

# **TREENET**

(TREE & ROADWAY EXPERIMENTAL  
& EDUCATIONAL NETWORK)

## **PROCEEDINGS OF THE INAUGURAL STREET TREE SYMPOSIUM**

7<sup>TH</sup> & 8<sup>TH</sup> SEPTEMBER 2000

CHARLES HAWKER  
CONFERENCE CENTRE

WAITE CAMPUS  
ADELAIDE UNIVERSITY

# **TREENET**

## **TREE & ROADWAY EXPERIMENTAL & EDUCATIONAL NETWORK**

### **MISSION**

To improve the streetscapes of Australia through the successful selection, production, installation and management of street trees in the urban environment.

A collaborative network of individuals, public and private organisations and institutions, TREENET achieves results through promoting and assisting research and education in the many facets of arboriculture.

Participants gain mutual benefit from the results obtained through the integrated pursuit of common objectives.

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This document is the compiled material from the Inaugural TREENET Street Tree Symposium, held at the Charles Hawker Conference Centre at the Waite Campus of Adelaide University on the 7<sup>th</sup> and 8<sup>th</sup> of September.

85 delegates attended the Symposium, representing local councils, nurseries, professional horticultural and arboricultural consultants & educational institutions. The TREENET Street Tree Symposium will be an annual event.

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## **TREENET Information Sheet**

TREENET (Tree and Roadway Experimental and Educational Network), based at the Adelaide University's Waite Arboretum, is a collaborative program providing a resource for the successful selection, production, installation and management of street trees. It is a not-for-profit organisation funded by SA Government, the Nursery Industry and Local Government grants including the Local Government Association Research and Development Scheme, as well as voluntary contributions from participating Councils, nurseries, and other groups. In 2001, TREENET will begin its national program, inviting stakeholders across Australia to participate.

TREENET will coordinate with Councils to establish new street tree trial sites. These sites will trial species of trees which have not previously been represented in the urban streetscape but show promise for meeting the needs of Councils. The trial site program gathers data about tree performance under street conditions and makes this material available to Councils to assist in the selection of species for new plantings. Currently, TREENET has 25 trial sites in regional and metropolitan Councils, with encouraging results. Another 20 are planned for the near future. Through increasing the appropriate selection and maintenance of street trees a longer-lived, healthier and safer street tree population can be achieved.

In order to make available to Councils the new species that are trialed successfully, TREENET coordinates with tree growers through individual nurseries and the Nursery Industry Association of Australia. Tree growers are encouraged to stock new species on the basis of the results of trial sites and through discussion with Councils can increase the availability of these species.

TREENET also involves participants from the fields of arboriculture, landscape design, urban planning, secondary and tertiary educational institutions and individuals with a stake in urban streetscapes and tree related issues. By bringing together a cross-disciplinary network of contacts, TREENET aims to provide the best resource for supporting more effective street tree management across Australia.

The inaugural TREENET Symposium was held in the Charles Hawker conference centre at the Waite Campus of the University of Adelaide on the 7<sup>th</sup> and 8<sup>th</sup> of September. Keynote speakers from professional fields related to street trees presented the latest information on best practice methods of street tree management, education and development. Delegates came from a broad cross-section of South Australian Councils and interstate nurseries, landscape and arboricultural services and educational institutions. The results of a state-wide survey of Local Government street tree practice were presented, to which there had been an exceptional response. Through the survey we aim to gain a clearer understanding of the common issues Local Councils have with street trees, and to provide a focus for further work to overcome these issues. TREENET was launched nationally in Brisbane in October 2000.

Next Symposium: Adelaide University - Waite Campus 6<sup>th</sup> & 7<sup>th</sup> September 2001.

