fostering research into
the biology and cultivation
of the Australian flora

Research Matters

Newsletter of the Australian Flora Foundation

July 2015

Inside

Presented here is the background and summary of a recent progress report on a project funded by the Australian Flora Foundation. Full reports can be viewed on the Foundation's website http://www.aff.org.au/

Progress report on the grant: Functional response and adaptation capacity of *Triodia* ('spinifex') in Australia's arid zone grasslands

Lisa Xian and Professor Susanne Schmidt, School of Agriculture and Food Sciences, University of Queensland.

Background

Grasslands dominated by endemic genus *Triodia* represent one of Australia's main vegetation types. The ≈70 species of *Triodia* form hummocks, and most species are considered extremophiles that tolerate extreme temperatures, water deficit and oligotrophic soils.

Triodia pungens at Cammooweal in north-western Queensland

It is predicted that Australia's arid zone will experience lower rainfall and higher temperatures, while atmospheric CO2 concentrations are higher than at any time in the past 800,000 years. With higher CO2 levels, some plant species achieve greater water use efficiency (i.e. require less water for growth), but there is no one trend of responses due to interacting factors that include species' traits, water and nutrient availability. *Triodia* has not been studied in this respect, and it is unknown how Australia's arid zone vegetation will respond to changing environmental conditions.

This project aimed to advance understanding of *Triodia* responses to increase the predictive capacity of how these grasslands will fare in the future. We chose controlled-environment and field-based experimentation to study the responses of *Triodia* to water, nutrients and CO2. While controlled-environment cabinets or glasshouses allow controlling water, nutrients and CO2, they do not fully replicate natural conditions due to difference in light intensity, biotic interactions, soil depth, etc. To provide context for controlled-environment experiments, *Triodia* species were also studied in the field along a rainfall gradient in north-west Queensland in dry and wet seasons.

We present results of three representative species, epistomatous (‘hard’) *T. longiceps* and *T. basedowii* (both are widespread) and amphistomatous (‘soft’) *T. pungens* (widespread resinous species that does not have abaxial stomata).

Summary

Climate change is expected to strongly alter arid ecosystems globally. Similarly, a hotter and drier climate together with rising atmospheric CO2 concentrations and interspersed extreme rainfall events poses challenges for Australia’s arid zone flora.

We studied the responses of widely distributed *Triodia* grasses to altered resource supply along a rainfall gradient and in a controlled growth environment.

Triodia species group into ancestral ‘hard’ epistomatous types and more recently evolved ‘soft’ amphistomatous types. Studied in natural habitat in north-west Queensland, both types had similarly high rates of gas exchange and carbon gain in the wet season, and no or negligible net carbon gain in the dry season. In both seasons, the hard species transpired significantly more water from leaves than the soft species, in line with the presence of stomata on both leaf surfaces, but incongruous with the hard species’ dominance in the most arid regions of the continent.

In controlled growth conditions, elevated atmospheric CO2 concentrations improved leaf-level water use efficiency of a soft species. A hard species reduced its growth with higher water availability, while the soft species tolerated a range of water regimes.

Our study provides a first insight into the functional differences of *Triodia* types in context of climate change and suggests different responses of hard and soft types.

Assisted colonisation as a climate change adaptation strategy

Dr Nola Hancock
Dept of Biological Sciences, Macquarie University

Assisted colonisation (also known as assisted migration, managed relocation or benign introduction) is the intentional movement of species beyond their native range, and has been proposed as a climate change adaptation tool for biodiversity conservation. It is generally accepted that unless species can tolerate new climatic conditions in situ, via phenotypic plasticity or evolution, they will need to disperse / migrate or risk becoming locally extinct. Barriers, both natural and fabricated, create problems for those species that need to move to more suitable climes; unless they are moved by us they may perish.

Identifying which species, communities and ecosystems may benefit most from assisted colonisation in the coming decades is a key goal for conservation. Despite this urgency, assisted colonisation is still hotly debated in the literature but the climate is already changing, species are moving and the pressure on at-risk species is increasing. Globally, the practice of assisted colonisation is limited and hence, few examples exist from which to guide practitioners.

To assist biodiversity conservation under climate change, a comprehensive literature review that concentrates on the theoretical aspects of assisted colonisation has been prepared for the NSW Office of the Environment and Heritage. The report details a series of scenarios that may predispose terrestrial species to the need for assisted colonisation in order to reduce extinction risk resulting from anthropogenic climate change, and includes a list of traits commonly associated with at-risk species. These traits may help to provide broad-scale guidance on how to select species to target for assisted colonization.

