Blayney Shire Council

Cemeteries Operations Plan

Operations Plan for all Blayney Shire Cemeteries

at Carcoar, Lyndhurst, Millthorpe, Neville and Newbridge Cemeteries

July 2019 Version: 3

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Supervisor Parks and Gardens

SHIRE COUNCIL
Blayney

Acknowledgements

This Cemetery Operations Plan is an initiative of the Central West Councils Environment and Waterways Alliance

CENTRAL WEST COUNCILS ENVIRONMENT & WATERWAYS ALLIANCE

It has been developed in cooperation with Rachael Young Consulting

Rachael Young CONSULTING

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Introduction

Blayney Shire Council is responsible for the management of all cemeteries in the Blayney Shire. The primary use of the cemeteries is burials and memorials to past residents and they often include memorials to a number of pioneering families. The village cemeteries began as small areas cleared out of the surrounding bushland or farmland.

Before European settlement, Box Gum Grassy Woodland ecosystems dominated the western slopes of NSW from the Victorian to the Queensland borders (Prober and Thiele, 1993). The cemeteries covered in this Operations Plan were no different and a combination of luck, people leaving 'unnecessary' parts of the cemeteries alone, and good management means that many of the small village cemeteries have retained remnants of their original vegetation communities.

Depending on the setting, the village cemeteries have well-preserved grassland communities and/or tree and shrub elements. Because it is a lot more work to mow the entire cemetery grounds, generally only the active areas have been constantly mown, leaving the inactive areas to survive in a fairly natural state.

The cemeteries contain and reflect the region's history. Newbridge and Carcoar contain some of the Shire's rare Chinese settler graves, and Millthorpe is the final resting place of John Lister who, along with William Tom, discovered payable gold at Ophir which lead to an explosion of interest in this area. Blayney Shire Council has done a lot of work in identifying the location and collecting the information about these graves. This invaluable source of information about grave locations and the sections of the cemeteries is mapped and can be found at the following URL - http://www.blayney.nsw.gov.au/residents/cemeteries.

This Operations Plan is backed up by a collection of supporting documents as the Neville, Lyndhurst and Carcoar cemeteries have been subject to a number of studies and recorded management actions. The following documents are contained in Appendix 1 to aid management decisions:

- 2015 Neville Cemetery Survey
- 2016 Neville Cemetery Survey
- Semple, W.S. et al (2009) Four rural cemeteries in central western NSW: Islands of Australiana in a European sea? *Cunninghamia: A Journal of plant ecology for eastern Australia 11*(1) Botanic Gardens Trust, Sydney Australia.
- K2W Project Report

Mr Brian Parker, Council's Parks Supervisor, has taken a proactive approach to the management of the remnant vegetation communities since his tenure as Parks Supervisor in 1997. Mr Parker has lived in Blayney Shire his entire life leading to a deep understanding of the landscape and the flora and fauna within it.

Through a passion for the natural environment, Mr Parker has driven a unique management regime at the village cemeteries that have enabled the community's cemetery needs to be largely balanced with the needs of the less disturbed natural areas in the cemeteries. This balance is achieved through often simple and practical actions that encourage native species to flourish such as; well timed mowing or weed control programs, trialling of cultural burning practices, and well placed and constructed fences that allow wildlife access whilst creating a soft barrier discouraging members of the public when required. Mr Parker has also keenly welcomed all opportunities to learn from others about the ecosystems and plant communities in the cemeteries and this has enabled the deep understanding that is synthesised into simple, achievable management actions.

This Operations Plan incorporates this knowledge, requirements for management and costs to ensure that Council adequately plans and budgets for the management of these important reserves.

"The Cemetery Operations Plan will identify key conservation values of the cemetery as well as threats to the health and future operation of the site"

Scope and Purpose

The aim of this document is to provide a strategic guide that focuses on providing guidance to the management actions required to maintain the strong environmental and cultural values of the cemeteries at Carcoar, Lyndhurst, Millthorpe, Neville and Newbridge. To ensure completeness, the plan will also cover the Blayney and Hobbys Yards cemeteries. This plan will provide Council with a strategic planning and sustainable management framework for improved conservation and public amenity of all of the Shire's cemeteries.

By having a dedicated Operations Plan, Council will be able to identify the needs of the cemeteries and allocate the necessary budget and resources to maintain and improve these areas. The plan may also aid Council by providing a strong basis with which to apply for external grant funding.

There are a number of stages involved in the development of the Cemetery Operations Plan:

1. Assess all cemeteries for the development of an Operations Plan
2. Gather information on the cemeteries and their surrounding reserves
3. Develop an integrated long term management program for the cemeteries and their reserves
4. Engage and consult with any stakeholder community groups as to the development of the Cemeteries Operations Plan
5. Finalise the Cemeteries Operations Plan

Council may choose to further formalise the plan by completing the following:

- Presentation of Draft Reserve Operations Plan to Council, recommending public display for comment
- Incorporation of changes that arise due to public display
- Presentation of the Reserve Operations Plan to Council for adoption.

This Operations Plan will primarily consider the environmental conservation values of the cemeteries while ensuring the cultural values are not forgotten.

The Cemeteries

Blayney Cemetery

Tenure: Council-owned reserve

Area: 3.2 hectares

This cemetery was dedicated on 6 December 1867 and like many cemeteries, has struggled with maintenance and neglect over time. On 29 July 1899, the Blayney Advocate and Carcoar Herald reported that the Blayney Cemetery was dilapidated and neglected and it was recommended that an "Improvement Bee" be established to undertake the needed works of tree and grass maintenance.

Things have since improved, and Blayney Shire now has a regular and active maintenance regime. The cemetery has the most graves of all the cemeteries, with segments for Roman Catholics and Anglicans having old and new sections. Blayney Cemetery also has a lawn cemetery, columbarium or niche walls, Methodist/Uniting section, Presbyterian section and a General section. The newest section was approved in April 2018 when a request for a Muslim section was received from the small community in town, and this addition has been warmly received.

Ecosystem type

Modified and planted with native and exotic species, this cemetery is managed for cultural values only.

Location

Blayney Cemetery is located at 1 Memorial Drive, Blayney and accessed from Millthorpe Road. Lot 7301 DP 1149152. The cemetery is surrounded by agricultural and industrial activity.

Blayney Cemetery has sparse exotic trees and is managed for aesthetics.

Carcoar Cemetery

Tenure: Council-owned reserve

Area: 2.8 hectares

Carcoar Cemetery was first gazetted on 31 May 1852 with further lots added in 1900 and 1917. It is thought to be the second-oldest cemetery west of the Blue Mountains after Bathurst, according to an article in the National Times on 24 June 1944.

The largest sections are the Anglican/Church of England and Roman Catholic sections. There are also Methodist/Uniting, Presbyterian and General sections, as well as an area of lawn cemetery and a niche wall. The cemetery is approximately 50% actively managed and 50% managed for conservation.

The mausoleum and an old headstone at Carcoar Cemetery

The cemetery has several large mausoleums that, combined with some large headstones, give the cemetery a very striking appearance. The cemetery also has spectacular views across to Mount Macquarie.

A story associated with one of the oldest graves involves Mr Ah Con who lost his life trying to save his friend Mr Robinson at Errowanbang Station when he was overcome by foul air, and was then also overcome himself. Another story in the Sydney Morning Herald on 17 June 1902 reported that an exposed human skeleton was discovered at the cemetery, as it was buried only 2 feet from the surface.

Ecosystem type

Derived Native Grassland in the cleared portion of the cemetery and Box Gum Grassy Woodland Box in the uncleared portions, boundary areas and road reserve.

Location

1722 Carcoar Road (-33.59162, 149.152983) within a hilly and quite steep agricultural context, which has seen most of the surrounding land cleared for grazing. The main cemetery area is contained on the following lots and deposited plans:

- Lot 7308 DP 1152303 – nearly half of the total cemetery area.
- Lot 7311 DP 1152303 – just under a hectare in size and uncleared.
- Lot7001DP1124380, Lot7309DP1152303, Lot7301DP1152303, Lot12DP1238668 - uncleared or planted with native but not endemic species.

Hobbys Yards Cemetery

Tenure: Council-owned reserve

Area: 4.5 hectares

The old Hobbys Yards Cemetery was dedicated on 21 August 1897. The current cemetery was dedicated some time later. Both cemeteries are set within an agricultural context.

Ecosystem type

Modified with pasture grasses.

Location

Hobbys Yards Cemetery is split across 2 locations in the village.

The old cemetery, now closed, is located at 9 Church Lane, Hobbys Yards. The cemetery, including the church, covers an area of 0.4 hectares and is under the care and control of the local church congregation.

The current cemetery is located at 30 Hobbys Yards Cemetery Road, Hobbys Yards and is comprised of Lots 7307, 7308, and 7309, DP 1158290.

The old Hobbys Yards Cemetery (top) and the new (bottom) are both largely managed by the Hobbys Yards community

Lyndhurst Cemetery

Tenure: Council-owned reserve

Area: 3.2 hectares

Lyndhurst Cemetery is a small cemetery on the western edge of the village. It has 6 sections; Anglican/Church of England, General, Lawn, Methodist/Uniting, Presbyterian, Roman Catholic, and Seventh Day Adventist. There is also a small niche wall at the edge of the Lawn. Approximately half of the cemetery is classified as being under active management.

It was first established in 1887 with a further lot dedicated in 1907 for the Church of England section. The Roman Catholic, Anglican/Church of England and Presbyterian sections of the cemetery contain the most graves and these three sections largely comprise the active management area. There are few graves in the Methodist/Uniting and Seventh Day Adventist portions. All of the General, most of the Methodist, half of the Seventh Day Adventist and a small portion of the Roman Catholic and Lawn sections of the cemetery are under conservation management.

In 1953, a number of actions at the cemetery were reported in the local paper – a working bee was held in late May, a Board of Trustees were elected in early November, and the fence was repaired in late November. These reports are reflective of the on-going needs of all cemeteries for regular smaller maintenance activities and less regular larger maintenance activities. The needs of the 1950's are similar to those faced by Council staff today and will be reflected in this plan.

In 1996, the Cowra Family History Group Inc. collated a book called 'Lyndhurst Cemetery', a copy of which is held by Central West Libraries (Orange Library). Also of interest is 'Faces of Mandurama' introduced by John Thompson and published in 1997. This book is a collection of photos and their associated history taken by E.A. J. Lumme, a resident of Mandurama and Lyndhurst, who was an avid photographer and amateur historian. This book can be found in the National Library of Australia at

https://nla.gov.au/nla.obj-5932094/view?searchTerm=Lyndhurst+Cemetery&partId=nla.obj-5944842#page/n127/mode/1up

Ecosystem type

The conservation areas of this cemetery are largely White Box Woodland, Derived Native Grassland and some areas of White Box Woodland regrowth.

Location

Lyndhurst Cemetery is on Newry Downs Road, Lyndhurst on the western side of the village. It is surrounded by scattered trees and agricultural activities, and the town is largely a sloping landscape. Recent residential development on the northern boundary has resulted in some of the neighbouring regrowth being cleared along the fence line.

The cemetery is located on Lot 7303 DP 1152289 and Lot 1 DP 927088. Both lots have been predominantly cleared with remnant White Box Woodland (and regrowth) left on the boundaries and in the unused north-east corner of the grounds.

Millthorpe Cemetery

Tenure: Council-owned reserve

Area: 3 hectares

Millthorpe Cemetery is a relatively small cemetery on the northern edge of Millthorpe and is co-located with St Marks Anglican Church (to the south) and St Canice's Catholic Church (on the northern side). Being the most populous village in Blayney Shire, Millthorpe's Cemetery is split into eight different sections, the largest being the Roman Catholic, Methodist/Uniting and Anglican/Church of England sections which are then further divided into old and new sections. This cemetery has the highest proportion of the cemeteries under active management due to its age and proximity to the village.

The cemetery was dedicated on 9 June 1874, not long after the establishment of the original slab and bark Church of England schoolhouse in 1867.

On Wednesday 22 January 1919, The Leader reported that the Methodist portion of the cemetery had been cleaned up with grass being burnt off to discourage snakes and wattle scrub being grubbed out to have it looking 'in splendid order'. Similarly, the Lydhurst Shire Chronical reported similar activities in the Church of England portion on 23 August, 1945. Requests for maintenance have not changed greatly in 100 years, although some of the management methods and priorities are changing.

Millthorpe Cemetery also holds the grave of John Lister in the Anglican section. John Lister, along with Edward Hargraves, successfully panned for gold at what would become Ophir in February 1851.

The crown reserve (Lot 9 DP 750384) adjacent to Redmond Oval is used by the school for Cross Country events and portions are mowed by the school.

The Lister Family gravesite includes John Lister, famous for being part of the discovery of gold at Ophir.

Millthorpe Cemetery

Ecosystem type

Remnant Box Gum Woodland on Lot 9 and some Derived Native Grasslands in Lot 7003.

Location

Millthorpe Cemetery is located at 56 Park St, Millthorpe on Lots 7302 & 7303 DP 1157031, Lot 7003 DP 1060551, Lot 1 DP 1122648, Lot 1 DP 650739, Lot 1 DP 668335 and Lot 9 DP 750384.

Just over a quarter of Lot 7003 and all of Lot 9 are managed for conservation purposes, whilst all the other lots are under active management.

A view across the Derived Native Grasslands to the fenced active cemetery beyond

Neville Cemetery

Tenure: Council-owned reserve

Area: 7.8 hectares

Neville Cemetery is located to the south of Neville on the edge of the village and was dedicated on 29 October 1880 around the same time as the local churches. There are a couple of outlying graves. With Neville being a small village most of the reserve is relatively undisturbed and thus the grass and forb community is very intact. Only a small proportion of the cemetery is actively managed, the rest is managed for conservation purposes.

Ecological surveys at Neville show that a Spring burn had positive results on the Derived Native Grassland habitats present. After the cool Spring burn there was a higher floristic diversity resulting from the creation of small 'clearings' as rank grass and leaf litter was removed from the site. It also showed that native plants were present in greater numbers and diversity after the burn than in other sections of the cemetery. Burning also favoured the re-emergence of Small Snake Orchid (*Diuris chryseopsis*). The report completed by DnA Environmental includes a comprehensive flora species list for the cemetery.

Ecosystem type

Box Gum Grassy Woodlands and Derived Native Grasslands.

Location

Neville Cemetery is located on Kentucky Road, just to the south of the village of Neville (-33. 719923, 149.211343). It is part of an important wildlife corridor that links several large patches of remnant vegetation to the south and north of the village.

Newbridge Cemetery

Tenure: Council-owned reserve

Area: 8.5 hectares

Newbridge Cemetery was dedicated as part of a common area in Newbridge by Government Gazette on 11 June 1886. It is located on several Lots that cover a total of 8.5ha, but only approximately 0.6ha is being actively used for graves and burials.

The remainder of the site is covered in good quality native vegetation and is an area of high biodiversity. In the backlots, a few very historical graves are contained. The cemetery is quite steeply sloping in some sections and there is a small ephemeral stream that flows from the south-east towards the north-northeast.

The cemetery has three sections; Roman Catholic, General, and Anglican/Church of England. All three sections are subject to active management, although nearly half of the Roman Catholic section is native vegetation and un-utilised.

In the bush section of the cemetery is the grave of Maryann Tattersall who died on September 20, 1855. In 2008 this grave was desecrated and the body dug up and taken from the site along with the iron fence that was around her grave. The headstone and plinth were left behind and have been reinstated. Also tucked away in the bushland portion of the cemetery reserve is a Chinese grave, one of very few within the Shire.

Ecosystem type

The area is an ecotone that includes a variety of woodland communities and species being present.

Location

Newbridge Cemetery is located on Wimbledon Road, Newbridge. The active cemetery is on Lot 1 DP 668404 and Lot 7007 DP 1054063. The remaining parcels (Lot 7006 DP 1054063; Lot 1 DP 668089; Lot 1 DP 668403; Lots 7009, 7008, 7010 DP 1055776) are relatively intact woodland ecosystems with high biodiversity.

Maryann Tattersall's grave at Newbridge Cemetery Bush Reserve was subject to grave robbing in 2008.

Groups Interested in the Management and Usage of the Cemeteries

There are a number of community groups, in addition to Blayney Shire Council, that have an interest in the use, management, maintenance and improvement of the cemeteries being managed in this plan. These groups are variously active depending on community priorities. Most are stakeholders with an interest in the management of the cemeteries, rather than active land managers.

Blayney Shire Cemetery Forum is the overarching body for enquires or information about cemeteries in the Blayney Shire and current members are listed below in Table 1, other groups with interests are listed in Table 2.

Table 1: Blayney Cemetery Forum members

Name	Email	Telephone
Cr David Kingham (Chair)		
Cr Newstead (Alternate)		
Hayley Lavers		
Helen Dent		
Mitchell Groves		
Vicki Pulling		
Janelle Adams		
Kevin Radburn Snr		
Kevin Radburn		
Geoff Braddon		
Candice Braddon		

Table 2: Other interest groups

Cemetery	Groups involved
Blayney	See Blayney Cemetery Forum above
Carcoar	Carcoar Historic Society Village Committee Email: thecarcoarvillageassociation@gmail.com The Secretary Carcoar Village Association PO Box 42 Carcoar 2791
Lyndhurst	Cowra Family History Group Inc. PO Box 495 Cowra NSW 2794 Lyndhurst Soldiers Memorial Hall and Village Committee
Hobbys Yards	See Blayney Cemetery Forum above
Millthorpe	Millthorpe Village Committee Email: millthorpevillage@gmail.com Millthorpe Public School Email: millthorpe-p.school@det.nsw.edu.au Golden Memories Museum 37 Park St, Millthorpe NSW 2798
Neville	Village Committee
Newbridge	Newbridge Rural Fire Service Newbridge Progress Association
General Contact	Blayney Shire Local & Family History Group Inc c/- Blayney Library 48 Adelaide St, Blayney NSW 2799

Conservation Significance (local and regional)

The Blayney Shire has been significantly cleared, as much of the shire is gentle rolling hills with deep fertile soils that were seen by early settlers as being prime agricultural land. These cleared lands were then sown with pastures they understood, such as phalaris and rye grass, and any regrowth of native vegetation was ruthlessly grubbed out.

Today, Blayney has no State Conservation Areas or National Parks, as less than 10%of the original vegetation or plant community types remain. Most of these remaining patches and trees are on private land, or are contained within small discrete reserves such as travelling stock routes, road reserves and cemeteries.

The village cemeteries are perhaps the least disturbed as they have been subject to little grazing pressure and, outside of the active management zones, have been subject to little interference. Due to the highly fragmented and disturbed nature of the vegetation, these small pockets of remnant vegetation are critically important to biodiversity conservation in Blayney Shire.

All village cemeteries included in this plan (except for Hobbys Yards) have native vegetation features present which have precipitated the need for this plan. In collecting the information to create this plan, it is clear that some of the cemeteries included in this plan are in better condition and have a higher conservation value than others. For example, Millthorpe Cemetery has a history of disturbance and high levels of use by the community, has a small relatively low quality Box Gum Grassy Woodland remnant remaining, and the native grasses suffer from inappropriate mowing regimes and therefore has the lowest environmental conservation value. However, the age and presence of a historical figure such as John Lister at the cemetery means that its cultural conservation value is high which precipitates a different management regime to Newbridge where there are important cultural and environmental values present.

The cemeteries do have competing demands placed upon their management and each cemetery will be managed in two zones – an active management zone and a conservation management zone.

The Conservation Management Zones are managed to prioritise elements such as endangered ecological communities, native grasses, native orchids and forbs, hollows, fallen timber for habitat, weed encroachment and feral animal management.

The Active Management Zones are managed to provide a neat and tidy appearance to the portions of the cemeteries where graves are located. This will also include edge trimming, weed control, feral animal control, litter management and spoil management.

Legislative responsibilities to be considered in the long-term management of both zones in the cemeteries include:

Biosecurity Act 2015 which prescribes weed species that land managers (both private and public) are required to control and include species such as blackberries, Chilean needle grass, privets and serrated tussock.

