

Vegetation Inventory Report: Truganina Cemetery Grassland

Melbourne Strategic Assessment



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Cover photo

Magenta Stork's-bill (*Pelargonium rodneyanum*): Steve Sinclair.

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Terms and abbreviations

BCS	Biodiversity Conservation Strategy for Melbourne’s Growth Areas (DEPI (2013a))
CaLP Act	The Victorian <i>Catchment and Land Protection Act 1994</i>
DELWP	The Victorian Department of Environment, Land, Water and the Environment
DEPI	The former Victorian Department of Environment and Primary Industries (now DELWP)
DSE	The former Victorian Department of Sustainability and Environment (now DELWP)
EPBC Act	The Federal <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVC	Ecological Vegetation Class, the units used to describe vegetation type in Victoria
FFG Act	The Victorian <i>Flora and Fauna Guarantee Act 1988</i>
KPI	Key Performance Indicator
MNES	Matters of National Environmental Significance, as listed under the EPBC Act.

Introduction

The Victorian Government is establishing a series of Conservation Areas on the periphery of Melbourne for the conservation of threatened plants, animals and ecological communities (DEPI 2013a). They include a network of small areas within Melbourne's Urban Growth Boundary, as well as the larger Western Grassland Reserve and the Grassy Eucalypt Woodland Reserve.

The establishment of the reserves is the result of the Melbourne Strategic Assessment, which aims to mitigate environmental losses caused by the expansion of Melbourne's Urban Growth Boundary. This expansion will impact 'Matters of National Environmental Significance (MNES)' listed under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A 'Strategic Impact Assessment' conducted by the Victorian Government recommended ways of mitigating environmental impacts. The mitigation measures agreed to by the Victorian and Australian governments are outlined in the 'Program Report' and the 'Biodiversity Conservation Strategy' (DSE 2009, DEPI 2013a). The commitments include regular reporting on ecological outcomes. A Monitoring and Reporting Framework (MRF) provides the logic and basis for monitoring target species and communities (DELWP 2015a). The MRF gives specific Key Performance Indicators (KPIs) for each listed species and vegetation community.

All Conservation Areas will be managed to achieve these management targets. The precise management strategy required to achieve the targets will, however, vary from place to place. Each area is different, and each supports a wide range of plant and animal species, different vegetation patterns, management issues, and other features. Detailed information about the type and distribution of assets and threats is required for each property that is protected. Much of that information will be contained in Fauna Inventory and Vegetation Inventory documents for each property (DELWP 2015b).

Purpose and scope

This Vegetation Inventory document forms part of the basic information required to start managing protected land. It should serve as a useful reference for managers, and also the logical basis of management actions. The specific purpose of this document is to:

- Identify and map any EPBC-listed plant species or ecological communities that are the targets of conservation measures under the MSA.
- Provide enough information about the distribution of vegetation on the land to allow management planning to proceed. That information includes the distribution of native vegetation types, significant species, and exotic species which threaten natural values.
- Fulfil (for the survey area) DELWP's commitment to produce a detailed inventory of the vegetation values within the WGR (DSE 2011, p38).
- Provide a qualitative baseline describing the vegetation when the survey area is brought into the WGR.

This document does not:

- constitute a management plan,
- describe the fauna of the survey area,
- make any claims about the likely presence or absence of values not recorded.

The survey area

This report covers the Truganina Cemetery Grassland (Conservation Area 10; DEPI 2013a). This site is a small rectangular block of land on the west of Woods Rd, Truganina, 1.6 ha in size. The survey area is shown in Figure 1. An additional area of equivalent size (1.6 ha) will be protected for future restoration as a grassland and potential expansion area of the Button Wrinklewort population, however it is currently active cropland without substantial environmental values, making a full assessment of the values redundant.

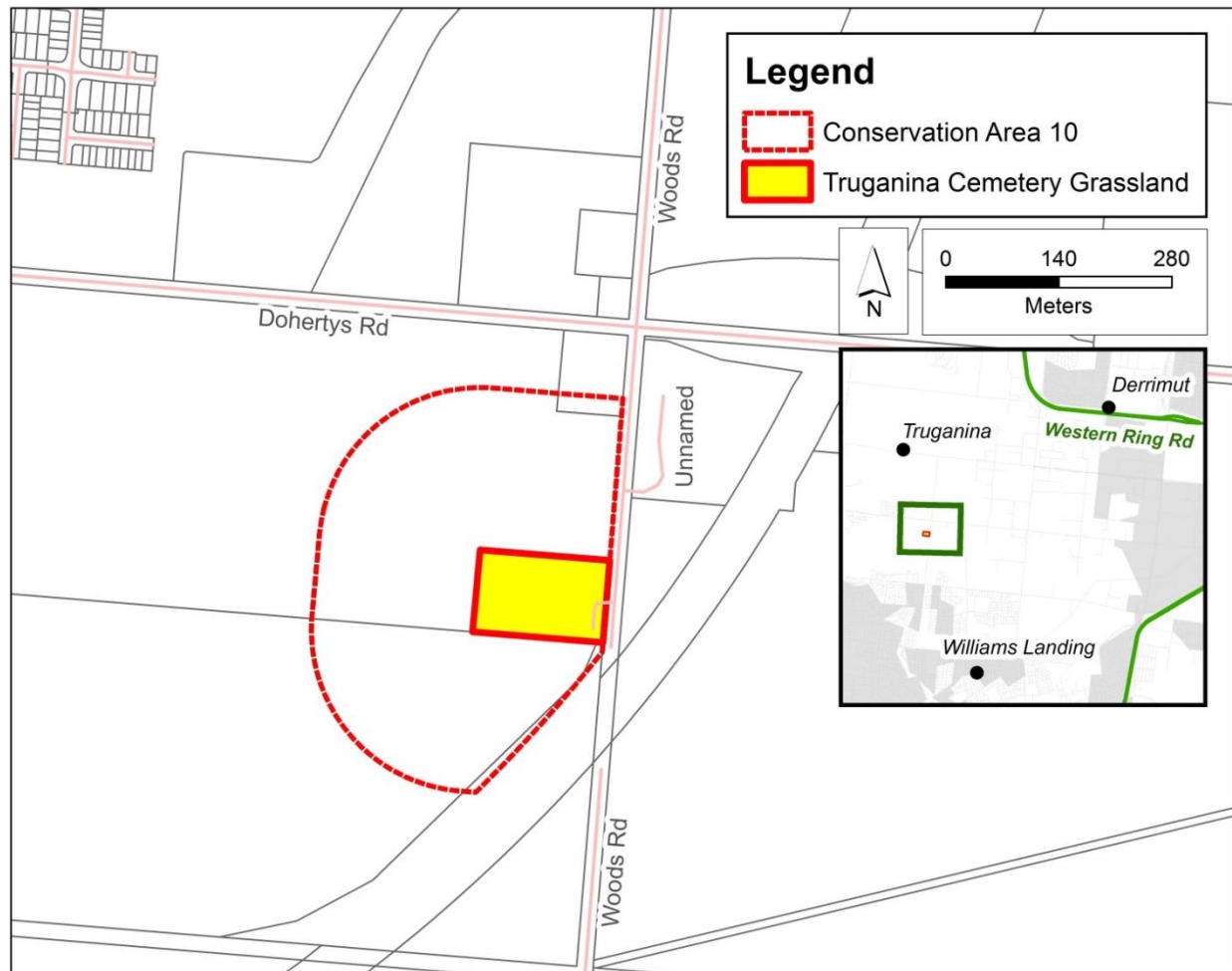


Figure 1. The location of the Truganina Cemetery Grassland. (boundaries of buffer and expansion area still to be finalised)

Previous survey information

The Truganina Cemetery Grassland has been the subject of several previous vegetation surveys or assessments:

- Stuwe (1986) included the site (as Site 98) in his assessment of a range of sites across western Victoria, but did not include a species list or a detailed description of the site. The site was noted as supporting Button Wrinklewort (*Rutidosia leptorrhynchoides*).
- McDougall (1987) included the site (as Site T2) in his assessment of sites across Melbourne, but did not include a species list or a detailed description of the site. The site was assigned “State Significance” and was noted as supporting a large population of *Rutidosia leptorrhynchoides*.
- Barlow (1989) included the site (as site 18) in his assessment of sites in the Werribee corridor, and provided a general description of the site, but did not provide a species list. The site was assigned “National Significance” due to the presence of a “viable population” of *Rutidosia leptorrhynchoides*.

