NEWSLETTER

AUTUMN 2014

NUMBER 79

FRIENDS OF THE WAITE ARBORETUM INC.

www.waite.adelaide.edu.au/arboretum

FORTHCOMING EVENTS

FREE GUIDED ARBORETUM WALKS
The first Sunday of every month at 11.00 am.
Walks meet in front of Urrbrae House

FOUH Annual General Meeting
Mon May 5, 5.30 pm.
Speakers' topic: *Sir Douglas Mawson.*

FWCR Annual General Meeting
Wed May 14, 7.30 pm.
Speaker Mike Moore: *Butterflies of Waite Conservation Reserve*.

Film *Grace of Monaco*
Sunday June 8, 3.00 pm
Capri Cinema

Illustrated talk by C. Buttigieg
Sunday, July 27, 2.00 pm
National Tree Day
The Heritage Trees of Anlaby

Visit to Adelaide Botanic Gardens
Wednesday August 13, 10.30 am
Mallee Walk and Wetlands

Jacob Cordover & Rupert Boyd
Friday November 21, 6.30 pm
Classical guitar concert

More details at:
www.waite.adelaide.edu.au/urrbraehouse/whatson/

FRIENDS OF
WAITE
ARBORETUM

Acer x *freemanii* 'Autumn Fantasy' ™, Photo Jennifer Gardner

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PRESIDENT'S ANNUAL REPORT

It is with much pleasure that I present this 19th Annual Report for The Friends of the Waite Arboretum I would like to start by thanking all of you as members, volunteers and guides for your ongoing support. Your committee has continued to work hard to achieve the aims of fostering interest in and raising funds for the ongoing maintenance and development of our unique Arboretum.

Members are kept up to date with the quarterly newsletters, which cover our activities during the year. I will summarise them briefly. At last year's AGM we heard a fascinating illustrated talk by Dr Katja Hogendoorn; titled "*The buzz about native bees*". In May a concert by *Duo Zoco* featuring our old friend, guitarist Jacob Cordover and Laura Karney playing oboe delighted the capacity room. The annual Treenet Conference took place on the first Friday in September. This year's theme was "*Trees of the Mediterranean*". Apart from the guided Arboretum walks, members were involved in the food and beverage serving and generally assisting with information and the smooth running of the day. In early December we had the annual Combined Friends' Christmas Party. One week later Urrbrae House Garden was the venue for the launch of "*Garden Voices*" by Anne Latreille. This was well attended and the commission on the sales of the new book was donated to the Friends. In the third week of February, together with Basketry SA, we staged the "*Waste not*…." Exhibition in Urrbrae House. This Fringe Festival event was well attended.

Upcoming events include a talk on National Tree Day, here on Sunday, 27th July by Charlie Buttigieg from Victoria, who amongst other positions, has been a Nominator for Significant and Heritage Trees for various state National Trusts. In spring we will visit the Mallee Section of the ABG and possibly the new Wetland. Later in the year another Guitar Concert is planned.

The FWA continue to work cooperatively with the other two volunteer groups, namely FOUH (Friends of Urrbrae House) and FWCR (Friends of the Waite Conservation Reserve), exchanging newsletters, meeting minutes and when feasible jointly involving ourselves in various functions.

The Arboretum continues to thrive under Director Jennifer Gardner's careful management and oversight. Appreciation goes also to groundsperson Andrew Walters who continues to work enthusiastically at the mountain of tasks involved in caring for the Arboretum. New plantings are ongoing each year. Minimal use of chemicals for weed control has been the practice for some time, which means grass mowing has to be timely and careful, especially as native grass species, especially Windmill Grass, are being encouraged to re-establish. A recently purchased, more suitable mower/slasher has helped with this work. The recent appearance of the Elm Beetle has been a challenge with some damage to the leaves occurring. Jennifer has been trialling some control measures, including removal of the thick mulching from around the base of the trees to discourage the build up of larvae. I thank the various volunteers for their assistance in scraping the mulch from under the canopies. Thanks to committee member Ron Allen's guided walks featuring the Rare and Endangered trees in the Arboretum, we have become even more aware of the value of the Arboretum collection. These specimens were sourced prior to the more stringent quarantine regulations in place today and before the species would have been included on the IUCN Red List, which began in 1963.

Partly because of the number of guides required for Treenet, we now have a dozen knowledgeable people able to take visitors on the usual first Sunday in the month or on any especially requested walk. Our overall membership remains reasonably steady at between 120 and 130. New members are acknowledged in the quarterly newsletters. The recent increase in membership dues for this current year, were the first for many years. This was necessary to cover the increased postage and printing costs for the Newsletter and other material, which we have carried for some time. Our redesigned and updated membership form heralded this change and has been well received.