## INTRODUCTORY ADDRESS

**David Lawry** - Chair, TREENET and Director of Lawry's Nurseries

In setting out the vision for TREENET this morning I'd like to draw your attention to two articles in this mornings' *Advertiser*. You couldn't miss the headline Page 1 which reports the tragedy involving a fallen tree on the Onkaparinga Valley Rd near Verdun yesterday. A motorist was crushed to death and the passenger had a narrow escape as a big old pine tree, weakened by poor management and inadequately assessed for hazard fell on her 4WD vehicle as she passed down the road. We all can share the horror of that event in purely human terms but perhaps beyond the common response are reminded of our duty as tree people to understand and manage trees in such a way as to prevent these "Acts of God"!

The second article trumpets the success of the wine industry in achieving record export sales yet again with the flagship Jacobs Creek label leading the industrial pack. South Australia can boast few such success stories and it is interesting to reflect that 20 years ago the wine industry was struggling and old vines were being pulled out all around the state. How did this happen and what does it have to do with the 'accident' on the Verdun Road?

The Winter 2000 edition of "Lumen", the Adelaide University magazine carries 2 articles which hint at the link. There is a brief overview, " TREENET – Everyone's a winner" and a profile on Brian Croser titled "Wine sets the standard in investment stakes". The latter article outlines the role Brian Croser and other graduates from the Adelaide University Waite Campus has in shifting an industry in the doldrums in the 70s to a world leader in the 90s. In the late 60s and early 70s when Croser, Day, Dunsford, Weaver, Gunner, Couche and others were students the emphasis at the Waite was wheat and sheep. There was no Oenology course and Croser undertook a Masters Degree at the University of California. The following years saw him establish similar courses in Australia and as an industry lobbyist assist in obtaining funding for the research needed within Australia. The article emphasises time and again the key role research and education played in the success of the wine industry and the central relationship between industry and the Adelaide University in that journey.

Croser said "The Waite is the best wine facility in the world, bar none, for oenological and viticultural research. If you combine the resources of SARDI, the University, the Australian Wine Research Institute, the CSIRO on that site, it's a magnificent complex".

Well we can say the same as a group whose interests cover all aspects of research and education in street trees. In fact we were in a better position 70 years ago than the wine industry was half a century later. We had Peter Waite bequest of the large area in the west of the campus which in 1928 became the Arboretum. Unfortunately there has not till now been the recognition within the University of the significance of this rare facility even though it is acknowledged throughout Australia and internationally by arborists as an outstanding arboretum with a continuous history of data collection and low impact management which provides an ideal opportunity for useful research. It is also one of the few arboreta in the world attached to a University.

The TREENET vision is based on this unique association, and following the example of the wine industry by emphasising research and education is set to have a significant impact on the way we deal with street trees in the future.

The inaugural meeting of the Urban Tree Cooperative Research Group was held in February 1997 and brought together representatives of State Government as well as the Nursery Industry and education sectors. There were 4 of us present.

The aims were "To improve the streetscapes of South Australia through a coordinated assessment of existing and potential client needs, species, production methods, establishment practices and information sharing."

The Arboretum had a great variety of trees with potential for street planting. TransportSA was happy to encourage research through financial support, and Urrbrae Agricultural High School was keen to involve Year 11 & 12 students in projects of this sort. We identified 3 main areas of activity:

- 1) Street Tree Trials – focussing on selecting trees which minimised problems of roots, leaf drop, line clearance, canopy management and to widen the palette of suitable species available. We intended to set these trials up on campus and figured we needed \$2000 to trial 10 species – We thought we'd find the money from the Catchment Boards, Telstra, Optus and ETSA.
- 2) Production of *Pyrus* 'Lynington' – this was a spectacular selection of *Pyrus calleryana* made by former Arboretum Curator Dr David Symon. The aim was to make the cultivar available to the trade and generate kudos and hopefully income for the Arboretum
- 3) Soil and Water management – the aim was to test new technology in irrigation and to research soil and water properties in relation to dryland and wetland plants.