- Cheal *et al.* (1989) included the site in their assessment of sites across Melbourne. A quadrat (B19412) was taken in the cemetery, and the site was assigned “National Significance” due to the presence of *Rutidosia leptorrhynchoidea*.
- DCE (1990), based on the work noted above, assigned the site “National Significance”, and provided a species list of 51 species. Given the date of this survey, those species have only been accepted in the current report if they were also encountered during recent surveys. Those that were not are discussed in Appendix 2.
- Włodarczyk and Williams (2004) prepared a management plan for the site, which included a species list and a map showing the locations of significant species. Given the date of this survey, those species have only been accepted in the current report if they were also encountered during recent surveys. Those that were not are discussed in Appendix 2.
- A species list for Truganina Cemetery is included in the 4th edition of the Flora of Melbourne (Bull and Stolfo, 2014), based on an accumulation of records from many observers, including the reports above.

Survey methods

Survey effort

The land was visited for 3 full days between 23rd November 2015 and 21st December 2015; and on numerous other occasions for shorter periods of time between 2011 and December 2015 (totalling approximately a further 2 days). Those visits included numerous specific activities, including vegetation mapping and species searches.

Definitions

Native vegetation

‘Native vegetation’ is defined according to DEPI (2013b): “...either...an area of vegetation where at least 25 per cent of the total perennial understory plant cover is native, or any area with three or more canopy trees where the canopy foliage cover is at least 20 per cent of the area”.

EPBC-listed communities

EPBC-listed communities are described according to the listing advice provided by the Threatened Species Scientific Committee, posted on the Department of Environment website.

Plant taxonomy

Plant taxonomy follows the Royal Melbourne Botanic Gardens Census of Vascular Plants in Victoria (Walsh and Stajsic 2008), unless otherwise noted. Departures from this standard have only been made to follow more recent taxonomic publications (as cited). Occasionally, apparently distinct but unrecognized forms are noted, if they were considered important to record (Appendix 2).

Significance of plants

Several sources are used to describe the conservation status or significance of plant species:

- EBPC listed (Critically Endangered, Endangered, Vulnerable). Follows the lists of species and communities maintained by the Australian Department of the Environment, available on the internet.
- Listed under the Victorian Government *Flora and Fauna Guarantee Act 1988* (FFG Act). Follows the list maintained by DELWP (updated 2013).
- Victorian Rare or Threatened (VROT; Endangered in Victoria, Vulnerable in Victoria, Rare in Victoria, Poorly Known). Defined by inclusion on either the ‘Advisory List of Rare or Threatened Plants in Victoria (DEPI 2014)’, maintained by DELWP, or as indicated in the Census (Walsh and Stajsic 2008).

Categories of Weeds

The Victorian *Catchment and Land Protection Act 1994* (CaLP Act) lists noxious weeds in several categories, used here:

- State prohibited weeds “either do not occur in Victoria but pose a significant threat if they invade, or are present, pose a serious threat and can reasonably be expected to be eradicated. If present, infestations of a State prohibited weed are relatively small. They are to be eradicated from Victoria if possible or excluded from the State.”

- Regionally prohibited weeds are “not widely distributed in a region but are capable of spreading further. It is reasonable to expect that they can be eradicated from a region and they must be managed with that goal. Land owners, including public authorities responsible for crown land management, must take all reasonable steps to eradicate regionally prohibited weeds on their land”.
- Restricted weeds are “plants that pose an unacceptable risk of spreading in this State and are a serious threat to another State or Territory of Australia. Trade in these weeds and their propagules; either as plants, seeds or contaminants in other materials is prohibited”.
- Regionally Controlled weeds are “usually widespread in a region. To prevent their spread, ongoing control measures are required. Land owners have the responsibility to take all reasonable steps to prevent the growth and spread of Regionally controlled weeds on their land.”

Survey results

EPBC-listed ‘Matters of National Environmental Significance’

Matters of National Environmental Significance (MNES) are those species or communities listed under the EPBC Act. MNES are the specific environmental values referred to by the Key Performance Indicators and targets (DELWP 2015a).

Four MNES are known to occur naturally at the Truganina Cemetery grassland:

- “Natural Temperate Grassland of the Victorian Volcanic Plain”, which was observed in the current study and is discussed below,
- Button Wrinklewort (*Rutidosia leptorrhynchoidea*, listed as Endangered), which was observed in the current study and is discussed below,
- Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*, listed as Critically Endangered), which was observed in the current study and is discussed below,
- Striped Legless Lizard (noted by Barlow, 1989), which is discussed in the separate Fauna Inventory Report).

Wlodarczyk and Williams (2004) noted one further MNES at the site which is considered unlikely to be present:

- Matted Flax-lily (*Dianella amoena*, listed as Endangered) is shown, with a precisely mapped location. Although this species occurs in the Melbourne region, it is generally absent from the drier parts of the Basalt Plains (i.e. Keilor Werribee Plains), and would not be expected at Truganina Cemetery (Geoff Carr, Director, Ecology Australia, author of original species description; Pers. Comm.). There are no other records of this species in the cemetery apart from that provided in Wlodarczyk and Williams (2004). Despite intensive searching using a systematic grid search (for monitoring of Button Wrinklewort), it was not found during the current survey. Numerous individuals of the very-similar species Arching Flax-lily (*Dianella* sp. aff. *longifolia* (Benambra)) were recorded, and it is considered likely that the record was a stunted individual of that species (which was also recorded by Wlodarczyk and Williams (2004)). The two species can be very difficult to distinguish (Geoff Carr, Pers. Comm.). Matted Flax-lily is considered unlikely to be present.

Wlodarczyk and Williams (2004) noted one further MNES which can be confidently discounted:

- Curved Rice-flower (*Pimelea curviflora* var. *curviflora*, listed as Vulnerable). This taxon does not occur in Victoria (Entwistle 1996; Walsh and Stajsic 2008), and is erroneously listed for the cemetery. The recent listing advice for this species (not available to Wlodarczyk and Williams, 2004) clearly states that the listed taxon is restricted to the coastal zone around Sydney (TSSC 2008a). The closely-related but unlisted *Pimelea curviflora* var. 1 occurs commonly in the cemetery, and in many other nearby sites.

Natural Temperate Grassland of the Victorian Volcanic Plain (NTG)

NTG is a treeless grassland community occurring on heavy soils on basalt terrain, dominated in intact stands by native tussock-forming grasses of the genera *Themeda*, *Poa*, *Rytidosperma* and/or *Austrostipa*. It also contains a variety of native herbs (notably daisies, Asteraceae), which may be dominant in some cases (TSSC 2008b). NTG corresponds closely to 'Western (Basalt) Plains Grassland Community' listed under the FFG Act (see below). This community is discussed in more detail below, under grassland 'states'.

NTG covers most of the Truganina Cemetery Grassland (1.2 ha or 75%).