There are, of course, many people to thank for their untiring work and effort in helping to keep our organisation running smoothly. I thank the Committee as a whole and particularly I wish to thank VP Marilyn Gilbertson ably assisted by Past VP Beth Johnstone for following up on and executing many of the jobs, which I have been unable or not present to attend to. Thanks also to Norma Lee our Secretary, to Peter Nicholls who has kindly returned to the demanding job of Treasurer and to Eileen Harvey, Newsletter Editor par excellence who is always grateful to the various contributors. I also wish to thank Brian Richards who has helped so much with the preparation of various flyers. I also express our appreciation to the Mitcham Council for their grant to help publicize the recent Basketry exhibition. The Committee is grateful to Dr Wayne Harvey who joined us early this year. We welcome Wayne's botanical knowledge and his experience in business and administration.

We are grateful to our speaker at the FWA AGM, Professor Hans Griesser, Director of the Mawson Institute at the University of South Australia who presented an update on his ongoing research into the medical application of components of certain *Eremophila* spp, Emu Bush for antibiotic purposes.

Henry Krichauff

IN THE ARBORETUM

FROM THE DIRECTOR

On the night of 3rd/4th February severe storms with wind gusts up to 100 km/h brought down powerlines and trees across Adelaide. A number of trees in the Arboretum were blown over or lost large limbs. It was very sad to see the damage to fine mature trees such as the *Fraxinus pennsylvanica* planted in 1950 and to our significant sugar gums planted by Peter Waite in 1877 at the entrance to Walter Young Avenue. Clean up is still under way and the Northern Turners led by Ron Allen are assisting by removing fallen timber for turning.

Fraxinus pennsylvanica #773 storm damage. Photo Jennifer Gardner

On a happier note, the Palm & Cycad Society held a working bee on 23 February and a number of Mexican cycads donated by members were added to the collection along the watercourse.

Palm and Cycad working bee, planting the new cycads. Photo Jennifer Gardner

Also in February we held our 4th fundraising exhibition in collaboration with Basketry SA. Congratulations to all the artists, organisers and Friends who staffed the very successful exhibition.

A new fence has been erected at the entrance to Walter Young Avenue to prevent vehicles from parking under the sugar gums. Compaction has a major negative impact on the health of trees. People and cars are at risk as the stressed trees are prone to drop limbs. There is now scope to mulch the trees and improve their health.

Our project, led by Andrew Walters, to reduce the weed fuel load and seed bank in the Arboretum and establish Windmill Grass *Chloris truncata* and other native grasses has extended to the Northwest Arboretum where the *Chloris* is already making a comeback. The help of regular volunteers Marilyn Gilbertson, Alan Retallack, Margaret and Ian Oliver is much appreciated.

Also in the Northwest corner, a seat has been donated in memory of Dr Bryan Coombe AM, who was appointed lecturer at the Waite Institute in 1959 and continued until his retirement. Bryan achieved international recognition in his field of viticultural physiology and loved the Arboretum, with a special interest in our flowering pears. Another seat has been donated to the gardens in memory of Jack Jones a frequent visitor to the rose gardens.

On the 15 January 2014 a fire started in inaccessible forest in the southern Flinders Ranges. The Bangor Fire, as it came to be known, burned out of control for 30 days and destroyed in excess of 35,000 hectares with a perimeter of more than 200 kilometres. 90% of the Wirrabara Forest was burnt including the historic Wirrabara nursery, established in 1877. Forestry SA has initiated a collaborative project to re-establish the Wirrabara planting. The Waite Arboretum has provided seeds of Grecian Juniper *Juniperus excelsa* and many other uncommon species to forest ranger Sam Everingham. Horticultural students from Urrbrae TAFE with lecturer John Zwar will also collect and propagate Arboretum material of interest for replanting in Wirrabara Nursery.

Mulch cleared from under elm canopy.

Thanks to successive heat waves this summer, our infestation of Elm Leaf Beetle has been very light. Volunteer Terry Langham and others have diligently worked their way the length of Elm Avenue raking back the mulch from the trunk to remove the litter in which the larvae hide to pupate.

Jennifer Gardner

GUEST SPEAKER

The AGM guest speaker, Professor Hans Griesser, Director of the University of South Australia's Mawson Institute, spoke to the Friends about his work in the field of biomaterials interfaces and in particular about the development of antimicrobial coatings for implants and medical equipment surfaces.

The idea that plants of the *Eremophila* genus may have antibacterial properties occurred to Prof. Griesser when he heard ethnobotanist Dr Susan Semple speak about traditional Aboriginal use of certain *Eremophila* species for skin ointments, throat washes and gargles.