Six key themes were identified that are associated with successful conservation translocations including recipient site selection and preparation, a clear understanding of species biology and ecology, and taking lessons from invasive species research. The report also includes examples of global policies and guidelines with reference to assisted colonisation as a response to climate change for biological conservation purposes and a compilation of established flora translocations in Australia (not including forestry literature).

The report can be found at:
http://www.climatechange.environment.nsw.gov.au/Adapting-to-climate-change/Adaptation-Research-Hub/Biodiversity-Node
Gallagher, R.V., Hancock, N., Makinson, R.O. & Hogbin, T. (2014). Assisted colonisation as a climate change adaptation tool. Report to the Biodiversity Hub of the NSW Office of Environment & Heritage,

or the abridged version:
Gallagher, R.V., Makinson, R.O., Hogbin, P.M., Hancock, N., 2015, Assisted colonisation as a climate change adaptation tool , Austral Ecology, 40 (1), pp. 12-20

In conjunction with this report, an online survey of participants in flora translocations and/or flora conservation in Australia was conducted. Using the results of our survey, we investigated the gap between theoretical and conceptual ideas about assisted colonization, and gauged preparedness for its implementation.

We found that the majority of respondents think that assisted colonisation is very important because of its ability to preserve species that are predicted to have no other means of avoiding extinction. However, the practice of assisted colonisation is not readily accepted. Increases in and/or restoration of habitat connectivity and the mitigation of proximal threats are preferred over actions that move species beyond their current range.

The survey results can be found at:
Hancock, N., & Gallagher, R. (2014). How ready are we to move species threatened from climate change? Insights into the assisted colonisation debate from Australia. Austral Ecology, 39(7), 830-838.

For further information contact Rachael Gallagher rachael.gallagher@mq.edu.au or Nola Hancock nola.hancock@mq.edu.au

---

Letter from Open Gardens Canberra

Shirley Pipitone
President, Open Gardens Canberra

What does Open Gardens Canberra have to do with the Australian Flora Foundation? First of all, I have been a supporter of the AFF for many years, and secondly Open Gardens Canberra has a subtle sustainability focus. At the very least that means Open Gardens Canberra will promote gardens displaying more of the plants best suited to their environment in garden designs best suited to their environment. Most importantly, Australia needs AFF research to continue to expand our knowledge of Australian flora, whether for garden use, commercial purposes or simply to understand them better.

Open Gardens Canberra will commence opening gardens in the Canberra region to members and the public in August this year. When I first heard that Open Gardens Australia was closing down, I felt a great sense of loss. I had been selecting gardens for OGA for eight years, with a strong focus on native plant gardens. After a short period of grieving, I decided someone had to do something to continue the tradition of open gardens in the Canberra region.

That someone ended up being me. My life and my own garden have been on hold for the past 8 months while I've been working to establish Open Gardens Canberra. The response from people in the Canberra region has been overwhelming and inspiring!

Open Gardens Canberra is now an incorporated association. We have already met my initial goal of opening 10 gardens in the coming season. We have a committee, an email address and we will soon have a website.
Our objects are:

- to open gardens in the Canberra region for viewing by the public;
- to promote the enjoyment, knowledge and benefits of gardens and gardening for all;
- to promote garden design and ecological sustainability;
- to promote understanding of nature and the human relationship with nature;
- to build public support for good design and sustainability in both private and public gardens in the Canberra region; and
- to support charitable organisations.

You will notice that three of our objects refer to sustainability and the related concept of biosensitivity (see http://www.fennerfoundation.org.au/). I don’t consider gardens to be an effective way of conserving Australia’s flora, but they are the only way many people have contact with the natural world. Experiencing nature is known to have significant benefits for human health and wellbeing, yet people in our time are becoming more and more isolated from the natural world. The result of that isolation is evident in climate denial – many people do not realise that we are part of nature and we are responsible for the health and wellbeing of our world as it is now and in the future.

So in a very small way, via Open Gardens Canberra, I am doing my bit for the future of *Homo insapiens*.

I am also planning to hand out AFF flyers at the nine gardens we are opening in 2015. I would like to raise some funds for AFF but that may have to wait until Open Gardens Canberra is more financially secure.