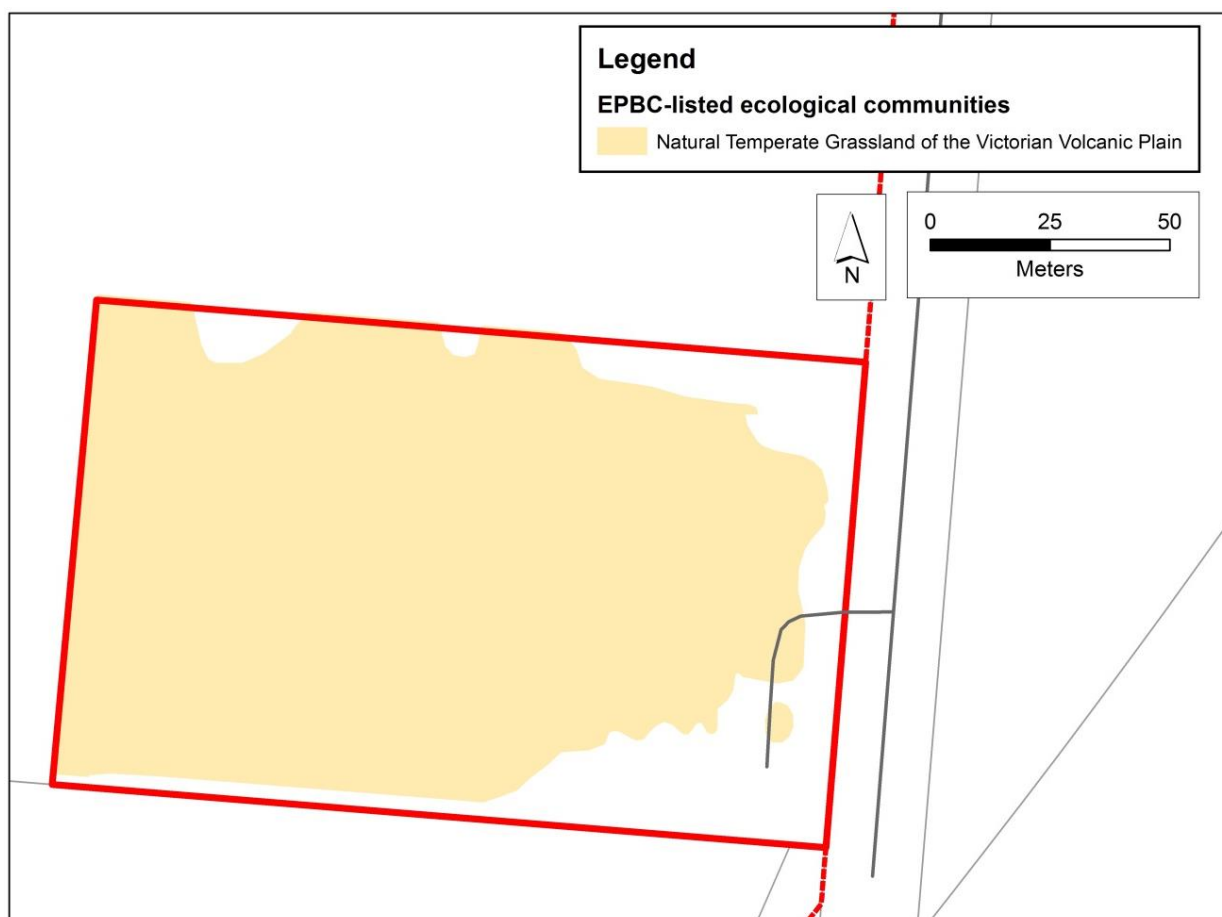


Figure 2. The distributions of Natural Temperate Grassland (NTG) at Truganina Cemetery

Button Wrinklewort

Button Wrinklewort (*Rutidosia leptorrhynchoidea*, Asteraceae) is a perennial daisy with narrow, dark green leaves and yellow flower heads 2.5 cm wide. It is known from the Australian Capital Territory, New South Wales and Victoria. Button Wrinklewort is listed as Endangered (EN) under the EPBC Act (Department of the Environment 2009). It is listed Threatened under the FFG Act and Endangered (e) in the DEPI advisory list (DEPI 2014). Button Wrinklewort is shown in the cover of this report and in Figure 3.

Under the MSA, Button Wrinklewort is the subject of an intensive monitoring program, involving a systematic gridded search of Truganina Cemetery, and a count of all individuals, with a record of their location on the grid. The data from the 2015 monitoring period was available to inform this inventory report. Figure 3 shows the distribution of Button Wrinklewort plants in Truganina Cemetery.

The cemetery currently contains 615 individuals of Button Wrinklewort. The plants are distributed very unevenly, with much of the cemetery unoccupied, and some areas supporting high densities of plants (up to ~7 plants per m²). The plants represent a range of age-classes. The population includes large old plants, some with 25 - 50 stems arising from a wide woody base (37 such individuals noted). The population also includes numerous small plants with less than five stems (166 such individuals noted), most of which show evidence of only a few years growth at their base. It is considered likely that many of these smaller plants germinated after the break of a long drought in 2010-11.

Button Wrinklewort was monitored at Truganina Cemetery by LaTrobe University from 2003 until 2012 (Dr John Morgan, Department of Ecology, Environment and Evolution, Pers. Comm.). The LaTrobe data shows that the species declined over that period, with a partial recovery to 2015 (based on the MSA monitoring data). In 2005, the last time a gridded survey recording every individual was undertaken, there were 866 individuals (c.f. 615 in 2015).

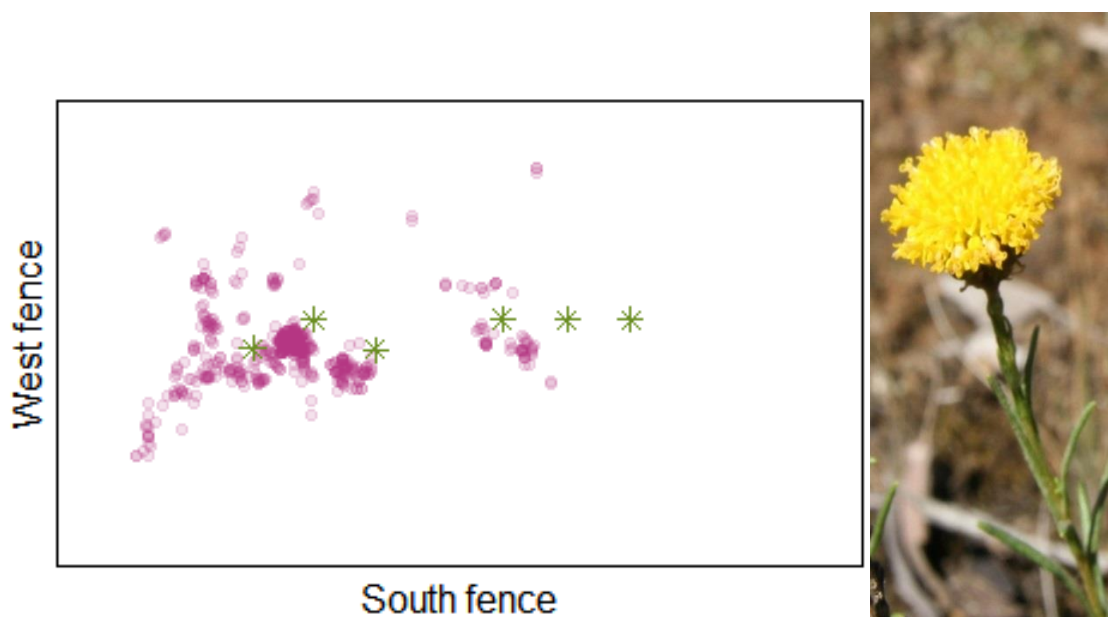


Figure 3. The distribution of Button Wrinklewort in Truganina Cemetery. Each pink point represents a single plant. Overlapping points are visible as darker colouration, showing that the 615 plants are concentrated in a relatively small area. The boundary of the Cemetery parcel is shown. The green stars represent the locations of the planted Sugar Gum (*Eucalyptus cladocalyx*) trees which are prominent in the middle of the cemetery. The photograph shows a flower-head of Button Wrinklewort.