In the 1990s researchers had found many highly unusual chemicals such as diterpenes, cyanogenic glycosides and verbascosides in *Eremophila* but none had been tested for antimicrobial activity. The plants produce more of these chemicals when under stress, possibly as a protection against being eaten.

There are over 200 species and over 80 subspecies of *Eremophila*. The genus, endemic to Australia, is very young in evolutionary terms and is still speciating. Most species are native to the arid areas of Australia and have developed mechanisms to cope with extreme heat, cold desert nights, drought, and fungal attacks when rain occurs. Some species have grey leaves covered with fine hairs which help prevent moisture loss. Others have glossy green leaves with a sticky, waxy coating. This group is resistant to fungal attack and Prof. Griesser and his team investigated the chemicals found in the resin coating the leaves.

There are up to 40 different chemicals in the leaf resin and these were laboriously separated out and tested for their antibacterial activity. The team tested extracts from *E. serrulata* and *E. neglecta* and found that a number of serrulatane compounds showed antimicrobial activity against *Staphylococcus aureus*. One of the compounds also showed antimicrobial activity against other Gram-positive bacteria including *Streptococcus pyogenes*, and *Streptococcus pneumoniae*.

Further testing of other *Eremophila species* with sticky leaves including *E. duttonii, E. drummondii, E. linearis, E. acrida, E. neglecta* and *E. virens* had similarly encouraging results but more work is being

carried out to improve the stability of the active compounds once they are isolated.

Rather than searching for a new antibiotic, Prof. Griesser and his team are developing very thin antimicrobial coatings which may be applied to the surface of devices such as catheters, contact lenses, hip, knee and other implants to prevent the development of biofilms which cause infections that are difficult to treat. Using ionised vapour (plasma) the team can produce a thin film coating which is $^{1}/_{100}$ the thickness of a human hair. The active compound is not designed to be released into the body from the thin film coating but to adhere to it by covalent bonds (which are very strong). The presence of the active chemical prevents the bacteria clumping together and cooperatively producing a biofilm.

There are many more species of *Eremophila* to test, some of which are rare or vulnerable with very restricted distributions. Prof. Griesser suggested that *Eremophila* plantations may be a future rural industry, especially as the plants grow well in poor conditions.

Prof. Griesser concluded by saying that the team had recently received Federal funding to trial the use of thin film coated miniature implants in mice.

There were numerous questions from the audience about the ongoing research, the method used to isolate the chemical compounds and future applications.

On behalf of the Friends, Beth Johnstone thanked Professor Greisser for the illuminating talk about his team's discoveries and ongoing research and presented him with a bottle of wine.

MORE ABOUT EREMOPHILAS

Eremophilas make colourful, drought tolerant garden plants which attract birds, bees and other insects. There are numerous species and cultivars for sale: State Flora at Belair National Park has over 60 different ones listed. You just need a sunny spot and well drained soil.

The Australian Arid Lands Botanic Garden at Pt Augusta has wonderful *Eremophila* plantings and, nearer to home, so does the Adelaide Botanic Garden.

Eileen Harvey

FRIENDS OF THE WAITE ARBORETUM NEWS

Basketry Exhibition opening address.

"WASTE NOT..." BASKETRY EXHIBITION

The Friends of the Waite Arboretum were very pleased to host the exhibition by Basketry SA at Urrbrae House in February. The Fringe Festival event attracted much interest with over 650 visitors attending during the week.

The exhibition was a bold approach to contemporary basketry and demonstrated the transformation of discarded and otherwise wasted materials, natural and manmade into beautiful baskets and works of art. The stunning creations were beautifully displayed in the drawing room of the Urrbrae House which provided a wonderful setting.

The Arboretum has been a source of materials for some of the exhibitors. Three guided walks in the Arboretum focussing on trees which have fibres used in basketry and weaving were held during the exhibition.

Sales of items both from the main exhibition and the trading table yielded a welcome commission to the Friends from Basketry SA.

Many thanks to the volunteers who helped with the event.

The exhibition was opened by Evette Sunset, an Environmental Sculptor. Her interesting address outlined the history of basketry, the craft's collaborative nature and its use of material that would otherwise be discarded. Ms Sunset concluded by saying '*To me these creatively conceived baskets are a special kind of container. A symbol of the gathering and preserving of skills and knowledge in a sustainable form—being revalued and made relevant for the times we live in, so that it can continue to nourish us in body and soul.*'

Marilyn Gilbertson

Photos A, D , E Joe Bennink. Photos B, C Jennifer Gardner.

