



## Paul's Piece

Hi all. This update comes with the GGRP now three months into its third year. How did we get here so quickly? It's a bit scary how time can seem to move so slowly on some levels and yet scream by at others. Oh well, enough philosophizing for the moment, one year to go and still much to be done in terms of preparing for our final sowing latter in the year. However, I want to start by thanking everyone again for their incredible contributions to the project which have that have got us this far. Efforts such as those that went into collecting and processing seed for our large second year sowings, the modifying and successful use of our direct seeder in sowing out all that seed, and of course the ongoing activities required to regroup and get things in order for our final year sowing have been nothing short of amazing.

In regard to where we find ourselves at present, the effects of the drought on our seed collections efforts have been dramatic. It is clear now how much we will rely on seed produced from our seed production areas for the third year sowing. The growers in our SPAs have

*A really nice sward of grass cover establishing and looking great in the foreground at Neville Oddies. Note the dry pasture in the background comprising bent grass and sweet vernal. This is what we have replaced with our sowing.*



*Our scraped treatment at our Bendigo (Ravenswood) site. The grass that germinated following sowing has largely died off and we have been left with a bare surface. Some grass seedlings are still hanging on, but just.*

been able, again, to not only get a large number of species to produce seed, but have managed in most instances to extend the period of seed production right through the spring, summer and into autumn at a time when little has grow or produced seed in the field. I would like to reinforce that this has taken great commitment on the part of our growers to stick at the job. And the effort put into tending these plants and collecting seed day in and day out has been amazing. So a HUGE thumbs up to our growers including Julie and Phil at the Geelong Botanic Garden, Rhonda and Steve at Horsham, Liz at Hamilton, David and Ron at Chatsworth and Kerrin at Burnley.

In the months since sowing out the larger second year treatments there has been little useful follow up rain. There have been frustratingly localized falls at or around our sites but no extended periods of rain. This unfortunately has seriously impacted on emergence and establishment at our sites. For instance, I was at our Bendigo site recently and both the surrounding landscape and sadly our 2nd year sowings looked as bare as a concrete driveway. The story was much the same at Beeac in the south, although incredibly just 20

or so kilometers up the road at our Colac site (at Claire and James Dennis's property) things look fantastic with a great cover of grasses interspersed with lots of forbs (including the nationally threatened *Leucochrysum albicans*). There has also been really encouraging establishment at our Chepstowe site (Neville Oddie's) and at the Werribee Zoo site. From our western sites Jess reports that Daryl Barbers site is looking good, and things are hanging in at Laharum, Chatsworth and Hamilton. In general, my hope is that while we have inevitably lost plants that germinated post sowing when there was some rainfall about, the seed that is viable and that remains in the soil at these sites may still yet germinate in the autumn if we get decent rain.



*Some Leucochrysum albicans (and a flat weed) up and in flower at our Colac site. I counted about 30 of these in flower at this site!*

I finish my Grassy Gazette column with thoughts that continue to hope that decent rain is not far off, both for us involved in the GGRP and for all those whose livelihood is dependant on the skies. I'd also like to welcome Nat Cook onboard as our editor. Nat has taken up the challenge of continuing the great work done on our early editions by Bec Passlow. Nat has already done a fine job on the current edition and I'm thrilled she is helping us out. And to finish on a happy note, I'd like to draw everyone's attention the fact that we are now well done the track to initiating a Gippsland GGRP site. Steve Bruce, who is sadly now leaving to take up a position with GA Canberra, has an enthusiastic landholder ready to be involved in reestablishing grassland on their property. Steve and his crew have had a good seed collection season in Gippsland and we have enlisted John Topp, an experienced local grower to propagate plants for a SPA. Great stuff!

Paul

## A quick update from the Gippsland region ...

From October we quickly rushed into a seed collection frenzy. We managed to collect 49 species with good quantities of some forbs despite the dry conditions. We are in the process of propagating plants for the seed production boxes. John Topp from Gippsland Indigenous Plants is undertaking a majority of the propagation and a keen volunteer Robin Philbey is propagating a few species at Forestech (Bairnsdale TAFE).

The seed production area is going to be set up at the GAV office in Maffra. It is planned to begin setup of the production area in March – April. In the meantime we are sourcing wooden pallets and polystyrene boxes.

We have also managed to find a very keen landholder in East Gippsland with a bare paddock that is willing to undertake a 3 hectare restoration of grasses and forbs. Due to the short timeframe of the Gippsland Project it is planned that 1 hectare will be revegetated with a complex mix of forbs and grasses and the other 2 hectares with mixed native grasses, with the possibility of been over sown with forbs at a later date.