Spiny rice flower

Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*; Thymelaeaceae) is a small spreading shrub, growing up to 30 cm high. It has narrow, green, oval shaped leaves 2-10 mm long and 1-3 mm wide. The flowers are hairless, pale yellow and usually unisexual. They have four oval-shaped petal-like lobes and four stalkless green bracts growing at the base. Mature plants possess a thick, straight taproot of ~1 m long. The species is endemic to Victoria and is listed as Critically Endangered (CR) under the EBPC Act (Department of the Environment 2009). It is also listed Threatened under the FFG Act and endangered (e) on the Victorian Advisory List (DEPI 2014). Spiny Rice-flower is shown in Figure 4.

During the grid survey for Button Wrinklewort, the numbers of Spiny Rice-flower clumps in each 3x3m grid square were also recorded (but not the precise co-ordinates of each plant). This allowed an accurate map of the distribution of Spiny Rice-flower plants to be produced, as shown in Figure 4.

The plants are distributed unevenly across the site, with some areas unoccupied, and other areas with dense concentrations of plants (several per m²). The spread of Spiny Rice-flower plants is wider than Button Wrinklewort, but the areas of main concentration for both species often coincide.

The cemetery contained at least 580 individuals of Spiny Rice-flower. The actual total is known to be somewhat higher, given that the species may occur in tangled clumps of several plants, such that a single clump may be multiple individuals. No attempt was made to count plants within clumps. In 2012, LaTrobe University counted 689 individual Spiny Rice-flower plants at Truganina cemetery, although no spatial information was recorded (Dr John Morgan, Pers. Comm.). These totals are broadly consistent.

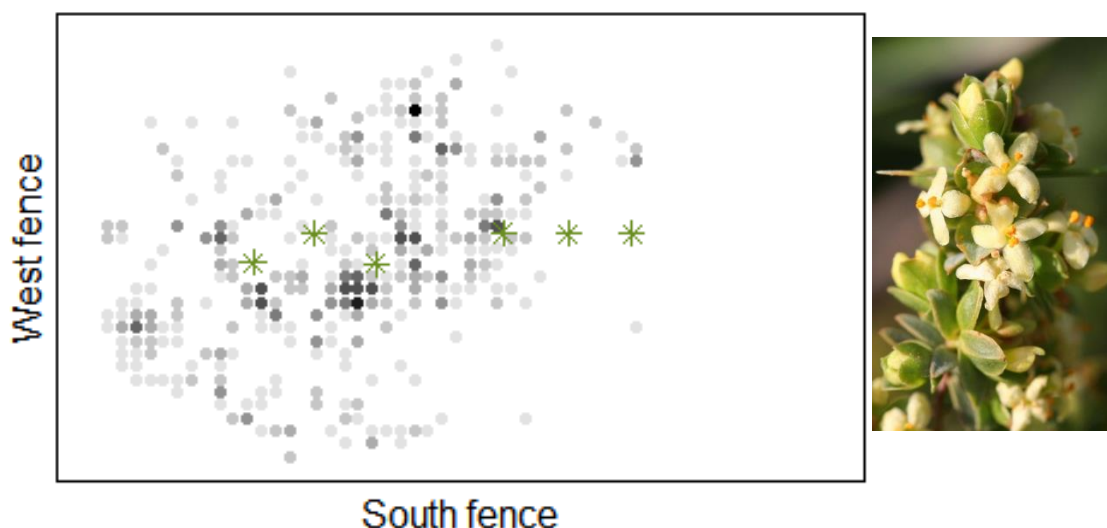


Figure 4. The distribution of Spiny Rice-flower in Truganina Cemetery. Each point represents a 3x3m grid cell. The entire cemetery was searched using this grid. Cells not represented by a point were not occupied by Spiny Rice-flower. The points representing occupied cells are shaded along a grey scale gradient to show the density of plants within that cell, with the number of plants ranging from one to thirteen. The green stars represent the locations of the planted Sugar Gum (*Eucalyptus cladocalyx*) trees which are prominent in the middle of the cemetery. The photograph on the right shows the flowers of a male Spiny Rice-flower plant.

FFG-listed values

The *Flora and Fauna Guarantee Act 1988* (FFG Act) is the primary Victorian legislation dedicated to the conservation of threatened species and communities and for the management of potentially threatening processes. Although the structure of the MSA and the goals of the WGR do not directly relate to the FFG Act, FFG-listed assets are the responsibility of Victoria to manage, and they provide a useful structure for considering the status of the values on the property.

One FFG-listed community occurs:

- 'Western (Basalt) Plains Grassland Community', which corresponds directly (on this property) with NTG, discussed above.

Two FFG-listed species occur naturally, both of which are also EPBC-listed and were discussed above:

- Spiny Rice-flower.
- Button Wrinklewort.

Native vegetation according to Ecological Vegetation Classes

The cemetery contains 1.2 ha of native vegetation (75 %).

The patterns of vegetation in this small cemetery with uniformly flat terrain are relatively simple, and can be described using a single EVC: Plains Grassland (EVC 132), described below.

Plains Grassland (EVC 132)

This EVC corresponds directly (on this property) to NTG, which was described above, and is dealt with in more detail below. DELWP recognizes several variants of Plains Grassland, with all in the surveyed area best referable to 'Heavy Soils Plains Grassland', with some affinities with 'Low Rainfall Plains Grassland' (e.g. diversity of chenopods).

This EVC, like NTG, covers 1.2 ha of Truganina Cemetery (75 %).

The distribution of this EVC is the same as that for NTG, shown in Figure 5. Before modification by agriculture, the entire cemetery was covered by Plains Grassland (No pre-1750 EVC map is thus provided).