NEW MEMBERS:

We warmly welcome the following new members:

Amanda Shepherd, Myrtle Bank

Rosemary Phillips, Burnside

Peter Reed & Christine O'Loughlin, Fullarton

Margaret Bungey, Para Hills

Benjamin Mudge, Byron Bay NSW

LETTERS TO THE EDITOR

FWA member and Arboretum guide, Jenny Birvé wrote regarding the *Emex australis* article in newsletter 78:

> There seem to be two offending weeds in SA with similar characteristics. *Emex australis*, which you have written about and Caltrop, *Tribulus terrestris*. My family thinks *T. terrestris* is the main offender in SA. What is the link? Are they related? *T. terrestris* seems to have an Asian / S-European origin? Jenny Birvé

Both weeds occur in the Arboretum. Recently Caltrop has come up thickly in parts of the Arboretum and the SARDI area and groundsperson Andrew Walters has been very busy spraying or digging it out.

Both Emex and Caltrop are declared weeds in SA but neither is listed as a Weed of National Significance. *E. australis* and *T. terrestris* belong to different families (Polygonaceae and Zygophyllaceae respectively) so are not closely related.

Both are introduced species. The original distribution of Caltrop is obscure because it is now so widespread, but was probably native to southern Europe and northern Africa. It is not known when Caltrop first appeared in Australia but it was first recorded in NSW and in SA in the 1890s. It may have come in as a contaminant of seed and there may have been various introductions in different parts of Australia.

Caltrop is widespread throughout mainland Australia. It is densest in areas of habitation and cereal-growing and easily spread along the road network. In South Australia there are widespread broadacre infestations on Eyre peninsula, it is common in most towns in the Northern pastoral district, it is widespread in the northern agricultural districts, Yorke Peninsula and the Murray Mallee, it is common in all towns in the northern part of the South East (but not further south) and it is widespread on the Adelaide Plains.

Caltrop is a prostrate annual herb with stems that spread up to 2 m from a woody taproot. Leaves are 4 to 8 pairs of small, opposite leaflets. The bright yellow flowers are small, have five petals and last one day. The fruit is a woody burr with sharp, rigid spines, which splits into segments when ripe. Each segment has four spines. Caltrop seeds germinate after rainfall in late spring and there are new rounds of germination each time it rains while soil temperatures remain warm. Caltrop grows quickly and develops deep roots in a few weeks. It forms a mat-like cover over large areas.

More than 1000 seeds can be produced by a single plant and seed can remain viable for many years. These seeds are easily spread because the sharp spines become embedded in anything they come in contact with. They can harm the feet of livestock, horses, dogs and humans, they stick in sheep fleece lowering its value and they can contaminate the harvest of cereals and dried fruit.

Caltrop foliage is toxic to livestock, especially sheep. Grazing of Caltrop has been associated with nitrate poisoning, photosensitisation and sheep staggers. In pasture land Caltrop may discourage the growth of other plants through the release of toxic chemicals (allelopathy).

I was not able to find any direct comparison of the costs to primary industry of *Emex australis* and *Tribulus terrestris* in South Australia but Dr Caroline Ireland, Director and Secretary of The Australian Rangeland Society wrote: *"I do hear a lot more about Caltrop (Tribulus) than I do about Emex in my travels around the arid zone – so I think in SA the former may be more costly to agriculture, at least in the arid zone of SA. Emex may be more of a problem back east. "*

References:

http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=3343

http://www.weeds.org.au/noxious.htm

http://nynrm.sa.gov.au/Portals/7/pdf/Fact%20Sheets/caltrop.pdf

http://www.pir.sa.gov.au/_media/pdf/pirsa_internet/biosecurity/nrm_biosecurity/plant_id_notes/plant_id_caltrop.pdf

Eileen Harvey

Please send your questions or comments to eileengarden@y7mail.com

Yellow-Wood, *Flindersia xanthoxyla*

It was such a sad sight to see that one of the Yellow-Woods in the Waite Arboretum had been vandalised. What a mindless act!

Flindersia xanthoxyla Photo Ron Allen

This is one of the lesser known members of 17 species of the genus *Flindersia*, of which there are 14 native to Australia, all from New South Wales and Queensland. Other species are native to New Guinea, Indonesia and New Caledonia. Of the Australian species all are tropical or sub tropical except for two. The better known of these is Leopard Wood (*Flindersia maculata*). This brings to mind an interesting story. Some years ago when planning a visit to the United Kingdom, a friend and fellow member of the International Wood Collectors Society asked if I could supply him with some Leopard Wood. On further discussion it became apparent that he thought that the wood had interesting spotted figure. Not true – the wood is pale and bland, it is the bark which give the tree its name. This is a dry land tree with some beautiful examples to be seen on the Barrier Highway, between Wilcannia and Cobar.

There are five species of *Flindersia* in the Waite Arboretum. The common Crows Ash (*F. australis*), Bennetts Ash (*F. bennettiana*), Bastard Crows Ash (*F. collina*), Leopard Wood (*F. maculata*) and Yellow-Wood (*F. xanthoxyla*).