Stephen Bruce, Greening Australia (Vic) Maffra



*Stuart Ritchie's property at Goon Nure*



## Using tetrazolium to test seed viability

A number of factors affect the quality of a seed lot: growing conditions, time of harvest, storage conditions, fungal or insect damage. A germination test under controlled conditions gives an estimate of the percentage of the seed lot capable of germinating immediately. However 'immediately' can mean anything from a couple of days to a couple of weeks depending on the species, and sometimes you need to decide sowing rate more quickly than that. There may also be an issue with seed dormancy, and a germination test may not give an accurate reflection of the total percentage of live seed in the seed lot. A viability test can provide an estimate in a couple of days if you have the right equipment and know what you're looking for.



*Austrodothionia caespitosa stains readily without cutting*

*Bothriochloa macra stains well after cutting*



*Austrostipa elegantissima was slow to stain and difficult to work with*

The most common test for seed viability uses the fact that living tissue respire, producing oxygen. When a seed is soaked in a (colourless) tetrazolium solution (TZ), the TZ is reduced to (red) formazan by the oxygen, staining all live tissue red. The pattern of staining can be used to judge whether the seed is viable, for example if the embryonic root stains strongly but the embryonic shoot does not, then the seed could not have produced a healthy seedling.

The procedure is:

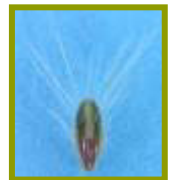
- imbibe a sample of the seed lot in water;
- cut the seeds to expose the embryo (if TZ can pass through tissues surrounding the embryo, cutting is unnecessary);
- soak the prepared seeds in TZ;
- evaluate the staining pattern.



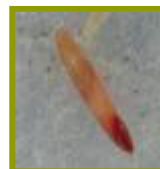
*Chloris truncata had few filled seeds (8%) but most of them were viable (in fact several were germinating after 24 hours imbibition). The upper right seed is dead.*

Cutting and evaluation are done under a dissecting microscope. Imbibition and TZ soaking times are species dependant, and different cutting techniques suit different species. These procedures are well described for domesticated plants but are usually a matter of trial and error for wild species such as those used for the Grassy Groundcover Research Project.

*Dichanthium sericeum stains readily without cutting*



Grasses have a relatively small embryo, usually restricted to the lower half of the seed, with starchy endosperm (which does not stain in TZ) occupying most of the seed volume. The seeds of many grasses require after-ripening before they will germinate and a viability test provides useful information about the quality of the seed lot in the interim.



*Dichelachne crinita has liquid endosperm contained by a tough seed coat which needs to be pierced with a needle or probe before soaking in TZ*



*Partially stained Themeda triandra seed. Transverse cutting proved the best method of exposing the embryo to TZ*



*Themeda triandra was slow to stain, even at higher temperatures. Cross sections of partially stained Themeda triandra seeds after soaking in TZ for 6 hours at 40°C*

In the second half of 2006, a study was done of nine wild grass species used in the GGRP to develop recommended viability testing protocols for those species. A summary of the recommendations was published in Australasian Plant Conservation Vol 15, No. 3 which had the theme "Grasslands and Grassy Ecosystems".

Marjorie Hall



*Not all staining is good. These Themeda triandra seeds have been infected by fungus*

*(front and cross section view)*

## Seed Production Update From little things big things grow ...

It's been 2 years since commencing our seed orchard in the Geelong Botanic Gardens nursery. No one knew what to expect, only that we would grow, what most of us thought to be bushland weeds (sorry Paul), in foam boxes and collect the seed.

In the first year we sowed seed that was wild collected by Paul and had a good germination of most species. The plants grew well and started to flower late Winter. This was when the real appreciation for the individual plants were realized. Suddenly we had a very pretty scene of yellow *Chrysocephalum*, white *Leucochrysum* and pink Geranium, not to mention the attractive forms of grasses.

Spring seed collection was easy with cool temps and many hands, however Summer collection was another story. Very hot days meant we needed to collect early in the morning. This often involved up to 5 staff members over a 2-3 hr period. Seed ready for collection at the same time would be *Leucochrysum*, *Solenogyne*, *Plantago*, *Wahlenbergia*, *Microseris*, *Convolvulus*, *Ptilotus*, *Vellia*, *Cynoglossum*, *Leptorhynchus*, *Helichrysum*, *Bulbine*, *Brachyscombe* to name a few.