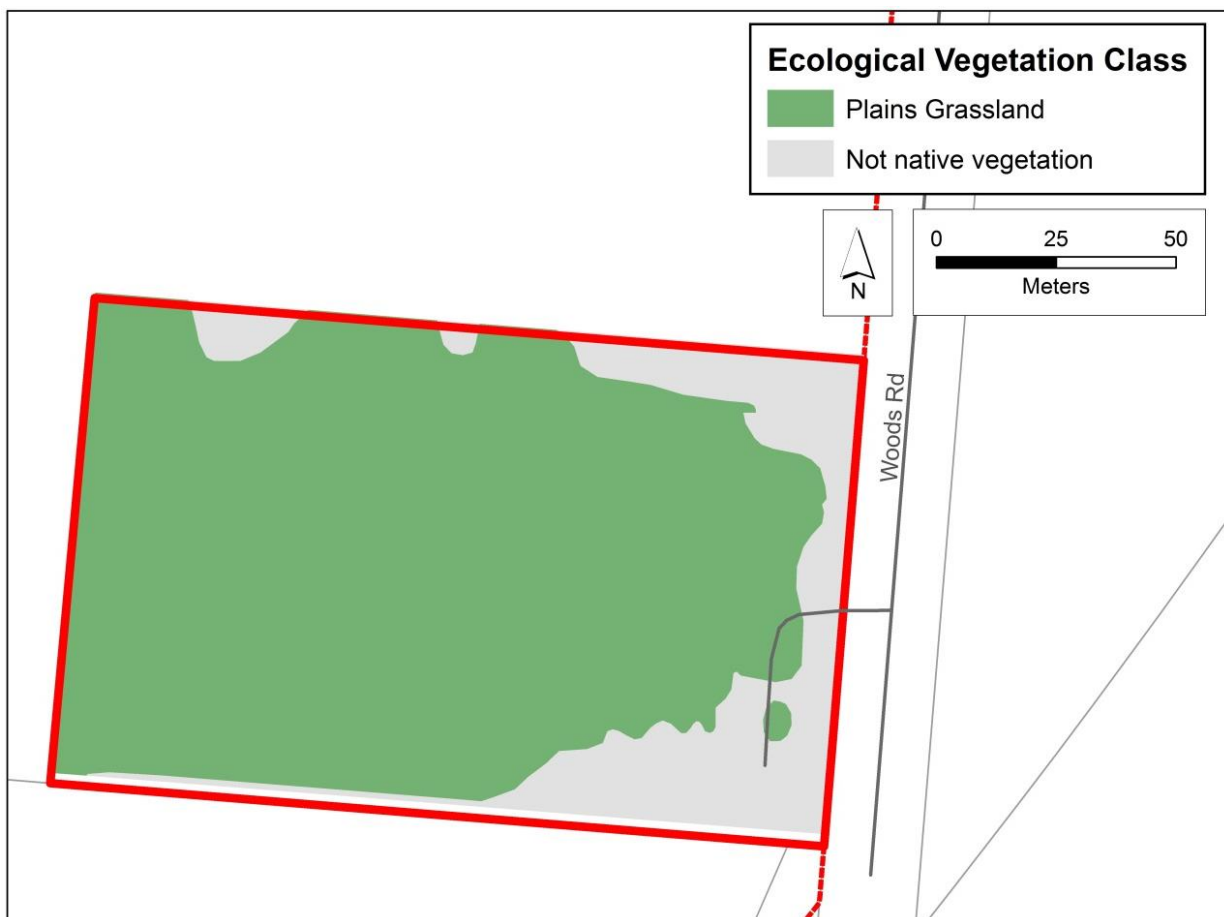


Figure 5. The current distribution of Plains Grassland (EVC 132) in Truganina Cemetery

Vegetation patterns - Natural Temperate Grassland 'states'

To assist the management of NTG, DELWP has created a state-and-transition model (STM) of this ecosystem. This is a conceptual model which describes the structure and dynamics of NTG in a way that is useful for management and planning. Any location within the NTG ecosystem (current native vegetation or cleared land) can be described as being in a particular 'state'. Locations may 'transition' (change) between states over time, as a result of natural disturbance or management. The ability to maintain and enhance NTG condition (i.e. reach management targets) depends on the ability to manipulate the transitions between states. Mapping the states is important because locations in a given 'state' share a particular set of management constraints and opportunities.

While some states are generally more intact than others, it is important to acknowledge that condition (or 'quality' or 'value') may vary substantially within a given state; and the assignment of a site to a particular state is not the same as a condition assessment. Certain states (or condition classes within a state) may be degraded to the point that they are no longer part of a listed community (Beeton and McGrath 2009).

Natural Temperate Grassland was identified in several states, described below. These are mapped in Figure 6.



Figure 6. The distributions of Natural Temperate Grassland (NTG) states in Truganina Cemetery

Herb-rich grassland (HG)

This state includes the most intact remaining grasslands. These areas have not been de-rocked, have relatively natural (low) nutrient levels, and retain most of their natural species diversity, including the dominant Kangaroo Grass (*Themeda triandra*).

This state covers most of the site, which has escaped agricultural intensification due to its early reservation (1865). A very high diversity of locally-depleted native species that are sensitive to grazing and/or elevated nutrients occur in this state at Truganina Cemetery. Some such species are relatively common at the site (e.g. Lemon Beauty-heads (*Calocephalus citreus*), Grassland Candles (*Stackhousia subterranea*), Spiny Rice Flower and Button Wrinklewort), others are rare and scattered (e.g. Magenta Stork's-bill (*Pelargonium rodneyanum*), Arching Flax lily (*Dianella* sp. aff. *longifolia* (Benambra), Spur Velleia (*Velleia paradoxa*)), and some are apparently now present as only one or a few individuals (e.g. Scaly Buttons (*Leptorrhynchus squamatus*), Featherheads (*Ptilotus microcephalus*), Tiny Star (*Hypoxis glabella* var. *glabella*), Scented Sundew (*Drosera aberrans*) and Austral Bear's-ears (*Cymbonotus preissianus*)).

The degree of weed invasion in Herb-rich Grassland is currently relatively low. This was confirmed by two monitoring plots placed within the cemetery for the purpose of monitoring NTG, which found perennial weed levels of less than 2%.

Herb-rich grassland covers 1.17 ha of the Truganina Cemetery Grassland (73%). All is considered native vegetation and NTG. A photograph of the vegetation is shown in Figure 7.



Figure 7. Herb-rich grassland (HG) in Truganina Cemetery. The Blue flowers are Bronze Bluebells (*Wahlenbergia luteola*). The prominent daisy flowers are Button Wrinklewort (*Rutidosia leptorrhynchoides*), the large asymmetrical yellow flowers are Spur Velleia (*Velleia paradoxa*), and the sub-shrub with tiny yellow flowers is Curved Rice-flower (*Pimelea curviflora* var. 1).

Themeda Grassland (TG)

This state includes areas which have never been de-rocked and retain the dominant Kangaroo Grass (*Themeda triandra*), but have lost their diverse herb component, usually as a result of grazing or the over-accumulation of biomass. In the case of Truganina Cemetery, this loss of herb species has presumably been caused by a combination of biomass accumulation, regular mowing and weed invasion. This state is effectively that part of the cemetery which remains referable to native vegetation, but is outside the conservation area and within the strip of land that is regularly mown and maintained as a lawn.

At Truganina Cemetery, this state is heavily invaded by perennial weeds, including Kikuyu (*Pennisetum clandestinum*), Couch Grass (*Cynodon dactylon*) and Chilean Needle-grass (*Nassella neesiana*). These species may spread rapidly, and the vegetation in this state poses a threat to the adjacent herb-rich native grassland.

Themeda Grassland covers 0.1 ha of the Truganina Cemetery Grassland (6%). All is considered native vegetation and NTG.

C3 Grassland (C3G)

C3 grassland describes sites which have not been de-rocked or suffered very high levels of nutrient elevation, but which have lost the naturally-dominant Kangaroo-grass. At Truganina Cemetery, C3 Grassland is used to describe small areas of vegetation under two distinct management regimes: mown lawns lacking *Themeda* that are dominated by introduced species (generally the areas around gravesites), and vegetation beneath planted trees dominated by litter, annual weeds and some native Chenopods. The mown areas of C3 Grassland are no longer native vegetation or NTG; while the treed areas remain native and referable to NTG.

It is worth noting that both mown lawns and planted trees are relatively unusual in the broader context of NTG. The state-transition model is not designed to cater for these situations in particular, and while C3 Grassland is considered the best fit for these areas, the generalised state description in the state model is focussed on the more typical context of C3 Grassland in large grazed paddocks .

C3 Grassland covers 0.4 ha of the Truganina Cemetery Grassland (34%).

Plant species

Ninety-two vascular plants were recorded at the site. While this tally represents a moderately large number for such a small grassland site (1.6 ha), the abundance of the species was markedly uneven. A small number of species covered most of the property (the native Kangaroo Grass alone covers approximately 30%). Most species were recorded in few places and in low abundance.

Of the 93 species recorded, 57 were native (61 %).

Appendix 1 lists all of the vascular plant species recorded, and describes their estimated abundance. This list is intended to be a useful reference guide for managers. Appendix 2 presents notes on plant identification.

It is worth noting that the season during which surveys was undertaken was very dry. It is likely that a number of annual species (e.g. native *Crassula* species) and possibly some geophytes (e.g. introduced Iridaceae) were not detectable during the time of survey due to the very dry conditions.

Significant native species

As noted above, two naturally-occurring species was recorded that are EPBC- and FFG-listed (Spiny Rice-flower and Button Wrinklewort). Two other species were recorded that are listed as rare or threatened in Victoria (VROT). Table 2 lists all the listed species, with some brief notes about their local occurrence. Figure 8 shows the locations of Arching Flax-lily.

