CANDELO CEMETERY VEGETATION

By Jackie Miles, Consultant Botanist

BACKGROUND

In 2001 I undertook a survey of rural cemeteries in the Shire for Bega Valley Shire Council, to look at their biodiversity value. It had been realised around that time among the scientific community that cemeteries can be significant sites for conservation of native plants, particularly grasses and herbs typically found in native grasslands or grassy woodlands. The reasons for this are twofold. Firstly, they have not been subjected to cultivation, fertiliser application or pasture improvement, all of which cause replacement of native plants with introduced pasture grasses and legumes. Also, the absence of regular grazing means that species which are particularly tasty to livestock have not been selectively grazed out over the years.

Secondly, cemeteries have generally been managed in such a way as to keep grass density down, either by mowing, burning or occasional crash grazing. As more research was done on managing native grasslands, it became apparent that at least on the more fertile soils in higher rainfall coastal and tablelands areas it is important to keep grass bulk controlled to some extent. Kangaroo grass (Themeda triandra), which tends to be the dominant native grass in ungrazed higher rainfall areas, accumulates a thatch of dead leaf material around the base of the plant which blankets the ground around each tussock and makes it hard for small herbs to survive. Native herbs rely on there being plenty of bare ground between the individual grass plants (the inter- tussock spaces). Grazing can achieve this, but also can result in the loss of some palatable species, so burning or slashing is preferable. Because cemeteries have generally been managed like this for many years, they can represent the last refuges of some native plants which have been largely eradicated from private property. Because these plants prefer the sort of habitat that has largely been cleared for agriculture or heavily modified by grazing (better soils, relatively flat, light tree cover) they are very unlikely to be found in National Parks and other reserves. Travelling Stock Reserves (which are often more lightly or intermittently grazed than farms), churchyards, showground reserves and road verges can provide other refuges, depending on their past management. I also surveyed most of these areas in Bega Valley Shire, and it appeared in 2001 that small rural cemeteries carried the best examples of native grassy vegetation, with the greatest number of native plant species and fewer weeds.

In recognition of the fact that there has been extensive clearing for farming of coastal grassy woodlands, such as those of the Bega Valley, and that remaining areas have been much modified and face a number of on-going threats (further clearing, overgrazing, weeds, tree dieback and general lack of management), such woodlands have been listed as Endangered Ecological Communities (EECs) under both NSW and Commonwealth legislation. The local EEC is called Lowland Grassy Woodland. Further up the coast there are also listings of similar communities, Illawarra Lowlands Grassy Woodland and Hunter Floodplain Red Gum Woodland. These are generally characterized by being on more fertile soils derived from alluvium or volcanic soil types (granite or basalt), having Forest Red Gum (*Eucalyptus tereticornis*) as one of the main trees, and having a dense and diverse groundcover of grasses and herbs, with not many shrub species.

A woodland is defined as a treed community in which the tree crowns do not overlap. One of the modifications to remaining areas of Lowland Grassy Woodland is that tree density has changed, either by clearing so that few or no trees remain, or by allowing a lot of tree regrowth to occur so they have become forest. The latter may have a detrimental effect on the groundcover species diversity by creating too much shade for some sun-loving grasses and herbs. Given the way treed remnants thicken up with young trees and shrubs such as Blackthorn (*Bursaria spinosa*) if unmanaged, it is very likely that it was Aboriginal burning practices which kept the Valley vegetation as woodland and allowed the plants and animals dependent on it to persist over thousand of years.

There are small populations of a few typically tableland trees scattered in the Bega, Yowrie and Towamba Valleys, such as the Yellow Box (*Eucalyptus melliodora*) and Snow Gum (*E. pauciflora*) in the Candelo Showground. This suggests that during the last ice age, some 10,000 years ago, when sea levels had fallen considerably and the coastline was much further east, the climate of the coastal valleys was more like that currently found on the tablelands. Many of the grassy woodland herbs also have closer affinities with tablelands vegetation than with the plant communities in the surrounding coastal forests.

Where the trees have been removed but the native grass and herb diversity is still high, the vegetation is said to be "secondary grassland", that is a grassland created by human intervention. The Candelo cemetery is an example of a secondary grassland. "Native pasture" refers to areas where the dominant grasses are native, usually kangaroo grass or weeping grass (*Microlaena stipoides*) in the Bega Valley, but there is a low diversity of native herbs due to past management. Much of the native grassy vegetation on private property in the district falls into this category.