Biodiversity Conservation Act 2016 regulates the clearing and removal of all native vegetation on all lands in NSW including native grasses. This Act also regulates threatened species and threatened communities. This legislation will need to be considered in the future management operations of the cemeteries, particularly any expansion into the areas covered with native grass.

Cultural Heritage - The cemeteries undoubtedly hold cultural heritage significance to both Modern Australian communities and possibly Indigenous Communities. The National Parks and Wildlife Act 1974 is the primary legislation for the protection of aspects of Aboriginal cultural heritage in New South Wales and ongoing consultation will be required.

Cultural Heritage Management of Cemeteries

Cemeteries are undoubtedly important cultural resources for the community. They tell us where we have come from and allow for the remembrance of family and friends.

The cultural assets of cemeteries include the graves, mausoleums and columbarium. These also include old freestanding graves outside of the Active Zones in the cemetery which help tell the stories of early settlers to the region and how this region was settled. Threats to the cultural assets include many of those that impact on the environmental values, and also include issues such as degradation of headstones and grave decorations.

This plan cannot cover the cultural significance and management requirements of the cemeteries, their graves and other infrastructure outside of those with an environmental significance.

Current Management Actions

This plan will discuss the cemeteries as containing two distinct zones:

- **The Active Zone** is the area of the cemetery that contains most of the graves and is where people continue to be buried. This area also includes area set aside for future burials. These areas are actively managed to meet community expectations.
- **The Conservation Zone** is the Native Grassland and Woodland portions of cemetery land and may contain the occasional very old burial. These areas are more passively managed with conservation of biodiversity in mind.

The cemeteries in this Operations Plan are subject to one or two distinct management regimes depending on the zone within the cemetery and the condition of the cemetery. The past and current management actions are therefore discussed reflecting these management zones. It noted that there are sometimes unforeseen management actions required as a result of storm damage or collapse of graves even though management actions such as tree inspections and feral animal control are undertaken.

Semple et al (2009) noted in a study of rural cemeteries 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…Rated as 'only dandelions' by one mowing contractor, it is locally common on all cemeteries except Lyndhurst, but does not occur in the surrounding grazed and/or cropped land."*

Tables 3 and 4 provide a brief list of current management actions for both management categories – Active and Conservation.

Table 3: Current Active Zone management actions

Cemetery	Active management actions
Blayney	• Mow up to 6 times per year, edge trim once over Spring/Summer or as required • Annual tree inspection • Empty bins as required • Check fence • Annual weed control
Carcoar	• Mow up to 6 times per year, edge trim once over Spring/Summer or as required • Annual tree inspection and trimming of roses • Empty bins as required • Check fence
Hobbys Yards	• Mow up to 3 times per year and edge trim once over Spring/Summer • Check fence • Annual weed control
Lyndhurst	• Mow up to 6 times per year, edge trim once over Spring/Summer or as required • Annual tree inspection • Empty bin as required • Annual weed control • Review fence integrity 2-3 times per year
Millthorpe	• Mow once per month and twice per month in Summer • Edge trim once per year and upon request • Weed spray twice per year • Bins emptied every month • Rabbit control every 5 years • Fence maintenance every 10 years or as required
Neville	• Mow up to 6 times per year, edge trim once over Spring/Summer or as required • Annual tree inspection and trimming of roses • Empty bins as required • Check fence • Annual weed control
Newbridge	• Mow as required up to 6 times per year • Remove pine wildings once per year • Annual tree inspection • Spray weeds every second year • Inspect fences 3-4 times per year and repair as required

Table 4: Current Conservation Zone management actions

Cemetery	Conservation management actions
Carcoar	• Mow native grasses every 2-3 years in Autumn • Review fencing and exotics • Annual weed control
Lyndhurst	• Mow once every 5 or so years to manage sward build up • Rabbit control every 3-5 years • Review and potentially remove some Eucalypt sapling/regrowth in grasslands to enhance tree growth and grassland management • Review fence integrity 2-3 times per year (significant pressure from kangaroos)
Millthorpe	• Mow once per year • Woody weed spraying once a year • Fence inspection and repair as required • Rabbit control every 5 years
Neville	• Suppress weeds through mowing and spraying annually • Cultural cool burn approximately every 5 years • Remove pine wildings once per year • Rabbit control every 7-10 years • Spray weeds every year in woodland
Newbridge	• Suppress weeds through spraying annually • Remove pine wildings once per year • Inspect fences 3-4 times per year and repair as required • Rabbit control every 7-10 years

Current Condition of the Cemeteries

The condition of the cemeteries varies and a brief description of each of these and their condition is provided below. The condition assessment is inclusive of both the Active and Conservation management areas. The cemeteries are all generally in a well-maintained condition with a variety of actions required in the active and Conservation Zones. All cemeteries share the common problem of blown litter in the form of plastic flowers and their wrappings, this is despite there being bins located at the gates of all cemeteries.

Blayney and Hobbys Yards Cemeteries

These cemeteries are only managed for active graves and there are no Conservation Zones present. Blayney Cemetery has a fringe of native and exotic trees although none of the Eucalypts are of local provenance.

Hobbys Yards Cemetery is located on top of a hill in the middle of a paddock with sweeping views over the valley. It has no conservation value, being dominated by introduced pasture grass species. Wombats are a cause for concern in the new cemetery.

Both cemeteries are actively managed via mowing, edging and ensuring fences and other infrastructure are in good order.

Carcoar Cemetery

Overall, the condition of Carcoar Cemetery is good. The active portion is largely cleared except for a few mature Eucalypts. The cemetery experiences few problems although some work on preventing erosion would be useful in both zones – particularly in the Roman Catholic section and just inside the bush reserve section in the southern portion. The soils on the hill are relatively thin and past disturbance has resulted in sub-soils being placed on top limiting revegetation.

The presence of fake flowers and plastic vases and containers for the flowers as blown litter is a problem with materials escaping into the Conservation Zones and being blown into the fences making the site appear untidy.

The old headstones, mausoleums and decorative iron fences are starting to deteriorate and works are needed to protect these structures. Headstones from as late as 1940 are also deteriorating and steps may need to be taken in the near future to protect them.

The border of trees to the north and west of the active cemetery has been planted with native, but not local, tree and shrub species. The road reserve and the Conservation Zone to the south are both in relatively good condition and the locally rare *Gompholobium huegelii* lives just outside the cemetery boundary in the road reserve.

Bill Semple et al reported in his 2009 paper 'Four Rural cemeteries in central western NSW: Islands of Australiania in a European sea?' that the dominant Eucalypt community would have been *E. dives* and *E. goniocalyx,* and that the proportion of native species in all management areas was relatively high at 54%. This is much higher than observed in the mown active portions of the cemetery where native groundcovers only comprise 41% of the groundcover. It was also noted that both the mown Derived Native Grasslands and the unmown portions supported different groundcover communities with 'disturbance lovers' such as *Euphorbia drummondii* (Caustic weed) and *Portulaca oleracea* (Pigweed) in the mown areas, and 'disturbance avoiders' such as *Tysanotus tuberosis* (Common Fringe Lily) and *Velleia paradoxa* (Spur Velleia) in the unmown areas. A full species list can be found appended to thispaper.

Neighbouring residents present challenges with their choices of garden plants and introduction of weed-like exotic species such as Robinia and Laburnum. Monitoring of these garden species will be required.

There are some persistent localised weeds including freesias and periwinkle (*vinca major*) present in all sections of the cemetery. Control is focused on the Conservation Zones, however, the weeds have extended to and are prevalent in the road reserve. The road reserve is now a source of new weed seed and material, and for effective control to be achieved the road reserve must have more active weed control applied.

The Conservation Zone is in good condition and contains hollow bearing trees and a good understory. There is a build-up of rank grass in parts of the Conservation Zone that would be well served by a cool burn in the nearfuture.

Lyndhurst Cemetery

This cemetery is largely cleared but has significant native grasslands and within these grassy areas are forbs, orchids and small shrubs that rely on sunny grassy glades as habitat. This cemetery falls in the middle of the conservation rankings for the cemeteries, being more degraded than those containing good quality woodlands, but having more values than the highly disturbed cemeteries with no native species.

The cemetery is well situated to be used for native grass seed collection due to its size and ease of access to the grassland areas. It works well environmentally with the mature white box trees on neighbouring private property. Further information on the floristic diversity at Lyndhurst can be found in Semple et al (2009) as it was part of the same study as Carcoar although for a shorter period of time. It was noted that the

proportion of natives species was lower at Lyndhurst (at 45%) but that the unmown grasslands were of a similar quality to those at Carcoar, with 54% of species being native.

The cemetery is still actively used, however, maintenance of the graves and disposal of plastic flowers is becoming problematic as families move out of the district leaving old headstones and fences to deteriorate and fake plastic flowers to become blown litter.

There is significant grazing pressure from kangaroos, creating tracks within the Conservation Zones, which could lead to future erosion problems. Council has commenced fence replacement works. It was noted that rabbits are increasing in number and urgent management of numbers is required.

Erosion is not a current problem at Lyndhurst, largely due to its flatter landscape and the tracks within the cemetery are in good condition. Some of the graves are in poor condition, however overall, this cemetery is in good condition. The values of the Conservation Zones in this cemetery are twofold. Firstly, as a possible source of native grass seed and secondly, as refuge for small forbs and orchids that require sunny open glades to thrive.

Millthorpe Cemetery

Millthorpe Cemetery is in the poorest condition of all the cemeteries largely due to more frequent use. The community use the cemetery lands, not only as a burial ground, but also for dog walking and school cross country racing, particularly in the small Conservation Zone. The cemetery also receives out of village visitors interested in history due to the age and presence of John Lister's grave.

In the Active Zone, it was noted that there were rabbits present along with a few burrows and that blown litter from plastic flowers and other burial tributes was present. The tracks within the cemetery are eroded and continuing to deteriorate and the lack of formal parking within the cemetery is encouraging visitors to drive to the gravesite increasing the compaction and erosion potential within the cemetery. The Conservation Zone is also degraded as it is impacted by over-frequent mowing by community stakeholders, blown litter and rabbits. It is also threatened by community desires for a tidy cemetery, and for fallen or dead standing timber to be removed. Weeds are gaining a foothold in the outer sections of the Conservation Zones.

Neville Cemetery

Neville is the largest of the village cemeteries and has a mix of treed areas, gravesites, grass and forb lands and pasture grasses. Significant work has occurred to protect the biodiversity at Neville, including the construction of hollows within some trees, fencing, and cool burns to encourage forb and grass diversity.

The graves are fenced by rabbit-proof fencing and so the cemetery is in very good condition overall. There are few weeds and little to no litter. The community uses the cemetery as part of a local walking circuit and the site is tidy and well-kept, where required, and more wild in the woodland areas creating an attractive mixed use space.

Newbridge Cemetery

Both management areas of Newbridge Cemetery are in very good condition. The cemetery is a large reserve with only a small portion used for active graves. It is adjacent to the travelling stock reserve and so is very much a bush cemetery. The Active Zone of the cemetery is largely cleared with a few mature eucalypts remaining.

The Active Zone is well managed with no erosion, few weeds, no rabbits and very little litter. The cemetery does not receive a lot of visitors and is used only very occasionally. The Conservation Zone is also in good condition, is fenced, and to the public largely appears as a separate reserve. It was cleared many years ago and has now regrown with some more mature trees now present. The area was also leased for cattle grazing up until the mid-1980s when the leases were cancelled and the practice ceased. Occasionally, livestock may get through the fence, although the damage is minimal.

Goals for the Conservation and Management of the Cemeteries

Goals for cemetery management in Blayney Shire are again split between the need for active management of burial areas and conservation management of bushland remnants.

Overall Active Management Goals

- Maintain a high amenity for actively managed areas through regular mowing, edging, and weed and rabbit control.
- Access heritage and other funding to ensure that old graves within the Shire are maintained appropriately.
- Encourage residents, via an education program, to leave biodegradable grave tributes to reduce blown litter.
- Create a dedicated spoil management area to improve amenity and movement of potential weeds.
- Regular mature tree inspection to ensure safety of trees to limit damage to graves from limb drop.

Overall Conservation Management Goals

- Protect and improve the native vegetation communities present through weed and pine wilding control, rabbit control and infrequent specific management actions such as cool burns.
- Work with stakeholders and local communities to improve understanding of the native vegetation present to reduce management conflicts.
- Create appropriate interpretive signage to respectfully raise awareness of the values of the Derived Native Grasslands and remnant Box Gum Grassy Woodlands within the cemetery

Goals for Each Cemetery

Blayney and Hobbys Yards

- Explore options for more space at Blayney for very long-term future growth of the cemetery that will support the very long-term closure of the active grave zone at the village cemeteries.

Carcoar

- Treat erosion in the Roman Catholic section over time by adding weed-free topsoil or compost when it becomes available.
- Find funding to protect and restore old graves and mausoleums.
- Manage fencing around the Active Zone to improve outcomes in the Conservation Zone.

Lyndhurst

- Improve the fencing and pathways to better reflect use by the community.

Millthorpe

- Develop and implement better mowing and management practices within the Conservation Zone in consultation with the school to reinvigorate grasses and forbs.
- Develop a future burial plan that will manage encroachment of graves into remnant Box Gum Grassy Woodlands and create a mechanism for collecting topsoil from this area for use as seedbank material.
- Work with the community to manage the introduction of exotic species into the cemetery and their encroachment into the Box Gum Grassy Woodlands.
- Formalised car parking and track creation to aid management and rehabilitation of erosion problems that are currently being experienced.

Newbridge

- Develop links with research institutions to better understand the biodiversity present within the Conservation Zone.
- Remove old fencing wire from ephemeral creek within the Conservation Zone.

Neville

- Maintain current condition.

Neville Cemetery native grasslands with fenced active cemetery management in the background.

Existing Operations Plans

Cemeteries are a traditional part of Council operations and experience relatively high levels of community expectation for presentation and ease of access. The dual management of the village cemeteries for their natural values is unusual for cemeteries outside rural and regional Council areas.

Blayney Shire Council's 2018/2019 – 2021/2022 Delivery Program and 2018/2019 Operational Plan has two mentions of cemeteries and provides for the management of natural areas through two main sections of the plan which are listed below.

Future Direction 1 – Maintain and Improve Public Infrastructure and Services

The longer term delivery program objective 1.1.9 is to *Maintain Council cemeteries in accordance with the community's needs and expectations*. The 2018-2019 Operational Plan requirements are to:

- Maintain cemetery records and provide on-line public access, and
- Maintain cemeteries to agreed service levels.

Future Direction 5 – Protect our Natural Environment

The longer term delivery program objective 5.3.1 is to *Ensure the Shire's 8 heritage listed cemeteries are maintained and protected*. The 2018-2019 Operations Plan requirements are to:

- Support engagement of specialist stone masons to commence restoration work on derelict graves, and
- Continue to eradicate vermin and install vermin prevention measures.

Future Direction 5 also supports the conservation efforts at the cemeteries through long term objective *5.4.1 Promote sustainable development and protection of our natural resources*. In the immediate financial year this is includes:

- Disseminate information to the community as it becomes available, and
- Facilitate the delivery of environment initiatives on Council-owned and controlled land.

This second action is very relevant to the Conservation Zones in the cemeteries as they are some of the best native vegetation under Council's ownership and control.

Current and Future Uses of the Cemeteries

The cemeteries have, first and foremost, a very clear and unique purpose in providing a place for people to inter their loved ones and as a place of remembrance. These portions (Active Zones include the historic graves and any closed sections) of the cemetery are managed for a high level of amenity with mowing, edging, and vermin and weed control being the most important actions.

Cemeteries also help the community remember who they are and where they have come from as they provide a link to the community of times past. Family history and other local history groups use the cemeteries and the information contained within the gravestones to help tell the stories of the communities and families of the district.

The larger cemetery reserves, such as Neville, contain accessible woodlands which are also used for walking and quiet reflection. The woodlands and grasslands are managed as Conservation Zones and primarily managed for biodiversity protection.

It is envisaged that the cemeteries will continue along similar use and management priorities until the Active Zones of the cemeteries are full in approximately 100 years. At this point, it is envisaged that a central town cemetery will established and all village cemeteries will be closed. This new cemetery will be managed only for active objectives and the village cemeteries will be managed to ensure grave stones and information is not lost and the grounds managed only for conservation objectives.

As the community of the Shire is becoming more diverse, and awareness of the impact of burials on the environment grows, Councils need to ensure that their cemetery services are sufficiently flexible to allow for the changing needs of families. This will include the need to be able to respond to a variety of religious requirements for burial, and also growing trends in burials such as eco-burials. Blayney Cemetery has already responded by allowing for the creation of a small Muslim section and it is expected that these requirements will increase into the long term future.

Eco-burials may not necessitate the creation of new sections within the cemeteries but may require extra space for the planting of trees. The range of practices that constitute an eco-burial are diverse, ranging from a simple change of a traditional coffin to a shroud or other quickly non-toxic biodegradable coffin that may include the planting of trees or other vegetation.

The NSW Biodiversity Conservation Act (2016) has established a system that requires conservation offsets to be created. Council may have an opportunity to use the scheme to establish some of the lands managed for conservation purposes as Stewardship Sites under this legislation. The creation of Stewardship Sites allows Council to achieve a number of goals, to support the long-term management of these conservation areas for conservation purposes and to be financially supported by the Biodiversity Conservation Trust in achieving those goals. The process to apply for a Stewardship Site is complex and takes time and expertise including the services of an Accredited Person under the Biodiversity Conservation Act. Nonetheless, it is recommended that Council seeks further advice on this matter. It is considered that the large Conservation Zones at Newbridge and Neville Cemeteries may be eligible.

Conservation Zone at Newbridge Cemetery

Council's Commitment and Budget for Cemetery Operations

Council is the only stakeholder that takes an active role in the management of the cemeteries currently undertakes all management activities in the cemeteries. Individuals often maintain the graves of loved ones and may pick up litter in the vicinity of these graves, but their actions are ad-hoc and do not extend further into the cemetery. Village committees and associations do not play an active role in the management of the cemeteries at this time.

Appendix 2 contains Council's current and future budget plans. This appendix should be updated on a regular basis. The Cemeteries Budget currently reflects the operational and capital costs of running cemeteries. The costings for future management activities has not been included and will need to be approved by Council as a variation on the current plans.