Numerous other species were recorded that should be considered of conservation significance in the local area. These are annotated in Appendix 1.

Table 1: Significant native species that are listed under the EPBC-Act, FFG-ACT or on the DEPI Advisory List (DEPI 2014). CE= critically endangered, EN=endangered, V=vulnerable, F = FFG listed, e= endangered, r= rare, k= poorly known.

Species	EPBC	FFG	VROT	Observations
<i>Rutidosia leptorrhynchoidea</i> (Button Wrinklewort)	EN	F	e	At least 615 individuals, spread across the cemetery as shown in Figure 4.
<i>Pimelea spinescens</i> subsp. <i>spinescens</i> (Spiny Rice-flower)	CE	F	e	At least 580 individuals, spread across the cemetery as shown in Figure 3.
<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra) (Arching Flax-lily)			k	Approximately 20 - 50 individuals, spread across the cemetery as shown in Figure 10.
<i>Convolvulus angustissimus</i> subsp. <i>omnigracilis</i> (Slender Bindweed)			k	Very common throughout the cemetery

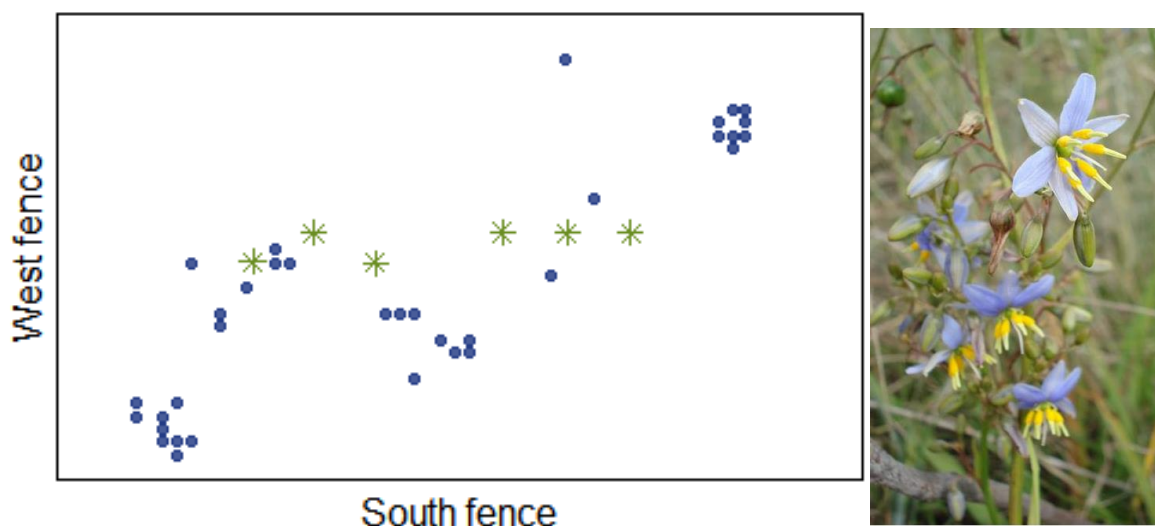


Figure 8. The location of Arching Flax-lily within Truganina cemetery.

Weeds

Of the 93 species recorded, 36 are introduced species. Some of the introduced species identified pose serious risks to native vegetation. The identification and mapping of those species is necessary to assist management.

Table 2 lists the species recorded on the property which are listed under the CaLP Act, and notes their category of listing in the Port Phillip region. Figure 9 shows the distribution on the surveyed land of some of these species. Some very abundant species are not shown on the map, for the sake of clarity.

In addition to these declared noxious weeds, DSE (2011) identified 10 species that were considered to be the most seriously threatening in the Western Grassland Reserve and surrounding area. Two of these occur on the surveyed property, both declared noxious weeds in the Port Phillip and Westernport region:

- *Nassella neesiana* (Chilean Needle Grass) (declared noxious, above)
- *Physalis hederifolia* (formerly *viscosa*) (Prairie Ground-cherry) (declared noxious, above)

In addition to those species, several others are considered very high threat weeds in the context of Truganina Cemetery:

- *Galenia pubescens* (Blanket Weed)
- *Oxalis pes-caprae* (Soursob)
- *Pennisetum clandestinum* (Kikuyu)
- *Vinca major* (Blue Periwinkle)

Table 2. Declared noxious weeds observed on the surveyed land.

CaLP Act category	Weed species	Observations
State Prohibited	None	NA
Regionally Prohibited	None	NA
Regionally Controlled	<i>Asparagus asparagoides</i> (Bridal Creeper)	A single plant noted.
	<i>Cirsium vulgare</i> (Spear Thistle)	Occasional, rare
	<i>Cynara cardunculus</i> (Artichoke Thistle)	Occasional, rare
	<i>Lycium ferrocissimum</i> (African Boxthorn)	Scattered as seedlings, rare
	<i>Nassella trichotoma</i> (Serrated Tussock)	Widespread, largely killed by recent spraying
	<i>Physalis hederifolia</i> (<i>viscosa</i>) (Prairie Ground-cherry)	Occasional
Restricted	<i>Nassella neesiana</i> (Chilean Needle Grass)	Localised patches, mostly in the eastern section and around the boundaries, where presumably spread by mowing
	<i>Oxalis pes-caprae</i> (Sour-sob)	Localised patches, throughout cemetery

