December 2014

Grassy Groundcover Gazette

Paul's Piece

Dr Paul Gibson-Roy
Greening Australia (Eastern Region)

Greeting valued readers and welcome to our December 2014 edition of the Grassy Gazette. Perhaps like some of you, I am currently scratching my head and wondering how it got from Christmas 2013 to December 2014 quite so quickly. My Nan once informed me that the years whip by at a quicker rate as you age, and perhaps this is just another reminder of where I am on life's journey. Anyway, these musings aside, I hope you will enjoy the various tales and reports we have to present in this edition. Once again I am thrilled that we do indeed continue to be able to report on various inspiring projects undertaken by GA and other groups across the country focussing on the restoration of diverse communities. This simple fact is uplifting in many ways as it shows that we as a community or sector are continuing to push the boundaries of what can be achieved in the restoration field. We are also able to look back on and assess outcomes on our work, allowing us to rejoice on successes or learn from set-backs, and to refine methods and approaches. Each is important so the sector can continue to develop its confidence and capacity for the change that is needed.

To touch on this point of the development of our sector I'd like to note some events I was privileged to attend in this last year. In March I was present at the City of Salisbury's (Adelaide) Fire Management within Grassland Ecosystems Forum. This was attended by fire officers, grassland practitioners, researchers and ecologists from all over Australia and its focus was on using fire as a tool to restore and manage grassy communities. It was so wonderful to see the City of Salisbury continuing to hold grassland related forums as they have been for a number of years now. This support is critical in allowing the sector to gather and discuss all manner of things. This forum was particularly interesting because it highlighted the many conflicting aspects of the use of, and our perceptions of fire. There was an overall consensus that in many instances fire can be used to great effect to manage biomass and preserve diversity in grassland systems. However, countering this was the reality of the broader community's fear of uncontrolled fire and the threat it poses to life and assets. This unescapable fact ensures the application of fire remains problematic and contested.

In September I attended the Revegetation Industry Association of WA Revegetating the Future forum held in Perth. Again this was a wonderful gathering of people committed to restoring our natural landscapes. Several were from the mining sector and while many are challenged by the impact of mining, there were some fantastic presentations, some highlighting successes and others difficulties. I was asked to speak on the value of seed production, and how it can assist in providing two of the key elements to complex restoration – seed in high volume and seed from a broad range of species. This approach has already been explored by GA in the Avon wheat belt project which David writes on in this edition. This was followed by attendance at the Friends of Grasslands (FOG) forum in Canberra titled Grass half full or grass half empty? Valuing native grassy landscapes. Another gathering of committed people with much knowledge to impart. Among the presenters was our own Graham Fifield from GA Canberra who highlighted several grassland direct seeding projects they've undertaken in the region (further updated in this edition).

Finally and most recently I passed through Victoria on my way to the Australasian Plant Conservation (ANPC) national conference in Hobart. I had been asked by Chris Findlay and Graeme Hoxley of Flora Victoria to be one of the presenters at their Starting from Scratch Industry Forum. Flora Vic have established a fantastic 13 ha grass-focussed SPA on the northern outskirts of Melbourne and can now supply native grasses for that region. What was particularly amazing at this event was not only the extremely impressive grass crops grown by the Flora Vic crew, but the local municipal support shown for direct seeding of native grasses highlighted by Simon Heyes from Brimbank City Council and Martin Roberts from Whittlesea City Council. Each had been instrumental in having their respective councils commit funding to restoring native grasslands and grassy woodlands by direct seeding. This could be a very significant outcome in Victoria as other municipalities begin to recognise their successes.

From this high-point I flew into Hobart and the ANPC conference. What a gathering this was. So many passionate and experienced people. In terms of "grassland-types'' it was a joy to hear Ian Lunt from Charles Sturt University's keynote address on how conservation science may be very different in 50 years time, as well as John Morgans (La Trobe University) fascinating presentation on how we can use plant demographic studies to develop strategies for reversing declines in once-common grassland species. Another stalwart, Linda Broadhurst (CSIRO) also promoted the use of SPAs in her genetics-focussed presentation. I've been attending restoration conferences for many years and enjoyed them all. But what stood out about the ANPC Tassie conference was a clear shift in the way presenters spoke about the future, and how as a sector we are going to have to in many instances let go of old techniques and even philosophies, and embrace the new to have any hope of addressing the catastrophic loss of habitat across the planet and the additional impacts that climate change will bring. This was brilliantly highlighted by Prof David Bowman from University of Tasmania in his provocative discussion of Conservation in the Anthropocene. The level of discussion among all the delegates generated by these and the other fascinating presentations (far too many to list) was so up lifting. I came away with a sense that our sector is really now prepared to push into new and sometimes uncomfortable territory to try and rectify our impacts on the world. This was encapsulated in no better fashion than by Bob Brown who gave the conference's final (and public) lecture. It was one of the most uplifting and insightful talks I've heard and I felt somewhat privileged to have been there in the audience.

You will have to forgive me for having taken the liberty to use perhaps too many words in my opening of this edition, but I hope what I've reflected on merits the space. There are real changes afoot in our sector influencing how we currently and will in future approach ecological restoration. I'm proud to say I think we who are involved with grassy ecosystems have been among those at the forefront of this change. It has not always been comfortable or well supported, be we have and continue (as shown in the stories we present in this edition) to tread a path worth following. So in conclusion I'd say, keep the faith and let's continue to build our sector. Importantly, don't forget to enjoy the other things in life such as family and friends, and on that point I trust you all have a great Christmas and New Year.

Rod Writes……

Rod White
Grassland Restoration Officer
Greening Australia (Victoria)

Western Water Treatment Plant Grey Box Woodland Restoration Project

Greening Australia was brought on board by the land owners, Western Water back in 2010 to put together a land management plan for the 30 hectare block that lies between two beautiful remnants of Grey Box Woodland, at Mount Cottrell, Pinkerton forest and Bushes paddock. Since then GA has worked with Western Water and the fantastically enthusiastic local friends group headed by Frances Overmars and Daryl Akers to transform this former 'sludge paddock' into what you see today (see image below), with a further 3 hectares seeded in August of this year.

The 2013 seeded area has established well, with a good cover of native grasses across the entire site. Exotic annual grasses are proving to be a management challenge, with a number of techniques being employed to control their numbers including brushcutting prior to seed set as well as treatment with a grass-specific herbicide in certain areas. It is envisaged that this issue of annual grassy weeds will become less of a problem over time, as the perenial native species continue to dominate and utilise a majority of the available resources.

The 2012 seeded are has been cut & baled this year in order to open up the sword once again to provide an opportunity for new germinates to occupy available inter tussock spaces. As well as to further remove nutrients (primarilary nitrogen) from the soil.