Family plot at Newbridge Cemetery

Conservation Importance – Environmental

Cemetery Name	Environmental Assets	Description Characteristics and current condition	Expanse	Local/Regional importance	Management Priority 1 = low 5 = high
Carcoar	Box Gum Grassy Woodland	There has been careful management within the reserve over the past 20 years of the woodland remnants with weed spraying and rabbit control. The site has good understory diversity and has hollows present. It provides essential habitat and biodiversity to the region.	1.6 ha	Local/regional	4
	Derived Grassland	This area has been managed to achieve better outcomes for the grassland biodiversity through reduced mowing regimes.	0.1 ha	Local	3
	Locally rare species	A variety of locally rare species exist including *Gompholobium huegelii*, yam daisies and a variety of small orchids. These species have been supported through reduced mowing regimes and regular weed suppression. Refer to Appendix 1 for detail of species present.	Small and variable	Local	4
Lyndhurst	Derived White Box Grassland	These small areas provide for some white box regrowth and also allow for native grasses, forbs and orchids to remain in the landscape. This site will form an important source of native grass seed going forward.	0.6 ha	Local/regional	3
	Box Gum Grassy Woodland	This area is quite degraded due to weeds and previous clearing. The site is heavily timbered with regrowth, it is also impacted to some extent by weeds but there has been a recent active management program.	0.8 ha	Local/regional	2
	Locally rare species	A variety of locally rare species are present, including yam daisies and a variety of small orchids. These species have been supported through reduced mowing regimes and regular weed suppression. Refer to Appendix 1 for detail of species present.	Small and variable	Local	4

Conservation Importance – Environmental continued

Cemetery Name	Environmental Assets	Description Characteristics and current condition	Expanse	Local/Regional importance	Management Priority 1 = low 5 = high
Millthorpe	Box Gum Grassy Woodland	In poor quality, this small section of Box Gum Grassy Woodland is heavily mowed and impacted by other uses of the site. It has little to no understory.	1.4 ha	Local	2
Neville	Box Gum Grassy Woodland	In good condition having never been grazed or cleared beyond the extent of the active graves. There are hollows and it has also been the site of hollow installation and monitoring. This reserve is home to squirrel gliders and other threatened species.	3.2 ha	Local/regional/ national	5
	Derived Native Grassland	In good condition with few weed incursions. Cool burning has helped restore orchids and other forbs to the groundcover mix.	2.8 ha	Local/regional	5
	Locally rare species	A variety of locally rare species are present. These species have been supported through reduced mowing regimes and regular weed suppression. Refer to Appendix 1 for details of species present.	Small and variable	Local	4
Newbridge	Box Gum Grassy Woodland ecotone	This is in mixed condition as up until the 1980's the woodland reserve was grazed. This practice has ceased and understory species are regenerating. Hollows have been installed and are being monitored at this site. Due to its unique location, it is an ecotone of Yellow Box, Mountain Gum and Red Stringybark	6.3 ha	Local/regional	4
	Locally rare species	A variety of locally rare species are present including *Bursaria spinosa subsp. Lasiophylla*. These species have been supported through reduced mowing regimes and regular weedsuppression.	Small and variable	Local	4

Conservation Threats – Environmental

Cemetery Name	Environmental Assets	Description of threat	Management Actions	Management Priority 1 = low 5 = high
Carcoar	Box Gum Grassy Woodland	Weed encroachment	Selective spraying or 'cut and paint' with appropriate herbicides on a regular on-going basis to ensure regeneration of native species. Regular fence inspections and maintenance.	3
		Illegal grazing either directly in the reserve or on adjacent road reserve	Ensuring that grazing permits are sought and correctly assessed.	2
	Derived Native Grassland	Weed encroachment	Selective spraying or 'cut and paint' with appropriate herbicides on a regular on-going basis to ensure regeneration of native species. Ensure crews are familiar with the management differences	3
		Over-mowing	between Active and Conservation Zones in the cemeteries and have them clearly marked in work plans as biannual maintenance. Regular fence inspections and maintenance.	4
		Illegal grazing either directly in the reserve or on adjacent road reserve	Ensuring that grazing permits are sought and correctly assessed.	2
	Locally rare species	Loss due to accident such as spraying	Find and then carefully mark the location of the plants with non-descriptive markers so that location is known to staff but not the public to ensure survival and safety.	4
		Illegal grazing either directly in the reserve or on adjacent road reserve	Regular fence inspections and maintenance. Ensuring that grazing permits are sought and correctly assessed.	4

Conservation Threats – Environmental continued

Cemetery Name	Environmental Assets	Description of threat	Management Actions	Management Priority 1 = low 5 = high
Lyndhurst	Derived White Box Grassland	Weed encroachment	Selective spraying or 'cut and paint' with appropriate herbicides on a regular on-going basis to ensure regeneration of native species.	3
		Over-mowing	Ensure crews are familiar with the management differences between active and Conservation Zones in the cemeteries and have them clearly marked in work plans as biannual maintenance.	4
	White Box Grassy Woodland	Resident expectations of tidy space	Work with stakeholders and residents to ensure understanding of Council's management actions and goals for the woodland areas and seek support. Selective spraying or 'cut and paint' with appropriate herbicides on a regular on-going basis to ensure regeneration of native species. Work with residents with regards to fencing and management	4
	Locally rare species	Loss due to accident such as spraying	Find and then carefully mark the location of the plants with non-descriptive markers such that location is known to staff but not the public to ensure survival and safety.	4
Millthorpe	Poor quality Box Gum Grassy Woodlands	Resident expectations of tidy space	Work with stakeholders and residents to ensure understanding of Council's management actions and goals for the woodland areas and seek support.	5
		Weed encroachment	Selective spraying or 'cut and paint' with appropriate herbicides on a regular on-going basis to ensure regeneration of native species.	3
		Over mowing	Ensure crews are familiar with the management differences between active and Conservation Zones in the cemeteries and have them clearly marked as biannual maintenance.	4

Conservation Threats – Environmental continued

Cemetery Name	Environmental Assets	Description of threat	Management Actions	Management Priority 1 = low 5 = high
Neville	Box Gum Grassy Woodlands	Weed encroachment	Selective spraying or 'cut and paint' with appropriate herbicides on a regular on-going basis to ensure regeneration of native species.	5
		Illegal grazing either directly in the reserve or on adjacent road reserve	Regular fence inspections and maintenance. Ensuring grazing permits are sought and correctly assessed.	2
	Derived Grassland	Weed encroachment	Selective spraying or 'cut and paint' with appropriate herbicides on a regular on-going basis to ensure regeneration of native species.	5
		Illegal grazing either directly in the reserve or on adjacent road reserve	Regular fence inspections and maintenance. Ensuring grazing permits are sought and correctly assessed.	2
	Locally rare species	Loss due to accident such as spraying	Find and then carefully mark the location of the plants with non-descriptive markers such that location is known to staff but not the public to ensure survival and safety.	4
		Illegal grazing either directly in the reserve or on adjacent road reserve	Regular fence inspections and maintenance. Ensuring grazing permits are sought and correctly assessed.	2
Newbridge	Box Gum Grassy Woodland ecotone	Weed encroachment	Selective spraying or 'cut and paint' with appropriate herbicides on a regular on-going basis to ensure regeneration of native species.	4
		Grazing by straying stock	Keep up regular maintenance of fences including regular checks by both Council and landholders to ensure stock are not straying.	5
		Illegal grazing either directly in the reserve or on adjacent TSR	Regular fence inspections and maintenance. Ensuring grazing permits are sought and correctly assessed.	2
	Locally rare species	Loss due to accident such as spraying	Find and then carefully mark the location of the plants with non-descriptive markers such that location is known to staff but not the public to ensure survival and safety.	2
		Illegal grazing either directly in the reserve or on adjacent TSR	Regular fence inspections and maintenance. Ensuring grazing permits are sought and correctly assessed.	2

Current Management Actions

Blayney Cemetery

Description of activity	Frequency of activity	When this occurs	Activity responsibility	Management priority 1 = low 5 = high
Active Zone				
Mowing	Every 4 weeks or as required*		Parks Crew	5
Edging	Twice per year	Spring and Summer	Parks Crew	4
Empty bins	Monthly or as required	In conjunction with other activities		5
Rabbit control	Annual	When weather permits	Contractors	3
Weeding and/or spraying	2 times per year	Spring and Summer	Parks Crew	2
Fence and infrastructure inspections and maintenance	Annual	In conjunction with other activities	Parks Supervisor and Contractor	4

NOTES: * Families may request maintenance of the cemetery prior to a burial.

Caroar Cemetery

Description of activity	Frequency of activity	When this occurs	Activity responsibility	priority 1 = low 5 = high
Active Zone				
Mowing	Every 6 weeks or as required*		Parks Crew	5
Edging	Once per year	Summer	Parks Crew	4
Empty bins	Quarterly or as required	In conjunction with other activities		5
Cut down roses	Once per year	Autumn	Parks Crew	2
Weeding and/or spraying	2 times per year	Spring and Summer	Parks Crew	5
Conservation Zone				
Weed spraying	Once per year	In conjunction with Active Zone program	Parks Crew	5
Fence inspections and maintenance	Once per year	Winter	Parks Supervisor	3
Mow grasslands	Once per year	After seed set	Parks Crew	4
Cool burns	Every 5 years	2019 Autumn-Winter	Parks Supervisor	4
Fence – replaced if required	Every 10 years	2020 if required in Winter	Parks Supervisor and Contractor	3

NOTES: * Families may request maintenance of the cemetery prior to a burial.

Hobbys Yards New Cemetery

Description of activity	Frequency of activity	When this occurs	Activity responsibility	priority 1 = low 5 = high
Active Zone				
Mowing	Every 6 weeks or as required*		Parks Crew	5
Edging	Once per year	Summer	Parks Crew	3
Rabbit control	Every 5 years or as required	When weather permits	Contractor	3
Weeding and/or spraying	Once per year	Spring or Summer	Parks Crew	1
Fence and infrastructure inspections and maintenance	Once per year	In conjunction with other activities	Parks Supervisor and Parks Crew	3
Fence replacement	Every 30 years	2030 or when required	Parks Supervisor and Contractor	2

NOTES: * Families may request maintenance of the cemetery prior to a burial.

Lyndhurst Cemetery

Description of activity	Frequency of activity	When this occurs	Activity responsibility	priority 1 = low 5 = high
Active Zone				
Mowing	Every 6 weeks or as required*		Parks Crew	4
Edging	Once per year	Summer	Parks Crew	4
Empty bins	Quarterly or as required	In conjunction with other activities	Parks Crew	4
Weeding and/or spraying	2 times per year	Spring and Summer	Parks Crew	5
Rabbit control	Every 5 years or as required	When weather permits	Contractor	4
Conservation Zone				
Weed spraying	Once per year	In conjunction with Active Zone program	Parks Crew	5
Fence inspections	Once per year	Winter	Parks Supervisor	3
Mow or cool burn grasslands	Every 5 years	Autumn or Winter	Parks Crew and Parks Supervisor	5
Tree review for thinning in woodland area	Every 10 years	In conjunction with other activities	Parks Supervisor	3
Replace fences	Every 20 years or as required	2019 when able to be scheduled	Parks Supervisor and Contractor	3
Kangaroo management	As required – new fencing required to minimise impact of kangaroos	2019-2020	Parks Supervisor	5

NOTES: * Families may request maintenance of the cemetery prior to a burial.

Millthorpe Cemetery

Description of activity	Frequency of activity	When this occurs	Activity responsibility	Management priority 1 = low 5 = high
Active Zone				
Mowing	Every 6 weeks or as required*		Parks Crew	5
Edging	Once per year	Summer	Parks Crew	4
Empty bins	Monthly	In conjunction with other activities	Parks Crew	5
Weeding and/or spraying	2 times per year	Spring and Summer	Parks Crew	3
Rabbit control	Every 5 years or as required	When weather permits	Contractor	4
Conservation Zone				
Weed spraying	Once per year	In conjunction with Active Zone program	Parks Crew	4
Fence inspections	Once per year	Winter	Parks Supervisor	3
Mow grasslands and EEC for exotic grass control	Every year	Autumn or Winter	Parks Supervisor and Parks Crew	5
Fence maintenance	Every 10 years or as required	Autumn, Winter or Spring	Parks Crew	3
Replace fences	Every 20 years or as required	2025 or when required in Winter	Parks Supervisor and Contractor	3
Install illegal dumping signage	When required	2020	Parks Supervisor	4

NOTES: * Families may request maintenance of the cemetery prior to a burial.

Neville Cemetery

Description of activity	Frequency of activity	When this occurs	Activity responsibility	Management priority 1 = low 5 = high
Active Zone				
Mowing	Every 6 weeks or as required*		Parks Crew	4
Edging	Once per year	Summer	Parks Crew	4
Empty bins	Quarterly or as required	In conjunction with other activities	Parks Crew	5
Weeding and/or spraying	2 times per year	Spring and Summer	Parks Crew	5
Rabbit control	Every 5 years or as required	When weather permits	Contractor	4
Conservation Zone				
Weed spraying	Once per year	In conjunction with Active Zone program	Parks Crew	5
Fence inspections	Once per year	Winter	Parks Supervisor	3
Mow grasslands	Once per year	Autumn or Winter	Parks Crew	5
Burn grasslands	Every 5 years	2021	Parks Supervisor	4
Fence maintenance	Every 10 years or as required	2027	Parks Crew	3
Replace fences	Every 20 years or as required	2039 when able to be scheduled	Parks Supervisor and Contractor	3

NOTES: * Families may request maintenance of the cemetery prior to a burial.

Newbridge Cemetery

Description of activity	Frequency of activity	When this occurs	Activity responsibility	Management priority 1 = low 5 = high
Active Zone				
Mowing	Every 8-10 weeks or as required*		Parks Crew	4
Edging	Once per year	Summer	Parks Crew	4
Empty bins	Quarterly or as required	In conjunction with other activities	Parks Crew	5
Pine wilding management	Once per year	In conjunction with weed management	Parks Crew	4
Weeding and/or spraying	2 times per year	Spring and Summer	Parks Crew	4
Rabbit control	Every 5 years or as required	When weather permits	Contractor	3
Conservation Zone				
Weed spraying	Once per year	In conjunction with Active Zone program	Parks Crew	5
Fence inspections	Every 4 months	January, May, September	Parks Supervisor	4
Fence maintenance	Every 10 years or as required	2026	Parks Crew	4
Replace fences	Every 20 years or as required	2036 when able to be scheduled	Parks Supervisor and Contractor	3

NOTES: * Families may request maintenance of the cemetery prior to a burial.

Future Actions and Goals

Cemetery Description of activity	MP*	Comments/Issues Start dates for works	Who is responsible (Council or partner)	Costs	Timeline
Combined Cemeteries					
Create a Cemeteries Works Guide for Parks Crew to guide actions such as weed quarantine actions	5	2019-2020	Council and contractors	$3,000	18 months
Create a formal area for spoil management	1	2019-2020	Council	$1,000	18 months
Explore opportunities and changes required to introduce eco-burials and similar burial styles	2	2025-2030	Council and community	Unknown	2 years
Blayney					
New cemetery for when all village cemeteries are full	3	2020-2025	Council	$50,000	100 years
Combined Village Cemeteries					
When cemetery is full, manage site for environmental conservation	4	Review cemeteries status in 2070	Council and community		As needed
Signage to improve awareness of conservation values of the cemetery	4	2020-2024	Council	$3,000	18 months
Signage to improve awareness of the impact of blown litter, such as plastic flowers and wrappings	4	2020-2024	Council	$3,000	18 months
Convert surrounding Conservation Zone into Stewardship Sites under the Biodiversity Conservation Act 2016	3	2021-2026	Council and Accredited Person	$50,000	3 years

*MP = Management Priority

Future Actions and Goals continued

Cemetery Description of activity	MP*	Comments/Issues Start dates for works	Who is responsible (Council or partner)	Costs	Timeline
Carcoar					
No specific goals					
Lyndhurst					
Improved pathway through the cemetery and reserves	1	2025-2030	Council and local	$5,000	2 years
Hobbys Yards					
No specific goals					
Millthorpe					
Reinvigorate the forbs/grasses through controlled cool burns in Conservation Zone	3	2021 and on-going	Council and local community	$1,000	New 5 yearly action that will take 1 day
Develop a strategy to stop new introductions of exotic species as grave plants	3	2020 and on-going	Council and local community	$3,000	2 years
Collect topsoil from new graves for rehabilitation of Conservation Zone	2	2019 and on-going	Council	$500	<10hrs/year
Neville					
No specific goals					
Newbridge					
No specific goals					

*MP = Management Priority

Document History

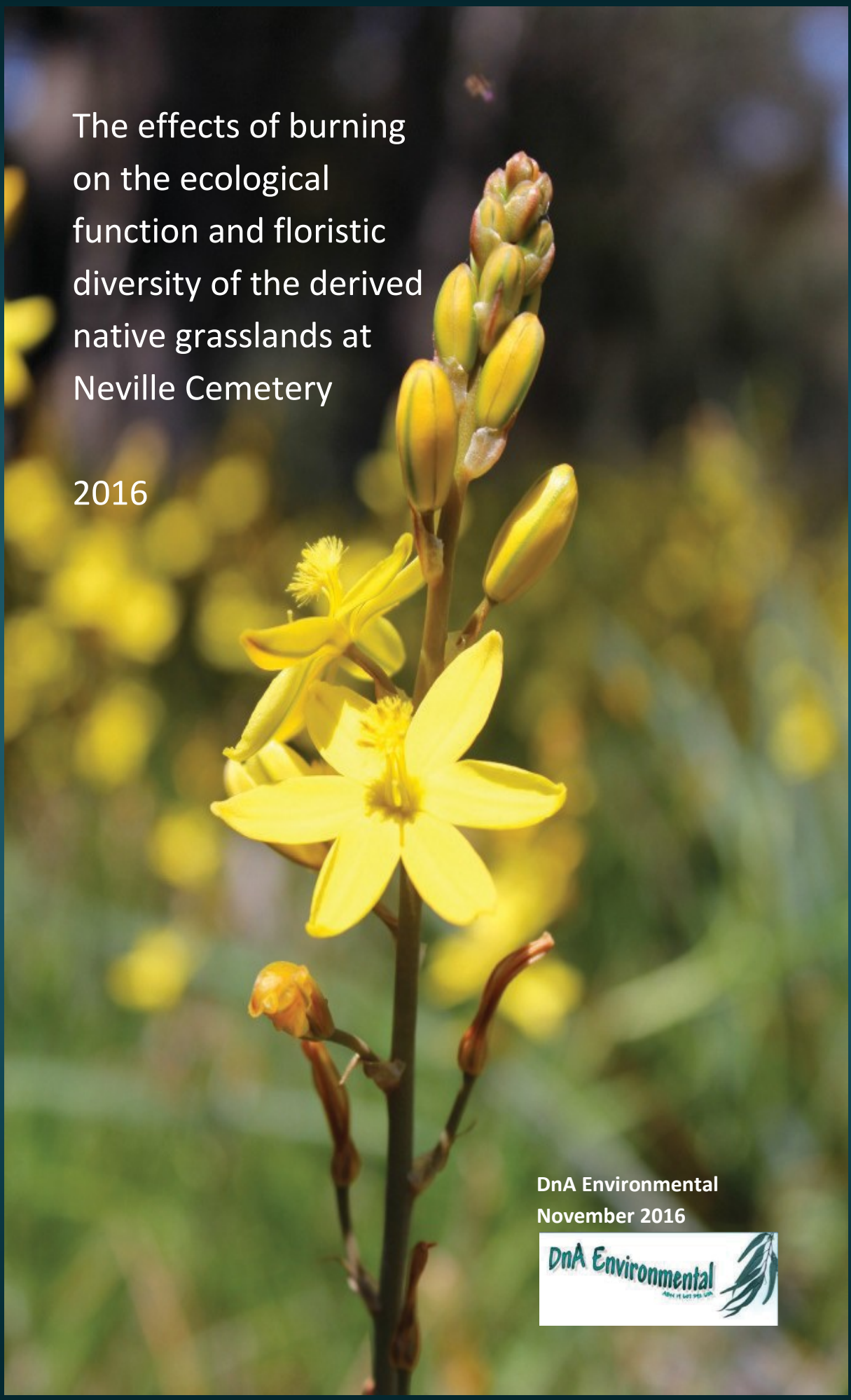
Activity	Responsibility (Officer)	Approved (Supervisor)	Date	Status

Appendix 1: Supporting documents list and location

These documents may be management plans, studies and research, planning documents, communication documents, grant applications or general information available about the cemeteries such as historical documents, flora and fauna surveys etc.

All documents referred to here should be made available through the records management system so that the knowledge is not lost.

Name of document	Date	Location File reference	Relevance to this Management Plan
Neville Cemetery: Ecological Surveys	December 2015		Survey of cemetery
The effects of burning on the ecological function and floristic diversity of the Derived Native Grassland at Neville Cemetery	November 2016		Describes impact of cool burns on cemetery flora
Four rural cemeteries in Central Western NSW	2009		Discusses flora of Carcoar and Lyndhurst cemeteries
K2W Project Report	2015		Project report for works and burn at Neville cemetery



The effects of burning on the ecological function and floristic diversity of the derived native grasslands at Neville Cemetery

2016

DnA Environmental

November 2016

Disclaimer

This is a report of work carried out by DnA Environmental. DnA Environmental have not been involved with the experimental design or the implementation of the burning regimes. The information contained herein is complete and correct to the best of my knowledge. The representations, statements, opinions and advice, expressed or implied in this report are produced in good faith but on the basis that DnA Environmental are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any or all of the content.

Signed: 

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Restoration Ecologist
PhD, B.App.Sc (Hons) MEIANZ

Front cover photo: *Bulbine bulbosa* (Native Leek).
Final report submitted: 20th February 2017

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Acknowledgements

The field work, data analyses and resultant report were undertaken and prepared by Dr Donna Johnston and Andrew Johnston from DnA Environmental. Brian Parker (Blayney Shire Council) provided some field assistance. Dr Col Bower (FloraSearch) kindly confirmed the identification of *Diuris chryseopsis* (Small Snake Orchid) in 2015. Friends of Grasslands (FOG) supplied a list of new species found within the wider cemetery area in October 2016.