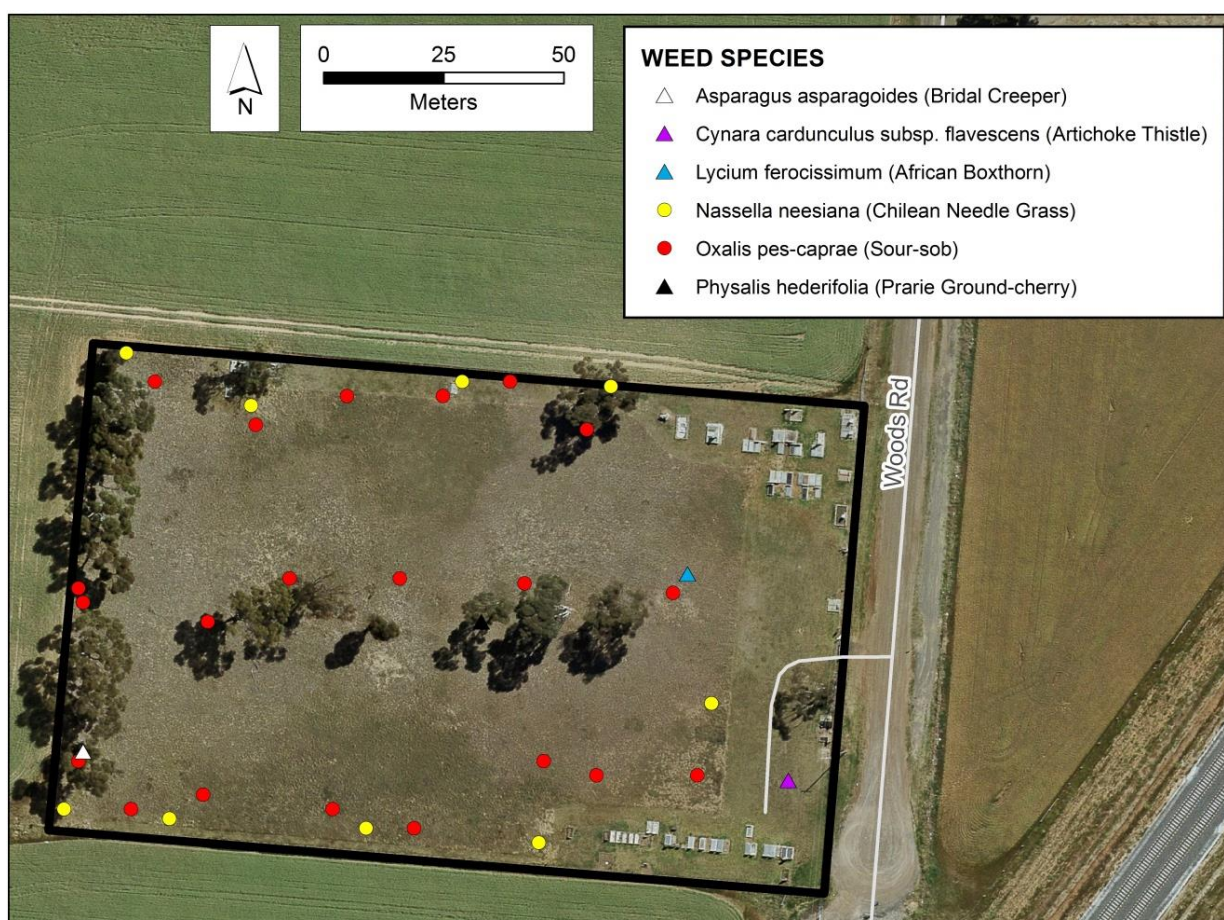


Figure 9. The location of selected weed species in Truganina Cemetery.

Hot Spots

The information presented above provides a formal spatial assessment of the values. This section is routinely included in inventory reports to provide a subjective assessment of where these values intersect to create conspicuous concentrations of biological values (and risks), called here “hot spots”. These are the places of particular interest on the property, and places where intensive or intricate management may be justified to protect the values of the site. The assessment of ‘hot spots’ is necessarily subjective, because it takes into account some intangible quantities, including interesting or unusual juxtapositions of biological values for educational purposes, etc.

For this site, the entire area of Herb-rich Grassland should be considered a “hot spot”.

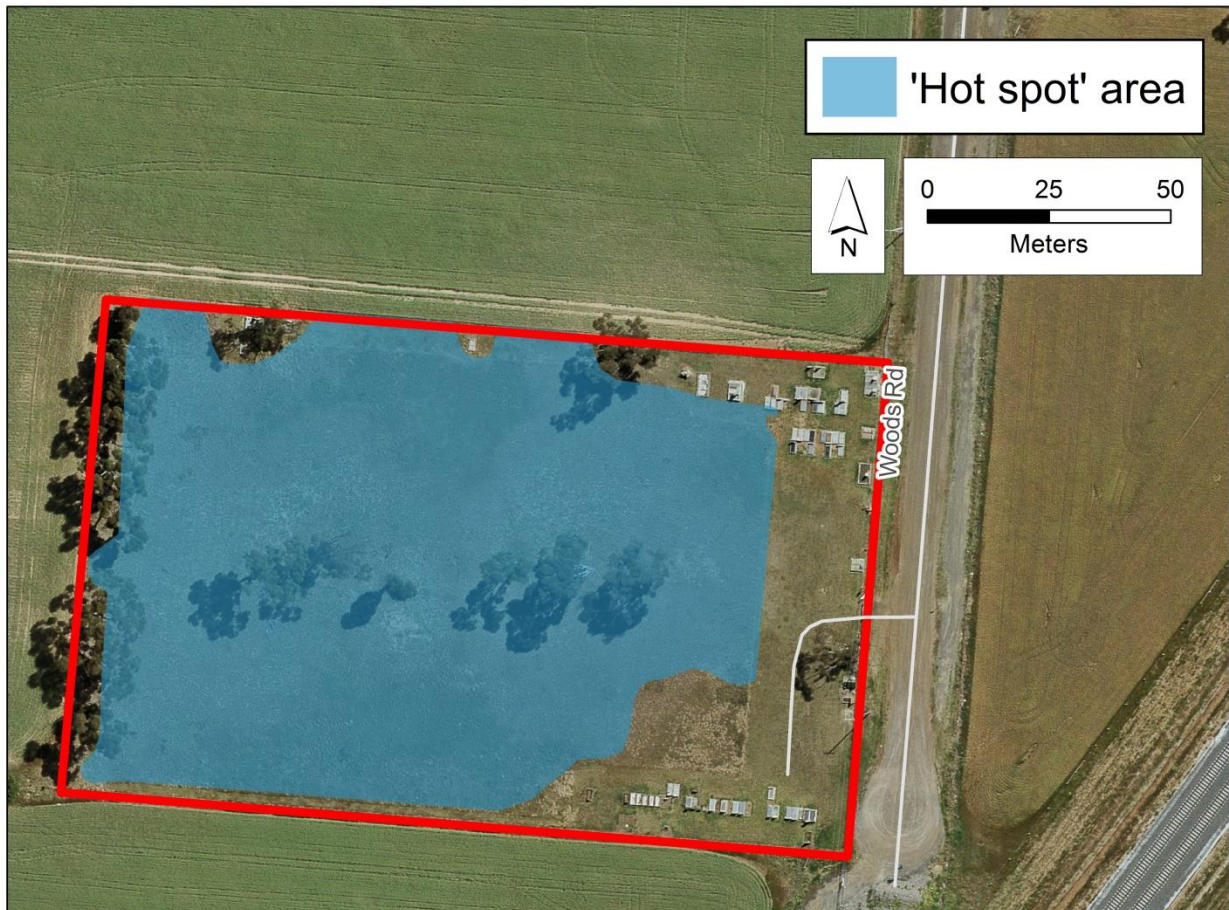


Figure 10. The biodiversity hot spot in Truganina Cemetery.

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Personal Communication: Geoff Carr (Director of Ecology Australia and the author of original species description of *Dianella amoena*) was consulted on 5th January 2016.

Appendix 1: List of vascular plants identified

The list below records all vascular plant species recorded. The significance of each species is rated using the following categories:

- EPBC: EPBC listed (see main text for discussion of species in this category)
- e VROT: Endangered in Victoria.
- v: VROT: Vulnerable in Victoria.
- r: VROT: Rare in Victoria.
- k: VROT: Poorly known in Victoria.
- SP: CaLP listed: State Prohibited weed.
- RP: CaLP listed: Regionally Prohibited weed.
- RC: CaLP listed: Regionally Controlled weed.
- Res: CaLP listed: Restricted weed.

The following categories, taken from Mueller-Dombois & Ellenberg (1974; *Aims and Methods of Vegetation Ecology*. Wiley, New York), describe the observed abundance / distribution of each species in the survey area. These are qualitative estimates that refer to the abundance of the species across the entire site, and may be assigned in retrospect after numerous site visits. The use of the categories makes no reference to the status of the species outside the study area

- r Solitary (or at least exceedingly rare)
- + Few individuals, <5% cover
- 1 Numerous or scattered, <5% cover
- 2 5-25% cover
- 3 25-50% cover
- 4 50-75% cover
- 5 >75% cover

The direct observations above are modified by the following categories which represent the author's (S Sinclair) opinion about the former abundance of each taxon before Agricultural land use (pre-1835). The combination of both abundance estimates represents some local measure of depletion:

- A: Abundant. Once numerous, and probably once contributed >5% cover within the vegetation type.
- C: Common. Once numerous, but probably did not contribute >5% cover within the vegetation type.
- O: Occasional. Always rare or incidental within the vegetation type. This includes 'freak' occurrences which are observable 'in' a vegetation type, but are not 'of' it.

Species marked with a ? are doubtful. The location of the ? denotes the level of uncertainty. Species with a ? before their generic names are of doubtful occurrence. Species marked with a ? before their specific or subspecific names are of doubtful identity, usually because mature material could not be obtained that displayed all of the characters required for positive identification.

Species marked with a '#' are noted in previous surveys (mostly the Flora of Melbourne (Bull and Stolfo 2014)), but were not encountered during the surveys for this report. All of these records are considered plausible and highly likely.

