

# WOODY MEADOW PILOT PROJECT

GUIDELINES TO CREATE DIVERSE  
FLOWERING LANDSCAPES







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April 2020

Cover Image: The Woody Meadow Project in Birrarung Marr in 2018, two years after planting.

Photo credit: University of Melbourne.

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# INTRODUCTION

In recent years, public land managers such as City of Melbourne have started to re-evaluate how they can deliver high quality public landscapes which also provide:

- enhanced community engagement with plants and public landscapes
- plantings which are resilient to climate change (both in terms of higher temperatures and lower rainfall)
- increased plant cover to reduce the Urban Heat Island Effect (which results in higher overnight temperatures) and stormwater runoff
- biodiversity habitat.

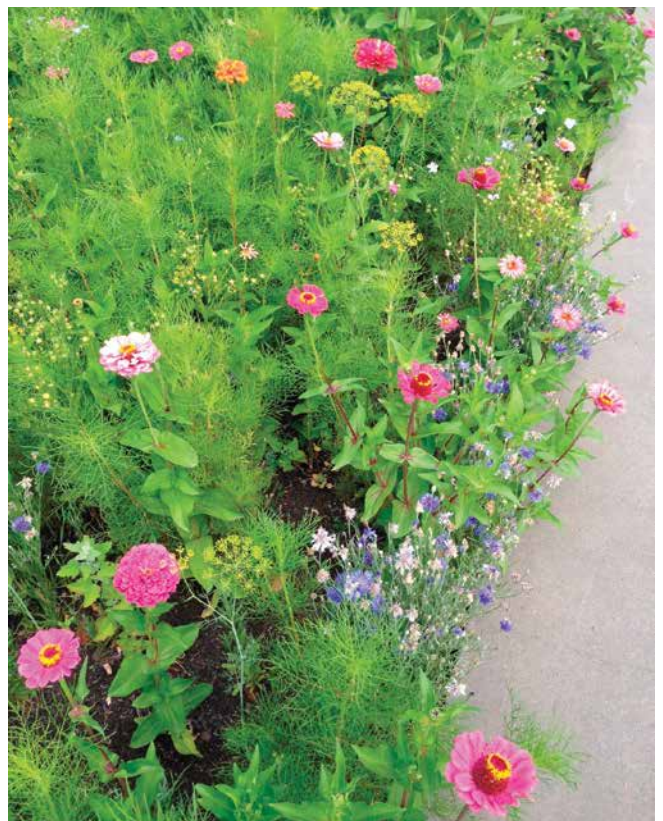
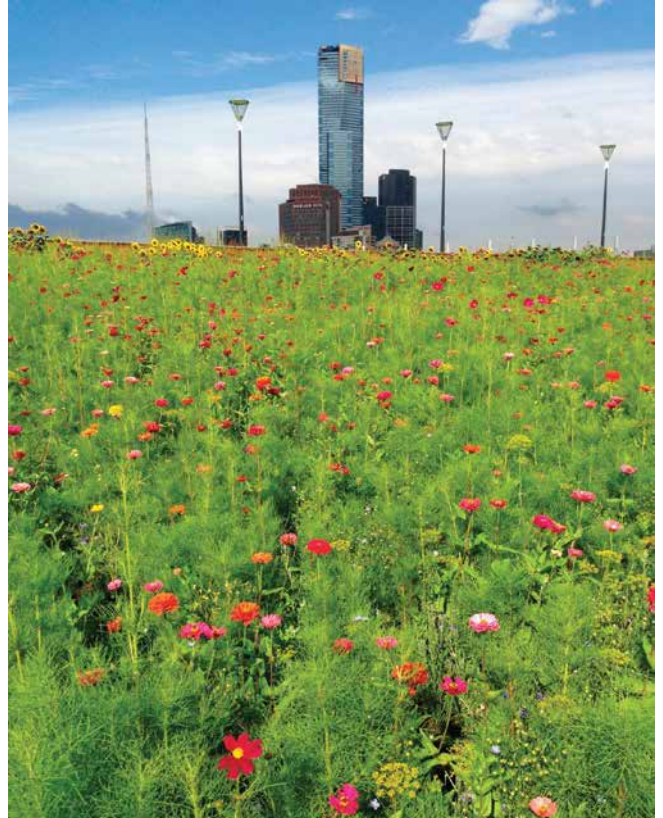
One way to overcome this is using *meadow plantings* that are highly diverse and have high aesthetic value. Inspired by the colourful flowering meadows showcased at the 2012 Olympic Games in London, City of Melbourne began to experiment with 'meadow' style plantings and installed a temporary flowering meadow of annual plants at Birrarung Marr from 2012-14. This annual meadow received positive community feedback and demonstrated the value of visually attractive plantings with greater species diversity and provided an opportunity to create 'delight' in the park.