Table of contents

1 The effects of burning on the ecological function and floristic diversity of the derived native grasslands at Neville Cemetery

1.1 Objectives

The primary objectives of the monitoring were to record a range of ecological data which will assist in identifying and quantifying changes in ecological function and floristic diversity of the derived native grasslands in the Neville Cemetery as a result of various management techniques, in particular different burning regimes.

1.2 Experimental design

The burning program has not been implemented under a valid statistical methodology and the results have not been replicated nor have been an adequate control area been included. Thus these results should be treated very conservatively. In addition, the cemetery site appears to have a mosaic of areas which have a different complement and composition of species as a result of differing management histories, thus they may not have been similar in the first place. Therefore making any comparisons or identifying changes as a result of the experimental burning regime difficult to determine.

1.3 Monitoring

The Neville Cemetery ecological monitoring was undertaken by Dr Donna Johnston (DnA Environmental) and was assisted by Mr Brian Parker (Blayney Shire Council) on 7th October, 2015.

In 2016, the cemetery was revisited on 9th October 2016 with Friends of Grasslands (FOG) who kindly supplied a list of species not previously recorded. These species have been included in Appendix 1. The cemetery was revisited on 4th November 2016 by DnA Environmental where the permanent monitoring plots were reassessed using the monitoring methodology used in 2015 and as described below.

2 Methodology

The methodology includes a combination of Landscape Function Analyses (CSIRO Tongway & Hindley 1996) and various measurements of ecosystem diversity and habitat values based on and adapted from the Biometric methodology (Gibbons 2002, Gibbons *et al* 2008a, 2008b).

2.1 Landscape Function Analyses

The LFA is a methodology used to assess key indicators of ecosystem function including landscape organisation and soil surface condition as measure of how well the landscape retains and uses vital resources. It was developed by CSIRO scientists Tongway and Hindley (Tongway 1994, Tongway and

Hindley 1995, 1996, 2003, 2004). The indicators used quantify the utilisation of the vital landscape resources of water, topsoil, organic matter and perennial vegetation in space and time. Additional information and data spreadsheets are freely available on the internet.

The LFA methodology collects data at two "nested" spatial scales.

1. At coarse scale, **landscape organisation** is characterised. Patches and interpatches, indicators of resource regulation, are mapped at the 0.5 to 100 m scale from a gradient-oriented transect (making sense of landscape heterogeneity); and

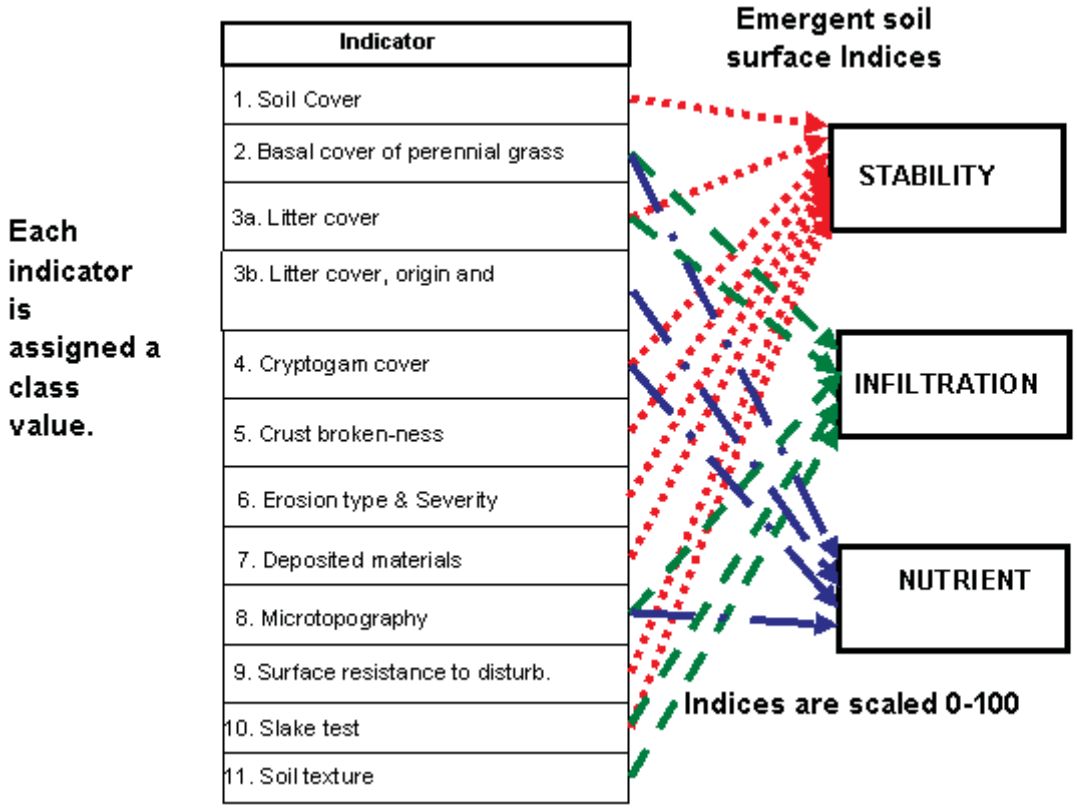
2. At fine scale, **soil surface assessment** (soil "quality") examines the status of surface processes at about the 1-m scale, with rapidly assessed indicators on the patches and interpatches identified at coarse scale.

At each scale, parameters are calculated that reflect several aspects of landscape function. In the first stage, we identify and record the patches and interpatches along a line oriented directly down slope. Sometimes there are several different types of each patch/interpatch which provides a measure of heterogeneity or "**landscape organisation**".
In the second stage, called "**soil surface condition" (SSC)** assessment, it is possible to assess and monitor soil quality using simple indicators including:

- Rain splash protection;
- Perennial vegetation cover;
- Litter;
    - Percent litter cover;
    - Origin of the litter;
    - Extent of decomposition;
- Cryptogam cover;
- Crust Brokenness;
- Soil Erosion Type and Severity;
- Deposited Materials;
- Soil Surface Roughness;
- Surface Nature (resistance to disturbance);
- Slake Test; and
- Soil Surface Texture.

These 11 features are compiled and calculated into three indices of soil quality:

1. **Stability** (that is, resistance to accelerated erosion),
2. **Infiltration** (the rate soil absorbs water) and
3. **Nutrient Cycling** (the way plant litter and roots decompose and become available for use by other plants).



2.2 Monitoring structural diversity, floristic and other biodiversity attributes

In addition to LFA, assessments of various biodiversity components must also be made to monitor changes in particular plants and groups of plants through the various successional phases and to document and/or identify critical changes or management actions required.

Some simple and rapid procedures for making these assessments were developed by CSIRO scientists (Gibbons 2002, Gibbons *et al* 2008), and were developed for assessment habitat quality across a range of vegetation types in the southern NSW Murray-Darling Basin. Some adaptations have been made to reduce monitoring effort where possible.

The rapid ecological assessment provides quantitative data that measures changes in:

- Floristic diversity including species area curves and growth forms;
- Ground cover diversity and abundance; and
- Vegetation structure and habitat characteristics (including ground cover, cryptogams, logs, rocks, litter, projected foliage cover at various height increments).

Permanent transects and photo-points are established to record changes in these attributes over time.

2.3 The permanent monitoring quadrats

The permanent monitoring quadrats are 20 x 20m, with the 20m LFA transect oriented down slope and this same transect was also used as the vegetation transect. This transect was positioned in the

centre (10m) of the monitoring quadrat to avoid inference from the adjacent entrance track or large variations in changes in vegetation composition.

A marker peg was installed at the start of the LFA/vegetation transect and GPS coordinates were taken to ensure the same quadrat and transect can be relocated (Figure 2-1).

2.4 Monitoring procedures

The procedures for quantifying species cover abundance and community structure are provided in and Table 2-1 and Table 2-2 respectively. Total floristic diversity is recorded in systematic increments within the monitoring plot, beginning at the start of the LFA/veg transect in the 1 x 1m sub-plot as indicated in Figure 2-1. The procedure for obtaining total floristic diversity is provided in Table 2-3.

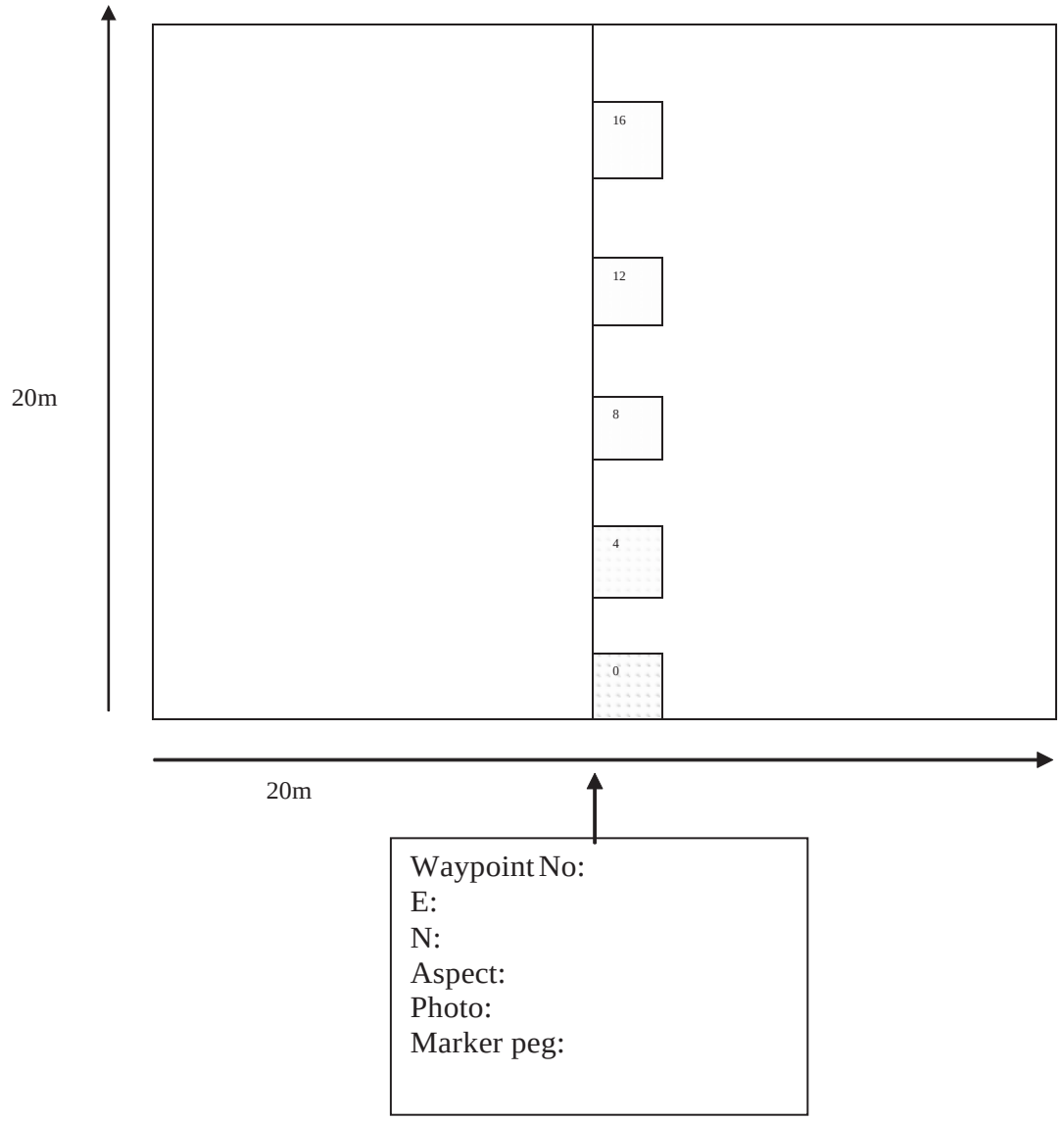


Figure 2-1. Schematic diagram and layout of the monitoring quadrat.

Table 2-1. Method for collecting data about species cover abundance

Variable	How to record it
Cover abundance	Record species name and allocate a cover abundance score using Braun-blanquet scale within $1m^2$ every 4m along the permanent 20m transect
ID	Take a specimen for later identification if required

Table 2-2. Method for collecting data about the structure of the vegetation community

Variable		How to record it
Litter	**NOTE:** these features should add up to 100% i.e. all ground cover, include bare, ground or litter or grasses beneath shrubs, trees.	% cover of litter (<5cm diameter) estimated at each of the 1m lengths every 4m along the permanent 20m transect
Annual Plants		% cover of live annual plants estimated at each of the 1m lengths every 4m along the permanent 50m transect
Cryptogam		% cover estimated at each of the 1m lengths every 4m along the permanent 20m transect – exclude any cryptogam cover that occurs on rock or log (rock and log defined as cm across)
Bare ground		% cover (including rock <5cm across, but not including cryptogam) estimated at each of the 1m lengths every 4m along the permanent 20m transect
Rock		% cover of rock cm across estimated at each of the m lengths every 4m along the permanent 20m transect
Log		% cover of logs cm diameter estimated at each of the m lengths every 4m along the permanent 20m transect
0-0.5m perennial plant		Projected foliage cover of live perennial plants estimated in vertical stratum from 0-0.5m (regardless of life-form or whether native or introduced) estimated at each of the 1m lengths every 4m along the permanent 20m transect
0.5-2m perennial plant		Projected foliage cover estimated in each vertical stratum from 0.5-2m (regardless of life-form or whether native or introduced) estimated at each of the 1m lengths every 4m along the permanent 20m transect
2-4m perennial plant		Projected foliage cover estimated in each vertical stratum from 2-4m (regardless of life-form or whether native or introduced) estimated at each of the 1m lengths every 4m along the permanent 20m transect
4-6m perennial plant		Projected foliage cover estimated in each vertical stratum 4-6m (regardless of life-form or whether native or introduced) estimated at each of the 1m lengths every 4m along the permanent 20m transect
>6m perennial plant		For overstorey (>6m), estimate projected foliage cover immediately above each of the 1m lengths every 4m along the permanent 20m transect

Table 2-3. Method for collecting data about floristic diversity

Variable	How to record it
New species	Record name of any new species located in the following series of subquadrats starting on the left hand side of the larger 20x20m monitoring quadrat 1x1, 1x2, 2x2, 5x5, 10x10, 10x20, 20x20. This will provide cumulative species diversity
ID	Take a specimen for later identification if required
No species	Number of native and exotic species and growth form
Growth Form	Growth forms as listed on field sheet

2.5 The monitoring sites

In 201,5 two 20 x 20m permanent monitoring quadrats were established within two different management areas in the derived grasslands with these being areas:

1. 2015 Unburnt;
2. 2015 spring burnt.

In 2016, the unburnt 2015 area had been subjected to a spring burn and the 2015 spring burnt area had remained unburnt. So data could be compared, a small area (2 x 1x1m^2 sub-plots) which remained unburnt was also assessed. Subsequently in 2016 the monitoring compared;

- 2015 unburnt/2016 burnt;
- 2015 spring burn/2016 burnt; and
- control (no burn)

In 2016, the 2015 unburnt/2016 burnt transect was moved downslope 4m as the 0 - 4m area of the transect remained unburnt. The GPS coordinates and transect bearings are provided in Table 2-4.

Table 2-4. GPS coordinates and transect bearings of the two permanent monitoring sites.

Site Name	Eastings	Northings	Bearing
2015 Unburnt/2016 burnt	55704844	6266636	88 E
Spring Burnt/2016 unburnt	55 704836	6266591	80 E
Unburnt (Control)	55 704835	6266636	88 E

3 Ground cover monitoring results

3.1 Permanent photo-points

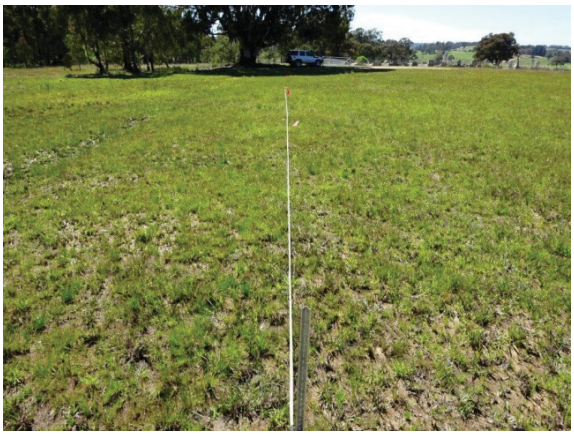
Permanent photo-points along the vegetation transects within the two grassland sites are provided in Table 3-1 and will be taken every year to visually capture changes occurring in the vegetation communities.

Table 3-1. Permanent photo-points along the vegetation transects in the grasslands monitoring quadrats.

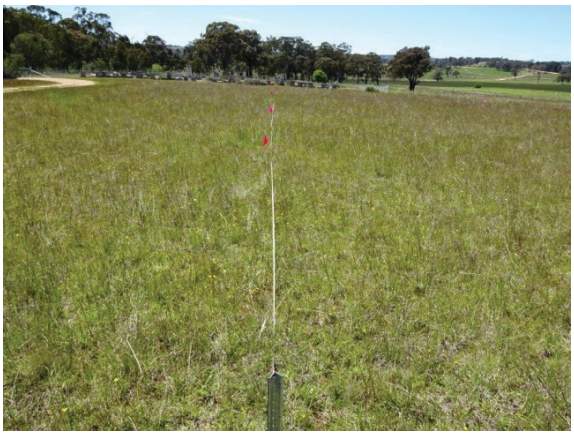
2015 Unburnt

2015 burnt

2015 Unburnt/2016 burnt



2015 burnt/2016 Unburnt



3.2 Landscape Function Analyses

3.2.1 Landscape organisation Index

A patch is an area within an ecosystem where resources such as soil and litter tend to accumulate, while areas where resources are mobilised and transported away are referred to as interpatches. Landscape Organisation Indices (LOI) are calculated by the length of the patches divided by the length of the transect to provide an index or percent of the transect which is occupied by functional patch areas (Tongway and Hindley 2004).

The grasslands within the Neville Cemetery were comprised of a well developed perennial grassland dominated by native grasses and herbs. Despite being subjected to a burning treatment in 2015 (2015 Spring Burnt/ 2016 unburnt) and in 2016 (2015 Unburnt/2016 Burnt) both areas continued to have a 100% functional patch areas. This year, the small area that remained unburnt also had an LOI of 100%.

3.2.2 Stability

In 2015 both sites had comparable Landscape stability of 73.5 (Figure 3-1) which was provided by the high perennial plant and cryptogrammic cover and soil surface crusts, with little evidence of erosion or deposition occurring within the two areas. In 2016, there was a reduction in stability in the 2016 spring burn area (2015 unburnt/2016 burnt) which scored an index of 68.5 this year. Fire had consumed most of the protective litter cover and had reduced the abundance of the perennial ground covers, leaving the interstitial spaces vulnerable to erosion. The perennial ground covers however were beginning to grow with the onset of the warmer weather and there was now an abundance of cryptogams.

In the area that was burnt in 2015 (2015 burnt/2016 unburnt) the ecological stability had increased to 80.5 and was even slightly higher than the control (no burn) area this area which scored a stability index of 78.8. This was due to the abundance of perennial plant and cryptogam covers and the dead leaf litter was accumulating, with these now providing a protective and stable soil surface layer.