It gave staff the opportunity for a new appreciation of our precious indigenous flora. There was great public interest in the project also, with the grasses being planted out in our 21<sup>st</sup> century garden for public viewing.

It has been interesting to note the longevity of harvesting compared to that of in-situ populations. This we feel is largely due to frequent watering and an absence of grazing animals. The second harvest season was also interesting noticing the varied performance of each species. Some species improved with age while others phased out. One of the highlights for me was to see the plants alive in Spring and Summer with dancing butterflies, showing biodiversity at work..

Overall it's been a great learning experience for all concerned and an important and beneficial partnership between Greening Australia, Melbourne University and Geelong Botanic Gardens. It's also been a good opportunity for a regional botanic gardens to fulfill a scientific role.

Julie Duffield, Geelong Botanic Gardens



*Grassland bed in 21st Century Garden at Geelong Botanic Gardens planted with *Austrostipa*, *Dichelachne*, *Chloris*, *Microlaena*, *Dianella* and *Eryngium**



## Little Rae of sunshine

These following photos were taken in my favorite patch of timber. This site is where we collect a lot of seed for the GGRP and it is also my reference site for the Buloke grassy woodland. The area hasn't been grazed for approx 15 years and was heavily grazed before that. The site is 67 acres and is privately owned. I always dream, and ask if I can own this block but so far unsuccessful.

Rae Talbot, Greening Australia (Vic) Minyip



*Stackhousia monogyne* & *Goodenia pinnatifida*?

*Test your knowledge!*



*How many different species can you identify in this photo? Look closely!*



*What butterfly is this??  
On Brachycome  
basaltica*



*Buloke grassy woodland with Minuria leptophylla in flower it looks like snow in the Wimmera. How beautiful. Isn't this sooooo much prettier than roses?*

## Seed Collection – The call for help was answered....

In this edition of the newsletter I would like to thank everyone who has helped over the season. Yet again many volunteers came forward to lend a hand and become involved personally in the grassy groundcover research project. Even though Paul and I have both developed a keen eye from a moving vehicle for interesting grasslands plants, nothing beats local knowledge and invitations to visit sites on private land.

### Laharum and Moyston

Each year the Wimmera Catchment Management Authority supports a Conservation Volunteers Australia crew to help out with natural resource projects in the Wimmera. So a big thankyou to the WCMA and the 10 person crew of young volunteers from all over North America, Canada and Vietnam. Tired from 10 weeks of solid project work the guys put in a great effort collecting *Stipa mollis* and *Danthonia* seed by hand in the Laharum area and also common everlasting, *Chryscephalum apiculatum* and *Elymus scabrous* for the Moyston site. For a change from seed collecting we set about clearing some rarely used tracks, mostly frequented for seed collection purposes, after a nasty wind storm made these places inaccessible.

Still collecting brush wire grass, *aristida behriana*, windmill grass, *chloris truncata* and yellow rush lily's, *tricornyne eliator*.



### Chatsworth

A big thank you to Karen Wales who manages the watershed program in the Glenelg-Hopkins Catchment. Through her networks we were able to hold two seed collection days around Chatsworth and Woorndoo which were invaluable given that the bandicoot grass harvester didn't even hardly get out of the shed. The grass was too low for mechanical harvesting this year. Thank you to those volunteers.

In addition to this I met up with the youth correctional services team from Portland where we collected a substantial amount of *stipa scabra*, *mollis* and *senecio quadridentata* for the Chatsworth site. The young guys from this team were hard working and a pleasure to work with. Hope to work in with your teams again Jack.

*Elymus scrabrus* was collected with assistance from the Hawkesdale secondary school year 8 class during end of term madness. Getting out and about was a welcome break for them and a great help for me.



### Hamilton

Paul Quigley volunteered his expert skills again over the season assisting Dale Tonkinson who also helped us out

here in Hamilton. Doing it cheap and only promoting the seed collection day here via email networks I was embarrassed to only have one volunteer turn up to my day. Perhaps a lesson for not doing things on Sundays. As it turned out meeting Carolyn Rundell, the brand new landcare co-ordinator, for the Glenelg-Hopkins CMA was invaluable. She ended up taking me on a tour of the local landholders and their farms, visited a few cemeteries and introduced me to their caretakers. We grabbed people wherever we found them as the day went on and a decent amount of seed was gathered in the process.