Encouraged by the flowering meadow trial, City of Melbourne partnered with the University of Melbourne and the University of Sheffield, to investigate whether we could create an Australian flowering meadow. The meadow would require less irrigation, fertiliser, and labour and plant replacement than the annual meadows, while still creating delight.

The 'flowering meadow' concept has been adapted to an Australian context by using a diverse range of Australian shrubs selected for high aesthetic values, plus their ability to reshoot to maximise flowering and longevity. We have based these plantings on natural shrub land ecosystems which occur throughout southern Australia. As these plantings use woody perennials, it is therefore described as a woody meadow.

The woody meadows are 'coppiced' or hard-pruned to about 200 mm above the ground every two to four years, to maintain dense canopies which reduce weeds and promote flowering. This reduces the maintenance inputs and makes them long-lasting.

Images 1-3. The flowering meadow in Birrarung Marr in 2014 was inspired by the colourful flowering meadows showcased at the 2012 London Olympic Games. Photo credit: Melanie Kinsey.



# ABOUT THE WOODY MEADOW PILOT PROJECT (2015–2018)

The Woody Meadow Pilot Project investigated whether Australian shrubs could be used to improve the appearance and function of low-maintenance landscapes. The project was a collaboration between the University of Melbourne, the University of Sheffield, City of Melbourne and the Royal Botanic Gardens Victoria (RBGV).

The project commenced in 2015 with design, development and testing phases. This included woody meadow plant selection and testing the ability of plants to re-sprout after coppicing (supported by the Trawalla Foundation in research plots at RBGV Cranbourne and at the Burnley campus of the University of Melbourne). These results were then used to design two woody meadows which were planted in the spring of 2016 in public parks in City of Melbourne: one in Birrarung Marr and the other in Royal Park on Old Poplar Road.

These Woody Meadow Pilot plantings have thrived over three years with two manual coppicing events (at six months and two years) and low maintenance. City of Melbourne is continuing to maintain the two woody meadow garden beds and the University of Melbourne is continuing to monitor the performance of the beds.

## Plant selection and design of the woody meadow

The initial plant selection evaluated 1200 species from the literature to generate a short list of 287 preferred plants which were then evaluated by a panel of experts (Paul Thompson, Rodger Elliot, Scott Watson, Digby Gowns, John Arnott and Warren Worboys) to determine suitability for planting in Melbourne. From this shortlist, 21 species (Table 1) were chosen for planting in the woody meadow based on their capacity to reshoot after coppicing, survive with no irrigation beyond establishment and to thrive with limited maintenance.

Woody Meadow Pilot plantings were designed as a three-layer community to replicate the structure of shrub-based natural ecosystems and provide visual interest. These three layers (Figure 1) were:

- base layer (species < 1 m in height) provides ground coverage and reduces weeds
- bump layer (1-2 m height) with most of the visual interest
- emergent layer (> 2 m in height) with fewer species due to their large size.

The woody meadows were planted into a raised bed filled with 200 mm deep scoria (8 mm minus aggregate including fines) which acted as inorganic mulch and provided a free-draining, low nutrient and weed-free growing media to help establish plants and reduce weeds. These plantings were both in full-sun conditions. Plants were coppiced six months after planting and were then monitored monthly for survival and flowering.



Image 4. Research plots at the Royal Botanic Gardens Victoria in Cranbourne. Photo credit: University of Melbourne.





Figure 1. The Woody Meadow Pilot planting at Birrarung Marr in City of Melbourne shows the three-layered community. This photo was taken two years after planting and 18 months after the first coppicing. Photo credit: University of Melbourne.



Images 5 and 6. From L to R *Grevillea* 'Coconut Ice' and *Acacia acinacea*. Photo credit: Elizabeth Alcorn and Melanie Kinsey.

## Performance

The Woody Meadow Pilot plantings flowered continuously and achieved canopy closure within one year after initial coppicing (six months after planting). Most plants (95 per cent) re-sprouted after the initial coppicing and developed multiple basal stems which created dense shrubs with lots of flowers. Mortality in these public plantings was very low (< 20 per cent), despite no irrigation and very low rainfall over summer months (< 2 mm of rainfall in February 2017).