Picture Below: 2013 (3 hectare) seeded area

Hoary Sunray Rehabilitation Project

This project funded by Vic Roads to rehabilitate approx 3 hectares of Plains Grassland at Duverney on the Hamilton hwy (5kms west of Cressy), aims to expand the range of the endangered* (*EPBC & FFG Act) Hoary Sunray (*Leucochrysum albicans subsp. albicans var. tricolor*). Preparation of the site involved scraping two areas (approx. 2100m ^{2}) at the site to a depth of approximately 100mm based on soil tests looking at weed profile and nutrient data. A number of non-indigenous trees were also removed from the site as well as significant weed control targeting the Cross-leaf honey-myrtle (*Melaleuca decussata*).

In 2014 the site has established well with good populations of Hoary Sunray at both scrape sites, along with a further 14 native wildflowers and grasses (see species list below). This successful establishment of native species within the scrape site along with the effective control of weeds in the surrounding remnant grassland has resulted in a marked improvement in vegetation quality across the whole 3 hectare roadside area.

Hoary Sunray within scrape site (with pink *Convolvulus spp.* flower)

Genus	Species	Common Name
Acaena	*ovina*	Sheeps Burr
Austrostipa	*Sp 1*	Spear Grass Sp. 1
Austrostipa	*Sp 2*	Spear Grass Sp. 2
Calocephalus	*citreus*	Lemon Beauty Heads
Chrysocephalum	*apiculatum*	Common Everlasting
Convolvulus	*angustissimus*	Bind Weed
Eryngium	*ovinum*	Blue Devil
Goodenia	pinnatifida	Cut-leaf Goodenia
Leucochrysum	***albicans var. tricolour***	**Hoary Sun Ray**
Linum	*marginale*	Native Flax
Maireana	*decalvans*	Common Bluebush
Plantago	*gaudichaudii*	Narrow-leaf Plantain
Rytidosperma	*sp*	Wallaby Grass sp 1
Velleia	paradoxa	Spur Velleia
Wahlenbergia	stricta	Tall Bluebell

October 2013 ***October 2014***

Tiverton Grassy Groundcover Site

Nargundy Pty Ltd engaged the services of Greening Australia in 2013 to restore approximately 5 hectares of highly degraded Stony Knoll Shrubland/Plains Grassy Woodland/Plains Grassy wetland mosaic at 'Tiverton' in Dundonnell, western Victoria. This project is to be implemented over five years, with the aim of seeding one hectare/annum. Due to the inherent 'stony' nature of the landscape, site preparation has consisted of a series of herbicide applications over a six month period, along with a biomass reduction burn in Autumn 2014.

The first hectare was seeded in September of this year with a suite of locally collected species (Table 1). Intensive follow up weed control is expected to be necessary over the next 12 months to ensure the successful establishment of the native perenials. The second hectare will be prepared in a similar fashion to the first and seeded in September 2015.

Table 1. Tiverton Species List

Genus	Species	Common Name	Weight (g's)
Austrostipa	*sp*	Spear Grass	10000
Bulbine	*bulbosa*	Bulbine Lily	253
Calocephalus	*citreus*	Lemon Beauty Heads	1400
Chrysocephalum	*apiculatum*	Common Everlasting	1400
Eryngium	*ovinum*	Blue Devil	413
Helichrysum	*rutidolepis*	Pale Everlasting	97
Ptilotis	*macrocarpa*	Feather Heads	560
Rytidosperma	*sp*	Wallaby Grass	20000
Senecio	*quadridentatus*	Large-Headed Groundsel	78
Solenogyne	*dominii*	Solenogyne	3
Themeda	*triandra*	Kangaroo Grass	30000
		Total	**64204 (64kgs)**

Greening Australia's specialised grassland direct seeder in action at Tiverton

Quandong Grassy Groundcover Site

Greening Australia was engaged by Victoria University back in 2012 to establish a research site for a Spiny Rice-flower (*Pimelea spinescens subsp. spinescens*) trial out at Quandong, North West of Werribee. The project involved the establishment of a forb-only population of native species into a scraped site.

Due to the absence of native grasses in the mix, the site has taken a little longer to establish, but establish it has!

The results have been spectacular, with countless Bulbine Lily's (*Bulbine bulbosa*), Common Everlasting (*Chrysocephalum apiculatum*), Pussy Tails (*Ptilotis spathulatus*) and Blushing Bindweed (*Convolvulus angustissimus*) to name but a few, and now with the addition of Spiny Rice-flowers to the site, it is truly a spectacular scene.

September 2012 – post seeding

September 2014 – 2 years post seeding

Restoration "All Stars" unite to battle African Olive on the Cumberland Plain

Chris Macris
Greening Australia (NSW)

In May of 2014 a very exciting partnership in the Sydney region commenced between Greening Australia, The National Botanic Garden, Mount Annan and Cumberland Plain Seeds (Tim Berryman).

In many respects this was a local "all stars" gathering of expertise in the areas of: invasive weed management (Peter Cuneo & Jordan Scott), project management (Samantha Craigie), Seed Production Area establishment and maintenance (Paul Gibson-Roy), direct seeding and reconstructed grassland management (Paul Gibson-Roy and Tim Berryman).

The particular target of this project and its steering group was African Olive (*Olea europaea subsp. cuspidata*), a highly invasive woody weed of Sydney's bushland. African Olive is a critical threat to the endangered Cumberland Plain Woodland ecological community of Western Sydney. Of course anyone who has spent time in the field as a bush regenerator or bushcare volunteer battling this beast (likely many painful hours) would be elated to hear about our project funded with a grant from the NSW Environmental Trust.

In essence, this project aims to develop methods that will enable us to successfully replace historic African Olive infestations established in the region with resilient and diverse native landscapes. In order to achieve this, African Olive will be hit on the head where it hurts most. Many consider the stronghold of the population to be present within the confines of The National Botanic Garden, Mount Annan – with a current coverage of approximately 80 hectares.

These resident populations of the woody weed, which in some areas are mature monocultures >15 years old and have been recruiting and expanding north for years. If you wish to know more about the invasive weed ecology of African Olive – there are a plethora of papers available by Australian expert Dr Peter Cuneo.

The Olive replacement project encompasses several key phases:

1. Aggressive mechanical clearing (forest mowing) of 5 hectares of the African Olive infestation within The National Botanic Garden, Mount Annan.
2. The establishment of a Seed Production Area (1500 square metres) growing 7 key grass species of the endangered Cumberland Plain Woodland (from locally sourced seed supplied by Plantbank).
3. The ongoing maintenance of this Seed Production Area and the timely harvest of its seed crops.
4. Direct seeding of the SPA's output into the newly Olive cleared landscapes to establish resilient, reconstructed grasslands.
5. Ongoing monitoring of the restored landscapes to inform future related Olive Removal and CPW Restoration projects within and beyond the Botanic Gardens.

Add to this already relatively complex project two other design briefs:

- The Mount Annan SPA must have high visual amenity: complimenting the newly built, world class Plantbank facility and its surrounding landscape (see the Mt Annan Botanic Garden web site for more information on this wonderful facility).

One view of the Palntbank facility and the stunning wildflower garden established by Mount Annan staff, showcasing the finest the Cumberland Plain has to offer.