### Minyip and Longerenong

Fortunately we worked a little bit too hard the previous year for these sites and have enough grass seed left over in storage to complete the sewing for this year. Lucky indeed when I would have to say these were the driest areas for our project except for Paul's poor Bendigo site. However, still collecting Silky Blue grass, *Dichanthium sericeum*, Red-leg grass, *Bothriocloa macra*, *Aristida behriana*, Maireana's and salt bushes (the Chenopodiums).

So now, last but not least I would like to thank friend and volunteer Jenny Murphy who will be joining me in



the shed tomorrow to mulch seed. Not exactly everyone's idea of a good time. What an amazing bunch of people we have working on this project!

Jess Gardner (Greening Australia)





## Hi everyone

This is the first time I have contributed to the Gazette. (I think its called being a bit slack) - let me introduce myself...



My name is Marlene and I'm employed by Stawell Intertwine Services. This is an organisation that provides support and employment for the disabled. It's a great place with a lot of terrific people and many challenges.

Two years ago we thought we would have a go at the Grassy Ground Cover Project. It sounded promising and rewarding. Talk about challenges! Our plot is out at Moyston and after we examined it we found nothing but weeds.

So the clean up began. It was ploughed and poisoned, ploughed again and more poison. We finally got it back to scratch. In the meantime we scoured the surrounding bush area for anything that looked remotely native and the planting began. It was like trying to grow a crop in the Sahara Desert. Waiting, waiting, where's the rain, still waiting and then suddenly there was a green hue covering the plots. Oh no the weeds are back. No they aren't, the plants are growing. Yahoo.



Thanks to Paul we also started setting up the seed orchard which was based at the lawn mowing section of Intertwine. The boys loved it. A great change from mowing lawns.

No doubt everyone is struggling with the drought and the one thing I found amazing is how the plants survive during these harsh times.

It's also exciting when you come across a rare and endangered species. We've stumbled across three varieties - the Trailing Hop Bush, Small Milk Wort and the Hairy Tails. So it does pay to walk around with your nose to the ground occasionally. I know we have all been watching the skies of late.



The silly season is almost over for 06-07 as far as seed collecting goes, but behind the scenes there's plenty to do. We've decided to relocate our seed orchard down to Greenfingers Nursery which is another program that Intertwine has so we have all been busy getting everything set up again. It's going to be a lot of fun working in the nursery.

It's been great to be involved with this project and the knowledge has been astounding. Working with Paul and Jess has been fantastic and the guys have enjoyed it also. They love having a go and it's been a great change for them. It sure beats mowing lawns.

Well I hope I haven't bored you all so till next time, cheers and good luck with it all.

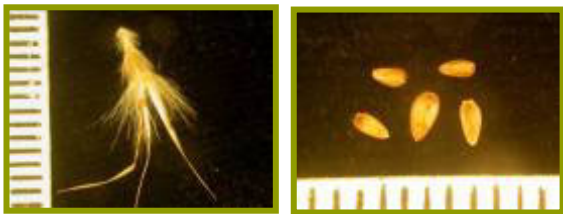
*Marlene and the crew from the Moyston Plot*



PHOTO GALLERY: images by  
Jenny Bear



*Aceana novae-zelandiae*  
*Bidgee-widgee*  
*Individual seed from globular head; note barbed spine*



*Austrodanthonia caespitosa*  
*Common Wallaby Grass;*  
*Fruit and seed or caryopsis*

*Brachyscome chrysoglossa*  
*Yellow-tounge Daisy*  
*Individual seeds;*  
*note irregularly lobed wings*



*Dianella revoluta*  
*Black-anther*  
*Flax-lily*  
*Fruit and seeds*



*Leuchochrysum albicans* ssp. *albicans* var. *tricolor*  
*Hoary Sunray*  
*Seed (Cypsela) topped with bristles*



*Linum marginale*  
*Native Flax*  
*Empty fruit and individual seeds*



*Maireana decalvans*  
*Black cottonbush*  
*Winged fruit and individual seeds*





# WERRIBEE ZOO: Preliminary twelve month findings

## Introduction

The following is a preliminary summary of findings from the first year of sowing at the Werribee Zoo. The data has yet to be statistically analysed, however it gives some idea of the trends we observed at this site. The same types of data have been gathered for each of our 13 sowing sites. I am in the process of collating and comparing information both within and between sites. In general, there are some differences, but many more similarities in terms of treatment outcomes across most sites.

## Background

At each site we tested various soil parameters. The soil at Werribee Zoo was classified as a yellow/brown clay. Interestingly, there were notable differences total nitrogen and phosphorus between the scraped and non-scraped plots (Table 1). The EC reading suggests there is low salinity and the pH is neutral to slightly acidic.