CANDELO CEMETERY

My surveys of the cemeteries consisted of wandering around and recording as many species as I could find several times in spring of 2000 and summer of 2001. A reasonably complete species list was been compiled from these visits, but a few may have been missed. Some native lilies and orchids which appear from underground tubers only at certain times of year may fail to appear at all in some years if conditions are too dry. Or they may appear, but only be identifiable for a very short period while flowering. Only a small part of the cemetery was allowed to remain unmown for the whole growing season during the project, so it is possible that some other plant species occur in other parts of the cemetery, but were not detected because of regular mowing.

Other areas around Candelo which were investigated include two Travelling Stock Reserves on Kemps Lane and one in Candelo village, all the road verges, and a few areas of private property. While it appears that there were at that time many sites around Candelo with grassy remnant vegetation containing small populations of regionally rare species, the cemetery vegetation was distinguished from nearly all other sites by its greater size. Most of the roadside sites, while they may have regionally rare plants, or even a high diversity of species on the one site, are very small and mostly quite weedy. Sites on private property generally have a much lower species diversity because of their grazing history. The cemetery, purely because of its size, could be expected to maintain its populations of regionally uncommon species more securely than smaller sites which are beset on all sides by weeds. However, it would need sympathetic management to achieve this.

In 2000-01 I found the grassy vegetation to be in good condition over most of the cemetery. Weeds were in low abundance in many parts of the cemetery, and there was a fair diversity of native herbs amongst the kangaroo grass and native sorghum, which dominated the site. Most native herbs were apparently present only in low numbers, though if mowing pressure were reduced, they may have been found to be more common than they appeared. This happened at Bemboka cemetery, where several previously unseen native herbs appeared in the summer of 2000-01 in the most weed-free area when it was left unmown, and species formerly thought to be confined to unmown locations such as grave tops and under fences were found to be more widespread.

There was a moderate infestation of African lovegrass in the cemetery in 2001, which was then scattered in patches throughout the whole area, and like most cemeteries, the area immediately around the graves is dominated by weeds due to the higher level of soil disturbance and more frequent moving in those areas.

The survey found 16 regionally significant species in Candelo cemetery. In general they are significant because they are confined to grassy ecosystems of farming areas, and are therefore much depleted, and now uncommon within the Shire. Many of them have a restricted distribution even within the agricultural areas, being found only in the best quality remnants. Examples are:

- Yellow box (*Eucalyptus melliodora*), a single young tree in one of the fence lines, more common in the Showground, restricted to the drier parts of the Valley (Candelo to Bemboka).
- Bulbine lily (*Bulbine glauca*) was found to be plentiful along the southern edge of the cemetery in 2001. Unlike other cemeteries, it was not confined to a narrow strip around the unmown edges, though certainly more common along the southern fence. But during a visit in 2023 only a single plant was found next to the southern fence despite the recent run of wet seasons, a hint at the deterioration in this cemetery over the last 20 years. This attractive yellow-flowered lily is almost entirely confined to ungrazed remnant vegetation, on roadsides and in most rural cemeteries, though generally confined to unmown areas.

- Yellow buttons (*Chrysocephalum apiculatum*) was found to be scattered all over, with both a silver and green-leaved form present. It is also present in several of the rural cemeteries and some other remnants, but generally uncommon in the region.
- Blue rice flower (*Pimelea glauca*), a few plants in the unmown south-western corner. Very uncommon in the region; also in Rocky Hall cemetery.
- Lespedeza (*Lespedeza juncea*), a single plant was seen below the southern-most graves in the south-west corner in spring of 2000. By December, with no mowing, this had increased to 3 plants, all small. Known from Bemboka, Wyndham and Rocky Hall cemeteries; otherwise very uncommon.
- Blue heron's bill (*Erodium crinitum*) was not detected in the cemetery, but in the reserve road to the east. This had not been recorded from the far south coast before. It was also found on one road verge and in one Travelling Stock Reserve around Candelo and on a footpath in Bega! In all cases only small numbers of plants were seen.