Future potential projects included:

- Revising ways to harvest storm water in gutters for the benefit of street trees
- Modeling different footpaths and assessing the effect on tree establishment
- Incorporation of green waste into tree planting
- Running a 2 day conference in 1999/2000
- Conveying information on all the projects via the internet.

Although our ideas were fairly ambitious and perhaps a little naïve, enthusiasm was high. We met again a little over a week later, the number of participants had grown to 7 and we adopted the name TREENET – Tree and Roadway Experimental and Educational Network. Since then, we have had over 100 meetings (quite often just 15 minutes long between two participants) and achieved our initial aims of setting up street tree trials, producing *Pyrus* 'Lynington', running a 2 day conference and commencing a website. More importantly we have created an organisation with a management structure which ensures most efficient use of existing resources and has access to a broad base of expertise in all aspects of research and education relating to street trees.

We are extremely fortunate that through the Waite Arboretum TREENET comes under the umbrella of Adelaide University and is endorsed by it. We have avoided a

cumbersome administration structure which would have to confer with a committee before taking any actions or spending any funds. The advantages include:

- Members, sponsors etc. can have confidence in the University's financial system
- The financial infrastructure is already in place
- Automatic auditing
- Tax deductibility for gifts
- The University's purchasing power on all expenditure
- As research income it helps to attract a greater share of Federal funding for the Faculty
- Eliminates the need to set up an independent incorporated body to manage funds.

The vision has now widened to a national stage and we are indeed fortunate to have on our Advisory Board Dr Greg Moore, Principal of Burnley College at Melbourne University and Judith Fakes, Senior Lecturer in Arboriculture at the Ryde College of TAFE, NSW. These appointments to the Board are crucial as I believe the future of research and education lies with tertiary institutions such as these. It is a great pity that there is no arboriculture course offered by the Adelaide University and I believe the new TAFE facilities at the Urrbrae Education Centre across the road offer a great opportunity to significantly improve the standard of arboricultural training in this state. It is to the credit of the South Australian Society of Arboriculture that they have identified the need for industry training and have instituted their own privately provided course. If I can take my TREENET hat off for a moment and offer a private view, I generally regard these "industry courses" as useful but limited in scope and would like to see lecture room based training given a prominent place in any tertiary course. If you don't have this opportunity to expose students to appropriately presented theory and practical as well as the culture that goes with sharing the journey with others under the guidance of highly influential tutors, they will not have an opportunity to assess the wide range of career paths available.

Where will the necessary research be done if we abandoned Universities in favour of private providers? Personally speaking, if the wine industry relied on getting a couple of blokes over from the local liquor store after hours to run a course on "Safe handling of empty bottles" and "How to recognise a bargain red when you see one" we would not have had that report of the success of the SA wine industry in this mornings' *Advertiser*".

The acronym TREENET not only emphasises research and education but is focussed on trees in the roadway. We are not involved in issues related to trees in parks, or the bush, or woodlots and so can address the myriad of issues unique to this very harsh urban environment. We are all allegedly forest dwellers and must have trees close at hand. For most Australians that means we rely on street trees to provide that need. We all are privileged to be part of the network and TREENET looks forward to your continuing involvement and contribution, fulfilling the TREENET vision.

# **TREENET: A MANAGEMENT SYSTEM & CHOICES FOR AUSTRALIA**

Keynote Speaker - **Gregory M Moore**

## **Abstract**

The role of trees in the urban landscape is essential not only to the aesthetics of cities, but also for the well-being of their citizens. Australians tend to take their parks, avenues and boulevards for granted, but in recent years there has been a significant loss of public open space, and a series of dramatic and often unintended attacks on trees growing in urban environments.

The controversies concerning overhead cabling, tree valuation, pay TV cables, inner city redevelopment and codes of practice for line clearing have all demonstrated the vulnerability of urban trees. It is time to affirm the importance of trees in urban landscapes, to recognise them as substantial assets and to adopt a more sophisticated approach to the planning and management issues that confront them.