	N [Total Nitrogen] %	P [Phosphorus (Colwell)] COL_P	EC [Elect. Conductivity] dS/m	pH (1:5 Water)
W-ZOO SCRAPE	0.19	49	0.13	6.1
W-ZOO NON-SCRAPE	0.31	77	0.25	5.7

Table 1. Soil characteristics from the Werribee Zoo site. Each reading was taken from 30 pooled soil cores taken at 75 mm depth.

You may remember that at each site we looked at four experimental treatments focusing on weed control and improving seedling establishment. The variables were:

- 1 year weed control
- Soil scrape (100 mm)
- Organic mulch
- Nil organic mulch.

These were combined so that plots were treated with:

- 1 year weed control + much
- 1 year weed control - much
- Soil scrape + mulch
- Soil scrape - mulch.

We were interested in comparing weed emergence between plots that had received weed control over one year or those that had soil removed from the top 100 mm. We also wanted to see if applying an open layer of organic matter (coarse mulch) improved seedling survival compared to those plots that had no addition of organic material.

To sow at any site we collected seed from local remnants or propagated and grew plants from that seed for seed production. The number of species included in seed mixes for any site was determined by how many were locally available in collections. At the zoo site we sowed 28 species onto sixteen 2 m x 2 m plots in the spring of 2004. Following this we took monthly counts of plant numbers until March 2005, and then a twelve month count in Oct 2005. At this time we also surveyed the number of non-sown plants (weeds), estimated % vegetative cover and cut-back and measured plant biomass within plots.

## Outcomes

In terms of investigating the capacity of grassland species to establish in the field from direct sown seed mixtures we found that 21 of the 28 species sown had emerged and were present at the site after twelve months. Most of these species flowered and set seed in this time, and there were many examples of recruitment from sown species observed in the walkways around the plots. Many of species that established are locally rare or threatened (e.g. *Austostipa elegantissima*, *Podolepis jaceoides* and *Pycnosoris chrysanthes*).



Plate 1. An image of the plots at Werribee Zoo twelve months after sowing.

Plate 2. *Podolepis jaceoides* flowering within a scrape –



OM plot



As expected, there was considerable plant mortality following germination/emergence with high numbers of seedlings in the months following sowing (600-800 m<sup>-2</sup>) declining to more sustainable numbers of adult plants in the spring of the following year (50-130 m<sup>-2</sup>) (Figure 2).

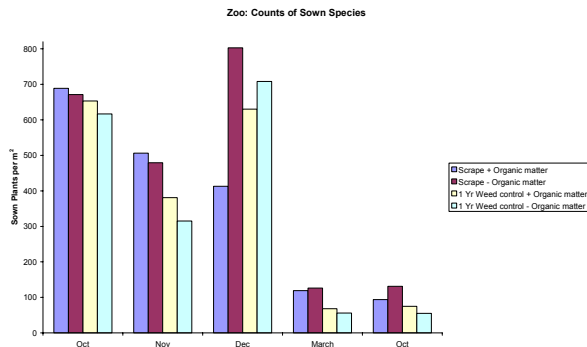


Figure 1. The number of sown plants m<sup>-2</sup> over twelve months.

In terms of the applied treatments it is also worth noting that although the difference in the number of sown plants between scraped and non-scraped plots wasn't large at the twelve month survey, the scraped plots were essentially weed free at this site (Figure 2).

It is also interesting to note that at the twelve month survey, the scraped plots minus organic matter contained higher numbers of plants than the scrape with organic matter, while the opposite applied to the cultivated one year weed prepared plots. At most other sites early counts showed the plots with organic matter had higher seedling counts. However, after twelve months, this evened out to a point where the addition of organic matter looks not to have resulted in higher numbers of established adult plants.

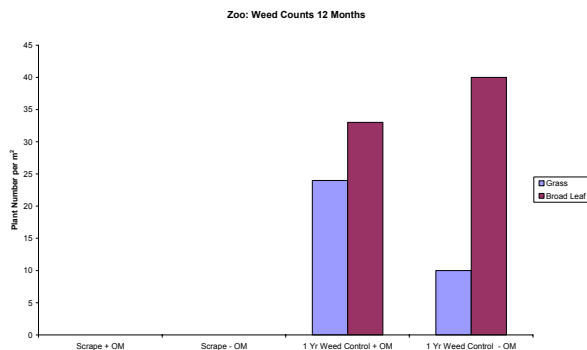


Figure 2. Average number of non-sown individuals (grass and broadleaf weeds) per m<sup>2</sup> within treatment plots at twelve months post sowing.