Table 1. Plant species planted in City of Melbourne Woody Meadow Pilot plantings.

BASE LAYER (< 1 M HEIGHT)	BUMP LAYER (1-2 M HEIGHT)	EMERGENT LAYER (> 2 M HEIGHT)
<ul style="list-style-type: none"> <li>• <i>Astartea fascicularis</i></li> <li>• <i>Banksia spinulosa</i> subsp. <i>spinulosa</i></li> <li>• <i>Beaufortia sparsa</i></li> <li>• <i>Callistemon</i> 'Little John'</li> <li>• <i>Dampiera alata</i></li> <li>• <i>Goodenia ovata</i> 'Gold Cover' (prostrate form)</li> <li>• <i>Grevillea lanigera</i> 'Mini Prostrate'</li> <li>• <i>Melaleuca thymifolia</i> 'Pink Lace'</li> <li>• <i>Philotheca myoporoides</i> subsp. <i>myoporoides</i> 'Profusion'</li> <li>• <i>Veronica arenaria</i></li> <li>• <i>Veronica perfoliata</i></li> <li>• <i>Xanthosia rotundifolia</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Acacia acinacea</i></li> <li>• <i>Calothamnus quadrifidus</i></li> <li>• <i>Eucalyptus latens</i> 'Moon Lagoon'</li> <li>• <i>Grevillea</i> 'Coconut Ice'</li> <li>• <i>Leptospermum polygalifolium</i> 'Cardwell'</li> <li>• <i>Melaleuca nesophila</i> 'Little Nessie'</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Alyogyne huegelii</i></li> <li>• <i>Eucalyptus caesia</i></li> <li>• <i>Eucalyptus preissiana</i></li> </ul>



# RECOMMENDATIONS AND GUIDELINES FOR IMPLEMENTATION

These guidelines and recommendations are informed by the Woody Meadow Pilot plantings at Birrarung Marr and Royal Park, and the horticultural experience of Doctor Claire Farrell and Associate Professor John Rayner from University of Melbourne.

They cover the following topics to ensure successful implementation of a woody meadow:

1. Installation
2. Plant selection and planting design
3. Maintenance.

## Recommendations

### 1. Installation

We recommend that site preparation be done at all sites to remove weeds and remediate from compaction. Pre-treatment and eradication of weeds should be based on an assessment of the weed flora present, including persistent and dormant perennial weeds (for example, Soursob, *Oxalis pes-caprae*) to determine which control treatments will be most effective.

Repeated herbicide applications with a long-lead time prior to planting have been shown to be highly effective in reducing weed competition after planting. Where this is not possible, a single herbicide application, followed by scalping to a depth of 50–100 mm of topsoil should be undertaken to remove the potential 'weed seed bank' from the soil.

De-compaction can be done through ripping or scoop and dump techniques with machinery. Some soil / sub-soil is needed for installation of the woody meadow. Growth cannot be maintained by the scoria inorganic mulch layer alone.

Installation of inorganic mulch such as scoria block mix (8 mm minus) to a depth of 200 mm is recommended at all sites. Scoria is a locally mined rock and this inorganic mulch replaces topsoil and other forms of mulching such as composted bark or green waste. The use of this layer (on top of de-compacted site soils) reduces weeds and ensures tube-stock plants establish well. This may require the installation of an edge restraint in many locations, depending on the nature of the planting. Tube-stock plants should be planted directly into this inorganic mulch layer at planting (this does not need to be removed away from plants at planting like bark mulch, as plants can grow directly into it and it will not cause rot).

Tube-stock plants should be planted in late autumn-early spring to maximise establishment with natural rainfall. Sourcing suitable plant stock for the woody meadow project was difficult, despite having all plants contract-grown by production nurseries. We recommend allowing a long-lead time to source suitable plant materials (12 months) and using high quality, contract-grown tubestock plants (100 mm sized tubes). An additional 10 per cent of plants should be ordered to allow for plant replacement during establishment.

Plant locations within each plot should be designated through the use of a grid to ensure the correct planting density, as outlined below. At planting, when plants are removed from the container, the top 10 mm of potting mix should be removed to avoid site contamination with any potential nursery weeds. All plants should be hand watered or irrigated immediately after planting.