The generic name *Flindersia* honours Captain Matthew Flinders and *xanthoxyla* comes from the Greek *xanthos* meaning yellow and *xylon* meaning wood, obviously referring to the distinctive yellow wood as per its common name. Other common names are Yellow Jack and Yellow Ash.

Although the tree in the Arboretum is conical in form with branches to the ground, in its natural environment Yellow-Wood is a tall tree attaining a height of more than 40 metres with a cylindrical trunk clear of lower branches and up to 900 mm in diameter. The bark is hard, fine textured and greyish brown. The leaves are up to 300 mm long, having up to 10 pinnate leaflets each up to 120 mm long. These are similar to most species of *Flindersia* and resemble the pinnate leaves of the true Ashes (*Fraxinus* spp.), hence the common name Ash given to many species of *Flindersia*. The flowers are large panicles of small individual yellow flowers.

Compound leaves Photo Ron Allen

F. xanthoxyla green fruit

F. australis green fruit

F. xanthoxyla dry fruit. Photo Ron Allen

F. australis dry fruit

The fruit are typical of most species of *Flindersia*, consisting of usually five boat shaped capsules, the back of which is covered by blunt prickles. They are very similar to those of the Crows Ash (*F. australis*) but are more delicate and papery in texture. The individual capsules all contain two winged seeds up to 50 mm long.

Yellow-Wood is confined to the coastal scrubs of sub tropical Australia from the Richmond River (near Ballina) in New South Wales to Gympie in

Queensland.

As the common name suggests the wood is yellow in colour. The heartwood is pale yellow and the sapwood is up to 20 mm wide and indistinguishable from the heartwood. It has a fine to medium texture and often has interlocking grain. The wood is medium density with an average air dried weight of about 680 Kg per cubic metre (c.f. Jarrah - 830 Kg per cubic metre). The wood is easy to dry with small shrinkage rates. The tree which was cut down in the Waite Arboretum gives good evidence of this. Despite that run of 40 plus degree days in February, the amount of checking on the end grain was minimal – one might have thought that it would have developed wide cracks during that extreme hot and dry period. The wood is relatively easy to work. It turns and carves well and is good for steam bending.

A section of figured grain obtained from a crotch in the tree. Photo Ron Allen

Three of the species of *Flindersia* have been important cabinet making timbers in Australia. The most famous is Queensland Maple (*F. brayleyana*), a very popular furniture timber, especially in the 1960s. Maple Silkwood (*F. pimenteliana*) is very similar to Queensland Maple, often with figurative grain, and also sought after because of the beauty of its timber. Another is Silver Ash (*F. bourjotiana*) which as the name suggests has very white wood, giving an impression of silver.

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Wood in Australia, Keith R. Bootle, McGraw Hill, 2002
Forest Trees of Australia, D. J. Boland and others, CSIRO, 1992

Ron Allen

BANKSIAS ON THE BANK AROUND THE DAM

The banksias on the dam wall flowered very well this summer and autumn and now have interesting dry flower spikes.

LEMON MYRTLE – SENSORY GARDEN

On a warm day in February, with a group leaving the Volunteers Room, we took the south path leading into the Sensory Garden and detected a faint soft lemon/lime fragrance rising from a small tree. Tearing a leaf released the strong, wonderfully uplifting and refreshing smell from the volatile oils. This was a Lemon Myrtle Tree, *Backhousia citriodora*, otherwise familiar to me in its culinary herb forms. Crushed dried leaves sprinkled over chicken, pork, or especially fish dishes, are enhanced with a fresh lemon tang. In many restaurants it is now also a popular flavouring ingredient in pasta meals and in ice-cream or sorbet deserts.

Since the late 1970s there has been an increasing awareness of the possibilities offered by 'bush foods' which were mostly overlooked, or dismissed altogether, by early European settlers. Of course aboriginal people had always known the safe methods to prepare such plant foods which had provided part of their sustenance for millennia. It is relatively recently that research has confirmed the health benefits which can be obtained from these plants. A study of 13 native dried herbs, spices and fresh fruits carried out in 2009 by the Rural Industries Research and Development Corporation, Canberra concluded that "*Native species evaluated in this study exhibited superior antioxidant capacity as compared to the Blueberry Standard, renowned worldwide as the health-promoting fruit*". Amongst the sources for flavourings herbs & spices tested, Tasmannia Pepper Leaf, Anise Myrtle and the Lemon Myrtle ranked particularly highly with their nutritional capacity in the results.