- The SPA must also function as an educational model displaying the value of SPA's to the broader community at large (primarily through open access to the public and informative, engaging signage).

Since on ground works commenced in May, the grasses have been established in the SPA and at the time of publication, all four of the mainstay grass species (*Chloris truncata*, *Dichelachne micrantha*, *Microlaena stipoides*, *Poa labillardieri*) are ready for harvest. Following this there will be a maintenance phase. This is all a very quick six month turnaround from planting to prolific seeding!

The *Poa labillardieri* and *Dichelachne micrantha* blocks at the time of planting in May (top) and three months later (bottom)

Dichelachne micrantha **seeding and showcasing its horticultural value as a future centrepiece for native landscaping (October 2014)**

So what factors have contributed to this phenomenal growth of our grasses?

1. The excellent site preparation of the SPA landscape prior to planting by Jordan Scott and Peter Cuneo. This involved chemical application of fusilade (128 g/L FLUAZIFOP-P) and mechanical scalping to a depth of 50 to 150mm (depending on the proximity to services underground).
2. Rabbit proof fencing to protect the four mainstay species.
3. Dense plantings (ranging from 5 to 9 plants per square metre, depending on species).
4. The size of nursery stock selected. Speed cells were supplied by Tim Berryman, and have likely established themselves much more rapidly than what more advanced plants would have (e.g. hikos or tubestock).
5. An integrated irrigation system, utilised on an as needs basis (but sparingly enough to prevent exotics from gaining a competitive advantage).
6. Mulch barriers and soft engineering controls (coir logging) to combat erosion and the movement of weed seed, particularly from the neighbouring nursery up slope.
7. Regular maintenance which involved knapsack application of broad leaf and sedge selective herbicides in a two-stage approach (spraying between and then across rows systematically across the SPA) and hand weeding of exotic grasses when required. Over spraying of selective herbicides was avoided to minimise risk of damage to the plants, particularly during their initial establishment phase.

The photo of the *Dichelachne* speaks a million words and you could definitely say that the initial phases of this project have been an outstanding success! We look forward to reporting back to the readership of this Gazette during the coming months.

African Olive, your days are numbered!

Looking after the Sydney SPA

Kieran Kinney
Greening Australia (NSW)

Welcome to Greening Australia's Sydney Seed Production Area (SPA). Situated between the Nepean River and the historic town of Richmond and located on former agricultural land owned by university of Western Sydney. My name is Kieran Kinney, Project Officer with GA and I am currently working a busy schedule to help build, establish and manage the new SPA facility which will provide seed to restore the threatened Cumberland Plain Grassy Woodlands.

I am working here at our site on the Uni of Western Sydney Richmond campus alongside a dedicated team of scientists, managers, horticulturists, bush regenerators, seed collectors and environment experts. I feel I am very privileged to witness the nascence and growth of an initiative and facility that is likely unique in Australia for the scale of its ambition.

Remarkable for its size and complexity, this SPA is an integral part of the now long running Grassy Ground Cover Restoration Project (GGRP). Like those first developed in Victoria, it is specifically designed to produce native seed (primarily from ground layer species) in quantities that is otherwise completely impossible to collect from wild sources. Fabricated from woven plastic weed matting, wire and steel, lots of sweat, a little blood and a bit of colourful language, the SPA currently covers an area equivalent to 53 tennis courts!

When in full production, we hope there will be Native Seed harvested through much of the year producing multiple kilograms of seed, quantities sufficient to revegetate hectares of degraded land across the vast tracts of Western Sydney and the Cumberland Plain. The SPA will house around 100+ species of herb and grass, some of them extremely rare in the Sydney Basin. A few of the species we grow here are considered very close to extinction on the Cumberland Plain.

The Sorts of Things I Do

My many roles and duties at the SPA range from design, construction and maintenance of the principle infrastructure, to weed control, crop harvesting, irrigation, species identification, propagation, planting, seed processing, wild seed collection, seed purity testing, monitoring of growth, pest control, and reporting! .....I am sure I have forgotten to mention something! Oh of course! Photography and communications!

It is a great pleasure to be involved in so many ways, and to be at the coal face from seed collection in the wild, all the way to final restoration of these threatened landscapes. A typical work day for me usually starts with a whistle stop tour of the site to ensure everything is in good order, looking out for storm damage to the structure or for plants that may need urgent attention. I will look at flower and seed production and make an assessment of general plant health. I may also make notes as to what species are close to harvest. After my quick tour I will usually commence weed control, an epic task covering hectares, and in spring time very urgent as weeds power ahead with the warmth and the spring rains.

After mid morning I may then have a meeting with Paul (Gibbo) to discuss strategy for the coming weeks. Then I may turn my hand to other tasks such as irrigation, or the complex task of construction or perhaps hand harvesting of the precious seed. The beauty of the SPA design is that even if we miss the window for harvesting seed by hand, the plastic fabric lined cells automatically catch the falling seed which is then simply swept or vacuumed. It really is a brilliant system. To finish off the day I fill out paperwork that records the tasks I have completed.

As of writing it is spring and my major concern is keeping on top of weed invasion. Despite the vastness of the weed matting coverage, weeds are a movable feast finding homes in every crevice and dusty hollow. If not rigorously hunted down they would quickly take over the SPA, contaminating the crops and making the facility look like some kind of Roman ruin. The weed control regime is relentless, as soon as I have finished, it is time to start all over again. Not unlike painting the Sydney Harbour Bridge!

Critters

Interestingly the SPA facility has become a haven for a myriad of fauna species, ranging from frogs to Robins, Wrens, Grass Parrots, Nankeen Kestrels, Brown Quail, Forest Skinks, Red Backed Spiders and a plethora of insect species. The Dusky Coral Pea (*Kennedia rubicunda)* vines and *Senecio* shrubs growing in the SPA are a favoured habitat for insectivorous birds. The Kangaroo Grass (*Themeda triandra)* production paddocks are used by the Quails and the Kestrels, the frog and skink species find homes in the extensive folds of plastic fabric. Insects of all descriptions flit about the site. And we could meet our match one day if the raucous local Cockatoos discover the nutritious bulb bearing forbs. I nervously watch as they fly overhead!

General Observations

Anyone who works on the SPA project finds it challenging at times. The unique design and site constraints mean that workers can be subject to extreme heat, and dehydration is an ever present danger. The reflective black fabric acts as a solar

radiation trap and temperatures in the workplace can soar. One of my roles is to ensure those working on the site are well informed and kept safe. During hot weather we take regular breaks to cool off and rehydrate, and regather our faculties.

Strong winds are another feature of the local landscape and make work challenging at times, testing our patience. Occasionally the gales that whip across the western plains of Sydney will tear apart our good work and considerable time is spent repairing storm damage. But when the week is done, and when all the cursing and sweating has occurred, when we can stand back and see the results of these epic battles, we are overwhelmed with pride.