### 2. Plant selection and planting design

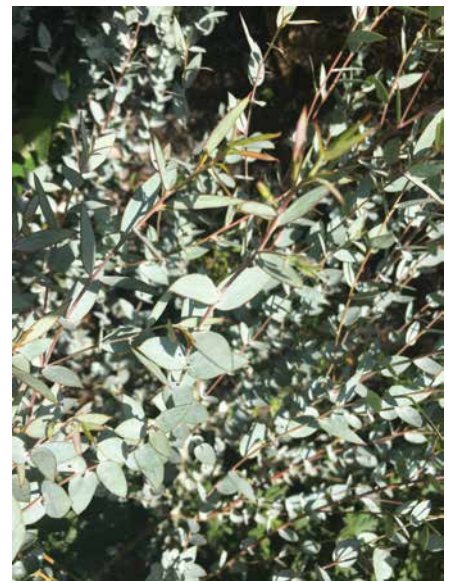
The design of future woody meadow plantings should be based on the following objectives:

- Select Australian shrubs that have high floral and foliage values (similar to the plant list in Table 1) and plant heights associated with the three desired layers of the woody meadow, that is, base layer (to 1 m in height), bump layer (to 1–2 m) and emergent layer (> 2 m).
- Create a planting design to achieve canopy closure (> 80 per cent) in the first 18 months post-planting, with plots that are a minimum of 9 m<sup>2</sup> in area.
- Plan for a lifespan of approximately 20 years, with coppicing every 2–4 years and minimal maintenance beyond plant establishment.
- Maximise outcomes for biodiversity by providing floral resources for insect and bird pollinators.



### Plant selection

The plant list (Table 2) includes plants researched as part of City of Melbourne woody meadow plots and from experiments conducted at both Burnley and RBGV Cranbourne. This plant list has been developed for woody meadow plantings in full-sun conditions.



Images 7-9. From L to R *Leptospermum polygalifolium* 'Cardwell', *Alyogyne huegelii* with *Acacia acinacea* and *Eucalyptus latens* 'Moon Lagoon'. Photo credit: Elizabeth Alcorn and Melanie Kinsey.



Images 10-12. From L to R *Grevillea preissii* 'Seaspray', *Dampiera alata* and *Eucalyptus caesia*. Photo credit: Elizabeth Alcorn and Melanie Kinsey.



Table 2. Recommended plants for woody meadows in City of Melbourne.

PLANT TAXON	PLANT DETAILS AND USES	NOTES AND POSSIBLE ALTERNATIVES
<b>Base layer</b>		
<i>Astartea fascicularis</i>	A spreading, fine-textured shrub that can reach 1-2 m and produces arching stems covered in white flowers. Can be a little slow to establish and re-grow from coppicing.	A possible replacement is <i>Thryptomene saxicola</i> which recovers well from pruning and has a similar form.
<i>Atriplex semibaccata</i>	Prostrate and dense shrub to 500 mm. very robust, grey-green foliage. Tolerates a range of conditions and responds well to pruning.	Use sparingly as it can become dominant. <i>Atriplex paludosa ssp paludosa</i> could be considered.
<i>Callistemon</i> 'Little John'	Rounded evergreen shrub to 1.5 m. Slow growing but reliable, red flowers in spring.	Other low-growing <i>C. viminalis</i> cultivars are available.
<i>Correa reflexa</i>	Variable shrub 1-2 m. Green or green and red flowering forms. Improved by pruning / coppicing.	<i>Correa decumbens</i> and <i>Correa</i> 'Dusky Bells' could be used.
<i>Dampiera alata</i>	Perennial herb to 600 mm from Western Australia that has distinctive upright 'winged stems' and mauve flowers. Tends to sucker under the right conditions.	Can be difficult in cultivation, but is growing well in the woody meadow plots.
<i>Goodenia ovata</i> 'Gold Cover'	Ground cover form of this yellow-flowered shrub. This cultivar only grows to 300 mm high. Some die-back of foliage has been observed.	Other ground cover forms include 'Prostrate' and 'Edna Walling Coverup'*.
<i>Grevillea lanigera</i> 'Mini Prostrate'	Slow growing and mat-forming reliable shrub, to 600 mm. Produces red terminal clusters of flowers.	Several low-growing forms are available and also hybrid cultivars.
<i>Grevillea preissii</i> 'Seaspray'	Shrub to 1 m with textured, ferny foliage and red spider flowers. Slow growth initially.	<i>Grevillea thelemanniana</i> is a possible replacement.
<i>Philotheca myoporoides</i> 'Profusion'	Rounded shrub to 1 m with pink buds and white flowers. Responds well to coppicing.	'Profusion' is only one of many low-growing cultivars which could be used.
<i>Scaevola calendulacea</i>	Prostrate, coastal shrub to 400 mm, waxy foliage and terminal spikes of blue flowers. Spreading and open habit.	Other <i>Scaevola</i> could be considered for use, including <i>S. aemula</i> cultivars.
<i>Veronica arenaria</i>	Evergreen perennial herb 500 mm to 1 m. Terminal mauve flowers, possibly not long lived, but has self-seeded widely in the woody meadow plots.	Short-term impact plant for higher density. Leave seedlings to establish <i>in situ</i> .