Since the closure of Open Gardens Australia, two other community organisations have also been established to continue opening gardens around Australia: Open Gardens South Australia (http://opengardensa.org.au/) and Open Gardens Victoria (http://www.opengardensvictoria.org.au/).

Keep up the good work and enjoy open gardens whenever you can!

Acacia wardellii: how to propagate

Dr Nita C Lester
Chairman of the Board of Directors Myall Park Botanic Garden and consulting botanist for the Queensland Government and private organisations.

Abstract
Acacia species proved difficult to propagate until methods were developed to allow moisture to permeate the tough outer seed coat. For many of the Acacia species, results had been varied until it was realised that a number of species germinate best from fresh seeds, while others seeds remain viable for over 50 years under correct storage conditions. This research paper details the procedures used to propagate Acacia wardellii. Acacia wardellii has a limited range recorded in western Queensland and has been a target species for a number of revegetation projects. The findings of this research provide successful propagation procedures and may offer procedures for other difficult-to-propagate Acacia species.

Acacia Wardellii
Photo: Nita Lester

Background / Introduction
Acacia wardellii was a target species selected by Origin Energy as part of their off-set programme in the Coal Seam Gas fields of south-western Queensland. In 2012, Myall Park Botanic Garden Ltd [http://myallparkbotanicgarden.com/] was approached to supply 1,000 seedlings with the possibility of a further 1,000. A proposal was submitted along with a budget both of which were accepted in late 2012.

Seed of many species of *Acacia* germinate readily under suitable conditions but others do not respond to the usually accepted *Acacia* seed treatments. Germination rates as low as 15% [Ainsley, P. J., Facelli, J. M. & Pound, L. M., 2015].] have been recorded for a number of species.

Seed of most acacias has a tough outer shell that does not allow water to enter the seed easily. *Acacia* seeds need to be treated before sowing to enable moisture to penetrate this hard seed coat. The frequently-accepted *Acacia* seed treatment approaches can be described as follows. One method is to cover seeds with near-boiling water and soak for up to 24 hours. Seeds which swell are ready for sowing, and the remainder may be re-treated. Another method is to scarify the seed. This can be conducted by rubbing the seeds between two pieces of sandpaper thus thinning the seed coat to allow water to penetrate. A third process is to nick the top of the seed on the opposite end to the seed stalk with a sharp blade or needle without damaging the soft part of the seed.

Acacia seeds with tough outer shells can be stored for over 50 years under appropriate conditions. There have been recorded exceptions such as *Acacia harpophylla* which has a softer coat and does not store successfully.

Field studies of *Acacia wardellii* seed propagating in the wild in the Thomby Range region of Queensland highlighted a number of factors.

1. For many years, no seedlings were recorded even though mature trees produced seeds and those collected appeared plump and intact [no insect infestation]
2. Only after good seasonal winter rains were seedlings recorded. These were often in depressions or where the soil had been disturbed.
3. Seedlings were only recorded within the immediate proximity of live mature seed-producing trees. In areas where mature trees had died in previous years, no seedlings were recorded.

These field observations indicated the following:

1. Specific conditions are required for germination
2. Fresh seed appeared to be best

But would this prove to be the case under nursery conditions?

Method

Data collection

Seed used for the 2013 sowing.

Fresh seed was collected from two locations: Thomby Region [Batch A] and south-east of Condamine [Batch B]. Both sites are in south-west Queensland. As well, three year old stored seed from the Thomby Range [Batch C] and south-east of Condamine [Batch D] were used.

2013 sowing

500 seeds from each batch were selected – only plump intact seeds were used. Seeds were not eliminated because of size. Plump and intact were the only sorting criteria used. Batch A seed consisted of the smallest seeds of all batches.

All four batches were treated as follows:

1. 250 seeds placed in near-boiling temperature water and soaked for 12 hours. Seeds that did not swell after 12 hours were re-treated.

2. 250 seeds were scarified by rubbing between fine sandpaper to thin the seed coat.

All seeds were sown individually into small seed raising pots. This process was selected as previous experience indicated *Acacia wardellii* produces a long tap root within three days of germination. The breaking of this tap root during 'potting out' hinders growth rate of the seedling considerably and often the seedling does not recover when compared with seedlings with intact tap root at 'potting out' stage.