Native species must be selected, trialed and bred so that we have appropriate specimens for use in the urban context. The performance of exotic trees under Australian conditions and in the various regions of Australia must also be evaluated. All services should be undergrounded as soon as possible, but no later than the year 2010. Proper budgets must be allocated for the professional management of trees growing in urban landscapes.

A proper database and network for sharing information must be established. Those managing trees, especially in urban environments must have quality information upon which to make decisions, and to assist in informing the decision making processes of other professions. Future vegetation management must also take into account the implications of the Kyoto protocols, which once enforced will impact upon the perception of vegetation, and especially long lived woody trees in created landscapes, to the point where the balance of power in decision making processes may be altered.

## **1. Introduction**

Trees make a major contribution to all urban landscapes, including streetscapes, roadsides, parks and gardens, and private dwellings. The significance of trees comes not only from their large size, but also from their long life spans. Their size gives a sense of scale to built structures, the importance of which is magnified by the presence of multi-storeyed dwellings and large numbers of utility poles and signs. The longevity of trees can span decades and even centuries, and they may persist as monuments to human intervention or management of the landscape longer than the labours of any other human endeavour.

In Australia the 'liveability' of the major cities is often associated with the impressive parks, gardens, streets and boulevards, which have largely resulted from the involvement of horticulturists in urban planning over a century ago (Spirn, 1984). These have contributed to the design of many Australian cities, especially those developed in the second half of the 19<sup>th</sup> century, and contributed to a legacy that has been enjoyed by generations since (Moore 1996).

It is disappointing given the history and tradition of Australian horticulture that at the moment there are major threats to the presence of trees throughout the whole of the nation (Table 1). There has been a significant loss of public open space in many States, and in most of our major cities over the past decade. The threats to street trees in both urban and rural areas have been highlighted by the controversies concerning overhead communication cables, line clearing, tree valuation, undergrounding services and inner city urban renewal (Anon, 1996). These threats if not properly addressed will cause a major degradation of the Australian urban landscape, especially in cities, on streets and along roadsides.

A number of issues need urgent consideration. The future role of trees in the urban landscape is being redefined not by horticulturists, but by others who have little interest or expertise in urban planning and vegetation management, but are driven by other imperatives. It is time to address some of these issues before changes are made that degrade the landscape, and which could take decades to remedy. Properly developed and implemented, Treenet could play a significant role in contributing to a new era of decision making, by providing quality information on trees to all involved in urban tree management.

**TABLE 1: THREATS TO AUSTRALIAN VEGETATION**

<ul style="list-style-type: none"> <li>• LOSS OF PUBLIC OPEN SPACE</li> <li>• LOSS OF PRIVATE OPEN SPACE</li> <li>• INNER CITY RE-DEVELOPMENT</li> <li>• OVERHEAD COMMUNICATION CABLES</li> <li>• POWER DISTRIBUTION COMPANY POLICIES</li> <li>• POOR PRACTICES FOR POWER LINE CLEARING</li> <li>• LOSS OF EXPERTISE FROM LOCAL GOVERNMENT</li> <li>• LACK OF DATA ON NATIVE TREE PERFORMANCE IN AUSTRALIAN REGIONS</li> <li>• LACK OF DATA ON EXOTIC TREE PERFORMANCE UNDER AUSTRALIAN CONDITIONS</li> <li>• LACK OF HORTICULTURAL INPUT INTO DECISION MAKING</li> </ul>
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## **2. Choices and Management**

### **2.1 Trees as Community Assets**

Trees are major community assets, which do not come free of cost to society. Considerable sums of public money are invested in their establishment and management, usually through local government or other public utilities (Moore, 1995a). As assets they must be properly valued and managed, which requires an appropriate budget on an annual basis for their management and replacement.