The agent responsible for producing the lemon characters is citral, an aroma compound found in the leaves which are also used in perfumery. Lemon Myrtle produces the highest natural source of citral oil. This compound is present in many other plants, for example Lemongrass (*Cymbopogon citratus*), Lemon-Scented Tea-Tree (*Leptospermum citratum* syn. *L. petersonii*), Lemon Verbena (*Aloysia citrodora*) and Lemon-Scented Gum (*Corymbia citriodora*). Citral oil has other remarkable properties. It acts as a powerful antifungal agent and also has significant antimicrobial activity.

The tree takes an erect, columnar form and grows to 8 metres in the wild; usually less in cultivation. Leaves are a pale-green colour. Small creamy-white flowers are produced in long-stalked clusters at the ends of the branches in summer, but in February the petals had fallen away leaving many bunches of calyx, each individual formed by the five persistent spreading calyx lobes. These have remained as an attractive feature in autumn.

Their natural habitat is sub-tropical Queensland and northern NSW, but they can be grown reasonably well in sheltered spots around the cooler parts of Australia providing they get protection from frost, especially when young and, being a rainforest species, they like soil pH to be at least slightly acidic. Extensive plantations in the hills surrounding Byron Bay and Nimbin on the North Coast of New South Wales are presently harvesting commercial quantities of foliage to be dried and transformed into spice, or steam distilled to produce oil for aroma therapies and soap making.

The tree was first described by Ferdinand von Mueller from specimen collected around the Morton Bay area in 1856. He named it *Backhousia citriodora* in honour of an early Quaker missionary, nurseryman and botanist James Backhouse (1794-1869) an Englishman who travelled around Australia between 1832-8 aiming to reform the administration of aboriginal society and penal settlements. A keen naturalist and botanist, he collected a valuable herbarium which he sent to Kew Gardens.

Graham Bald

Photos Graham Bald

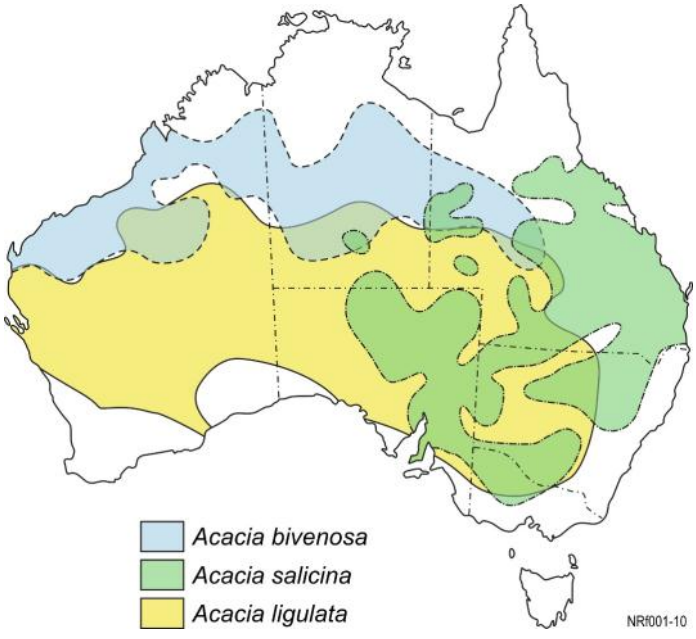
ACACIAS WITH STRANGE PHYTOCHEMISTRY IN THE ARBORETUM

A number of plants have been identified that are able to accumulate metals at levels much above usual concentrations. This phenomenon is known as hyperaccumulation. Metals that may be hyperaccumulated include silver, arsenic, chromium, copper, nickel, zinc and lead.

Metal hyperaccumulators may be useful for bio-geo-prospecting for significant mineralisation that may provide information similar to that obtained from drilling, but at a lesser cost (Reid et al. 2009).

Although a number of species that hyperaccumulate metal and metalloid elements have been identified none has previously been observed that hyperaccumulate non-metals. The *Acacia bivenosa* group appears to be an exception, and may provide the first example of hyperaccumulators of sulphur.

Members of the *Acacia bivenosa* group grow across Australia in different terrains and environments but have similar growth forms. Hybridisation between species is not uncommon. The species are *Acacia ampliceps, A. bivenosa, A. cupularis, A. didyma, A. ligulata, A. rostellifera, A. salicina, A. sclerosperma, A. startii, A. telmica, A. tysonii* and *A. xanthina* (Chapman & Maslin 1998).



Spatial distributions of the most dominant *Acacia bivenosa* group members (adapted from Moore, 2005).

Distributions of three of the species in the group are shown in the figure above. *Acacia bivenosa* (two-nerved wattle) has a widespread distribution across much of northern Australia.

Acacia ligulata (umbrella bush) is very common across Australia. It merges with *A. bivenosa* to the north and *A. cupularis* along the southern coast.

Acacia salicina (cooba) is common across eastern Australia; in particular the Murray-Darling basin where it grows along water courses (creek and river banks, beside dams and ephemeral wetland areas.