In my 2001 report to Council I said "The management of this cemetery to maintain its native vegetation and reduce weed populations is desirable since it provides an interesting example of what the grassy understorey of the farming areas may have been like prior to European settlement of the area. All of the native plants recorded in Candelo cemetery to date are also found in other rural cemeteries and on various roadside sites. The outstanding feature of Candelo cemetery is its size. The relatively large area involved makes the cemetery potentially more viable as a reserve for the protection of significant native plants than the many small sites scattered around the Candelo area, most of which are very small and acutely threatened by weed invasion."

Unfortunately this sympathetic management did not occur. The local cemetery committee at the time was not particularly receptive of my ideas and wanted to go on mowing most of the cemetery regularly, and hoped that this would serve to manage the weed problems then present. Actually all this management method did was spread African Lovegrass (ALG) over the entire cemetery, so that its biodiversity values have been much reduced. This is not entirely down to unsatisfactory management, as ALG has increased its extent and density over much of the region, promoted by the succession of droughts since 2002.

However, it does highlight that grassy remnants need active management, particularly weed control, to remain in the condition they were in 20 years ago. "Lock it up and leave it" simply does not work as a management strategy for this vegetation community. Experience with the cemeteries that have had fire as part of their management (albeit sporadically since 2000) has shown that it is probably the best way to maintain native species diversity and minimize weed invasion.

Obviously cemeteries do need to be mown, for the safety and convenience of its human users. However this could be limited for most of the year to the areas immediately around the graves, with the remainder being allowed to flower and set seed. It could then be burnt or mown once a year, after seed has been shed, to help maintain populations of native plants. There would probably also need to be some targeted weed control work during the period when it was not being mown, to prevent weeds from also taking advantage of this period to produce seed.

Fauna also uses cemeteries to some extent and would also benefit from this type of management. Seed-eating birds such as finches certainly would, and smaller animals like reptiles and invertebrates (insects, spiders etc) would have more cover from predators and breed up to provide food for insectivorous or carnivorous birds.

SPECIES LIST FOR THE CANDELO CEMETERY, 2000-01 and 2023

A scale of relative abundance has been used to indicate roughly how common or uncommon each species is on the site, as follows:

1 = less than 5% of total vegetation cover and only a small number of individuals

2 = still less than 5% of cover, but common (small plants)

3 = 5 to 20% of total vegetation cover

4 = 21-50% cover

5 = 51-75% cover

An asterisk precedes an introduced species or an Australian native which is not native to Bega Valley.

Note: it is likely some of these species are no longer present in 2023, and the abundance of some is likely to have changed substantially, e.g. an increase in African Lovegrass and decrease in native grass cover. Most of the species not recorded in 2000-01 but picked up in 2023 are exotics, possibly newly arrived on graves due to disturbance there, or imported on vehicles/mower, or possibly due to the wet summers preceding the 2023 surveys (two, in April and July, so poor timing for detecting spring flowering species, both natives and weeds, accounting for some apparent absences in 2023.

Scientific name	Common name	Cover 2000- 01	Comment	Cover 2023
Trees				
*Acacia baileyana	Cootamundra wattle	1	Planted near entrance	Gone
Acacia mearnsii	Black wattle	1	Unmown patch close to fences	1
Acacia melanoxylon	Blackwood	1	Unmown patch close to eastern fence	1
*Acer negundo	Box elder	1	Planted near showground side	Gone?
*Ailanthus altissima	Tree of heaven	1	Suckers coming up along southern fence	1
Angophora floribunda	Rough-barked apple	1	Unmown patch close to showground fence	1
Brachychiton populneus	Kurrajong	1	One young tree in fence line	1
*Chamaecytisus palmensis	Tagasaste, Tree Lucerne	0	One planted (?) along S fence + 1 young one under it.	1
*Crataegus monogyna	hawthorn	1	Suckers in less frequently mown area	1
Eucalyptus melliodora	Yellow box	1	One young tree in the fence line	1, + regen near showground
Eucalyptus tereticornis	Forest red gum	1	Unmown patch close to fence, NE corner	1
*Malus domestica	Apple	1	Unmown patch close to fence	In reserve road to E
*Pinus radiata	Radiata pine	1	One large tree among the graves	Gone
*Prunus sp.	Plum	1	Suckers in unmown area.	Gone?
Shrubs				
Bursaria spinosa ssp Iasiophylla	Blackthorn	1	A few plants came up in the unmown area, from rootstocks which are kept suppressed by mowing.	2, in lower SW corner area, less often mown
*Ligustrum lucidum	Large-leaved Privet	0	Under Yellow Box, S fence	1
*Ligustrum sinense	Small-leaved privet	1		