It is all too easy to identify the costs and problems associated with trees growing in urban landscapes, while the benefits and advantages are ignored. The benefits are both many and diverse (Table 2), but they are seldom publicised, and even more rarely properly costed. Even the tangible and economic benefits provided by trees are frequently overlooked, by those who

take a hard line economic approach to other components of the urban landscape

Such an approach requires that proper inventories be kept of all urban vegetation. These must be computer based and provide full and comprehensive information on the specimen, including its identity, location, age, condition and value amongst other important details. The monetary value must be assigned to a tree using an acceptable amenity tree valuation program (Moore, 1995b). This value raises the status of the tree to that of an asset, and allows for the proper recognition of trees in the decision-making processes by those who fail to recognise the inherent value of the tree.

Since trees are major assets that make significant contributions to our landscape they must be properly managed. It is simply a matter of getting priorities right! A good street tree can be worth many thousands of dollars and must not be vandalised. This view is not based on an antipathy to the introduction of new technology, which will certainly be welcomed by the majority of citizens. It simply requires that an appropriate balance is reached, which necessitates that there is sufficient information on tree species and that the information is relevant to the specific situation that the tree is growing within.

## **2.2 Trees: Nothing Else Will Do!**

Vegetation provides a number of benefits within the context of urban and created landscapes (Table 2). The vegetation is not just a 'nice' or 'pleasant' addition to the landscape, but is an essential component that makes the landscape human and tolerable (Moore 1994). Proper attention to vegetation in the landscape provides memorable landscapes and avoids developments where the vegetation component is low on the priority list and results in the failures that are so often seen in malls and city squares.

**TABLE 2: BENEFITS OF TREES IN URBAN AREAS**

- LANDSCAPE VALUES
- RECREATIONAL AND HUMAN HEALTH BENEFITS
- EDUCATION AND INTERPRETATION OPPORTUNITIES
- CONSERVATION VALUES
- CLIMATIC AMELIORATION
- ENVIRONMENTAL VALUES AND AMELIORATION
- ECONOMIC BENEFITS

(After Anon, 1989)

Under each of these headings the nature of the benefits provided can be considerably expanded (Table 3). While some, such as landscape value, conservation and education are difficult to quantify, others such as climatic and environmental amelioration and economic benefits should not be so difficult. Indeed in the case of economic benefits, it is puzzling that the cost of trees are so often costed, publicised and used in decision making while the

benefits are largely either under-estimated, or worse ignored altogether (Moore 1997).

While the value of vegetation and large trees is often recognised by residents, attempts to put real value on them as assets have proved difficult. Concern about the environment has continued to grow and is now part of the political landscape at local, state and national level. Furthermore, international concerns have seen two Earth summits take place the first in Rio De Janeiro, and more recently the Conference in Kyoto, Japan). One of the more tangible outcomes from these summits was the concern about the global effect of greenhouse warming, and the emission of greenhouse gases. Of these gases carbon dioxide is the most significant, and as a consequence the conference at Kyoto adopted a set of protocols concerning carbon emissions to which Australia is a signatory. Amongst these protocols is the recognition of carbon sequestration by perennial woody vegetation, as a means of locking up carbon for significant periods of time. Another consequence of the protocols is the recognition of trading carbon sequestration and outputs through a system of carbon credits.

Clearly these protocols recognise the value and role of woody vegetation in balancing atmospheric levels of carbon. This value should translate into an added recognition of the value of woody vegetation in real terms. In short it would seem logical that the present situation, which often substantially undervalues woody vegetation may change dramatically once the impact of the Kyoto protocols on greenhouse gas emissions are recognised. While these protocols are not intended to impact upon urban vegetation and small scale plantings, it would seem that there will be an impact, as the political dynamic is likely to change. It would appear reasonable to harbour some optimism that many of the problems that have confronted tree managers in urban landscapes for many decades could be brought to a head under the banner of carbon sequestration and greenhouse gas control.

**TABLE 3. SOME GENERAL AND SPECIFIC CONTRIBUTIONS OF TREES TO URBANISED SITES** (Compiled from Grey and Deneke, 1978; Anon, 1989; Harris, 1992; Finnigan, 1994).