The seed raising medium was 50% commercial seed raising mixture and 50% sand. The position of the largest and smallest seed of each batch was marked. Seed pots were placed in semi-shade and kept moist at all times.

2014 sowing

No fresh seed was collected, hence all seed was 12 months older. Again, only plump intact seeds were used, and all seeds fulfilling these criteria were used.

Soaked seeds were soaked as above but for 48 hours. As germination was low in 2013, this procedure was selected in the hope of increasing germination.

50% of each batch was planted individually as per 2013. The remainder was planted in groups of five per pot. Five was selected as the pots were rather small and there was only space for five seeds to lie separately.

The smallest and largest seeds were planted individually and labelled as before.

Results

Germination records were kept daily to record when the first seedling appeared per batch and when the last seedling appeared. All pots were kept for three weeks after the last seedling appeared to ensure all germinating seeds were recorded.

The outcomes of the different approaches of 2013 and 2014 were also recorded. See tables 1 and 2 below.

Table 1 provides the 2013 germination records.

Table 1
2013 Germination rates

Batch 500 seeds each	Date sown	Germination		Percentage success		TOTAL seedlings
		First seedling	Last seedling	Soaked 250 seeds %	Scarified 250 seeds %	
A	20 January	8th day	21st day	6.8	6.0	32
B	21 January	7th day	23rd day	8.4	8.0	41
C	22 January	4th day	8th day	62.4	63.2	314
D	23 January	4th day	9th day	61.2	62.8	310
All smallest seeds germinated within the range. None of the largest seeds from batch A and B germinated. Batch C and D largest seeds both germinated on the 6th day.						

Batches A and B were fresh seed. When compared with the older seed the following is noted:

1. Fresh seed preformed poorly compared with the older seed.
2. First fresh seedlings appeared on the 7th and 8th days, whereas the older seeds took a shorter period to germination, with the first seedlings appearing on the 4th day.
3. Fresh seed germination was over the period of 14 [Batch A] and 17 days [Batch B] whereas the older seed germination period was 5 [Batch C] and 6 days [Batch D].
4. Minimal difference in germination percentage was recorded between the soaking and the scarifying methods for both fresh and stored seed.

Table 2 provides germination records for 2014.

Table 2
2014 germination rates

Batch 500 seeds each	Date sown	Germination		Percentage success		TOTAL seedlings
		First seedling to appear	Last seedling to appear	Planted individually 250 seeds %	Planted in groups of 5 250 seeds %	
A	10 January	3rd day	8th day	60.4	94.4	387
B	11 January	4th day	9th day	59.2	94.0	383
C	12 January	4th day	9th day	62.8	92.4	388
D	13 January	4th day	8th day	63.2	90.8	385
All smallest seeds germinated within the range. Largest seeds of Batch A, C and D germinated within the range. Largest seed of Batch B did not germinate.						

The seeds of all batches were a year older. The results indicate the following:

1. 12 months of storage markedly improved germination for batches A and B.
2. Planting in groups of five seeds in the same pot increased germination in all batches.
3. Germination period was very similar across all batches.

Analysis

2013

As the Table 1 clearly indicates, the fresh seed germination was very low. 12 months of storage increased germination rate by approximately 77%. The older seeds germinated faster and the percentage was higher. There was no difference between scarifying and soaking pre-sowing treatments.

In many cases, the smaller seed of each batch sowed germinated faster than the largest.

2014

The second 1,000 seedling order was received, providing an opportunity to experiment further. This time the scarifying process was not used as it did take much time to conduct and results were similar to the soaking process. All seeds were soaked for 48 hours.

50% of the seeds was planted individually, while the remainder was planted in groups of five. Making this decision was based on empirical data collected over many years. Observation records showed seedlings were observed in groups, at times with mass seedling numbers, whereas no records were found of individual seed germinations. It could be conjectured that seeds germinate in favourable conditions and thus all seed germinations fall into these conditions. But it is proposed that individual seeds could also fall into favourable locations for germination. Hence it could be that groups of seeds close together encourage germination under favourable conditions.

Conclusion

The findings indicate that *Acacia wardellii* seeds fall within the group of *Acacia*s that germinate best after a period of storage. Both accepted pre-treatments for acacias did allow water to enter the seed coat before sowing. As the scarifying treatment was time and labour intensive, under mass planting regimes soaking appears to be the best option. Further research is currently being conducted with 24 month old seed and a new batch of fresh seed.