2					
Scientific name	Common name	Cover 2000- 01	Comment	Cover 2023	
*Lycium ferocissimum	African Boxthorn	0	S and E fences, x2	1	
Melicytus dentatus	Tree violet	1	Unmown patch close to fence	Gone?	
*Pyracantha angustifolia	Firethorn	1	One plant under yellow box near showground fence.	Gone?	
*Rosa rubiginosa	Briar rose	1	Unmown patch close to fence	1	
*Rubus fruticosus	Blackberry	1	Scattered along S side.	1	
Rubus parvifolius	Small leaved bramble	1	Native raspberry, trails through grass, not erect like blackberry.	1	
<u>Grasses</u>					
*Aira sp.	Hairgrass	2			
*Anthoxanthum odoratum	Sweet vernal grass	1			
Aristida vagans	wire grass	1	Under yellow box near showground fence.		
Austrostipa verticillata	Bamboo Grass	0	On 1 grave (Linda Hopkins)	1	
*Avena fatua	Wild oats	1			
Bothriochloa macra	Red grass	1		1	
*Briza maxima	Blowfly grass	2			
*Bromus catharticus	Prairie Grass	0		1	
*Bromus ?mollis	Soft brome	1	Only round graves		
Cymbopogon refractus	Barbed wire grass	1	Showground fence.	1	
*Cynodon dactylon	Couch	0?	Next to central road	2	
*Dactylis glomerata	Cocksfoot	0?		1	
Dichelachne crinita	Plume grass	1			
Dichelachne micrantha	Plume grass	2		1	
*Digitaria sanguinalis	Summer or Crab Grass	0		1	
Elymus scaber (Anthosachne scabra)	Common wheat grass	1	In unmown areas under yellow box near showground fence.	1	
*Eragrostis curvula	African lovegrass	2	Common, but patchy. Dominant in some small areas.	5 (dominant over much of area, still patchy in some bits)	
Eragrostis leptostachya	Paddock lovegrass	1	A native lovegrass, quite different in appearance to the exotic one.	1	
*Holcus lanatus	Yorkshire fog	1	Round seepage area.	1	
Imperata cylindrica	Blady grass	1	Tall grass with cottony seed heads only in seepage area	0-4	
*Nassella trichotoma	Serrated tussock	1	One plant dug out from area left unmown over summer. Could be more present, being kept in check by mowing.	0	
Panicum effusum	Panic grass	2		1	
*Paspalum dilatatum	Paspalum	1	Round graves, & seepage	1	

3						
Scientific name	Common name	Cover 2000- 01	Comment	Cover 2023		
			area.			
*Pennisetum	Kikuyu	1		2		
clandestinum						
*Phalaris aquatica	Phalaris	0		1		
Poa labillardierei	Poa or silver tussock	1	Round fences where not mowed	2		
Poa ?meionectes	Small poa tussock	1	Very fine leaves	1		
*Poa pratensis	Kentucky bluegrass	1		0		
Rytidosperma pilosa	Slender wallaby grass	1		0		
*Setaria sp.	Pigeon grass	1	Seepage area	1		
Sorghum leiocladum	Native sorghum	2	Common (recognisable by "ballet skirts" round stems)	Not seen, but hard to spot without seed heads		
*Sporobolus africanus	Parramatta Grass	0	Track edges mostly	2		
Sporobolus elongatus	Rat's tail grass	1				
Themeda triandra	Kangaroo grass	5	Dominant species on site	3 (still dominant in less often mown W and N edges)		
sedges or tussocks						
Baumea rubiginosa		1	In seepage area.	1		
Carex appressa		0		1		
Carex breviculmis		1	In drier grassy areas.			
Carex gaudichaudiana		0	Seepage area	3		
Carex inversa	Knob sedge	0		1		
Juncus planifolius	Duch	1	In seepage area.			
Lomandra filiformis ssp. filiformis	Tiny mat rush	1	Only seen close to memorial garden, but easily overlooked due to small size.			
Lomandra longifolia	Spiny mat rush	1	Large tussock plant near fences			
Lomandra multiflora	Mat rush	1	In drier grassy areas.			
Luzula sp.	Woodrush	1	Around seepage area.			
Schoenus apogon	Common bog sedge	2	Seepage area.			
Herbs						
Acaena sp.	Sheep's burr	1	Long spike of small burrs	1		
*Acetosella vulgaris	Sheep sorrel	1	Red 'coral' type flower heads	1		
*Agapanthus sp.	Agapanthus	1	Planted in memorial garden.	1		
*Aloe maculata	Soap Aloe	0	On grave	1		
*Arctotheca calendula	Capeweed	1	Only among graves.	1		
Arthropodium milleflorum	Pale vanilla lily	1	Tall spikes of small white flowers and broad grass- like leaves with a whitish bloom.	1		
Bossiaea prostrata	Creeping bossiaea	1	Small yellow pea flowers			
Bulbine glauca	Bulbine lily	1	Mostly along southern side.	1		