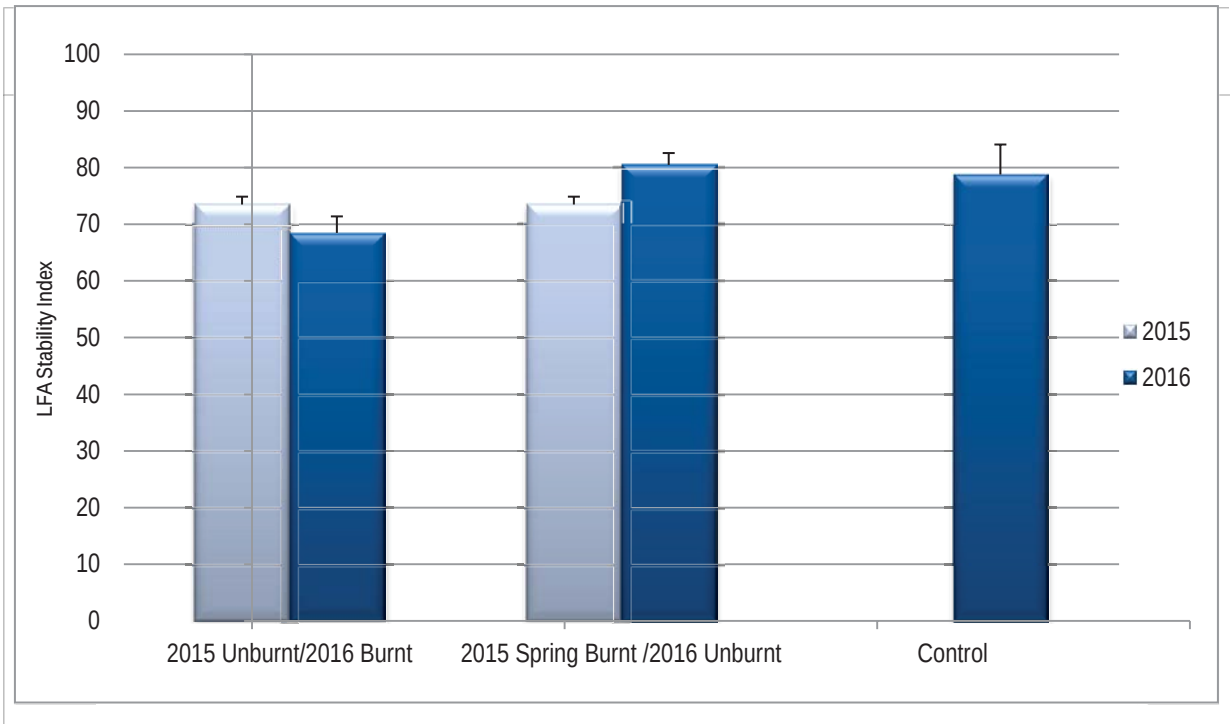


Figure 3-1. LFA Stability indices recorded in the monitoring sites.

3.2.3 Infiltration

In 2015, the unburnt area scored an infiltration index of 43.5 (Figure 3-2). The area was comprised of a deep layer of litter which was in slight to moderate states of deposition with the soil surface having an abundance of cryptogam cover. The dense sward of perennial grasses and other ground cover plants also provided a comparatively high soil surface relief which reduces runoff and assists with moisture penetration into the soil profile. The area that remained unburnt this year (control) remained quite similar to those last year however this year the soils were quite spongy with the resultant infiltration index being 52.7 and much higher than the comparable area last year.

This year the spring burn has resulted in the reduction on the plant and litter covers, resulting in a reduction on soil surface relief and increase surface hardness. Subsequently, the infiltration capacity of this burnt area has significantly declined as a result of the recent burn and this area scored an infiltration index of 27.4.

In the area which was subjected to a burn in spring 2015, there has been a significant improvement in infiltration capacity as the litter, perennial plant and cryptogam covers increase in depth with slight states of litter decomposition already being evident. This area scored an infiltration index of 40.7.

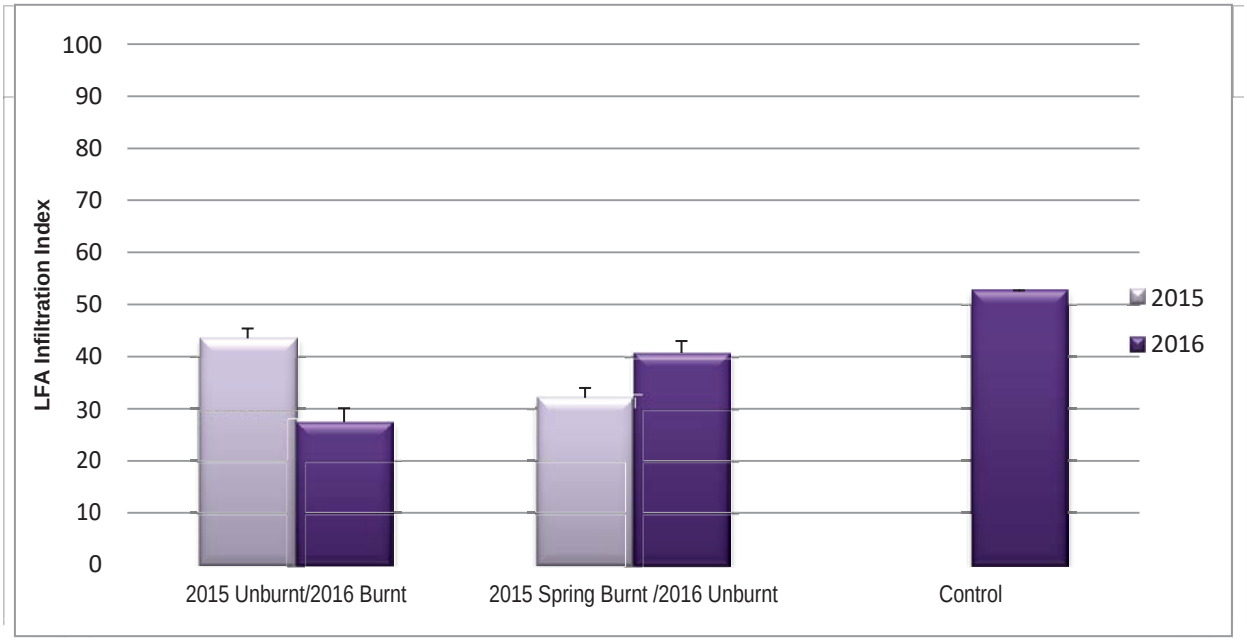


Figure 3-2. LFA Infiltration indices recorded in the monitoring sites.

3.2.4 Nutrient recycling

There were similar changes in the nutrient recycling capacity of the three areas as a result of the burning regimes. In the unburnt control, there was a nutrient recycling index of 48.7 (Figure 3-3) recorded this year, with a good cover of perennial grasses and cryptogams and the deep litter layers being in moderate states of decomposition. These in turn have resulted in the development of a stable, spongy humus soil profile.

Large changes occurred as a result of burning which resulted in a reduction in the abundance of perennial plant covers and depth and decomposition of the litter layers. As a result the soils also became hard and crusted. This was evident in the 2016 spring burn area where the nutrient recycling index declined from 45.3 – 31.2. This process was also recorded in the 2015 spring burn area in 2015 (which scored 35.5).

This year, the 2015 burnt area had improved vegetative and cryptogrammic cover and states of litter decomposition, resulting in a simultaneously reduction in soil surface hardness. The 2015 spring burn area scored a nutrient recycling index of 48.3 this year which was negligibly lower than that recorded in the control (unburnt) plot.

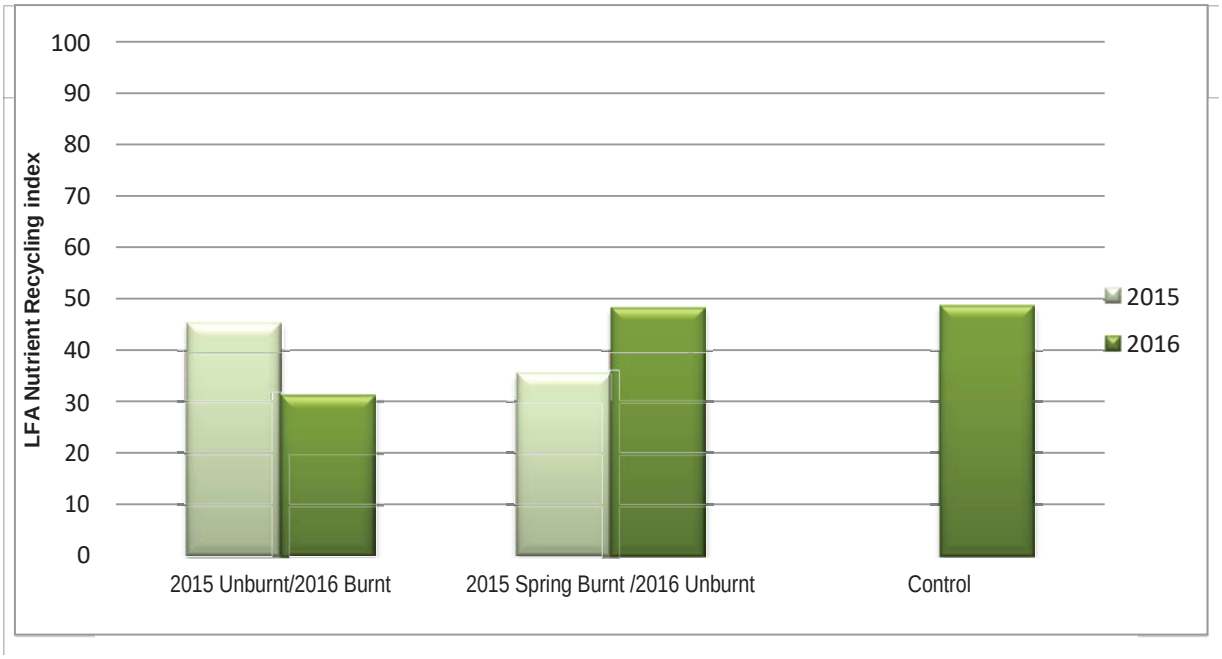


Figure 3-3. LFA Nutrient Recycling indices recorded in the monitoring sites.

3.2.5 Total landscape function

The total ecological function, as the sum of stability, infiltration and nutrient recycling indices are provided in Figure 3-4. The data indicate that the recent spring burning had resulted in the temporary reduction in ecological function, with a total score of 127.1 being recorded this year. A reduction in ecological function was also recorded last year as a result of burning, however this grassland area appears to have significantly recovered and scored a total function of 169.5 compared to the unburnt control which scored 180.2. Examples of the ground covers as result of the burning treatments in 2015 and 2016 are provided in Table 3-4.

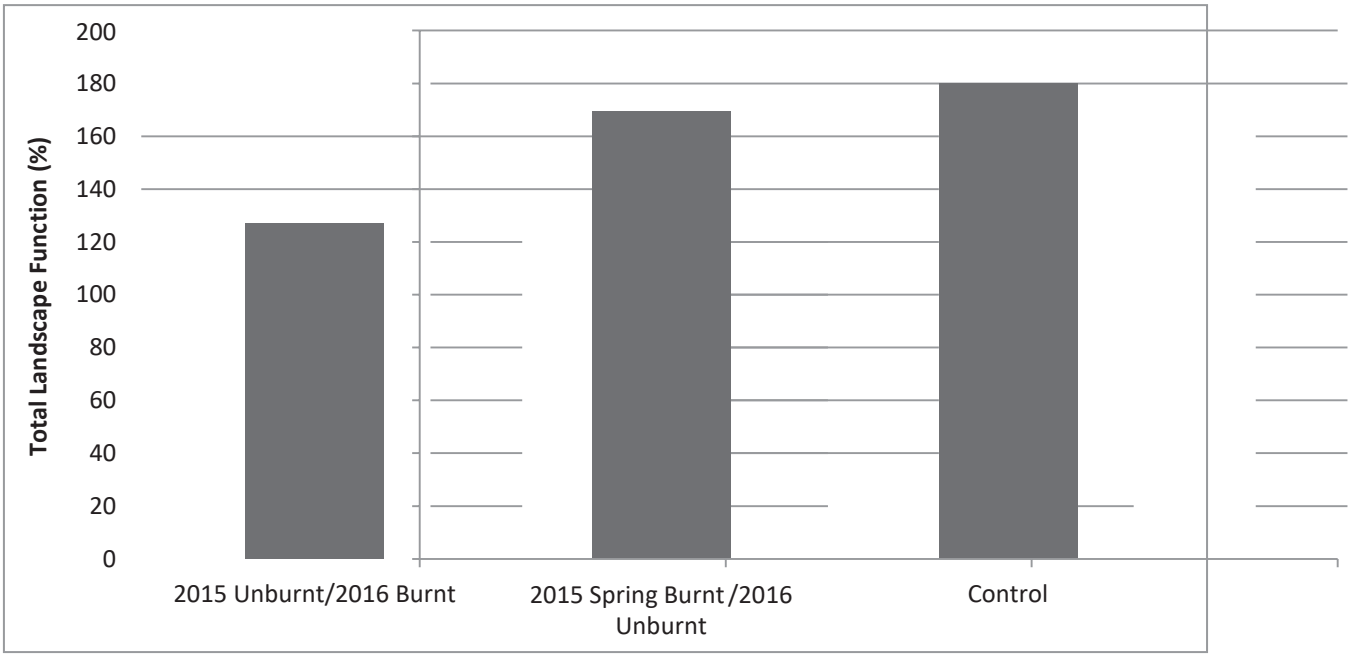


Figure 3-4. Total landscape function recorded in the monitoring sites in 2016.

Table 3-2. Ground cover composition within the different burning regimes as recorded in 2015 and 2016.

2015 Unburnt

2015 Spring burn

Control

2015 Unburnt/2016 burnt

2015 burnt/2016 Unburnt

3.3 Floristic diversity

The total number of native species recorded in the 20 x 20m monitoring plots is shown in Figure 3-5. There was insufficient area of comparable grassland to establish a new site in an unburnt area so that changes as a result of burning could be made.

This year there was a higher diversity of native species in both of the burnt areas but the highest diversity continued to be recorded in the 2015 spring burn area which had an increase from 30 to 38 native species per 0.04ha plot (Figure 3-5). In the recent 2016 burn area, a total of 27 native species were recorded and this was an increase from 15 native species recorded last year.

There was also an increase in exotic species in the 2015 burn area which had an increase of 6 to 17 exotic species over the past year (Figure 3-6). In the 2016 burn area, there continued to be only nine exotic species.

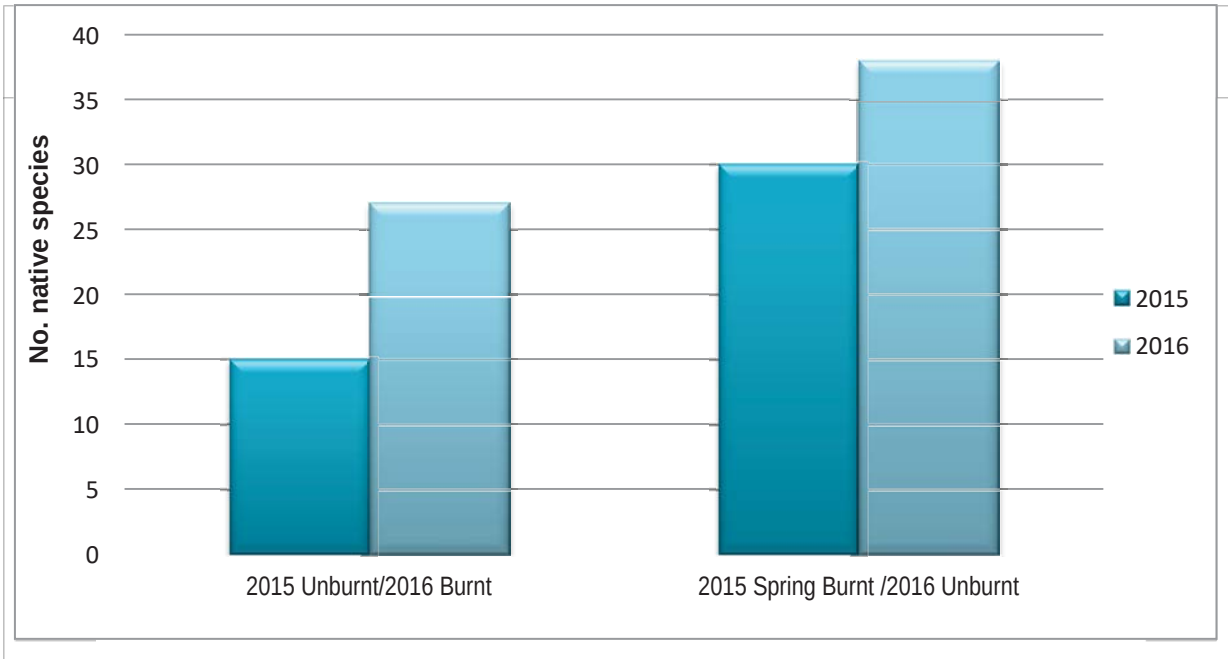


Figure 3-5. Total native species recorded in the 20 x 20m monitoring sites.

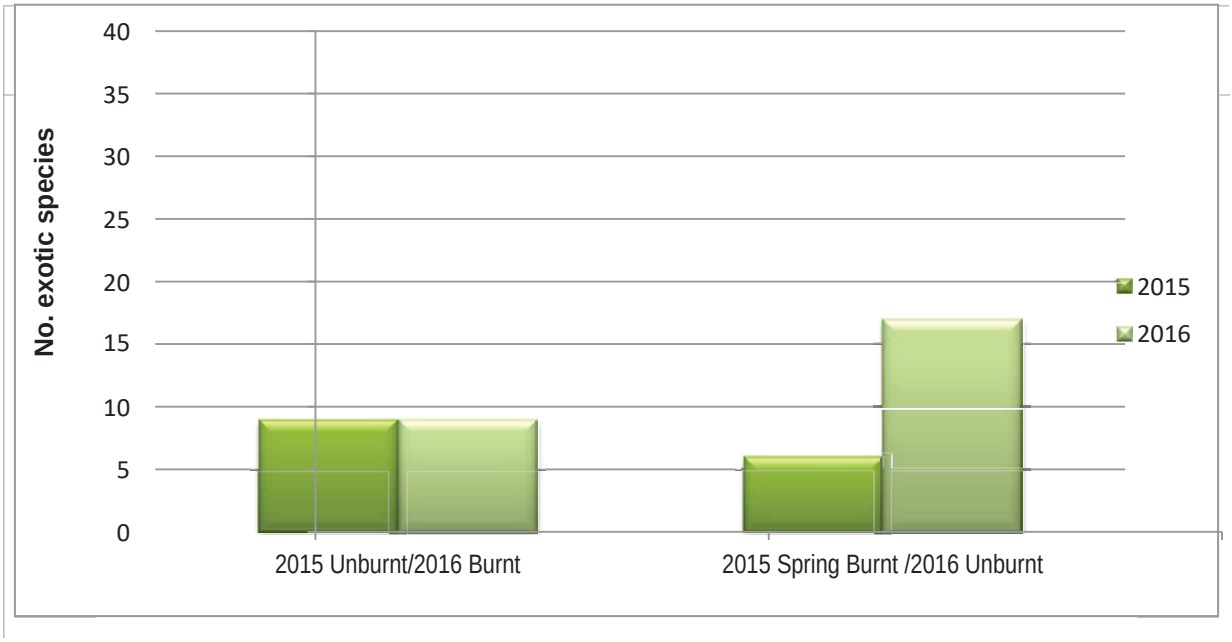


Figure 3-6. Total exotic species recorded in the 20 x 20m monitoring sites.

3.4 Average species diversity

The average number of native species per m^2 in the 2015 spring burnt cemetery site was much higher than the 2016 unburnt area. In both sites, this diversity was higher than was recorded last year, with 6.2 native species per m^2 in the 2016 burn compared to 10.0 native species per m^2 in the 2015 area. In the unburnt control there were fewer native species with 5.5 native species per m^2 being recorded this year (Figure 3-7).

There continued to be a higher diversity of native species compared to exotic species per m^2 in both burnt areas. There were however slightly more exotic species recorded this year with 4.0 and 5.0 exotic species per m^2 recorded in the 2016 and 2015 burn areas respectively. In the control, there was an equivalent diversity of native and exotic species, with 5.5 exotic species per m^2 (Figure 3-8).