Acacia salicina in the Waite Arboretum

A. salicina phyllodes

The Arboretum specimen of *A. ligulata* has died but there are large, healthy specimens of *A. salicina* in the Waite Arboretum alongside Claremont Avenue. Phyllode samples from *A. ligulata* from the Arboretum specimen had concentrations of sulphur and calcium of 1.7 and 4.5% (dry weight basis) respectively. *A. salicina* had similar concentrations.

The primary mechanism for sulphur uptake and assimilation by plants is by the transport of sulphate ions from soil pore water/groundwater across the plant root membranes into the root. The sulphate is then reduced to sulphide for transport to the extremities where it is incorporated into the amino acid cysteine, which is primarily stored in the vacuoles of leaves (Abrol and Ahmad, 2003).

Interest in the possible sulphur accumulation in the Bivenosa group began on two fronts:

1. Bio-geo-prospecting in the Tanami Desert where Reid et al. (2009) observed sulphur content in *A. bivenosa* at about 10 times more than usual in most plants.

2. Monitoring of potential sulphur dioxide pollution from a point source in South Australia.

This study of three species found anomalous sulphur concentrations in only one of the species collected: *A. ligulata* had sulphur concentrations up to 10 fold that of the other two species, *A. aneura* and *Atriplex vesicaria*, (Radcliffe, unpublished).

Subsequent sampling of members of the *A. bivenosa* group from various sites around Australia has resulted in similar sulphur contents. In addition, historical samples (courtesy of the SA Herbarium)

Acacia ligulata
Photo florabank.org.au

A. ligulata phyllode
Photo bie.ala.org.au

collected long before the construction of the potential point source that initiated this aspect of the investigation revealed similar high levels of sulphur in members of the *A. bivenosa* group.

Members of the *Acacia bivenosa* group, consisting of 12 related species, appear to be sulphur hyperaccumulators with sulphur concentrations up to 2 orders of magnitude greater than the concentration of sulphur in the phyllodes (foliage) in other species grown in the same substrate and greater than concentrations in plant species known to produce sulphur rich organic compounds.

Unlike other plant species, the sulphur was not stored as the amino acid, cysteine, nor was it stored as sulphur-rich aromatic compounds, such as that seen in some other species. The sulphur appeared to be stored as sulphate in the veins and vacuoles of the phyllodes which formed gypsum crystals upon drying as observed by scanning electron microscopy (Reid, pers. com).

These species actively take up sulphur, even in sulphur poor soils. A possible reason for the hyperaccumulation of sulphur and storage of sulphate could be for defence against herbivores. Some anecdotal evidence suggests that *A. ligulata* is unpalatable, and that even rabbits will eat it only as a last resort. If confirmed, this could support the defence against herbivory hypothesis.

These observations indicate that when choosing plant species as indicators of pollution, care should be taken to exclude hyperaccumulating plants that may give misleading results. In addition sulphur hyperaccumulators might provide a useful tool in the clean-up of mine or industrial sites contaminated with sulphur.

Acknowledgements

The State Herbarium of South Australia and the late Dr David Symon for providing historical samples from voucher specimens.

Kelly Jo Kovacs and Jim Hondros for coordinating collection of plant material.

Nathan Reid for allowing the use of summarised material from an unpublished manuscript.

Barbara Radcliffe

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FWA COMMITTEE ELECTION

The President announced the following nominations for the new Committee:

Beth Johnstone, Norma Lee, Henry Krichauff, Eileen Harvey, Andrew Walters, Marilyn Gilbertson, Peter Nicholls, Ron Allen, Robert Boardman, Dr Wayne Harvey, Terry Langham and Dr Jennifer Gardner (ex officio). As there were no further nominations those named were elected.

Subsequent to the AGM, the new Committee met to elect the office bearers: Henry Krichauff, (President), Marilyn Gilbertson (Vice-President), Norma Lee (Secretary), Peter Nicholls (Treasurer), Eileen Harvey (Editor) with Beth Johnstone, Andrew Walters, Ron Allen, Robert Boardman, Dr Wayne Harvey, Terry Langham and Dr Jennifer Gardner (ex officio) forming the rest of the Committee.