Scientific name	Common name	4 Cover	Comment	Cover 2023
	Common name	2000- 01	Comment	
*Canna indica	Canna lilv	1	Planted in seepage area.	Not seen
*Centaurium ervthraea	Pink centaury	1		1
Centella asiatica		1	In seepage area.	Not seen
*Chenopodium album	Fat hen	1	In memorial garden.	
, Chrysocephalum	Yellow buttons	2	Yellow daisy with silver	1 Occas in
apiculatum			leaves, & on this site occasionally with larger green leaves.	less mown bits
*Cirsium vulgare	Black thistle	1		1
Commelina cyanea	Scurvy weed	0		1
*Conium maculatum	Hemlock	1	In memorial garden.	0
*Conyza sumatrensis	Tall Fleabane	1		1
Convolvulus erubescens	Australian bindweed	1	Quite large pink flowers.	0
Desmodium varians	Slender tick trefoil	1	Small native legume, clover like leaves, pinkish flowers	1
Dianella longifolia	Blue flax lily	1	Tall blue lily with spreading flower heads and small flowers. In unmown areas and on graves.	1-2 in less often mown bits, no longer on graves (they get slashed)
Dianella revoluta	Blue flax lily	1	Similar but leaves blue-ish on underside. On grave.	1
Dichondra repens	Kidney Weed	0?	Around graves	1
Diuris sulphurea	Tiger orchid	1		0
*Echium plantagineum	Patterson's curse	1	Only among graves.	0
*Echium vulgare	Viper's bugloss	1	Weed similar to Patterson's curse, removed from along western (front) fence.	0
Einadia nutans		0	, <i>í</i>	1
Epilobium billardierianum	Willow herb	1		1
Epilobium hirtigerum	Hairy Willow herb	1	Greyish furry leaves and small pink flowers. Fluffy seed. Around seepage area.	1
*Erigeron karvinskianus	Seaside Daisy	0	On graves	1
*Erodium cicutarium	Pink Storksbill	0	On graves	1
Euchiton japonicus	Small Cudweed	0		1
*Euphorbia peplus	Petty spurge	1	Only among graves.	1
<i>*Fumaria</i> sp.	Fumitory	0	On grave	1
Geranium gardneri	Native geranium	1	Small pink flowers in pairs.	1
*Galium aparine	Cleavers, "Velcro plant"	0		1
*Galium ?divaricatum		0		1
*Gamochaeta calviceps	Silver Cudweed	1		0
*Gamochaeta coarctata	Cudweed	0		1
*Gazania sp.	Treasure Flower	0	On grave	1
Glycine tabacina	Purple glycine	1	Around graves	1
Glycine ?tomentella	Hairy glycine	1	Small twining herb with hairy clover like leaves and small pale purple flowers.	Not seen