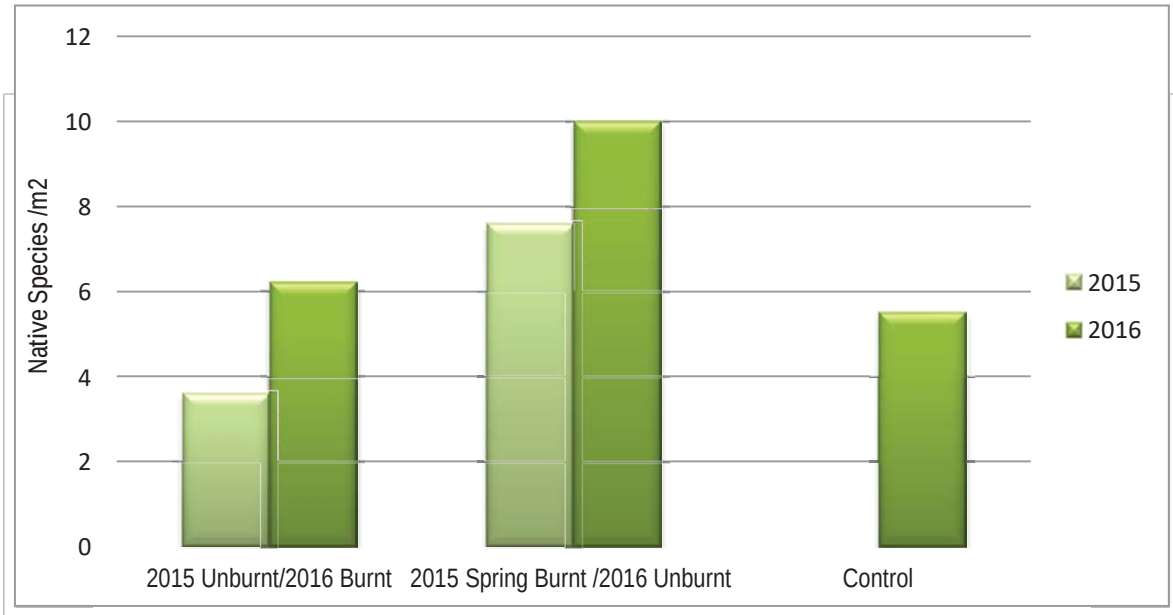


Figure 3-7. Average number of native species recorded per m^2.

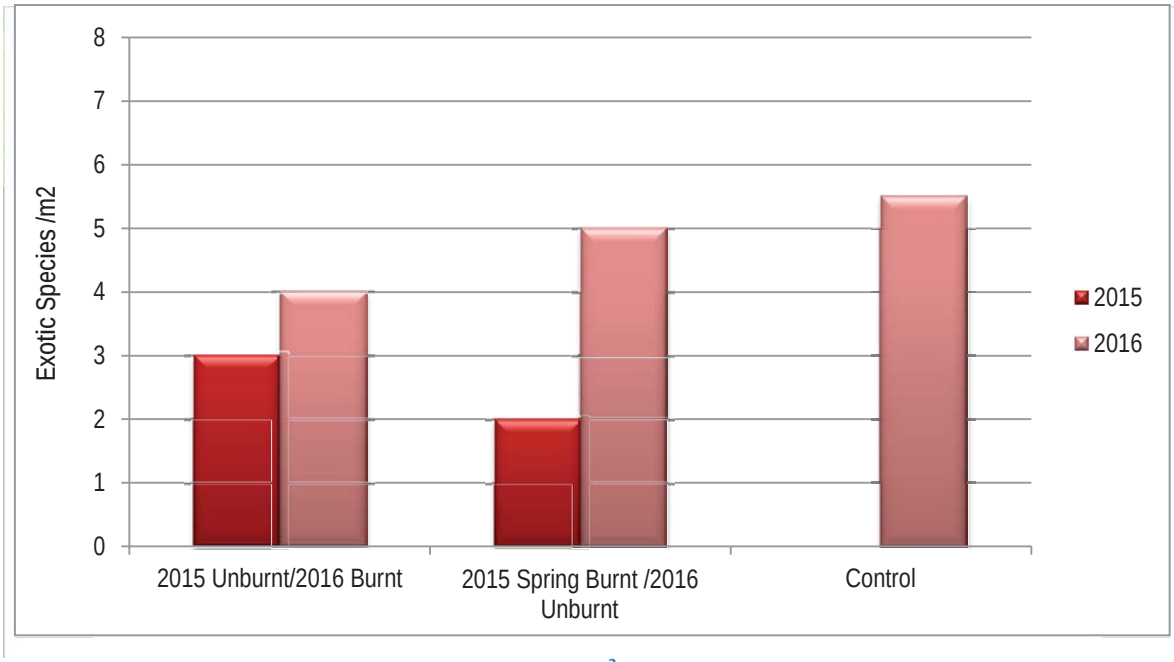


Figure 3-8. Average number of exotic species recorded per m^2.

3.5 Structural composition

The various combinations of the ground covers and structural compositions of the cemetery grassland sites are provided in Figure 3-9.

Compared to last year, the two sites have transformed with the recently burnt area appearing more structurally similar to that of the burnt area last year. In the 2016 burnt area, there was 27% perennial plant covers and there was space for the occasion annual plant and cryptogrammic covers which provided 4% and 10% of the total ground covers on average, with 48% of the ground with no protective cover at all.

The ground cover in the 2015 burnt site had significantly recovered and was largely comprised of perennial ground covers and dead leaf litter which provided on average 52% and 37% of the total ground cover respectively this year. A small contribution was provided by annual plants and cryptogams this year which provided 6% and 5% cover respectively and there were no bare areas.

Given the relatively small size of the monitoring quadrats there was little other habitat features such as fallen branches, shrubs or tree canopies. Rocks are also not typically a characteristic feature in these derived grassland communities.

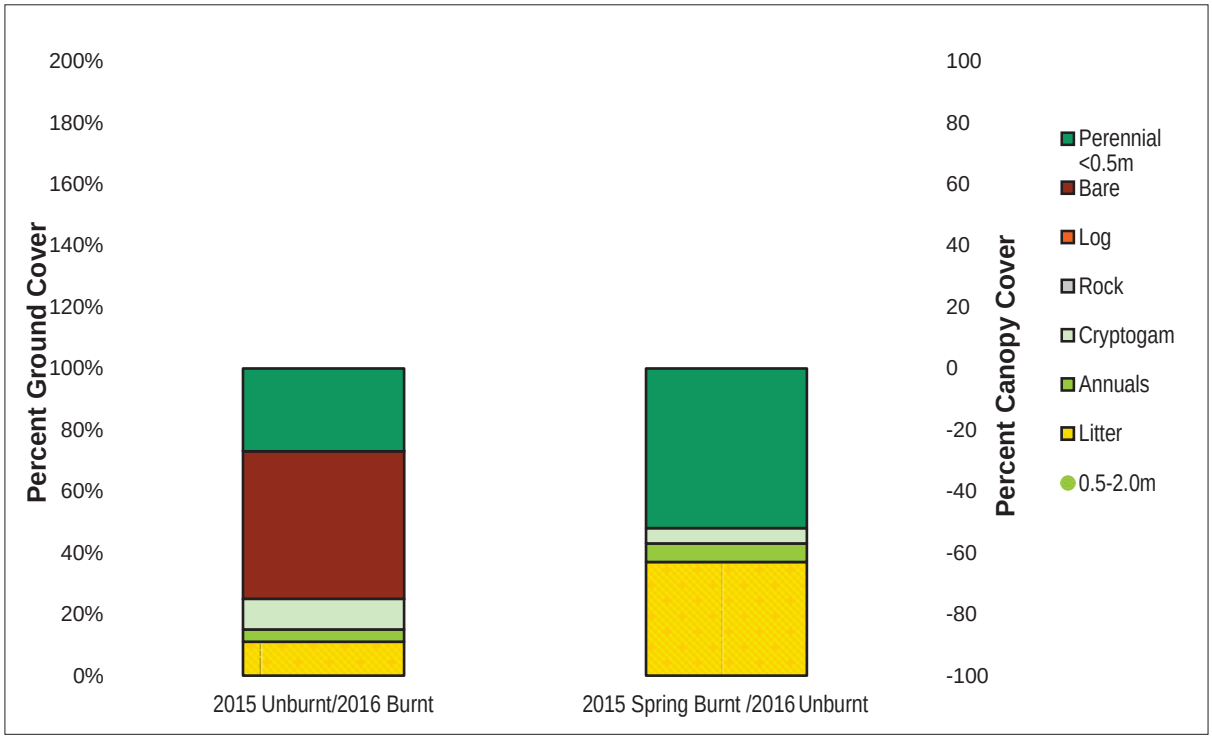


Figure 3-9. Average percent ground cover composition and projected foliage covers recorded in 2016.

3.6 Percent endemic ground cover

The percent endemic ground cover is an ecological indicator used to provide some measure of the cover abundance of the live native vegetation along the vegetation transect and therefore indicates the level of weediness at the monitoring sites. While it is only estimation the percent cover of endemic ground cover species has been derived by the following equation.

Percent cover endemic species = sum of the five Braun- blanquet scores for native species / (sum of the five Braun- blanquet scores of exotic species + native species) x 100

The percent endemic plant cover has declined in both the 2015 and 2016 burnt areas as a result of the increased abundance of exotic species this year. In the 2015 and 2016 burnt areas however, native species continued to be more abundant with a total live plant cover of 76.4% and 65.9% native species respectively. In the control, there was only 56.1% indicating a higher abundance of weeds in this unburnt area.

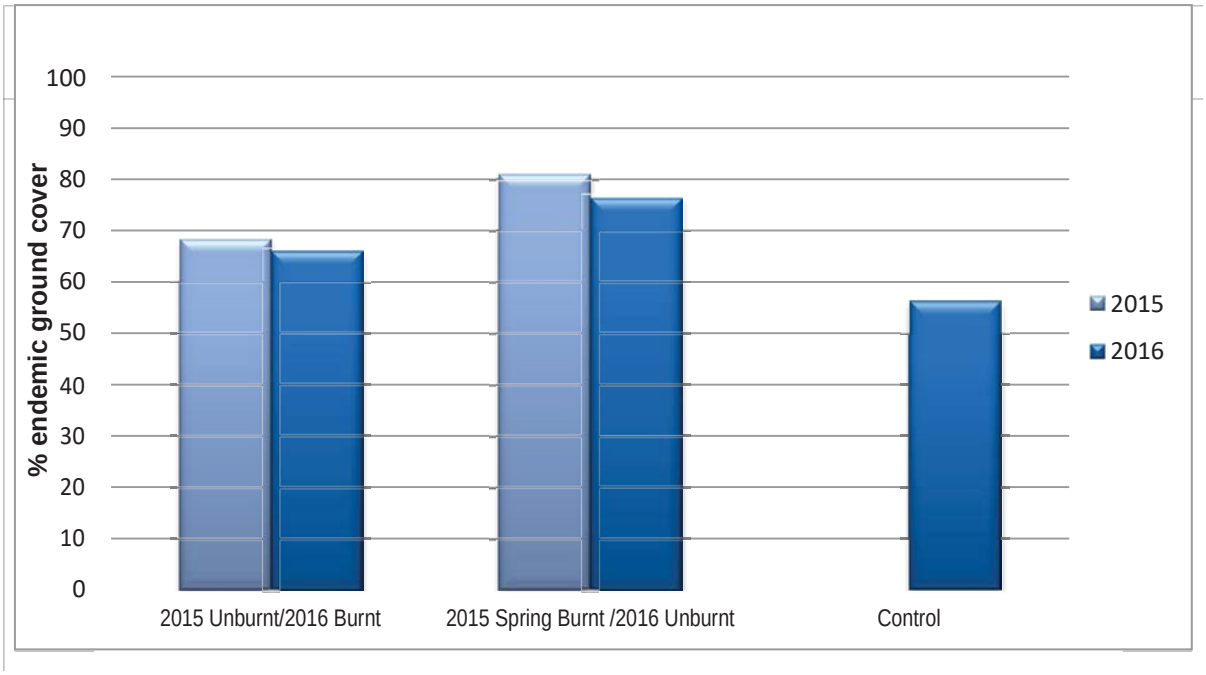


Figure 3-10. Percent endemic ground cover recorded in the cemetery monitoring sites.

3.7 Most common and abundant species

In both monitoring areas *Themeda triandra* (Kangaroo Grass) continued to be the most dominant species with Braun-blanquet scores of 18 (out of a possible 30) in the 2016 burnt section of the cemetery and 25 (out of a possible 30) in the 2015 spring burnt area.

There continued to be a comparatively lower diversity of species in the 2016 burnt area (Figure 3-11) compared to the 2015 spring burnt area (Figure 3-12). Common and abundant native species in the 2016 burn area included *Carex inversa* (Knob Sedge) and *Schoenus apogon* (Common Bog Rush), while *Juncus bufonius* (Toad Rush) was also common but provided low cover scores. Common exotic species included *Anthoxanthum odoratum* (Sweet Vernal Grass), a short lived exotic perennial grass which was recorded in every sub-plot along the vegetation transect. It also contained relatively high abundance of *Hypochaeris radicata* (Flatweed), an exotic perennial herb was also common in all sub-plots. This year *Briza minor* (Shivery Grass) was also recorded in all low abundance in four of the five sub-plots. The remaining species were recorded on only one occasion and provided low cover scores.

The 2015 burnt area continued to be more diverse and this year common and abundant native species, apart from *Themeda triandra,* included Poa *sieberiana* (Fine-leaf Tussock) and *Leptorhynchos squamatus* (Scaly Buttons) which were recorded in all five sub-plots. Others included Chrysocephalum *apiculatum* (Common Everlasting), *Leucopogon virgatus/fraseri?* (Common Beard Heath) and *Scleranthus biflorus/fasciculatus*? (Spiny Mat-plant). Common exotic species included *Anthoxanthum odoratum, Briza minor, Centaurium erythraea* (Common Centaury) and *Trifolium dubium* (Yellow Suckling Clover). The remaining species were recorded on only one occasion and provided low cover scores.

In the two sub-plots that remained unburnt (control), the diversity of species was much lower but *Themeda triandra* was also the most dominant native species and scored 10 out of a possible 12 (Figure 3-13). The native grass *Rytidosperma* spp. (Wallaby Grass) and the exotic *Anthoxanthum*

odoratum were the next most abundant species. Other common natives included *Carex inversa, Geranium solanderi* (Native Geranium) and *Schoenus apogon* with these being recorded in relatively low abundance in both of the sub-plots. *Aira caryophyllea* (Silvery Hairgrass), *Centaurium erythraea, Hypochaeris radicata* and *Trifolium dubium* were also recorded in both sub-plots.

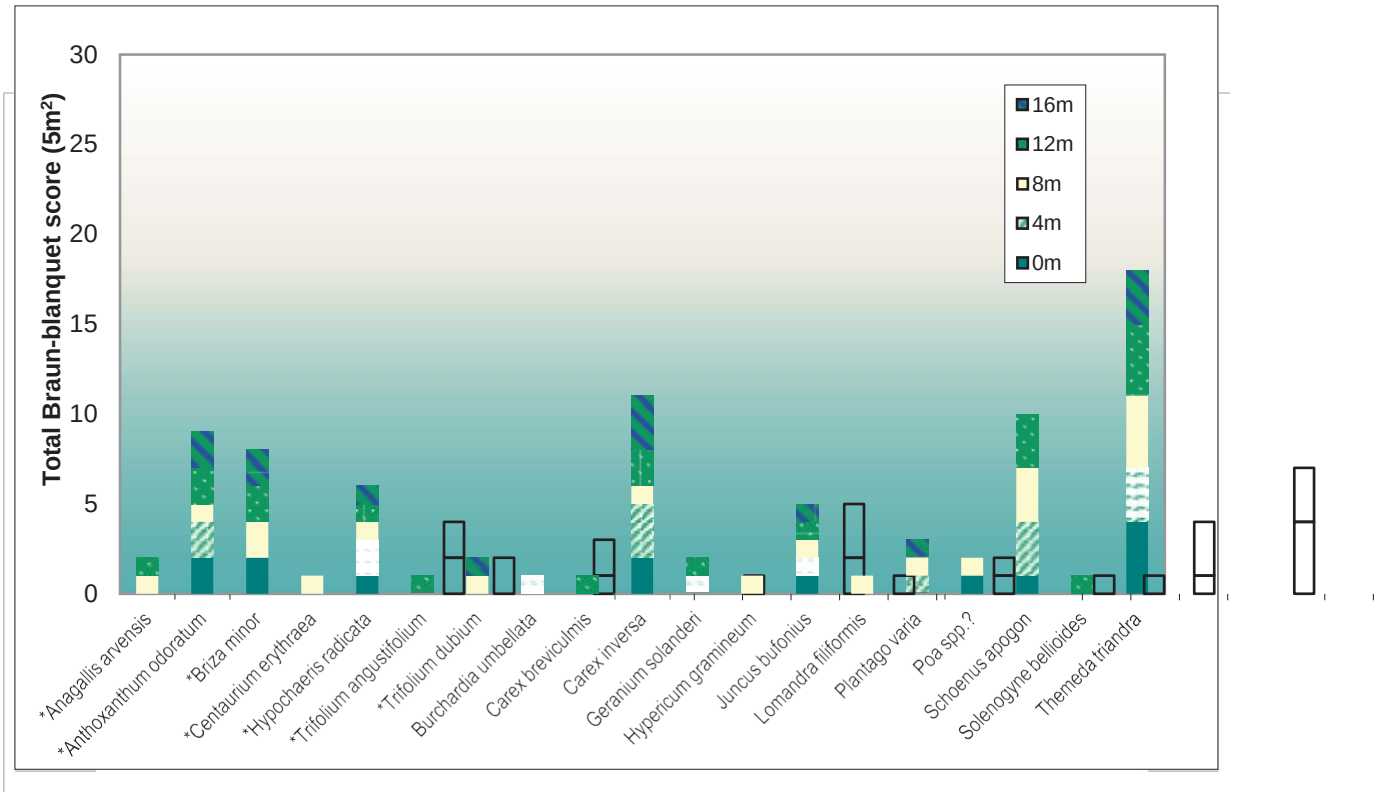


Figure 3-11. Species cover abundance recorded in the 2015 unburnt/2016 burnt area of the cemetery.

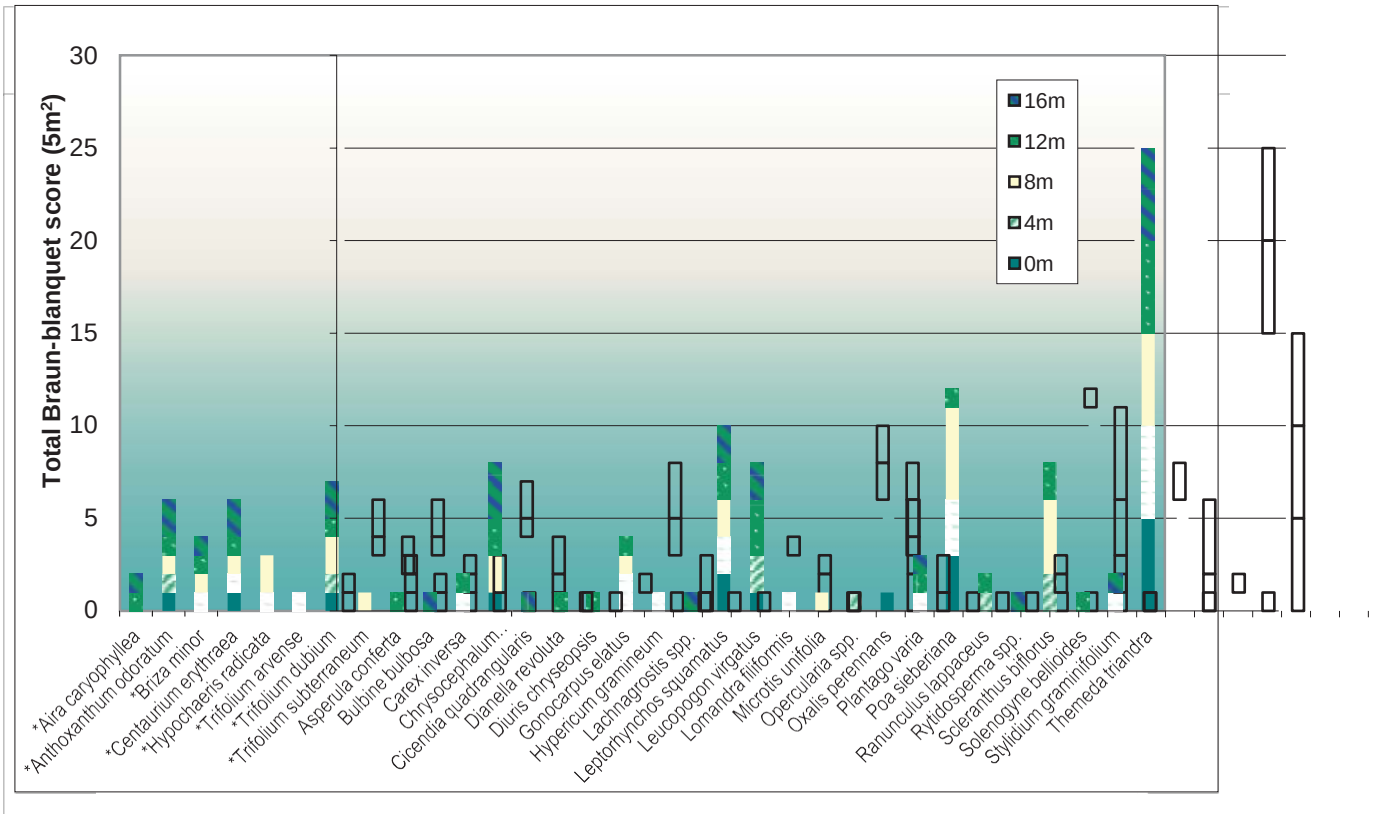


Figure 3-12. Species cover abundance recorded in the 2015 spring burn/2016 unburnt area of the cemetery.