<p><b>LANDSCAPE VALUES</b></p> <ul style="list-style-type: none"> <li>• A SENSE OF SCALE</li> <li>• SOFTENING OF BUILT LANDSCAPE</li> <li>• FOCUS AND DIRECTED SIGHT LINES</li> <li>• LINKING &amp; UNIFYING LANDSCAPE</li> <li>• A BUFFER TO UNWANTED NOISE</li> <li>• VARIETY OF COLOUR, FORM, TEXTURE &amp; PATTERN</li> <li>• VARIATIONS IN SHADE AND LIGHT</li> <li>• AN EMPHASIS TO SEASONAL CHANGE</li> <li>• A CONTRIBUTION OF FRAGRANCE</li> </ul>	<p><b>CLIMATE AMELIORATION</b></p> <ul style="list-style-type: none"> <li>• SHELTER FROM THE WIND</li> <li>• SHADE/THERMAL INSULATION</li> <li>• TEMPERATURE MODIFICATION</li> <li>• HUMIDIFYING THE AIR</li> <li>• FILTRATION OF POLLUTED AIR</li> <li>• INTERCEPTION OF RAIN FALL</li> <li>• REDUCED RUN OFF &amp; WATER TURBIDITY</li> <li>• ALTER EFFECTIVE PRECIPITATION</li> <li>• REDUCTION IN GLARE</li> </ul>
<p><b>RECREATIONAL BENEFITS OF TREES</b></p> <ul style="list-style-type: none"> <li>• PASSIVE RECREATION</li> <li>• LINKING OF HUMAN GENERATIONS</li> <li>• LINKS TO PARKLANDS</li> <li>• HUMAN PHYSICAL HEALTH</li> <li>• HUMAN PSYCHOLOGICAL HEALTH</li> </ul> <hr/> <p><b>CONSERVATION VALUES</b></p> <ul style="list-style-type: none"> <li>• CREATE &amp; PRESERVE HABITAT</li> <li>• PRESERVE FLORA AND FAUNA</li> <li>• CONSERVE GENETIC RESOURCES</li> <li>• MAINTAIN WILDLIFE HABITAT</li> </ul>	<p><b>ENVIRONMENTAL VALUES AND AMELIORATION</b></p> <ul style="list-style-type: none"> <li>• PRODUCTION OF OXYGEN</li> <li>• FIXING OF CARBON DIOXIDE</li> <li>• REDUCING EROSION</li> <li>• PROTECTING WATERSHEDS</li> <li>• ALTERING WINDFLOW PATTERS</li> <li>• NOISE ABATEMENT</li> <li>• REODORISING AIR</li> <li>• MODIFYING AMBIENT TEMPERATURE</li> <li>• PURIFYING THE AIR</li> </ul>
<p><b>EDUCATION AND INTERPRETATION</b></p> <ul style="list-style-type: none"> <li>• LOCAL NATURAL HISTORY</li> <li>• GARDENING AND HORTICULTURE</li> <li>• WILDLIFE/VEGETATION RELATIONS</li> <li>• ENVIRONMENTAL APPRECIATION</li> </ul>	<p><b>ECONOMIC BENEFITS</b></p> <ul style="list-style-type: none"> <li>• INCREASED PROPERTY VALUES</li> <li>• IMPROVED INVESTMENT</li> <li>• GREATER LEVELS OF TOURISM</li> <li>• UTILISATION OF TREE PRODUCTS</li> <li>• CARBON BALANCE BENEFITS</li> <li>• EFFECTIVE USE OF WATER</li> <li>• EFFICIENT MAINTENANCE REGIMES</li> </ul>

It is the soft landscape that provides the ambience of these inner city developments. Too often however, the budget for landscape design and construction and plant materials is miniscule to begin with and rapidly eroded as the costs of the hard landscape components escalate or 'blow out'. Often the choice of plants, and particularly trees in such sites is limited by a lack of data on what will perform in the particular landscape context. Consequently inferior landscapes result that do not welcome visitors to their precinct, and which are then judged as failures. There are many examples of these

situations throughout Australia and yet the lessons of their construction are rarely learned.