Family	Species name	Status	Abundance	Former
NATIVE SPECIES				
MONOCOTS				
Liliaceae	<i>Dianella admixta</i>		1	C
	<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	k	1	C
	<i>Hypoxis glabella</i>		r	C
Poaceae C3	<i>Anthosachne scabra</i>		+	C
	<i>Austrostipa bigeniculata</i>		1	C
	<i>Austrostipa oligostachya</i> #		?	O
	<i>Austrostipa scabra</i> subsp. <i>falcata</i>		1	A
	<i>Dichelachne crinita</i>		+	C
	<i>Poa seiberiana</i> var. <i>seiberiana</i>		2	A
	<i>Rytidosperma bipartitum</i>		+	C
	<i>Rytidosperma caespitosum</i>		+	A
	<i>Rytidosperma erianthum</i>		+	C
	<i>Rytidosperma fulvum</i>		1	C
Poaceae C4	<i>Chloris truncata</i>		+	O
	<i>Themeda triandra</i>		3	A
	<i>Walwhalleya proluta</i>		+	O
FERNS				
Adiantaceae	<i>Cheilanthes seiberi</i>		+	C
DICOTS				
Amaranthaceae	<i>Ptilotus macrocephalus</i>		r	C
Apiaceae	<i>Eryngium ovinum</i>		1	C
Asteraceae	<i>Brachyscome dentate</i>		1	A
	<i>Calocephalus citreus</i>		1	A
	<i>Cassinia acuate</i>		r	O
	<i>Chrysocephalum</i> sp. 1		1	A
	<i>Cymbonotus presissianus</i>		r	C
	<i>Leptorhynchus squamatus</i> subsp. <i>squamatus</i>		r	C
	<i>Rutidosis letporrhynchoides</i>	EPBC e	1	A
	<i>Senecio quadridentatus</i>		+	C
	<i>Solenogyne domminii</i>		+	C
	<i>Solenogyne gunnii</i>		+	C
Campanulaceae	<i>Wahlenbergia communis</i>		+	C
	<i>Wahlenbergia gracilis</i> #		?	C
	<i>Wahlenbergia luteola</i>		1	C
Caryophyllaceae	<i>Spergularia ?brevifolia</i>		+	O
Chenopodiaceae	<i>Atriplex semibaccata</i>		1	C
	<i>Einadia nutans</i> subsp. <i>nutans</i>		1	O
	<i>Enchylaena tomentosa</i> subsp. <i>tomentosa</i>		1	O
	<i>Maireana enchylaenoides</i>		+	C
Convolvulaceae	<i>Convolvulus angustissimus</i> subsp. <i>omnigracilis</i>	k	1	C
Clusiaceae	<i>Hypericum gramineum</i> #		?	O
Droseraceae	<i>Drosera aberrans</i>		r	O
	<i>Drosera peltata</i>		r	O
Euphorbiaceae	<i>Euphorbia drummondii</i>		+	O
Gentianaceae	<i>Sebaea ovata</i> #		?	C
Geraniaceae	<i>Geranium</i> aff. <i>retrosum</i> (Grassland)#		?	C
Goodeniaceae	<i>Velleia paradoxa</i>		+	C
Oxalidaceae	<i>Oxalis perrenans</i>		1	C
Plantaginaceae	<i>Plantago gaudichaudii</i>		+	C
Polygonaceae	<i>Rumex brownie</i>		+	O
	<i>Rumex dumosus</i> #		?	C

Family	Species name	Status	Abundance	Former
Portulacaceae	<i>Portulaca oleracea</i>		+	O
Rosaceae	<i>Acaena echinata</i>		1	C
Rubiaceae	<i>Asperula conferta</i>		1	C
Stackhousiaceae	<i>Stackhousia subterranea</i>		1	C
Thymeleaceae	<i>Pimelea curviflora</i>		1	A
	<i>Pimelea glauca</i>		+	C
	<i>Pimelea spinescens</i> subsp. <i>spinescens</i>	EPBC e	1	C
INTRODUCED SPECIES				
MONOCOTS				
Asparagaceae	<i>Asparagus asparagoides</i>		r	
Iridaceae	<i>Romulea rosea</i> var. <i>australis</i>		1	
	<i>Bromus</i> sp.		+	
	<i>Nassella neesiana</i>	R	2	
	<i>Nassella trichotoma</i>	RC	1	
Poaceae C4	<i>Cynodon dactylon</i>		+	
	<i>Pennisetum clandestinum</i>		+	
DICOTS				
Apocynaceae	<i>Vinca major</i>		+	
Aizoaceae	<i>Galenia pubescens</i>		+	
Asteraceae	<i>Arctotheca calendula</i>		+	
	<i>Cirsium vulgare</i>	RC	r	
	<i>Cynara cardunculus</i> subsp. <i>flavescens</i>	RC	r	
	<i>Helminthotheca echioides</i>		r	
	<i>Leontodon taraxacoides</i>		+	
	<i>Sonchus oleraceus</i>		1	
Brassicaceae	<i>Capsella bursa-pastoris</i>		+	
	<i>Lepidium africanum</i>		1	
Cactaceae	<i>Opuntia ?ficus-indica</i>		r	
Chenopodiaceae	<i>Chenopodium album</i>		r	
Fabaceae	<i>Medicago polymorpha</i>		+	
	<i>Trifolium angustifolium</i>		+	
	<i>Trifolium ?striatum</i>		+	
	<i>Trifolium</i> sp.		+	
Gentianaceae	<i>Centaurium erythraea</i>		+	
Geraniaceae	<i>Erodium botrys</i>		+	
Malvaceae	<i>Malva parviflora</i>		1	
Myrtaceae	<i>Eucalyptus cladocalyx</i>		+	
Oxalidaceae	<i>Oxalis pes-caprae</i>		2	
	<i>Oxalis purpurea</i>		1	
Plantaginaceae	<i>Plantago lanceolata</i>		1	
Polygonaceae	<i>Acetosella vulgaris</i>		+	
	<i>Rumex crispus</i>		+	
Primulaceae	<i>Anagalis arvensis</i>		+	
Solanaceae	<i>Lycium ferocissimum</i>	RC	1	
	<i>Physalis hederifolia</i>	RC	1	
	<i>Solanum nigrum</i>		+	

Appendix 2: Notes on plant identification

Some plants displayed characteristics or variations worthy of note. These may include plants that were difficult to assign to a species, plants which occurred in several apparently distinct but unrecognized forms, and plants which could be assigned to a sub-specific rank not formally recognized, but commonly noted and/or listed on the curation version of the Victorian Biodiversity Atlas database. Further, some previous surveys have reported species that are unlikely to occur on site, or are difficult to interpret in line with current taxonomy.

- *Chrysocephalum apiculatum* is recorded in the Flora of Melbourne (Bull and Stolfo 2014). This species is very similar to the more recently-distinguished *Chrysocephalum* sp. 1, which is largely distinguished by narrower leaves and smaller flower-heads. The latter species is very common on the basalt plains; the former is exceedingly rare. All specimens examined keyed to *C. sp. 1*. It is considered likely that *C. apiculatum* is absent from the site, but retained by Bull and Stolfo (2014) from an older list.
- *Pimelea octophylla* (Woolly Rice-flower) is given in the list in DCE (1990). This distinctive species is generally restricted to well-drained sandy soils (Bull and Stolfo 2014), and has not otherwise been recorded on the volcanic plain. It is considered an error and omitted from the list presented here. Bull and Stolfo (2014) include it in their list for the site, but also note that it is doubtful.
- *Opuntia ficus-indica* is listed with uncertainty. This species is probably the most frequent *Opuntia* in the district, but no mature material was available from the site to confirm its identity in the cemetery.
- *Plantago varia*. The flora of Melbourne (Bull and Stolfo 2014) lists this species. It is notoriously difficult to distinguish from *Plantago gaudichaudii*, which occurs in various un-named forms.

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