During my time working here I have learnt a great deal about the men and women who have contributed to the GGRP and equally those that have spent their lives working on the land. I have learnt that they carry a vision and they have immense skill, determination, courage and ingenuity. At Richmond SPA I have been able to work alongside such people and I hope, learn from them and inherit these traits. Because one thing is for certain, in industries like this you need these attributes or you won't survive long under that unforgiving Australian sun. The Big Blue Sky that we work under is beautiful, but it tests your resilience. It helps to carry a healthy sense of humour, to practice camaraderie, and to watch out for each other.

Personally, I think that the GGRP is a perfect collision of Art & Science. It is underpinned by rigorous scientific research, careful planning and multi-disciplinary cooperation. But I think that in so many ways it is also a visionary exercise in aesthetics and in Philosophy. The project recognises that Science can bring Beauty into our lives, not just the rather more prosaic 'outcomes' and 'targets' so beloved of bureaucracy.

The restoration of ecosystems on a landscape scale is a difficult, expensive and ambitious exercise. But as a rich and powerful nation we have the resources and the duty to not only to aspire to grand visions, but to act on them. I think the Richmond SPA project is a brilliant showcase of Australian environmental sciences and intellectual achievement. It is also a showcase for Greening Australia and the sheer hard work on the ground by our teams of talented people. The SPA team openly welcomes visitors. We want to show it off, all the challenges and all the successes. I'd like to see our Richmond SPA become a destination of learning in Western Sydney for both community and the sector.

My role at the SPA facility has changed my life for the better. Please come down and visit and also see the restoration sites where this seed was sown. They may well change your life too. Bring on the Harvest!

Grasslands at the State Library of Victoria

John Delpratt, Honorary Fellow, University of Melbourne, Burnley Campus

An extensive native grassy understory, complete with grasses in full flower and many species of colourful wildflowers, has not carpeted the hillside on the corner of Swanston and La Trobe Streets in central Melbourne for very many years; probably not since the 1830s. However, this has been the scene that has greeted city regulars and occasional visitors for most of October and November.

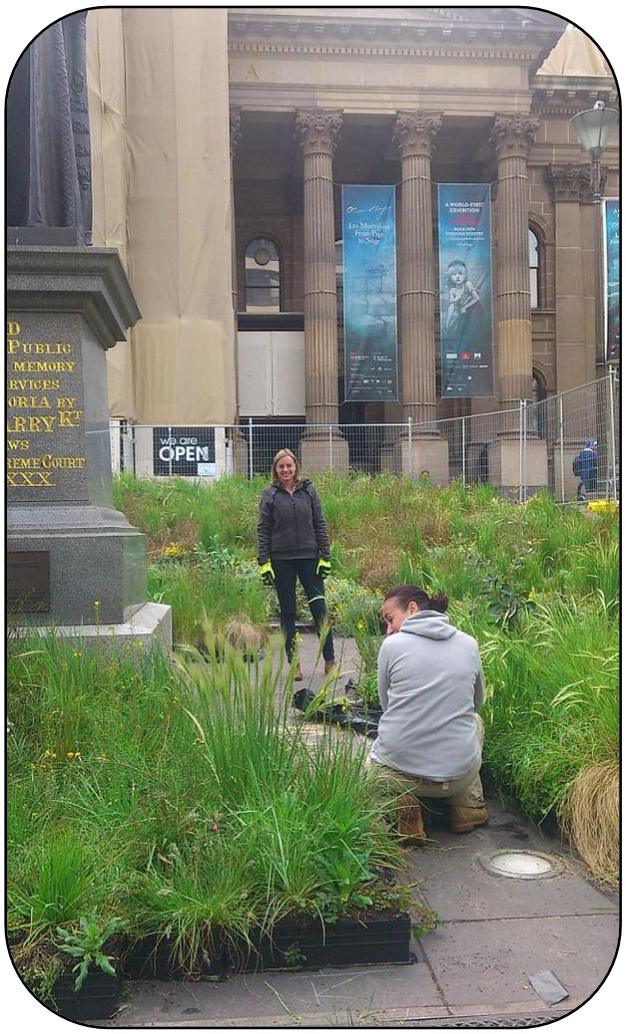
For the past 16 months, I have been privileged to work with artist Linda Tegg (lindategg.com; grasslands.cc) to realise her vision of returning the forecourt and slopes in front of the State Library of Victoria to a vegetation community that represents its condition immediately prior to the arrival of European settlers in the early 1830s.

Linda developed the concept as a State Library visiting fellow on a Georges Mora Foundation Fellowship in 2012. While her careful study of the Library's pictures collection failed to uncover a detailed representation of the hill and its vegetation at, or soon after European settlement, Linda was able to develop a comprehensive species list from historical records and current expert opinion.

I became involved when Linda visited Burnley Campus on a search for advice and guidance on the ecological and horticultural aspects of her vision. Between us, and with the help of colleagues with expertise in green roof design and construction, we launched into growing the 1500 crates of grasses and forbs that would form the basis of *Grasslands*. Crates were sown with specified mixes of native grasses such as Kangaroo Grass

(*Themeda triandra*), Wallaby Grasses (*Rytidosperma* spp.), Plume Grass (*Dichelachne crinita*), Spear Grasses (*Austrostipa* spp.) and Weeping Grass (*Microlaena stipoides*), together with a few robust forbs, such as common everlasting (*Chrysocephalum apiculatum*) and Australian Bluebells (*Wahlenbergia* spp.). Large numbers of forbs were either sown and grown at Burnley for later transplanting or ordered from local indigenous plant nurseries. The first crates were sown in December 2013 and the forbs were introduced from May through to October 2014. Approximately 60 species of native grasses, forbs, shrubs and trees are represented in the *Grasslands* plantings.

Each of the crates included in the installation was selected by Linda and labelled individually for its exact location on the Library forecourt stairs or lawns. The crates were transported to the Library site during the week of 5 October, with a number of very early starts to complete the deliveries while the city was still more-or-less asleep. A dedicated team of Linda's family, friends and colleagues worked for three full days to place each of the crates and other plants in the exact position nominated by the artist. A timelapse of the installation can be viewed at: http://www.theage.com.au/entertainment/art-and-design/grass-from-the-past-in-swanston-street-20141010-1146k4.html.



The State Library recruited and trained 17 volunteers whose task it was to be with the installation on a rotational basis from 10 am to 4 pm each day. They were a wonderful asset for the artwork, responding to, and informally documenting, the high level of interest among the general public in this heavily-used and highly visible space.

Grasslands' appearance changed gradually as the season moved on but it continued to be a vibrant representation of a grassy woodland, with a succession of species reaching full flowering as happens in nature.
The event was not without its challenges. In a stunning display of institutional and corporate insensitivity, a section of the installation was dismantled and placed to one side (including the stacking of some crates) to make way for a large corporate structure. The artist was not consulted, nor were the State Library staff managing the artwork. Little more than 24 hours later the corporation 'folded its tent', leaving many hours of work to recover the situation as best we could. This powerful metaphor for the processes leading to the dramatic decline of native grassy communities was not lost on those involved – at least on the grassland side.