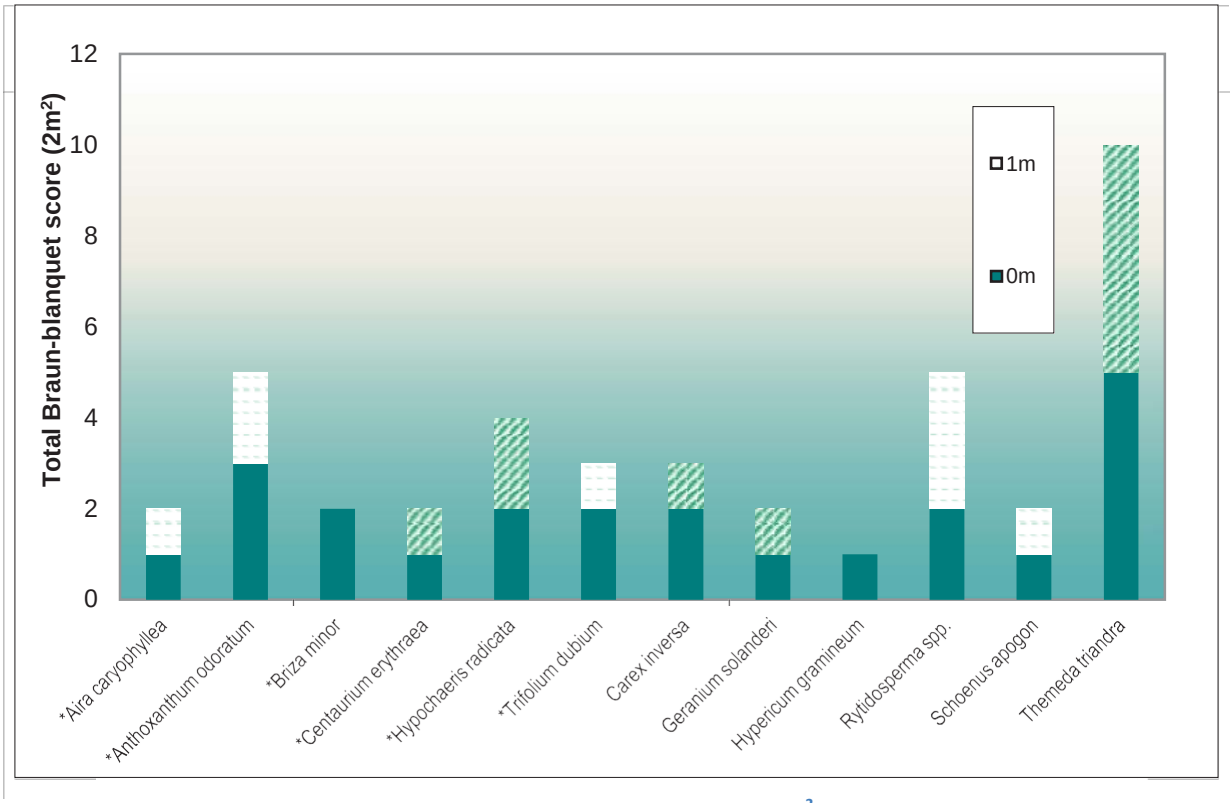


Figure 3-13. Species cover abundance recorded in the two sub-plots (2 x 1m^2) in the unburnt (control) area of the cemetery.

3.8 Number of *Diuris chryseopsis* individuals

The number of *Diuris chryseopsis* (Small Snake Orchid) were not counted across the cemetery sites this year. There were however, two individuals recorded in the 20x20m 2015 burnt monitoring plots compared to 18 individuals which were recorded last year. There were 23 individuals recorded in the 20x20m 2016 burn monitoring plot compared to none recorded last year.

Diuris chryseopsis continued to be common within within the mown graveyard areas of the cemetery but these numbers appeared to be lower than the estimates of 310 individuals which was made in 2015, perhaps due to the later timing of the monitoring (Table 3-3).

Figure 3-14. *Diuris chryseopsis* (Snake Orchid).

Table 3-3. Estimated number of *Diuris chryseopsis* occurring in the mown graveside areas in October 2015

Area	Sub division	No Diuris chryseopsis
Main graveyard area	front	63
	back	67
	Left of graves	14
	Front right	0
	Front left	98
Left grave site area	all	68
Total		310

3.9 List of flora recorded in the monitoring sites

A list of species recorded in the two 20x20m monitoring plots in 2016 is provided in Table 3-4. Species recorded in the wider cemetery area by a random meander were not included this year but have been provided in Appendix 1. In 2015 there were a total of 66 species with 18 (27%) of these being exotic species (Appendix 1).

In 2016 there were 66 species in the two 0.04ha monitoring plots with 20 (30%) of these being exotic species. A comprehensive list of species recorded in the unburnt, burnt and meandering transect in the Neville Cemetery in October 2015 and new species recorded by FOG are provided in Appendix 1. The total number of species recorded to date is 112 species and these included 26 exotic species.

Table 3-4. Flora recorded in the 2015 burnt and 2016 burnt 20x20m monitoring quadrats in the Neville Cemetery in November 2016.

Group	Family	exotic	Scientific Name	Common Name	Habit	2015 Spring Burn	2016 Spring Burn	Total
Dicotyledon	Asteraceae		*Chrysocephalum apiculatum*	Common Everlasting	h	1		1
Dicotyledon	Asteraceae	*	*Conyza bonariensis*	Fleabane	h	1		1
Dicotyledon	Asteraceae		*Coronidium scorpioides*	Button Everlasting	h	1		1
Dicotyledon	Asteraceae		*Euchiton sphaericus*	Japanese Cudweed	h	1		1
Dicotyledon	Asteraceae	*	*Hypochaeris radicata*	Flatweed	h	1	1	2
Dicotyledon	Asteraceae		*Leptorhynchos squamatus ssp. squamatus*	Scaly Buttons	h	1		1
Dicotyledon	Asteraceae		*Solenogyne bellioides*		h	1	1	2
Dicotyledon	Asteraceae		*Solenogyne dominii*	Smooth Solenogyne	h	1		1
Dicotyledon	Brunoniaceae		*Brunonia australis*	Blue Pincushion	h	1		1
Dicotyledon	Campanulaceae		*Wahlenbergia spp.*	Bluebell	h	1		1
Dicotyledon	Caryophyllaceae		*Scleranthus biflorus/fasciculatus?*	Spiny Mat-plant	h	1	1	2
Dicotyledon	Clusiaceae		*Hypericum gramineum*	Small St. John's Wort	h	1	1	2
Dicotyledon	Clusiaceae	*	*Hypericum perforatum*	St. John's Wort	h	1		1
Dicotyledon	Droseraceae		*Drosera peltata*	Pale Sundew	h	1	1	2
Dicotyledon	Ericaceae		*Leucopogon virgatus/fraseri?*	Common Beard Heath	ss	1		1
Dicotyledon	Euphorbiaceae		*Poranthera microphylla*	Small Poranthera	h	1		1
Dicotyledon	Fabaceae		*Hovea linearis*	Hovea	ss	1		1
Dicotyledon	Fabaceae (Faboideae)	*	*Trifolium angustifolium*	Narrow-leaf Clover	h		1	1

Group	Family	exotic	Scientific Name	Common Name	Habit	2015 Spring Burn	2016 Spring Burn	Total
Dicotyledon	Fabaceae (Faboideae)	*	*Trifolium arvense*	Haresfoot Clover	h	1		1
Dicotyledon	Fabaceae (Faboideae)	*	*Trifolium dubium*	Yellow Suckling Clover	h	1	1	2
Dicotyledon	Fabaceae (Faboideae)	*	*Trifolium repens*	White Clover	h	1		1
Dicotyledon	Fabaceae (Faboideae)	*	*Trifolium subterraneum*	Subterraneum Clover	h	1		1
Dicotyledon	Gentaniaceae	*	*Centaurium erythraea*	Common Centaury	h	1	1	2
Dicotyledon	Gentianaceae	*	*Cicendia quadrangularis*		h	1		1
Dicotyledon	Geraniaceae		*Geranium solanderi*	Native Geranium	h		1	1
Dicotyledon	Haloragaceae		*Gonocarpus elatus*	Hill Raspwort	h	1		1
Dicotyledon	Onagraceae		*Epilobium billardierianum*	Willow Herb	h	1		1
Dicotyledon	Oxalidaceae		*Oxalis perennans*	Yellow Wood-sorrel	h	1		1
Dicotyledon	Plantaginaceae	*	*Plantago lanceolata*	Ribwort	h	1		1
Dicotyledon	Plantaginaceae		*Plantago varia*	Variable Plantain	h	1	1	2
Dicotyledon	Polygonaceae	*	*Acetosella vulgaris*	Sheep Sorrel	h	1	1	2
Dicotyledon	Primulaceae	*	*Anagallis arvensis*	Scarlet Pimpernel	h		1	1
Dicotyledon	Ranunculaceae		*Ranunculus lappaceus*	Common Buttercup	h	1	1	2
Dicotyledon	Rosaceae	*	*Rubus fruticosus*	Blackberry	s	1		1
Dicotyledon	Rubiaceae		*Asperula conferta*	Common Woodruff	h	1	1	2
Dicotyledon	Rubiaceae		*Opercularia spp.*	Stinkweed	h	1		1
Dicotyledon	Stylidiaceae		*Stylidium graminifolium*	Grass Triggerplant	h	1	1	2
Dicotyledon	Thymelaeaceae		*Pimelea curviflora*	Curved Rice Flower	ss	1	1	2
Monocotyledon	Asphodelaceae		*Bulbine bulbosa*	Bulbine Lily	h	1	1	2
Monocotyledon	Colchicaceae		*Burchardia umbellata*	Milkmaids	h		1	1
Monocotyledon	Cyperaceae		*Carex breviculmis*		r	1	1	2
Monocotyledon	Cyperaceae		*Carex inversa*	Knob Sedge	r	1	1	2
Monocotyledon	Cyperaceae		*Isolepis congrua*	Slender Club-sedge	r		1	1
Monocotyledon	Cyperaceae		*Schoenus apogon*	Common Bog Rush	r	1	1	2
Monocotyledon	Juncaceae		*Juncus bufonius*	Toad Rush	r		1	1
Monocotyledon	Juncaceae	*	*Juncus capitatus*	Capitate Rush	r		1	1
Monocotyledon	Juncaceae		*Juncus spp.*	A Rush	r	1		1
Monocotyledon	Juncaceae		*Juncus usitatus*		r		1	1
Monocotyledon	Juncaceae		*Luzula meridionalis*		h	1	1	2
Monocotyledon	Lomandraceae		*Lomandra filiformis*	Wattle Mat-rush	h	1	1	2
Monocotyledon	Orchidaceae		*Diuris chryseopsis*	Common Golden Moths	h	1	1	2

Group	Family	exotic	Scientific Name	Common Name	Habit	2015 Spring Burn	2016 Spring Burn	Total
Monocotyledon	Orchidaceae		*Microtis unifolia*	Common Onion Orchid	h	1	1	2
Monocotyledon	Phormiaceae		*Dianella revoluta*	Native Flax Lily	h	1	1	2
Monocotyledon	Poaceae	*	*Aira caryophyllea*	Silvery Hairgrass	g	1		1
Monocotyledon	Poaceae	*	*Anthoxanthum odoratum*	Sweet Vernal Grass	g	1	1	2
Monocotyledon	Poaceae	*	*Briza minor*	Shivery Grass	g	1	1	2
Monocotyledon	Poaceae		*Elymus scaber*	Common Wheatgrass	g		1	1
Monocotyledon	Poaceae		*Lachnagrostis spp.*	Blown Grass	g	1	1	2
Monocotyledon	Poaceae	*	*Nassella trichotoma*	Serrated Tussock	g	1		1
Monocotyledon	Poaceae	*	*Paspalum dilatatum*	Paspalum	g	1		1
Monocotyledon	Poaceae		*Poa sieberiana*	Fine-leaf Tussock	g	1		1
Monocotyledon	Poaceae		*Poa spp.?*		g		1	1
Monocotyledon	Poaceae		*Rytidosperma sp.2*	Wallaby Grass	g	1		1
Monocotyledon	Poaceae		*Rytidosperma spp.*	Wallaby Grass	g	1		1
Monocotyledon	Poaceae		*Themeda triandra*	Kangaroo Grass	g	1	1	2

Note that "1" denotes the presence of that species within the monitoring quadrat.

s = shrub; ss = sub-shrub; h = herb; g = grass

3.10 Species of interest

The cemetery contained a high diversity of native forbs which have become locally rare and/or have a limited distribution across known populations. Some of these include species such as *Myosotis australis* (Australian Forget-me-not), *Burchardia umbellata* (Milkmaids), *Brunonia australis* (Blue Pincushion), *Coronidium scorpioides* (Button Everlasting), *Leucopogon virgatus* (Common Beard Heath), *Pimelea curviflora* (Curved Rice Flower), *Poranthera microphylla* (Small Poranthera), *Pterostylis mutica* (Midget Greenhood) and *Ranunculus lappaceus* (Common Buttercup). Photographs of some of these species in October or November 2015 are provided below.

Stylidium graminifolium

Brunonia australis

Pterostylis mutica

Ranunculus lappaceus

Burchardia umbellata

Coronidium scorpioides

4 Conclusion

Burning in spring in both 2015 and 2016 has resulted in the decline in the vegetative biomass and decomposing litter layers and the formation of a hard soil surface crusting. While the area maintained good perennial plant cover, the burnt area had a lower ecological function than the unburnt site in 2015. In 2016, the 2015 burnt area had almost recovered to levels comparable to the unburnt control.

In terms of floristic diversity, there was a significantly higher diversity of native herbs, including the small ground orchid *Diuris chryseopsis* within the 2015 burnt grassland area in 2015. A higher frequency of orchids was also observed within the more frequently mown graveyard areas in both monitoring years. This year there was an increased diversity of species recorded in both of the 2015 and 2016 burnt areas, but there continued to be a higher diversity recorded in the 2015 burnt area. This area also contained a higher diversity of exotic species, however an increase in exotic species was recorded in both sites this year, perhaps as a result of the wet winter and early spring.

In 2016 both areas have seen a decline in native plant cover as a result of the increased cover of exotic species.

Spring burning has shown positive ecological outcomes in the longer term despite the short term decrease in ecological function and integrity. Burning appears to have promoted species diversity by reducing the dense comparative ground covers, however it may also result in the grassland becoming more vulnerable to invasion by exotic species. The perennial exotic species *Anthoxanthum odoratum* (Sweet Vernal Grass) and *Hypochaeris radicata* (Flatweed) were common and abundant throughout both of the burnt areas, but was also common within the unburnt area. The highly invasive noxious weed *Hypericum perforatum* (St John's Wort) was also recorded in the cemetery and should be eradicated before it becomes dominant. Care however should be taken to ensure the target species only is affected by herbicide.

Whilst frequent mowing was not measured *per se*, observations indicate that similar diversity outcomes may be obtained by infrequent mowing, providing a dense biomass is not allowed to build up. The retention of low perennial plant and litter covers as a result of mowing may decrease the potential for exotic species such as *Anthoxanthum odoratum* and *Hypochaeris radicata* to become established. Other areas which have not had frequent mowing or burning tended to be dominated by a different variety of species and observations indicated that they also had comparatively low species diversity.

The burning program has not been implemented under a valid statistical methodology and the results have not been replicated nor has an adequate control area been included. Thus these results should be treated very conservatively. In addition, the cemetery site appears to have a mosaic of areas which have a different complement and composition of species as a result of differing management histories, thus they may not have been similar in the first place. Therefore making any comparisons or identifying changes as a result of the experimental burning regime difficult to determine.

Nonetheless, the results to date therefore indicate there is a requirement of the *Themeda* triandra dominated grasslands to have some form of disturbance such as the spring burning, however infrequent mowing may also result in maintaining similar ecological outcomes.