Trees give a sense of scale to all landscapes, but this is particularly important in cities and suburbs, where there are so many large hard structures. There is a widespread idea that replacing trees with shrubs along streets and roadsides, and in the urban environment in general will provide a solution to problems that many perceive are caused by trees.

Nothing could be further from the truth. Replacing trees with shrubs is a recipe for a barren, unimaginative urban landscape. The shrubs give no sense of scale, and many are shallow rooted and high water users. Such plants provide no solutions to any of the problems that are, so often wrongly, ascribed to trees. Indeed in some instances, they provide more management problems than the presence of trees, but none of the benefits of scale and longevity. Once again it is a situation where a lack of data and the knowledge of how trees perform in a particular landscape context that leads to poor design.

Because trees can be very long lived they span not only the years, but often human generations as well. They are a part of our heritage, and are a living link between the present generation and those which have preceded and those which will follow. This may explain why people become so attached to particular trees, especially at the local community level. Such attachment seems to be rarely appreciated by politicians and bureaucrats. This generation has benefited from the foresight of earlier generations, and surely it has the responsibility to leave a worthy heritage for the generations to come.

**TABLE 4: SOME CONTRIBUTIONS OF TREES TO THE LANDSCAPE**

- |   |
|---|
| <ul style="list-style-type: none"><li>• A SENSE OF SCALE</li><li>• AN ENDURING HERITAGE</li><li>• A SOFTENING OF THE CREATED LANDSCAPE</li><li>• A LINKING OF MANY HUMAN GENERATIONS</li><li>• THE CAPACITY TO LINK LANDSCAPES</li><li>• AMELIORATION OF HARSH ENVIRONMENTS</li></ul> |
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### **2.3 Trees and Urban Services: Getting the Balance Right**

The controversies in relation to overhead cabling and communication systems is a sad reflection on the status of trees in our environment and the professional practices associated with planning and development. It is clear that the majority of citizens want access to new technology, but they also want the services undergrounded. Poor Federal government legislation is allowing the effective vandalism of trees, which both undervalues the worth of the trees and diminishes their value as community assets.

Communication companies and the privatised power, gas and water distributors have legislative powers, and management policies and practices that place trees at considerable risk. There is no value to our society in the offer by some of these companies to remove trees near overhead services and

replace them with seedlings of a shrub species. Such an approach sees major assets traded for short term gains.

It is pleasing to see that so many local government and other agencies are now advocating a policy of undergrounding services. Such a policy deserves whole hearted support, especially when deadlines for the undergrounding of services are set. Undergrounding services is likely to cost more at the time of installation, but if the long term maintenance costs, particularly of vegetation management, are taken into consideration the equation alters. Undergrounding will probably be more costly to the utility operators, but cheaper to society as a whole. Clearly society must be prepared to take a long-term view of this matter, and invest in the future of the environment.

Undergrounding services is no excuse for damaging, or even interfering with tree root systems. There should be no open trenching near the base of trees, as modern technology allows efficient and effective boring and tunnelling under trees at the depths required. Tree roots are for the most part shallow and spreading, and it is perfectly sensible to tunnel under them without interfering with important root structures. However, detailed data on root architecture and growth rates in specific Australian locations, and under the unnatural conditions often found in urban sites is both rare and far from comprehensive. Interestingly, directional boring is not only technically possible, but is often cheaper than the traditional open trenching techniques.