Grasslands continued to be a spectacular, if temporary, contribution to Melbourne's CBD up to its closing on 23 November. The Melbourne City Council has relocated the plants to a suitable, more permanent site in Melbourne's Royal Park. This will be a complex piece of horticulture that could, perhaps, be the basis of another article sometime in the future.

Above: The grassland in production at Burnley Campus, Melbourne September 2014

Left: Final touches – Linda Tegg (standing) casts an artistic eye over the installation

The portable grassland – destination State Library of Victoria

***Grasslands* and its admiring public**
October 2014

Threatening processes – all this for a funds-raising event. Note the re-use of some of the dispersed crates to soften the base of each pillar

Ben and Steve supervise seed delivery as Haydn drives on at the ACT Government's resource management centre

Milestone moments and playing in the mud

Graham Fifield, Nicki Taws, Ben Hanrahan, Stephen Bruce and Haydn Burgess

We've marked it in the diary. 2014 was a milestone year for the Capital Region team based in Canberra. Under the expert tutelage of Rod 'the grasslands guru' White, we sowed our first four hectares using the GGRP seeder. Unfortunately heavy rains in April coincided with Rod's visit to the nation's capital and as the rain poured down around us, we were restricted to tyre kicking, talking seed rates and devising strategy. Even the short drive from the back of the tow truck to the shed doubled the tyre size on the tractor as the mud caked on. It was just too wet to play and we were going to have to wait before we could sow. As we waited and the rain continued to fall, it became apparent we had just missed the first decent autumn break for nearly 10 years.

Of course the sun did come out and before long we were out there mixing seed with sand and unloading the tractor and seeder once again. The first site was at the ACT Government's resource management centre in West Belconnen, Canberra. The aim was to establish a thick sward of native grasses and a few forbs across one hectare of these clay capped mounds to stabilise the soil and keep weeds at bay. Unlike deep-rooted trees and shrubs, herbaceous plants are not likely to fracture the all-important sealing layers. Several species of grass were sown including native Sorghum (*Sorghum leiocladum),* a grass that is now rarely seen across south east NSW. While the brief was largely for grasses, we couldn't resist including a few forbs including the superb colonizers; Mueller's fuzzweed (*Vittadenia muelleri*) and Hoary Sunray (*Leucochrysum albicans*).

Seeding in the rain was sure to end in at least one vehicle stuck in the mud

Our second foray into large-scale grass seeding was at Scottsdale reserve near Bredbo NSW. Owned by Bush Heritage Australia, Scottsdale has some fantastic Yellow Box (*Eucalyptus melliodora*) and Snow Gum (*E. pauciflora*) grassy woodland. Unfortunately much of it has a fantastically modified understorey comprising African Lovegrass, thistles, Aaron's rod (*Verbascum thaspus*) and other weeds. A long history of cropping and pasture improvement has left the soil overly fertile and weedy. Under Nicki's expert eye, local knowledge from reserve manager Peter Saunders and with funding through the Federal Government's Biodiversity Fund, two patches of half a hectare each were identified for nutrient reduction. The first site complements a nice patch of Yellow Box woodland, the other is close to the shed and an easy spot to show the hordes of visitors that pass through the property. The seed mix hit 50 species using seed from our seed production areas bolstered with some fantastic seed harvested from the property by Bush Heritage super volunteer Sue Connelly. A further two hectares prepared for tubestock planting was sown with native grasses.

Nicki and Ben supervising seed flow at the Yellow Box sowing site

Fast forward to early October and there is great germination of grasses and wildflowers, despite missing the autumn break. Species that could be identified include *Bulbine bulbosa, Chrysocephalum apiculatum, Leucochrysum albicans* (flowering), *Linum marginale, Microlaena stipoides, Microseris lanceolata, Plantago varia* (flowering) and *Rytidosperm*a spp. The pattern of germination coincides with the tines from the seeder which create fantastic niches for seed and rain to accumulate. As the first flowers start to emerge, we can't wait to see what this site has in store for us over the coming months and years. We already have plans for more seeding next autumn and if Rod is accompanied by another 150mm of rain, we might book him in as well – after the seed is in the ground this time!

We are thrilled with the seed bed the GGRP seeder creates and these great results from the autumn sowing 6 months ago

Myth of Western Australian Grasslands

David Collins

There is a myth going around that Western Australia had no native grass species of any consequence before settlement. There are however written accounts of grassy open woodland from early botanist's and historians, with the large scale clearing of native vegetation for cropping and introduction of domestic stock and rabbits most of these ecological systems have disappeared.

Many of the smaller ground cover and herbaceous native plants have suffered the same fate, Greening Australia has established a Seed Production Area at Northam in the Avon Valley 100 km East of Perth to propagate many of these species to collect seed or plant material for cuttings so they can be reintroduced to areas with managed grazing of domestic stock and rabbit control has been undertaken.

***Wallaby Grass (Rytidosperma caespitosum)* at SPA Northam**

To date over 30 species have been grown including *Maireana, Atriplex, Ptilotus, Rhagodia* and local grass species. A second SPA has been established at Yarraquire near Beverley where the seed collection methods will be improved and the aim is to re-establish these species on this culturally significant property.

We planted the Kangaroo Grass (*Themeda triandra*) as tube stock most survived the dry summer ok at Orals

SPA *Maireana* species

Euroa

Kate Stothers

We've all seen the aerial photographs depicting agricultural landscapes, with the linear strips of vegetation along roads and creeklines, and, maybe, the odd patch of vegetation scattered throughout. We've learnt about the fragmentation process and resulting isolation effect, both detrimental states of our natural ecosystems. Even more striking, however, in terms of the impact of the loss and current state of our remnant vegetation is when you've been 'up close and personal' with it – that is, collecting seed from individual plants scattered throughout it.

Collecting native seed is a wonderful activity to engage you in the spatial and temporal processes of our native vegetation. You need to know where it is across the landscape, and you also need to be there at the right time to get it. You are often, however, driving for miles to visit individual plants – maybe on repeat rotations (once, to put stockings over the plants after flowering and, second – or third – to collect the deposited seed), or arriving to find that insects, or rabbits or hares or wallabies or kangaroos were there first, or seed set was simply non-existent that year. Investing so much time and effort that really is a culmination of years of experience and knowledge on plant whereabouts and reproductive nuance, only to look down at the palm of your hand to see the three or four seeds as the resulting product, hits home hard the dire state of our remnant vegetation of the agricultural landscape. If we are to achieve functioning ecosystems with our restoration efforts, these seeds are an invaluable resource. We need to be able to reintroduce the rarer and depleted plants in a more effective way. The Euroa Arboretum is working to make the seed from these plants more readily available and included in environmental restoration activities.