Table 2. Recommended plants for Woody Meadows in the City of Melbourne. (cont.)

PLANT TAXON	PLANT DETAILS AND USES	NOTES AND POSSIBLE ALTERNATIVES
<b>Bump layer</b>		
<i>Acacia boormanii</i>	Suckering shrub. An upright form to 3–4 m, with bright yellow flowers in late winter. Suckering is promoted by coppicing.	Dwarf forms of this species (e.g. 'Olympic Gold') are available. There are potentially several wattles suitable for use.
<i>Agonis flexuosa</i>	Small evergreen tree that has performed well as a shrub through coppicing. Distinctive red foliage as new growth.	Two low-growing cultivars are available - 'Nana' and 'Denmark Delight'.
<i>Atriplex nummularia</i>	Highly stress-tolerant shrub. An upright form to 3 m with grey foliage. Very adaptable for use and recovers strongly from coppicing.	Many other Saltbush species ( <i>Atriplex</i> , <i>Rhagodia</i> ) could be considered.
<i>Callistemon salignus</i>	Small evergreen tree that has performed well as a shrub through coppicing. Distinctive pink foliage as new growth.	<i>Callistemon citrinus</i> cultivars could be considered.
<i>Calothamnus quadrifidus</i> (Grey form)	Upright shrub to 3 m with grey, needle-like leaves and red, claw-like flowers at the base of the stems. Very reliable.	The green form of the species is more common but less attractive.
<i>Grevillea</i> 'Coconut Ice'	Rounded shrub to 2–3 m, attractive foliage and red flowers over winter and spring. Best in low nutrient sites.	A hybrid cultivar from <i>G. bipinnatifida</i> and <i>G. banksii</i> , others from this pairing (e.g. 'Robyn Gordon') could be used.
<i>Eucalyptus albida</i>	A Mallee Eucalypt that grows to 3–4 m. It forms a hemispherical mound of grey-silver foliage when coppiced. Best in higher light locations.	No real alternatives at this height range. <i>E. pulverulenta</i> and <i>E. perinniana</i> are similar but will produce a 2 m growth between coppice treatments.
<i>Eucalyptus latens</i> 'Moon Lagoon'	A Mallee Eucalypt that grows to 3–4 m. It forms a hemispherical mound of grey-silver foliage when coppiced.	
<i>Goodenia ovata</i>	Variable but upright shrub to 2 m. Yellow flowers in spring / summer. Responds well to coppicing and its form / habit is typically improved by this treatment.	<i>Eremophila maculata</i> might be suitable as it tolerates severe pruning and has similar form.
<i>Leptospermum polygalifolium</i> 'Cardwell'	Variable shrub to 3 m with small white flowers borne on lateral stems over spring and summer. Recovers well from coppicing but best used in lower numbers per plot.	Other cultivars should be considered. <i>Kunzea ericoides</i> is a suitable replacement.
<i>Myoprum montanum</i>	Rounded shrub to 8 m with deep green elliptic-lanceolate leaves. Can produce white star-like flowers between coppicing events. Robust and reliable across a range of conditions.	Other Myoporium species (e.g. <i>M. bateae</i> , <i>M. insulare</i> , <i>M. floribundum</i> ) could be considered, many respond well to hard pruning.
<i>Rhagodia spinescens</i>	Grey-foliage shrub to 1 m. Spreading and fast-growing. Very tolerant of hostile conditions and re-grows vigorously from coppicing. Use sparingly as can dominate in mixed plantings.	A good replacement is <i>A. parabolica</i> . Other saltbush (e.g. <i>Atriplex</i> ) may also be suitable.