Group planting clearly increased germination so it appears this is a procedure to be considered. Bearing in mind that a broken tap root at the 'potting out' stage reduced vitality of *Acacia wardellii* seedlings, the pricking out process must be conducted with care. Additional care such as 'washing' the seedlings apart in preparation for 'potting out' is beneficial. The groups of five sown seeds were removed from the pots and placed in a bowl of water and gently agitated to 'wash' the tangled roots apart. This procedure proved to be quite fast as the sand and potting mixture freely released the roots. Being clean of the potting mixture assisted with the 'potting out' process as a long narrow hole could be prepared in the new pot for the long tap root to be dropped into. Results recorded from this process indicated the seedlings were not adversely impacted, growing quickly into strong plants.

The small seeds from all batches produced an interesting result in both years. All smallest seeds of the batches germinated. These individual seedlings were labelled at all stages of growth and records indicated they grow into strong healthy seedlings. It has often been recorded that small seeds should not be sown if larger ones were available. The findings of this research indicated that plump, intact *Acacia wardellii* seeds, no matter the size, could germinate and grow on to produce strong seedlings. Considering these findings, size may not be an important issue for other *Acacia* species.

For further information I may be contacted at
nita.c.lester@gmail.com

Acknowledgements

Ahmadi, E., Nasr, S. M. & Savadkoohi, S. K. [2013]. Effect of different seed treatments on dormancy breaking and germination in three species in arid and semi-arid lands. *Forest Science and Practice*, Vol 15, Issue 2 pp. 130-136.

Ainsley, P. J., Facelli, J. M. & Pound, L. M. [2015]. Dormancy-breaking and germination requirements for seeds of *Acacia papyrocarpa*, *Acacia oswaldii* and *Senna artemisioides* ssp. × *coriacea*, three Australian arid-zone Fabaceae species *Australian Journal of Botany, Vol.* 62, Number 7, pp. 546 -557.

Lester, N. C. [2008]. *Woodland to Weeds*. Copyright Publisher, Brisbane.

Enhanced online resource gives land managers "heads up" for invasive plants

Weed invasion in Sydney's urban bushland.
Photo: Michelle Leishman

A web resource that screens potential plant invaders under future climates and provides the information to land managers has been expanded to screen nearly 600 exotic plant species.

The website, developed by researchers from Macquarie University and the NSW Office of Environment & Heritage, provides essential resources for land managers involved in conservation and agriculture.

"Invasive plants are a serious threat to Australia's land managers, with millions of dollars spent on their control. However, until now we didn't have much of an idea how climate change may affect these exotic species," said Professor Michelle Leishman, Macquarie University.

"This website provides a window into the future by showing how weed species of today may be affected by climate change, and what climate change may do to create weed species of the future.

"The resources of the website essentially provide a 'heads up' for weed managers for any region of interest in Australia."

The website now includes the worst of the weeds, including the Weeds of National Significance, noxious weeds, and other weeds recognised as significant problems. It then highlights which of these invasive species are likely to have an increase in regional and local areas, including individual Local Government Areas, national parks and conservation reserves.

In Australia, there are more than 30,000 exotic plant species introduced since European settlement. A small number of these have become widespread problem weeds, including well-known species such as bitou bush, blackberry and lantana. Also among these are a huge pool of exotic plants known as 'sleeper weeds' – these are exotic plant species waiting for the right combination of factors to work together to support a successful invasion.

Weed Futures website: weedfutures.net

Principal researchers: Professor Michelle Leishman (Macquarie University), Professor Lesley Hughes (Macquarie University), Dr Paul Downey (University of Canberra).

How old are the Cumberland Plain's trees?

Peter Ridgeway
Senior Biodiversity Officer, Greater Sydney Local Land Services

The Cumberland Plain has some of the oldest and most magnificent trees of any part of NSW. However most of our trees are very young, and old trees are in short supply. As well as supporting arboreal fauna, old trees provide us with a critical terrestrial resource - hollow logs.

Without old trees (and hollow logs) many woodland remnants have little habitat value for the small terrestrial animals which are disappearing from the Cumberland Plain. In the Cumberland Plain, old trees are exceptionally rare. Unpublished local National Parks studies reported that less than 1% of trees in the Cumberland Plain reserve system are over 0.6 metres trunk diameter. This is a severe problem!

