,E	–
Paronychia brasiliana (v)	–	–	M,E	–
Petrorhagia nanteuilii (v)	–	–	M,U,E	M,U

	Carcoar	**Lyndhurst**	**Garra**	**Toogong**
Petrorhagia velutina (v) [B]	U	M,U	–	–
Polycarpon tetraphyllum DL?	M	M	M	M
Silene gallica var. gallica	–	–	–	M
Spergularia rubra (v) DL?	M	M	M	–
Stellaria sp. B (v)	–	–	U	–
CHENOPODIACEAE				
Chenopodium album DL?	–	M	M	–
CLUSIACEAE				
Hypericum perforatum	M,U,E	M,U,E	U,E	U
CUCURBITACEAE				
Cucumis myriocarpus	–	–	–	U
EUPHORBIACEAE				
Euphorbia peplus (v)	–	U	–	–
FABACEAE				
Medicago lupulina	–	M	–	U
Medicago minima [B]	–	–	M,U,E	M,U
Medicago polymorpha (v) DL?	–	M	–	M
Medicago sativa	–	M	E	U
Trifolium angustifolium	M,U,E	M,U	M,U,E	M,U
Trifolium arvense	M,U,E	M,U,E	M,U,E	M,U
Trifolium campestre	M,U	M,U	M,U,E	M,U
Trifolium dubium	M,U,E	M,U,E	M,U,E	M
Trifolium glomeratum	M,U,E	M,U,E	M,U,E	M,U
Trifolium repens	M,U	M	–	–
Trifolium scabrum [B]	–	–	M,E	U
Trifolium striatum	M	M,U	M,E	M
Trifolium subterraneum	M	M	M,U,E	M
Vicia sativa (v)	M,U,E	M,U,E	M,U,E	–
FUMARIACEAE				
Fumaria muralis (v)	–	–	–	M
GENTIANACEAE				
Centaurium erythraea (v)	M,U,E	M,U,E	M,U,E	–
Centaurium tenuiflorum (v)	M,U,E	–	–	M,U
GERANIACEAE				
Erodium cicutarium (v)	–	M	M,U,E	–
LAMIACEAE				
Lamium amplexicaule	–	–	M,E	–
Marrubium vulgare	–	–	M,E	M,U
Salvia verbenaca	–	–	M,U,E	M,U
LINACEAE				
Linum trigynum (v)	–	–	E	–
MALVACEAE				
Malva parviflora DL?	–	M	–	M
Modiola caroliniana DL?	M	M	–	M
MYRSINACEAE				
Anagallis arvensis	M,U,E	M	M,U,E	U
ONAGRACEAE				
Oenothera stricta DL?	M	M	–	–
OROBANCHACEAE				
Orobanche minor	E	–	–	M,U
OXALIDACEAE				
Oxalis articulata (v)	M,U,E	E	–	–
Oxalis corniculata (v)	M,U,E	–	–	M,U
Oxalis pes–caprae (v)	M,E	–	–	–
Oxalis purpurea (v)	M,U,E	–	–	–
Oxalis thomsoniae (v)	–	–	M	–
PAPAVERACEAE				
Papaver hybridum	–	–	M,U	–
Papaver somniferum	M,U	–	M,E	M,U

	Carcoar	**Lyndhurst**	**Garra**	**Toogong**
PLANTAGINACEAE				
Plantago lanceolata	M,U,E	M,U,E	M,U,E	–
POLYGONACEAE				
Acetosella vulgaris	M,U,E	M,E	–	–
Polygonum aviculare DL?	M	M	M	–
Rumex crispus	U	E	–	–
RESEDACEAE				
Reseda luteola	–	–	–	U
ROSACEAE				
Aphanes arvensis (v)	–	M,U	–	M
Sanguisorba minor	M,E	M,U	–	–
RUBIACEAE				
Galium aparine	–	E	–	–
Galium divaricatum (v)	–	–	M,U,E	U
Galium murale (v)	M	M,U	M	M
Sherardia arvensis	–	M	E	–
SCROPHULARIACEAE				
Kickxia commutata (v) [B]	–	–	E	–
Linaria pelisseriana [B]	–	–	U	–
Parentucellia latifolia	–	M,U	M,E	M
Verbascum virgatum	M,E	–	M,U,E	M,U
Veronica arvensis (v)	–	M	M,U,E	M
SOLANACEAE				
Datura sp.	–	–	M	–
Solanum nigrum	M,U	M	–	M,U
URTICACEAE				
Urtica urens (v)	–	–	–	M
VERBENACEAE				
Verbena rigida (v)	M,U,E	–	–	–
ZYGOPHYLLACEAE				
Tribulus terrestris DL?	M	M	–	M
Total naturalised species: 154 (all sites)	**92**	**93**	**90**	**86**
NON–NATURALISED (PLANTED) EXOTIC SPECIES				
MONOCOTYLEDONS				
AMARYLLIDACEAE				
Amaryllis belladonna	M	–	M	–
Leucojum aestivum (v)	M	–	–	–
Narcissus jonquilla	M,E	–	–	–
ASPARAGACEAE				
Asparagus asparagoides	–	E	–	–
ASPHODELACEAE				
Asphodelus fistulosus (v)	–	–	M	–
HYACINTHACEAE				
Muscari armeniacum (v)	M	–	–	–
DICOTYLEDONS				
AIZOACEAE				
Aptenia cordifolia (v)	–	M	–	–
Carpobrotus sp. (v)	M	–	–	–
ASTERACEAE				
Calendula officinalis (v)	M	–	–	–
Osteospermum ecklonis (v)	–	M	–	–
CRASSULACEAE				
Sedum praealtum (v)	–	M,U	–	–
GERANIACEAE				
Geranium/*Pelargonium* sp.	–	M	–	–
LAMIACEAE				
Lavandula sp.	M	M	–	–
VALERIANACEAE				
Centranthus ruber	–	M	–	–
Total non–naturalised species: 14 (all sites)	**7**	**7**	**2**	**0**