PLANT TAXON	PLANT DETAILS AND USES	NOTES AND POSSIBLE ALTERNATIVES
<b>Emergent layer</b>		
<i>Acacia acinacea</i>	Upright shrub to 2 m. Yellow flowers over spring. Suckers freely after coppicing, which also increases plant density.	There are many <i>Acacia spp.</i> that respond well to coppicing (e.g. <i>A. aphylla</i> ).
<i>Alyogyne huegelii</i>	Fast growing and upright shrub to 3 m with lilac flowers. Produces flowers for most of the year and performs well across different sites.	Might need coppicing annually. <i>A. hakeifolia</i> is an excellent alternative.
<i>Eucalyptus caesia</i>	Small Mallee Eucalypt to 6-7 m. Pendulous branches, distinctive bark and attractive red flowers. Grew to 2 m in two years in plots.	Other small Mallee Eucalypts could be considered.

The Woody Meadow Pilot Project has shown that plots planted with fewer species (low diversity) and with lower spacing (high density) have produced the best results in establishing and sustaining a successful plant community, at least in the first two years of monitoring.

**Based on these results we recommend the following:**

- Plots that are a minimum of 9 m<sup>2</sup> in area (3 m x 3 m) but preferably larger.
- 61 plants used per 9 m<sup>2</sup> plot, planted at a density of 7 plants per m<sup>2</sup> (approximately), providing spacing of 380 mm (rectangular grid planting) or 410 mm (triangular grid planting).
- The 61 plants comprise:
  - base layer plants = 48 (six species x eight individuals)
  - bump layer plants = 12 (three species x four individuals)
  - emergent layer = one individual.

### 3. Maintenance

#### Plant replacement

To ensure the woody meadow plantings are 'low input' we recommend replanting only during the first six months (establishment period).

#### Irrigation

During establishment, a minimum of 25 mm of irrigation per week is required (when there is not rainfall), supplied through irrigation or hand watering. After establishment, emergency irrigation should be considered for extended periods of hot and dry weather (> 6 weeks).

#### Coppicing

Coppicing is a key component of managing a woody meadow. The first coppicing should be made with secateurs to 150 mm in height three to six months after planting. Note that emergent layer plants are not coppiced during establishment. Subsequent coppicing should be done every two to four years to 200 mm in height using a brush cutter, ideally in March or November.



Images 13 & 14. From L to R The Woody Meadow Pilot Project plot in Birrarung Marr 18 months after the first coppicing and Royal Park 12 months after the second coppicing. Photo credit: Melanie Kinsey.

#### Monitoring and weed control

During establishment, fortnightly inspections of the planting site are recommended to monitor plant growth, weeds and litter. The plots and surrounds (to 1 m) should be kept weed-free (> 95 per cent of area). Hand weeding is preferred, with minimal soil disturbance. Herbicide is only recommended on the surrounds and should be applied carefully by a licensed operator with use of a spray-hood applicator to minimise herbicide drift. Any weeds and litter, including rubbish and plant litter, should be removed from across the plots during these visits.

After establishment, we recommend monthly inspections to monitor plant growth, weeds and litter.

#### Mulching

Mulching is not required in sites where the scoria substrate has been used as part of the site preparation. In areas where natural or brought-in topsoil has been used for woody meadow plantings, a mineral aggregate mulch (for example, 7 mm scoria aggregate) 70 mm deep should be applied prior to planting.

#### Fertiliser

We recommend use of a low-P, controlled-release, long-acting fertiliser, applied biennially.

#### Conclusion

The Woody Meadow Pilot Project has demonstrated the success of this innovative low-maintenance planting style. Implementation of new woody meadows using these guidelines will ensure that these plantings also thrive and continue to demonstrate how Australian shrubs can be used to create resilient and diverse landscapes.

The City of Melbourne Woody Meadow Pilot Project is part of a network of woody meadow plantings being implemented by the University of Melbourne. The network is an ongoing program that encourages new woody meadow plantings to be registered to facilitate monitoring and integration of key learnings into new installations.

Further information can be found at:

<https://woodymeadow.unimelb.edu.au/woody-meadows/>

<https://www.rbg.vic.gov.au/visit-cranbourne/attractions/plant-collections/research-garden>







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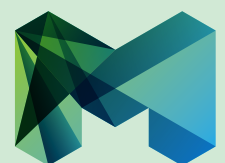
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