Operating as a volunteer Committee of Management over a 27ha site for the past 20 years, the Euroa Arboretum has had a paid part-time project manager since 1997. Once the VicRoads depot for the Hume Highway by-pass of the Euroa township, the Euroa Arboretum has undergone an extensive restoration program that has included the establishment of wetlands, woodlands and representative floristic communities of the surrounding landscape. It has an indigenous nursery on the site, which grows up to 40,000 plants, and employs a Bush Crew to assist local environmental projects and a Community Education Coordinator to run environmental education activities.

In 2005, the first of what is now four intensive seed production areas was established. At that time, the seed production set-up was a unique and innovative solution to collecting quantities of the rarer and hard-

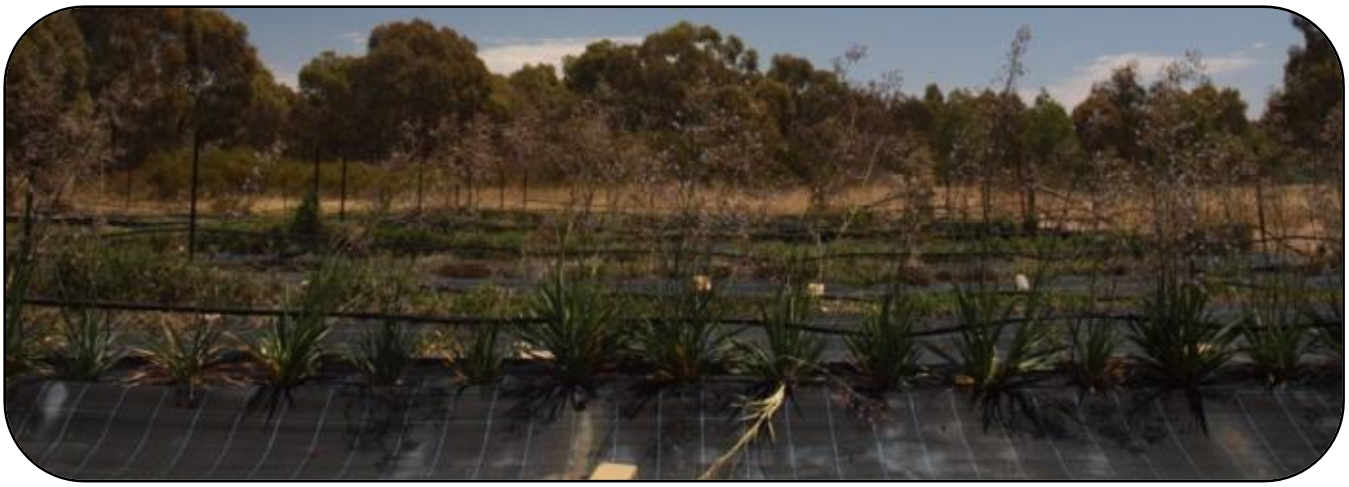
to-collect species in the wild. Whilst still an ongoing adaptive lesson in design, material selection and layout, the success of this venture is undeniable. The quantity of seed coming out the seed production areas vs. seed collected from the wild speak for themselves. (Table 1)

Table 1: *Seed quantities collected from plants in the seed production area and from the wild.*

Species	Kg/g collected in wild	Kg/g collected in the SPA
Glycine tabacina	10 – 15 g/year	4 kg per year
Desmodium varians	10g/year	6 kg per year
Kennedia prostrata	50g/year	1.5kg per year and rising!

With good quantities of seed produced from a range of ground-cover species, it was time to start thinking about how to establish these species back in the wild. Inspired by the work undertaken by Dr Paul Gibson-Roy on grassland establishment in the basalt plains west of Melbourne, the Euroa Arboretum applied for project money to help adapt this process to ground-cover restoration of grassy woodland communities. Three sites were identified as trial restoration areas – the Euroa Arboretum itself, and two private land sites. Thanks to the state government's Communities for Nature program, this money was forthcoming, so work has begun on soil tests, site preparation and seed collection. To supplement the seed grown within the intensive seed production areas and to achieve a higher diversity of plants, some plants will be grown in planter boxes adjacent to the nursery – predominantly daisies that produce fluffy seed and need rapid collection during hot weather.

Over the summer months this year, we intend to be collecting grasses, daisies, lilies and peas on mass – some from the wild, and as much as we can from seed production areas in the Arboretum and grounds. We hope to then be following in Paul's footsteps come autumn 2015 – sowing into sites that have had a scalping treatment – either to remove high nutrients, heavy weed seed load, or to create 'patches' in amongst areas of low diversity but good native grasses.



Another prickly basket

Stuart McCallum

Spiny Rice-flower *(Pimelea spinescens subsp. spinescens*) is listed as Critically Endangered under the EPBC Act. It is also listed under the State FFG Act. This unobtrusive species has punched above its weight in terms of fines levied against those who fail to notice its presence and bury it with road material or drive a grader over it. The Commonwealth Department of the Environment website provides a range of information on its distribution and the threats that it faces.

See: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=21980

Spiny Rice-flower (Pimelea spinescens subsp. spinescens)

My experience with this species relates to its surprising presence on a site under 'preparation' for a housing development, along the Kororoit Creek valley at Burnside Heights, just to the east of Caroline Springs. GA was engaged by the Developers and Victoria University researcher Dr Deborah Reynolds to conduct weed control, mowing and thatch removal at a set of experimental plots. The four treatment areas were; Control, Burn, Weed Mat and Mow.

Dr Reynolds was investigating, using a partially doomed population, how optimal conditions for seeding and subsequent regeneration could be provided. We were to use mowers, brush-cutters and leaf rakes to remove the highly competitive Artichoke Thistle, Wild oat, Kangaroo grass and Serrated Tussock. We were also required to cut the Pimelea down to a low height to encourage "bushing out" and subsequent seed production. The seeds should be provided with suitable open space. In other circumstances, such action would attract a six figure fine! The population had become very etiolated (pale and drawn out due to a lack of light) from smothering by the vigorous grass growth. The difficulty for the on-ground workers was in spraying, mowing or brush-cutting the grasses without taking out the Pimelea at ground level. In some instances, the root system could be over a meter away from where the flowering tips appeared.

The test plots were quite large and VERY ROCKY, so the work required fierce concentration to avoid damage to plants or machinery. Boxthorn and Artichoke thistle provided an extra challenge. While boxthorn is very upfront about its spines, the Artichoke thistle is much more devious, as the slender but tough spines easily penetrate any gloves.

It will be some months until we have some idea of the Pimelea recruitment rates in the different treatment areas.

Mowing of Serrated Tussock by Greening Australia

Thatch raking

Clear ground for Pimelea seeds

Serrated and thistles

Moolapio Grassland

Candice Parker
Moolapio Project Officer
Greening Australia (Victoria)

This year we were able to conduct another ecological burn within the Moolapio grassland. This was carried out in the 2009 sowing zone on an area of approximately 1 hectare. The burn was successful in removing built up biomass along with weeds, particularly the weedy *Convolvulus arvensis* (field bindweed).