The observation of no weed species in the scraped plots meant that individuals to have emerged from the sown seed mix did not have to compete for resources with weed species. While a trend towards lower weed numbers in scraped plots was observed at all sites, none

were as dramatic as at the zoo site. This general reduction in weed load on scraped plots is likely to be due in part to the removal of weed seed bank in the scalping process. The surveys of % vegetative cover (figure 3) and plant biomass (figure 4) at the twelve month survey also confirm that the scraped plots at the zoo were free of weed competition.

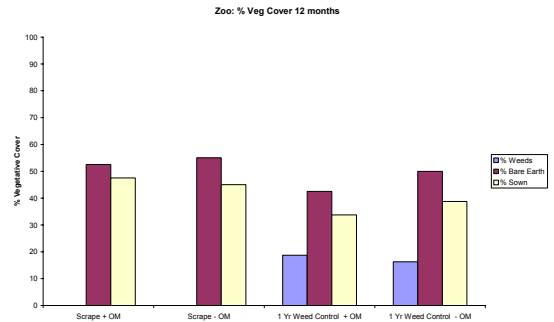


Figure 3. The percentage proportions of weed species, bare earth and sown species within treatment plots at twelve months post sowing.

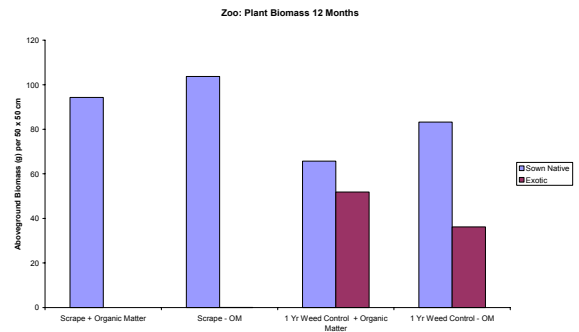


Figure 4. Average above-ground plant biomass within treatments twelve months post sowing.

Those native species that seemed to do best in the cultivated 1 year weed control plots (where weed loads were high) were the grass species, particularly *Austrodanthonia spp.*. The lower growing forbs were much less successful in these plots. In contrast, the tall upright daisy *Senecio quadridentatus* successfully established in these plots above the native and exotic grass swards.





Plate 3. The first two plots are cultivated 1 year weed control plots. Note the dominance of grasses in the first and Senecio quaridentatus in the second.

In summation, the zoo site provided us with very encouraging results. Seed was sown, plants germinated and grew to maturity, and weed loads were lower in particular treatments. However, it must be noted that this was the first of a three year study and so it will be some time before we can really begin to understand what has happened or what is going on. And while the success of the first year sowing at the zoo site is very encouraging it will be with some interest we follow the success or failure of plots at this and our other sites over five and ten year periods.

Paul

## Do they know good rains are coming?



After looking very ordinary in December, with desiccated and insect ravaged leaves, the amazing remnant Red Gums around Chatsworth in SW Victoria have produced a complete new canopy of leaves. Some are over 20m high, 1.8m across their trunk and hundreds of years old. They must have an incredible network of roots to sustain them during such a serious drought and be able to

extract the water required for transpiration (the evaporation of water into the atmosphere from leaves and stems). It has been estimated that transpiration accounts for approximately 10% of all evaporated water. They are slowly dying, and it is a sobering thought to imagine what the landscape will be like in 50 or so years without these icons. We need to plant more scattered groups of trees on farms as well as the usual plantation model. There will be a big gap on the horizon before these trees mature.

David Franklin

P.S. Can you pick the eagles nest in the above photo? They successfully raised a chick last season.

## Want to know more about the GGRP?

### Contact:

Paul Gibson-Roy  
Research Project Leader  
9250 6885  
[roypg@unimelb.edu.au](mailto:roypg@unimelb.edu.au)

Jess Gardner  
Project Ecologist  
5362 2250  
[gardnerj@unimelb.edu.au](mailto:gardnerj@unimelb.edu.au)

## Would you like to subscribe to the Grassy Groundcover Gazette?

### Please email:

Natalie Cook  
[ncook@gavic.org.au](mailto:ncook@gavic.org.au)

## or for more information about Greening Australia:

[www.greeningaustralia.org.au](http://www.greeningaustralia.org.au)



Greening Australia, growing the future together with the University of Melbourne