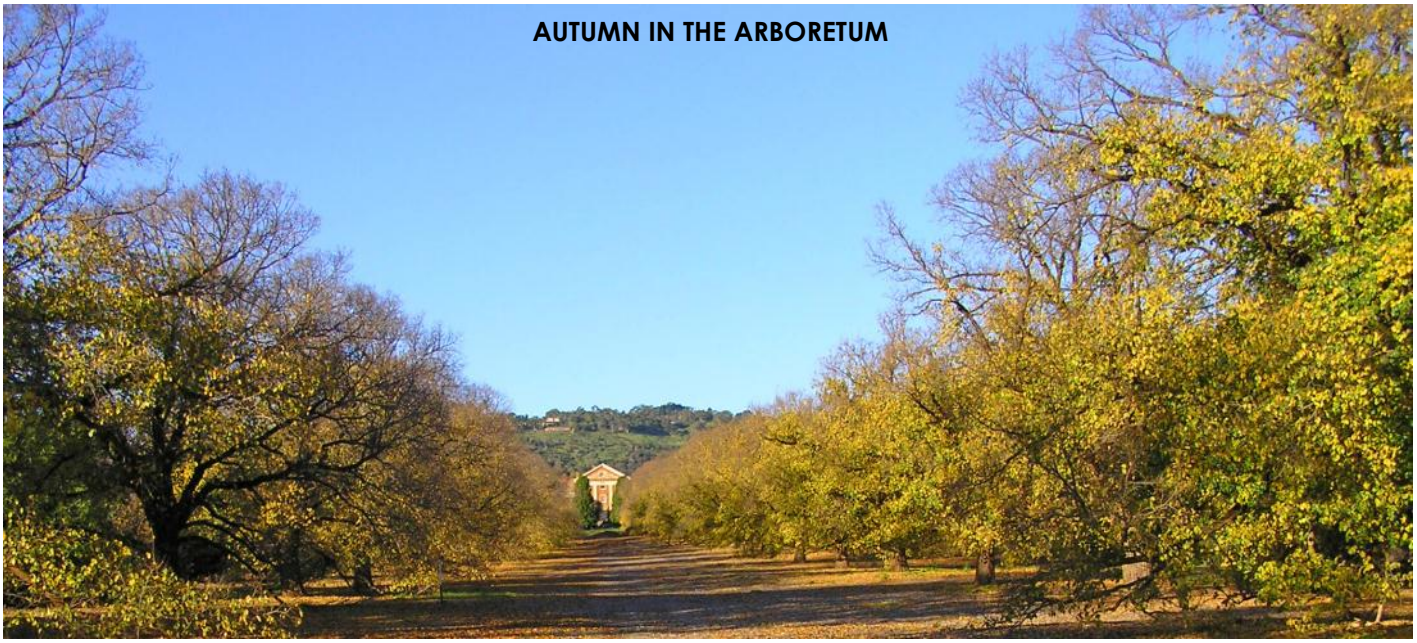
NATIONAL TREE DAY SUNDAY JULY 27

This year the Friends celebrate National Tree Day with a talk by horticulturist Charlie Buttigieg whose topic is: *The Heritage Trees of Anlaby - Listening to the Forgotten Stories from our Past*. Charlie has a deep interest in the social and botanical history of significant trees and what they reveal about our past. Anlaby, a historic pastoral property in the Barossa Valley, has the largest collection of heritage trees in one location in Australia.

FAREWELL TO JOE

On 14 March Joe Bennink, Manager of Community Engagement retired. He has been a very strong supporter of the Arboretum and a valued colleague whose wise counsel and affable personality is greatly missed. We all look forward to seeing Joe at Friends' events and we wish him a fulfilling retirement enjoying all the things he likes to do best.

AUTUMN IN THE ARBORETUM



Pyrus ussuriensis var. *ovoidea,* Manchurian Pear. True *Pyrus ussuriensis* have been propagated from a single tree found in the Mount Lofty Botanic Gardens, SA. The original seeds are of the *ovoidea* variety, collected by Dr David Symon on a trip to Manchuria. Origin China.

The bright orange flowers on *Castanospermum australe*, Black Bean, are followed by large pods with toxic seeds which were eaten by Aboriginal people after careful preparation. The seeds and foliage are poisonous to livestock. Origin NSW, Qld.

Hakea fraseri, Corkwood Oak grows on the dry and steep rocky slopes of river gorges. It is listed as vulnerable because of low population numbers and restricted distribution. Origin NSW, Qld.

Mexican Buckeye, *Ungnadia speciosa,* is a small tree with fragrant bright pink flowers in spring. Fruit is a 3-lobed capsule with poisonous seeds. Autumn foliage is a golden yellow. Origin Mexico.

Lagerstroemia indica, Crape Myrtle is beautiful in all seasons with colourful flowers, mottled bark and pink autumn foliage. Origin China.

In autumn the brightly coloured flower spikes of *Banksia grandis* on the dam wall are followed by attractive dry fruits. Origin Australia.

Pyrus salicifolia, Willow Leaved Pear has attractive flowers and bright autumn leaves. Origin SE Europe W Asia.

Poncirus trifoliata, Trifoliate Orange has deciduous compound leaves and is used as a rootstock for citrus. Origin China.