Accumulated biomass in the Moolapio Grassland

Ecological burn well underway

A successful burn completed

November 2014, Blue Devil (*Eryngium ovinum*) are thriving in the newly created spaces from the burn

Over-sowing wildflowers into the Moolapio Grasslands

In conjunction with the burning management an attempt was made to reintroduce wildflowers by over-sowing into already established areas. This was undertaken as a replicated research trial and any findings are intended to help us understand what techniques will allow the enhancement of established grasslands – remnant or restored. The broad aim of the study was to reintroduce a complex mix of wildflowers into grassy dominated areas. Here any previously established forbs were only sparsely represented. Two plot areas were set out for over-sowing in each of two zones of the larger Moolapio grassland (the 2008 and the 2009 grassland). This was four in total, with each plot measuring 2 X 10metres ($20m^2$).

Before any treatments were applied a baseline survey was undertaken monitoring natives and exotics within each plot. This focused on species identity and number, and percent coverage, after which weeds were removed by hand.

Following the survey, tussock biomass in each plot was reduced by brush cutting and removal. This action was undertaken to open up the sward to create gaps for the over-sowing of seed. Following this, the soil within the inter-tussock gaps was lightly raked to scarify the soil and create a roughened surface for the seed to lie. Each plot was then sown using hand broadcast with a very heavy rate of wildflower seed/chaff/sand; 11kg per $20m^2$ or $550gm^2$. This rate is more than 100 times higher than the rate used in most GGRP seeding. This very high rate was intended to flood the site with seed, and hopefully ensure that some was able to germinate and establish in the highly competitive zone occupied by adult grasses. In earlier studies using the lower rate of 5g m^2, we had little to no success from over-sowing, primarily we think due to the competition from the established native grasses. To better understand the characteristics of the seed mix and its performance under field and ideal conditions we trayed up samples in the nursery and kept them irrigated and protected from harsh conditions. We also undertook purity testing of the sowing mix to determine what component was chaff and what was pure seed.

Survey plots sown with a wildflower / sand mix

At the time of writing surveys show there has been very minimal germination or establishment of wildflowers – in either the field or nursery. This is very interesting, and suggests that if the seed is failing to respond under the favourable nursery conditions then perhaps there may have been issues with its viability. The seed used in this study had been collected in 2011, and so was three years in age. It is also likely that its storage conditions had not been optimal which together with its age may have impacted on its potential for germination and establishment. In the field survey only one plot has a survey record of a native wildflower (*Eryngium ovatum*) not there prior to the over-sowing. However, as we have seen in some early GGRP sowings, it may take longer time periods for plants to establish. In the meantime the plots will continue to be monitored, and where possible the biomass reduced in order to keep the gaps from closing.

Moolapio Grassland Management

Apart from the ecological burn conducted, a focus for management was to reduce the seed set of Narrow-leaf Clover (*Trifolium angustifolium*) and Fleabane (*Conyza spp*.) which had infested small pockets of the grassland. These were hand weeded, bagged and taken away from site.

A full load of Narrow-leaf Clover (*Trifolium angustifolium*)

Woorndoo Grassland

Elizabeth Fenton

In early November at Woorndoo in South West Victoria we were thrilled to see a new grassland created by the local community under the guidance and encouragement of local grassland guru, David Franklin.

David has worked with Paul on GGRP projects since the early research days and has great skills and a commitment for getting it right. David also has a significant seed production facility at his nearby native plant nursery. The Woorndoo community and David have certainly created an excellent example of what can be done by a community with a passion for their grasslands and attention to detail.

The local Woorndoo Land Protection Group, the Basalt to Bay Landcare Network, the Warrnambool Venturer/Scouts, the Moyne Shire, The Eel Festival committee and others participated in seed collection, site preparation, weed removal and the sowing of the site.

The new grassland is approximately 250 metres long by 40 metres wide along a roadside verge. In days gone by it was a diverse native grassland site but unfortunately like many other roadsides the grasslands were destroyed by someone who did not recognise their value and the area was planted to grain crops. The area adjacent to this restored site still has evidence of the cropping.

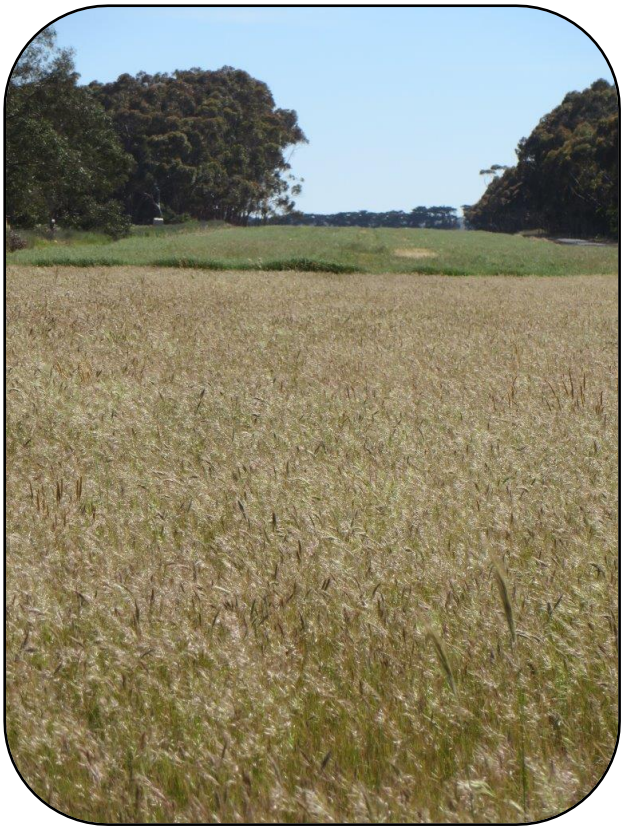
On the day we visited the sun was shining and wallaby grass was shimmering for almost as far as the eye could see. Between the grasses there were many patches of colour from a number of other species including the nationally threatened Hoary Sunray (Leucochrysum albicans) which was blooming and setting seed.

A sea of Wallaby Grass (*Rytidosperma spp*.) with scattered Hoary Sunray (*Leucochrysum albicans var. tricolor*)

Ironically a short while after the work was completed on the new site in late 2013 contractors for a large company destroyed or damaged significant amounts of the remnant flora on a nearby roadside containing one of the very best examples of herb and lily rich grasslands in the region.

Hoary Sunray (*Leucochrysum albicans var. tricolor*)

A stark contrast of native grass in the foreground versus the cropped non-native pasture



David Franklin's Seed Production Area set-up (above and below)

David Franklin's Seed Production Area in full flower

Gippsland's Woodland Revegetation has gone Grassy

Martin Potts
Gippsland Project Manager
Greening Australia (Victoria)

Thanks to the support of the East Gippsland Catchment Management Authority (EGCMA), Greening Australia now has a Grassy groundcover revegetation project as part of its suite of services offered in the restoration of the Gippsland Red Gum Plains.