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6 Appendix 1. List of flora species recorded at the Neville Cemetery

Group	Family	exotic	Scientific Name	Common Name	Habit	2015 Unburnt	2015 Spring Burn	2015Meander	2016 Spring Burn	2015 Spring Burn	2016 FOG Visit
						2015			2016		
Dicotyledon	Asteraceae		*Cassinia arcuata*	Chinese Shrub	s			1			
Dicotyledon	Asteraceae		*Chrysocephalum apiculatum*	Common Everlasting	h		1			1	
Dicotyledon	Asteraceae	*	*Conyza bonariensis*	Fleabane	h		1				
Dicotyledon	Asteraceae		*Coronidium scorpioides*	Button Everlasting	h		1				1
Dicotyledon	Asteraceae		*Euchiton sphaericus*	Japanese Cudweed	h	1	1				
Dicotyledon	Asteraceae	*	*Hypochaeris glabra*	Smooth Catsear	h	1					
Dicotyledon	Asteraceae	*	*Hypochaeris radicata*	Flatweed	h	1	1	1	1	1	
Dicotyledon	Asteraceae		*Leptorhynchos squamatus ssp. squamatus*	Scaly Buttons	h		1			1	
Dicotyledon	Asteraceae		*Leucochrysum molle*	Hoary Sunray	h					1	
Dicotyledon	Asteraceae		*Senecio quadridentatus*	Cotton Fireweed	h						1
Dicotyledon	Asteraceae		*Senecio spp.*		h			1			
Dicotyledon	Asteraceae		*Solenogyne bellioides*		h		1		1		
Dicotyledon	Asteraceae		*Solenogyne dominii*	Smooth Solenogyne	h	1	1			1	
Dicotyledon	Asteraceae		*Solenogyne gunnii*	Hairy Solenogyne	h						1
Dicotyledon	Boraginaceae		*Myosotis australis*	Australian Forget-me-not	h			1			
Dicotyledon	Brunoniaceae		*Brunonia australis*	Blue Pincushion	h		1			1	
Dicotyledon	Campanulaceae		*Wahlenbergia spp.*	Bluebell	h		1				
Dicotyledon	Caryophyllaceae	*	*Cerastium glomeratum*	Mouse-ear Chickweed	h			1			
Dicotyledon	Caryophyllaceae		*Scleranthus biflorus/fasciculatus?*	Spiny Mat-plant	h	1	1		1	1	
Dicotyledon	Caryophyllaceae		*Scleranthus fasciculatus*	Knawel	h						1
Dicotyledon	Clusiaceae		*Hypericum gramineum*	Small St. John's Wort	h		1		1	1	
Dicotyledon	Clusiaceae	*	*Hypericum perforatum*	St. John's Wort	h	1	1			1	
Dicotyledon	Crassulaceae		*Crassula sieberiana*	Austral Stonecrop	h						1
Dicotyledon	Dilleniaceae		*Hibbertia riparia*	Silky Guinea Flower	ss			1			
Dicotyledon	Droseraceae		*Drosera peltata*	Pale Sundew	h		1		1	1	
Dicotyledon	Epacridaceae		*Acrotriche serrulata*	Honey Pots	ss						1

Group	Family	exotic	Scientific Name	Common Name	Habit	2015 Unburnt	2015 Spring Burn	2015Meander	2016 Spring Burn	2015 Spring Burn	2016 FOG Visit
Dicotyledon	Ericaceae		*Leucopogon fraseri*	Beard Heath	s						1
Dicotyledon	Ericaceae		*Leucopogon virgatus/fraseri?*	Common Beard Heath	ss	1	1			1	
Dicotyledon	Euphorbiaceae		*Poranthera microphylla*	Small Poranthera	h		1			1	
Dicotyledon	Fabaceae		*Daviesia latifolia*	Bitter-Pea	s			1			
Dicotyledon	Fabaceae		*Hovea linearis*	Hovea	ss		1			1	
Dicotyledon	Fabaceae (Faboideae)		*Hardenbergia violacea*	Happy Wanderer	v						1
Dicotyledon	Fabaceae (Faboideae)		*Platylobium formosum*		ss						1
Dicotyledon	Fabaceae (Faboideae)		*Pultenaea spp.*	Bush-pea	s						1
Dicotyledon	Fabaceae (Faboideae)	*	*Trifolium angustifolium*	Narrow-leaf Clover	h				1		
Dicotyledon	Fabaceae (Faboideae)	*	*Trifolium arvense*	Haresfoot Clover	h		1				
Dicotyledon	Fabaceae (Faboideae)	*	*Trifolium dubium*	Yellow Suckling Clover	h	1	1	1	1		
Dicotyledon	Fabaceae (Faboideae)	*	*Trifolium repens*	White Clover	h		1				
Dicotyledon	Fabaceae (Faboideae)	*	*Trifolium subterraneum*	Subterraneum Clover	h		1	1			
Dicotyledon	Fabaceae (Mimosoideae)		*Acacia dealbata*	Silver Wattle	s			1			
Dicotyledon	Gentaniaceae	*	*Centaurium erythraea*	Common Centaury	h	1	1		1	1	
Dicotyledon	Gentianaceae	*	*Cicendia quadrangularis*		h		1				
Dicotyledon	Geraniaceae		*Geranium solanderi*	Native Geranium	h	1			1	1	
Dicotyledon	Haloragaceae		*Gonocarpus elatus*	Hill Raspwort	h		1			1	
Dicotyledon	Haloragaceae		*Gonocarpus tetragynus*	Raspwort	h						1
Dicotyledon	Myrtaceae		*Eucalyptus macrorhyncha*	Red Stringybark	t			1			
Dicotyledon	Myrtaceae		*Eucalyptus rubida*	Candlebark	t						1
Dicotyledon	Onagraceae		*Epilobium billardierianum*	Willow Herb	h		1				
Dicotyledon	Onagraceae		*Epilobium spp.*	Willow Herb	h			1			
Dicotyledon	Orobanchaceae	*	*Parentucellia latifolia*	Red Bartsia	h			1			
Dicotyledon	Oxalidaceae		*Oxalis perennans*	Yellow Wood-sorrel	h		1	1		1	
Dicotyledon	Plantaginaceae	*	*Plantago lanceolata*	Ribwort	h	1	1			1	
Dicotyledon	Plantaginaceae		*Plantago varia*	Variable Plantain	h		1		1	1	
Dicotyledon	Polygonaceae	*	*Acetosella vulgaris*	Sheep Sorrel	h		1		1	1	
Dicotyledon	Portulacaceae		*Montia fontana*		h						1
Dicotyledon	Primulaceae	*	*Anagallis arvensis*	Scarlet Pimpernel	h				1		
Dicotyledon	Ranunculaceae		*Ranunculus lappaceus*	Common Buttercup	h		1		1	1	

Group	Family	exotic	Scientific Name	Common Name	Habit	2015 Unburnt	2015 Spring Burn	2015Meander	2016 Spring Burn	2015 Spring Burn	2016 FOG Visit
Dicotyledon	Rosaceae		*Acaena ovina*	Sheep's Burr	h					1	
Dicotyledon	Rosaceae		*Aphanes spp.*		h						1
Dicotyledon	Rosaceae	*	*Rosa rubiginosa*	Sweet Briar	s						1
Dicotyledon	Rosaceae	*	*Rubus fruticosus*	Blackberry	s	1	1				
Dicotyledon	Rosaceae		*Rubus parvifolius*	Native Raspberry	s			1			
Dicotyledon	Rubiaceae		*Asperula conferta*	Common Woodruff	h		1	1	1		
Dicotyledon	Rubiaceae		*Galium gaudichaudii*	Rough Bedstraw	h					1	
Dicotyledon	Rubiaceae		*Opercularia spp.*	Stinkweed	h		1				
Dicotyledon	Stylidiaceae		*Stylidium graminifolium*	Grass Triggerplant	h		1		1	1	
Dicotyledon	Thymelaeaceae		*Pimelea curviflora*	Curved Rice Flower	ss	1	1		1		
Monocotyledon	Asphodelaceae		*Bulbine bulbosa*	Bulbine Lily	h	1	1		1	1	
Monocotyledon	Colchicaceae		*Burchardia umbellata*	Milkmaids	h				1		1
Monocotyledon	Colchicaceae		*Wurmbea dioica*	Early Nancy	h	1				1	
Monocotyledon	Cyperaceae		*Carex appressa*	Sword Sedge	r						1
Monocotyledon	Cyperaceae		*Carex breviculmis*		r		1		1		1
Monocotyledon	Cyperaceae		*Carex inversa*	Knob Sedge	r	1	1		1	1	
Monocotyledon	Cyperaceae		*Isolepis congrua*	Slender Club-sedge	r				1		
Monocotyledon	Cyperaceae		*Schoenus apogon*	Common Bog Rush	r		1	1	1		
Monocotyledon	Iridaceae	*	*Romulea rosea*	Onion Grass	h			1			
Monocotyledon	Juncaceae		*Juncus bufonius*	Toad Rush	r	1			1	1	
Monocotyledon	Juncaceae	*	*Juncus capitatus*	Capitate Rush	r				1		
Monocotyledon	Juncaceae		*Juncus spp.*	A Rush	r		1	1			
Monocotyledon	Juncaceae		*Juncus usitatus*		r				1		
Monocotyledon	Juncaceae		*Luzula meridionalis*		h		1	1	1		
Monocotyledon	Lomandraceae		*Lomandra filiformis*	Wattle Mat-rush	h	1	1		1	1	
Monocotyledon	Lomandraceae		*Lomandra longifolia*	Spiny-headed Mat-rush	h						1
Monocotyledon	Lomandraceae		*Lomandra multiflora*	Many-flowered Mat-rush	h	1					
Monocotyledon	Ophioglossaceae		*Ophioglossum lusitanicum*	Adders Tongue	h						1
Monocotyledon	Orchidaceae		*Diuris chryseopsis*	Common Golden Moths	h		1		1		
Monocotyledon	Orchidaceae		*Diuris lanceolata*	Golden Moths	h			1		1	
Monocotyledon	Orchidaceae		*Microtis spp.*	Onioin-orchid	h						1

Group	Family	exotic	Scientific Name	Common Name	Habit	2015 Unburnt	2015 Spring Burn	2015Meander	2016 Spring Burn	2015 Spring Burn	2016 FOG Visit
Monocotyledon	Orchidaceae		*Microtis unifolia*	Common Onion Orchid	h		1		1		
Monocotyledon	Orchidaceae		*Pterostylis cycnocephala*	Swan Greenhood	h						1
Monocotyledon	Orchidaceae		*Pterostylis mutica*	Midget Greenhood	h			1			
Monocotyledon	Orchidaceae		*Thelymitra spp.*	Sun Orchid	h						1
Monocotyledon	Phormiaceae		*Dianella longifolia*	Blueberry Lily	h						1
Monocotyledon	Phormiaceae		*Dianella revoluta*	Native Flax Lily	h	1	1		1	1	
Monocotyledon	Poaceae	*	*Aira caryophyllea*	Silvery Hairgrass	g		1	1			
Monocotyledon	Poaceae	*	*Anthoxanthum odoratum*	Sweet Vernal Grass	g	1	1		1	1	
Monocotyledon	Poaceae	*	*Briza minor*	Shivery Grass	g	1	1		1		
Monocotyledon	Poaceae		*Digitaria spp.*		g					1	
Monocotyledon	Poaceae		*Elymus scaber*	Common Wheatgrass	g			1	1		
Monocotyledon	Poaceae		*Hemarthria uncinata*	Matgrass	g						1
Monocotyledon	Poaceae		*Lachnagrostis spp.*	Blown Grass	g		1		1		
Monocotyledon	Poaceae		*Microlaena stipoides*	Weeping Rice-grass	g						1
Monocotyledon	Poaceae	*	*Nassella trichotoma*	Serrated Tussock	g		1	1			
Monocotyledon	Poaceae		*Panicum effusum*	Hairy Panic	g						1
Monocotyledon	Poaceae	*	*Paspalum dilatatum*	Paspalum	g		1	1			
Monocotyledon	Poaceae	*	*Phalaris spp.*	Phalaris	g			1			
Monocotyledon	Poaceae		*Poa sieberiana*	Fine-leaf Tussock	g	1	1			1	
Monocotyledon	Poaceae		*Poa spp.?*		g				1		
Monocotyledon	Poaceae		*Rytidosperma spp.*	Wallaby Grass	g		1	1		1	
Monocotyledon	Poaceae		*Rytidosperma spp.2*	Wallaby Grass	g		1				
Monocotyledon	Poaceae		*Themeda triandra*	Kangaroo Grass	g	1	1		1	1	
Pteridophyta	Dennstaedtiaceae		*Pteridium esculentum*	Common Bracken	f						1

Note that "1" denotes the presence of that species within the monitoring quadrat.

s = shrub; ss = sub-shrub; h = herb; g = grass

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.

Cunninghamia **(2009) 11(1): 81-96**

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 (e) 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; 181/81

Fig. 3. Part of the Toogong cemetery: mown area in foreground and unused area in the background. !February 2006; 240/201

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

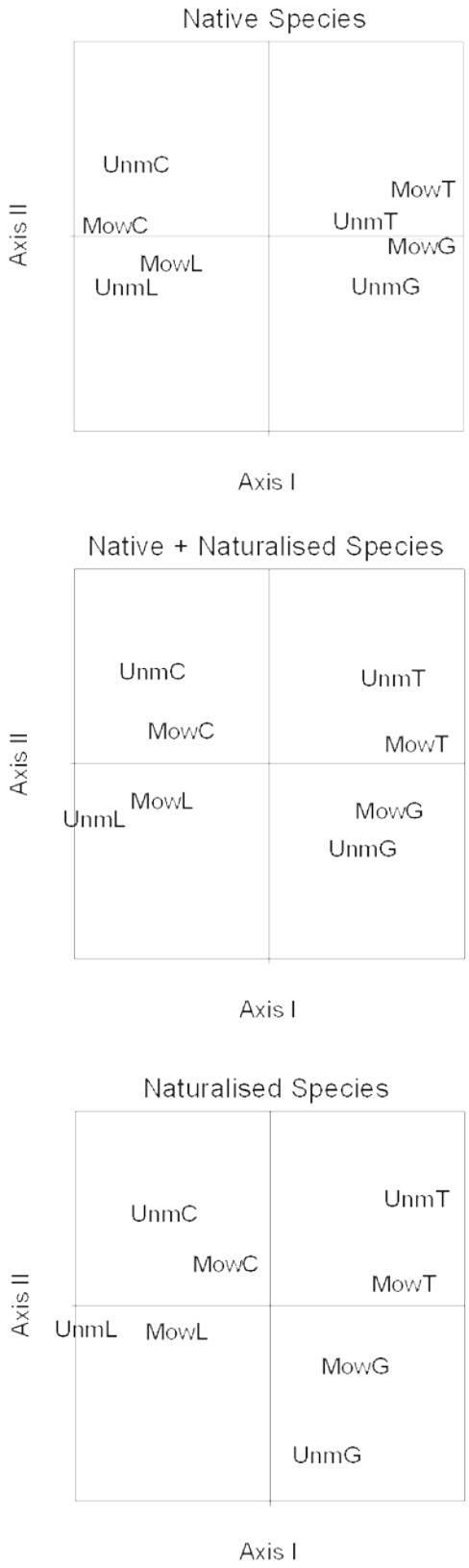

Fig. 4. Representation of the similarity of species profiles from eight environments: 4 cemeteries by 'mown' (Mow) and 'unmown' (Unm) management areas. Central Tablelands sites: C = Carcoar, L = Lyndhurst; Central Western Slopes sites: T = Toogong, G = Garra.

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.

Acknowledgments

Over the ten or so years when investigations were carried out at the four cemeteries, numerous people helped out. Thanks to Cabonne and Blayney Councils (Brian Parker, particularly) and their mowing contractors for advice and assistance; Sandra Semple for field assistance; Jon Guyver and Louise Harcombe for providing cadastral information; botanists at the Royal Botanic Gardens Sydney for invaluable plant identifications; Ian Packer for his observations on the value of cemeteries for soil studies; the late Reg Bennett (1909-2007) for background information on Garra cemetery; Suzanne Prober for her Toogong cemetery species list; and David Eldridge for suggested methods of data analysis.

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Manuscript accepted 22 December 2008

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 1*Sarga leiocladum*l	–	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**

K2W Project Neville Cemetery

I have compiled a brief chronology of activities that Blayney Shire Council has undertaken as part of their commitment to the K2W Program.

I met with the Blayney Shire Council Cemetery forum on the evening of Thursday the 13th of August 2015 to discuss the proposed activities and the associated funding that the Council could attract by allowing these activities to take place.

The community consultation regarding Mosaic burns and new fencing at the Neville Cemetery was well received and Council was able to start the process.

Arrangements were made with the LLS and the OLALC with assistance from Blayney Shire Council Parks Team and the local Rural Fire Service a Mosaic Burn was conducted on August 31st.

Several sections were burnt while other areas were left.

On Tuesday 1st of September 2015 the team conducted another burn as a demonstration as a field trip for the NSW Landcare state conference that was being hosted in Orange.

On the 7th of October 2015 Dr Donna Johnstone from D&A Environmental conducted a survey at the site to compare the burnt and non-burnt areas. See attachment above.

Friday 20th of May the team was back together to conduct the 2nd burn in the program this time we burnt the areas that were formerly left.

Tuesday the 14th of June Council was fortunate enough to receive funding for Hollows for Habitat program and we nominated the Neville Cemetery to value add to the environmental outcomes at the site and professional tree surgeons were engaged to augment the hollow features into the nominated trees. Council will look forward to monitoring these assets to see which animals take up residents. We hope the Superb Parrots that are the target species take up residents.

Interpretive signage and a mown walk way will complete the activities at the Neville Cemetery and Council staff will settle back into routine maintenance of the site.

From this program, Council will be able to formally construct an Operations plan for the Neville Cemetery and from this, we will be able to adapt an operations plan for the other Blayney Shire Council Cemeteries regarding environmental issues.

Importantly the main function of the Cemeteries are not lost, as they remain active with burials and ceremonies.

Brian Parker
Parks Supervisor

Appendix 2: Current and Future Budget for Cemetery Management

As Management and Operational Plans for Council are updated this appendix should be updated to reflect current management actions and allocated budgets.

SP	Sub-Programme Description	Type	Type Description	COA	Description	2014/15	YTD Actual	2015/16	YTD Actual	2016/17	YTD Actual	2017/18	YTD Actual
2202	Public Cemeteries	3	Operating Income	220270	Revenues - Cemeteries	(39,938)	(33,134)	(48,655)	(48,241)	(42,783)	(43,696)	(60,280)	(105,469)
2202	Public Cemeteries	3	Operating Income	220271	Grants & Contributions - Public Cemeteries	0	0	(15,000)	(15,000)	0	0	0	0
					Total Operating Income	**(39,938)**	**(33,134)**	**(63,655)**	**(63,241)**	**(42,783)**	**(43,696)**	**(60,280)**	**(105,469)**
2202	Public Cemeteries	2	Operating Expenditure	220201	Public Cemetery Maintenance & Repairs	49,537	49,719	75,335	104,650	86,038	96,184	67,904	47,258
2202	Public Cemeteries	2	Operating Expenditure	220202	Public Cemetery Utilities & Other Expenditure	0	0	10,000	11,939	0	3,510	0	2,671
					Total Operating Expenditure	**49,537**	**49,719**	**85,335**	**116,589**	**86,038**	**99,693**	**67,904**	**49,929**
					Operating Surplus/(Deficit)	**(9,599)**	***(16,585)***	**(21,681)**	***(53,348)***	**(43,256)**	***(55,997)***	**(7,624)**	***55,540***
2202	Public Cemeteries	4	Capital Expenditure	220261	Public Cemeteries - Capital Works	0	0	0	0	40,000	345	60,000	12,016

Full GL Acct number	G/L Account Number & Description	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Operating Income											
12202700.128	12202700.128 | Discretionary Fees - Cemeteries - Revenues - Cemeteries	(90,000)	(93,150)	(96,410)	(99,785)	(103,277)	(106,892)	(110,633)	(114,505)	(118,513)	(122,661)
12202710.195	12202710.195 | Grants & Contributions Provided For Operating Purposes - Grants & Contributions - Public Cemeteries	-	-	-	-	-	-	-	-	-	-
Total Operating Income		**(90,000)**	**(93,150)**	**(96,410)**	**(99,785)**	**(103,277)**	**(106,892)**	**(110,633)**	**(114,505)**	**(118,513)**	**(122,661)**
Operating Expenditure											
12202010.500	12202010.500 | Salaries - Public Cemetery Maintenance & Repairs	26,670	27,470	28,294	29,143	30,017	30,918	31,845	32,801	33,785	34,798
12202010.540	12202010.540 | Materials - Public Cemetery Maintenance & Repairs	8,615	8,830	9,051	9,277	9,509	9,747	9,991	10,241	10,497	10,759
12202010.541	12202010.541 | Service Contracts - Public Cemetery Maintenance & Repairs	5,000	5,125	5,253	5,384	5,519	5,657	5,798	5,943	6,092	6,244
12202010.542	12202010.542 | Legal Expenses - Public Cemetery Maintenance & Repairs	1,025	1,051	1,077	1,104	1,131	1,160	1,189	1,218	1,249	1,280
12202010.615	12202010.615 | Water Rates - Public Cemetery Maintenance & Repairs	513	525	538	552	566	580	594	609	624	640
12202010.663	12202010.663 | Indirect Overhead Charge - Public Cemetery Maintenance & Repairs	18,669	19,229	19,806	20,400	21,012	21,642	22,292	22,961	23,649	24,359
12202010.664	12202010.664 | Plant Running Costs - Public Cemetery Maintenance & Repairs	10,230	10,486	10,748	11,017	11,293	11,575	11,864	12,161	12,465	12,776
Total Operating Expenditure		**70,722**	**72,717**	**74,768**	**76,878**	**79,048**	**81,279**	**83,574**	**85,934**	**88,361**	**90,857**
Operating Surplus/(Deficit)		**19,278**	**20,433**	**21,642**	**22,907**	**24,230**	**25,613**	**27,059**	**28,571**	**30,152**	**31,804**
Capital Expenditure											
Infrastructure Works		10,000	10,250	10,506	10,769	11,038	11,314	11,596	11,887	12,184	12,489
		-	-	-	-	-	-	-	-	-	-
Total Capital Expenditure		**10,000**	**10,250**	**10,506**	**10,769**	**11,038**	**11,314**	**11,596**	**11,887**	**12,184**	**12,489**