Despite this there are a few very large old trees remaining on private land. The biggest of these are:

- The recently discovered 'Mr Fat' at Camden, a 2.6 m diameter natural hybrid of *Eucalyptus saligna x E. botryoides*. (Photo at right)
- The Ebenezer Church Tree, a 1.7 m diameter Forest Red Gum stump.
- Three 1.6 m diameter roadside Forest Red Gums (two on Cobbitty Road and one scheduled for destruction on Northern Road).
- The 1.6 m diameter Grey Box in front of Oakville House.

To date we didn't know how old our trees were. This has been a significant barrier to conserving old trees locally. To fix this problem I recently dated two local 'reference' trees.

How the ages were determined

Local trees grow opportunistically so tree rings are not representative of annual growth. Trees also grow according to local conditions, so growth curves from other regions (or from nurseries) are not accurate.

Thankfully tree girth is generated very regularly over the long term and provides a reliable technique for dating. I generated growth curves for representative trees using a series of three or more confirmed tree girths calculated from dated historic photos. Doing this properly required trigonomic calibration using photo scales - fixed objects of known size & distance (such as old buildings).

The results

The technique was successfully applied locally for two trees. The Ebenezer Church tree (*Eucalyptus tereticornis* 1.7 m dia.) is dated between 380 – 480 years old. The growth curves suggest it was a 1.1 m diameter tree around 1800 – 1810 which is consistent with reports from that date, when church services were held under its shade. It is likely that other Forest Red Gum in the Cumberland Plain region will have grown at broadly similar rates.

Surprisingly the St Pauls Church tree (*Angophora subvelutina* 1.2 m dia.) was dated between 330 – 460 years old - comparable to the 'older-looking' Ebenezer Church tree. The growth curve for

Angophora subvelutina has greater error margins due to lower resolution in the historic photos used.

What you can do

It would be very helpful to also calculate the age of Grey Box *E. moluccana*. To do this I need your help. If you have access to historic photos please look through these for any which may include remnant *E. moluccana* trees which could be dated.

I am also interested in knowing about any other old trees over 1.1 m diameter. Make sure you measure the circumference with a tape at breast height, and take a GPS location and a photo.

You can contact me at ridgewaypeter@gmail.com with any questions or suggestions. Have fun!

Ebenezer tree and church *circa* 1952

New mailing address

The Australian Flora Foundation has recently changed its mailing address to: PO Box 846 Willoughby NSW 2068.

Changes to our Office Bearers and Councillors

Dr Charles Morris is once again our Treasurer. Charles was Treasurer from 1995 to 2001, and has taken over from Dr Jenny Jobling. Jenny has done an exceptional job as Treasurer for eight years. Thank you so very much, Jenny!

Dr Rhonda Daniels, who was appointed to the Council at last year's AGM, has decided to resign because of insufficient available time. We wish Rhonda well in her future endeavours involving native plants.

About us

The Australian Flora Foundation is an Australian not-for-profit charity dedicated to fostering scientific research into Australia's flora. It is totally independent. All members of the Council and the Scientific Committee give their time freely as volunteers.

Each year the Australian Flora Foundation provides funding for a number of grants for research into the biology and cultivation of the Australian flora. While the grants are not usually large, they are often vital in enabling such projects to be undertaken. Many of the researchers are honours or postgraduate students, and their success with an Australian Flora Foundation grant hopefully stimulates their interest in researching Australia's unique and diverse plants throughout their careers.

This work is only made possible by the generous support of donors and benefactors.

The Council (*governing body*)

- Dr Peter Goodwin, President
- Professor Richard Williams, Vice President
- Associate Professor E. Charles Morris, Vice President and Treasurer
- Mr Ian Cox, Secretary
- Dr Tina Bell
- Dr Jenny Jobling
- Professor Michelle Leishman
- Dr Paddy Lightfoot
- Dr David Murray
- Mr Ross Smyth-Kirk

The Scientific Committee

- Professor Richard Williams, University of Queensland - Chair
- Professor Kingsley Dixon, Kings Park & Botanic Gardens, WA
- Associate Professor Betsy Jackes, James Cook University
- Associate Professor Peter McGee, University of Sydney

Email Contacts

Peter Goodwin, President: petergoodwin@internode.on.net
Ian Cox, Editor and Secretary: itcox@bigpond.com

Australian Flora Foundation Inc.
ABN 14 758 725 506
PO Box 846
Willoughby NSW 2068
http://www.aff.org.au/