As part of its recent proposals, Martin Potts, Gippsland Project Manager, included one hectare of grassy groundcover practices into every ten hectares of woodland revegetation projects undertaken on the Red Gum Plains. 'This can be enhancing old revegetation sites with inter row or island type plantings', Martin explains. The Department of Environment and Primary Industries and Parks Victoria have shown strong interest in using this service to enhance some of their flora reserves.

The EGCMA have been fantastic in their support to keep exploring how Gippsland can improve their revegetation techniques in the catchment and this program will see works undertaken over the next five years, ensuring that the grassland component is a new base standard in the Red Gum Plains 'Grassy Woodland' revegetation. Quality over Quantity.

The first trial site occurred when the 12 Grassy Groundcover Restoration Project sites were undertaken across the state. 'We were the unofficial 13th site', explains Martin. Being four years old now, it has been an excellent site to take investors and community, to highlight the success of the project.

The first site has been seeded for this new phase of the Grassy Woodland Project, situated in a very prominent location on the plains that is creating a lot of public interest. New sites for the next two years are already allocated and Martin is looking to further funds to support the return of grasses into older revegetation sites including Trust for Nature covenanted sites.

Site preparation

Grassland expertise of Rod White and David Franklin, with the seeder in the background

Testing germination responses of selected ground layer species prior to their use in restoration

Narmi Kenar
University of Western Sydney (UWS)

This study was undertaken on a range of grasses and forbs to determine germination characteristics under defined test conditions prior to their use in direct seeding (Greening Australia's Cumberland Plain restoration program). The tests were undertaken at the plant growing lab at the Hawkesbury Campus of UWS.

Seeds were supplied as single species and some mixed species lots. Species, including the grasses *Austrostipa ramosissima, Bothriochloa macra, Dichanthium sericeum, Capillipedium parviflorum, Chloris truncata, Eriochloa pseudoacrotricha, Microlaena stipoides* and *Themeda triandra,* and the forbs *Arthropodium milleflorum, Dichopogon fimbriatus (*as a blend*), Tricoryne elatior* and *Wahlenbergia communis* were tested.

From each seed lot four replicates of 25 seeds were sampled and placed in petri dishes with 1% agar gel for germination in a growing cabinet. Temperature was set at 20°/10°C in a diurnal mode with 12 hours dark/12 hours light intervals. The species showed a range of responses under the test conditions. The first seed lot to exhibit germination was the *Arthropodium-Dichopogon* blend where one seed germinated after 24hours and the next on day 7. Signs of broader germination across seed lots started after day 7, with *Chloris n*=10, *Bothriochloa and Dichanthium n=3, Capillipedium n=11* and *Arthropodium-Dichopogon* blend *n=18.*

After day 10 most species exhibited increases in germination. However, while seeds from most species continued to germinate between days 10 and day 25 (the completion of the test) only the *Arthropodium/Dichopogon* blend reached over 50% (Table 1). Four Themeda collections were tested and germination ranged markedly from 5-46%. The two collections of Capillipedium (7 & 12 %) and Poa lab (23 & 28%) exhibited narrower ranges. Six species or collections exhibited below 10% germination at day 25, two (Tricoryne and Wahlenbergia) with nil germination.

These are generally low germination percentages from the species tested. The possible reasons for poor germination may include low seed viability, inappropriate test conditions or seed dormancy. Overall, the cabinet tests indicate relatively low potential to germinate in the field. As a result a series of follow up nursery-based seed tray tests were conducted to examine if these cabinets results were maintained (not reported here).

Species	% Germination Day 25
Arthropodium/Dichopogon	60
Austrostipa	20
Bothriochloa	21
Capillipedium_1	7
Capillipedium_2	12
Chloris	31
Dichanthium	16
Eriochloa	1
Grass Blend	12
Microlaena	7
Poa lab_1	23
Poa lab_2	28
Themeda_1	17
Themeda_2	46
Themeda_3	5
Themeda_4	8
Tricoryne	0
Wahlenbergia	0

Narmi Kenar's Honors Study

Dr Paul Gibson-Roy
Greening Australia (Eastern Region)

Should ecological restoration maintain local genotypes or enhance genetic diversity in a changing world? This is the subject of an honours project recently initiated by Narmi Kenar at the University of Western Sydney. This study is co-supervised by Dr Paul Rymer (UWS), Dr Bob Godfree (CSIRO) and myself (Dr Paul Gibson-Roy). Using Kangaroo Grass (*Themeda triandra*) and Weeping Grass (*Microlaena stipoides*) as his test species Narmi will investigate two complimentary components (1) potential issues with mixing species (chromosomal, population genetic and environmental differences), and (2) testing the consequences of mixing with controlled pollinations(genetic incompatibility, breakdown of local adaptation and/or enhanced resilience to climate change). These issues are of great interest in the field of ecological restoration where large volumes of seed are required to undertake field scale restoration. They are also relevant in light of projected changes to environmental conditions under a rapidly changing climate.

Using a combination of genetic testing Narmi will determine chromosomal differences (ploidy) across the species collection range. See some preliminary results indicating variation in ploidy across soil, altitude and region (Figure 1). A wider study including more populations from a wider range is in progress. Narmi has also set up a common garden experiment to study genetic compatibility or incompatibility. This will focus on plant fitness outcomes of various crosses among populations. He will then examine morphological traits (plant size, leaf, flower traits) and seed production and viability outcomes.

Ecological restoration strives to rebuild ecosystems that are resilient, functional, self-maintaining, and that provide habitat for other species. However, for some time questions relating to Local-is-best have been raised. Narmi's study will help to inform whether or not local genotypes need to be maintained to avoid genetic incompatibility, the dilution of locally adapted genotypes, the displacement of local by superior non-local genotypes or hybridization. In the current setting where complex restoration of grassy ecosystems are now considered technically feasible, studies such as his will be critical to underpin our understanding of these issues.

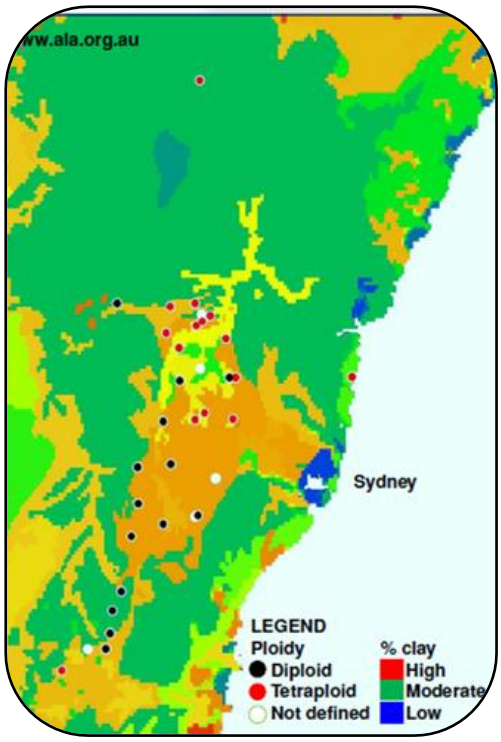


Figure1. Ploidy characteristics of *Themeda* populations across greater Sydney region.

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