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Scientific name	Common name	Cover 2000- 01	Comment	Cover 2023	
Gonocarpus tetragynus	Raspwort	1	Scattered throughout. Flowers red and tiny.	0	
Haloragis heterophylla	Swamp Raspwort	1	In seepage area.	2	
Hardenbergia violacea	Native sarsaparilla	1	Small bright purple pea flowers and single leaf (not clover-like)	0	
*Hirschfeldia incana	Buchan Weed, Hairy Mustard	0		1	
Hydrocotyle laxiflora	Stinking pennywort	1	Kidney shaped leaves and small balls of tiny, unpleasantly smelly flowers	1	
Hypericum gramineum	Small St John's wort	1	Native, and harmless unlike introduced species. Small pale yellow flower.	1	
*Hypericum perforatum	St John's wort	1	A few plants, south of track and roughly central.	1 (half way up north side in less often mown bit)	
*Hypochaeris radicata	Cat's ear or flatweed	2	Abundant yellow flowered daisy with flat rosette of leaves and large flower head, often confused with dandelion.	1	
*Lactuca serriola	Prickly Lettuce	0	In gazebo planting	1	
*Leontodon saxatilis	Hawksbit	0	Seepage area	1	
Lespedeza juncea	No common name	1	Tall native legume with erect stems of narrow clover like leaves and small white flowers. Three plants near southern end of isolated row of graves.	Not seen	
*Lilium formosanum	Formosan Lily	0		1	
*Lobularia maritima	Alyssum	1	Spreading around graves.	2	
*Lysimachia (Anagallis) arvensis	Scarlet pimpernel	1	Orange flowered small weed, only round graves.	1	
*Medicago lupulina	Black Medic	0		1	
*Modiola caroliniana	Orange mallow	1	Only round graves.	1	
*Narcissus sp.	Jonquils	1	On or near graves.	Not seen	
*Oenothera sp.	Evening primrose	1	Only round graves.	1	
*Oxalis sp.	Pink oxalis	1	Only around graves.	1	
*Papaver somniferum *Petrorhagia nanteuilii	Opium poppy Proliferous pink	1	Only among graves. Pink flower like a tiny carnation. Only among	Not seen	
		-	graves.		
*Petunia hybrids	Petunia	1	Spreading among graves.	1	
Pimelea curviflora var sericea	Curved rice-flower	1		Not seen	
Pimelea glauca	Blue rice-flower	1	A few in area left unmown.	1	
*Plantago lanceolata	Plantain	2		2	
*Polycarpon tetraphyllum	Four-leaved Allseed	0		1	
Pteridium esculentum	Bracken Fern	0	In less mown bits	1	
Ranunculus lappaceus	Common buttercup	1	Large shiny yellow flower.	Not seen	
*Richardia humistrata	Mexican Clover	0	Near track and graves	0-2	

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Scientific name	Common name	Cover 2000- 01	Comment	Cover 2023
*Romulea rosea	Onion weed	1-2	Grass-like leaves, pink flowers in spring.	Not seen (spring only)
Rumex brownii	Native dock	1	Tall herb with spikes of tiny burrs.	1
*Salvia verbenaca	Wild Sage	0	On grave	1
*Sanguisorba minor	Sheep's Burnet	0		1
Scleranthus fasciculatus	Knawel	1		Not seen
*Senecio	Fireweed	1		2
madagascariensis				_
*Sherardia arvensis		1		
*Silene gallica	French catchfly	1	Small pink or red and white flowers.	
*Solanum chenopodioides	Whit-tip Nightshade	0		1
*Sonchus oleraceus	Milk thistle	1		1
*Stachys arvensis	Stagger Weed	0	On grave	1
*Taraxacum officinale	Dandelion	0	<u> </u>	1
*Tolpis barbata		0		1
Tricoryne elatior	Yellow rush lily	1	Small yellow flowers on wiry stems	1
*Trifolium dubium	Suckling clover	1	Small yellow balls of flowers	
*Trifolium sp.	Clover	0		1
*Tritonia lineata	Lined tritonia	1	A cream flowered bulb similar to freesia, spreading around graves.	1
*Verbascum thapsus	Giant mullein	1	Large furry leaves, tall yellow flower spikes.	1
*Verbena bonariensis	Purpletop	0		1
*Verbena rigida	Purple verbena	1		1-3
*Vinca major	Periwinkle	1	Two big patches, to south of graves.	1 (patches bigger)
*Vicia sp.	Vetch	1		1
Wahlenbergia gracilis	Tiny bluebell	1		1
Wahlenbergia capillaris (communis)	Wiry bluebell	1	Large pale blue flowers on wiry stems	1
Wahlenbergia multicaulis	Tadgell's bluebell	1	Only one seen, near track.	1
*Watsonia meriana	Watsonia	1	Near graves.	Not seen
Zornia dyctiocarpa	Zornia	1		Not seen