Codes of practice for power line clearing are another cause of major concern. These place little emphasis on the preservation of street trees and streetscapes and seems to assume that tree removal, or replacement with smaller specimens is a desirable and sensible strategy to pursue. These codes fail to recognise the individual habits and growing characteristics of trees, and a database such as Treenet could provide valuable local data that could inform decision making and implementation that is site or region specific. Without the input of such information, the implementation of such codes would virtually eliminate trees near power lines in cities and rural areas, and could disseminate established avenues and boulevards. At present the codes would seem to be advocating a major vandalism of streetscapes and the destruction of a significant number of trees.

## **2.4 Towards a Vision of Tree Management in Urban Landscapes**

The role of horticulturists in urban design a century ago has left an important impact on the Australian environment. However, recent events suggest that the role of the horticulturist will be overlooked in much of the planning process and as a consequence there is no guarantee that a world class facilities will be produced. However, while advocating caution the potential for proper high class development should be recognised (Table 5). There is the potential for a whole new generation of horticulturists, landscape architects and arborists to contribute to the creation of new landscapes that will contribute to an environment that will be enjoyed by generations a century hence.

**TABLE 5: A SUMMARY OF A VISION**

- PRESERVATION NOT ALIENATION OF PUBLIC OPEN SPACE
- MORE AVENUES AND BOULEVARDS NOT LESS
- ALL SERVICES UNDERGROUNDED, NO OVERHEAD CABLES
- LINKED PARKLANDS NOT ISOLATED BEAUTY SPOTS
- CITIES WITH A WORLD CLASS HORTICULTURAL CENTRE
- A SERIES OF LINKED LINEAR AND RING PARKS
- PROPERLY SELECTED AND BRED URBAN TREES
- ACCESS TO A PROPER DATABASE TO INFORM DECISION MAKING

## **2.5 Managing Trees: Databases and Management Plans**

Many people fail to appreciate the value of trees, especially those in streets, boulevards, avenues and parks for the historic assets they are. Appropriate management strategies must be put in place (Hannah and Yau, 1993). A number of these strategies should be self-evident, but appear not to be in place for many significant streetscapes. Amongst the elements of an appropriate management strategy, the following should be mandatory (Table 4):

- \* location, extent and number of trees involved in the urban landscape
- \* comprehensive data on all specimens
- \* recognition that the streetscape has value, especially any special values
- \* appropriate warning flags for any intended works
- \* identification of responsible officers to liaise on the management of the trees
- \* access to an appropriate inventory and tree history
- \* provision of contact details for appropriate arboricultural advice
- \* clear guidelines for canopy management
- \* clear guidelines for root system and soil management within the canopy dripline

This list whilst far from comprehensive would provide the basis for a management strategy that should protect valuable streetscapes. It should also reduce the inadvertent and unthinking damage that often occurs to trees not because of ill will, but due to ignorance.

**TABLE 6: ELEMENTS OF A MANAGEMENT PLAN**

- LOCATION, LENGTH AND WITH OF THE STREETScape
- SPECIES COMPOSITION
- TREE DETAIL-HEIGHT, GIRTH, SPREAD, SPACING, CONDITION
- HISTORIC, ENVIRONMENTAL, LOCAL VALUES
- REPLACEMENT STRATEGIES
- CANOPY MAINTENANCE
- ROOT ZONE DETAIL AND MANAGEMENT
- PEDESTRIAN AND VEHICULAR TRAFFIC
- OWNERSHIP/MANAGEMENT AUTHORITY
- CONSTRUCTION WORKS MANAGEMENT STRATEGY
- IDENTIFICATION OF APPROPRIATE MANAGEMENT EXPERTISE

(After Hannah and Yau, 1993)

## **2.6 Trees for Urban Areas: Breeding, Selection and Data Collection**

Many urban sites are potentially hostile to the growth and development of trees. As a consequence it is important that trees are selected with a view to the value they provide and their capacity to cope with the urban environment. It is sobering to realise how little thoughtful and professional selection has been made for native trees that are grown in Australian cities.

Australians have typically exploited the native vegetation that is available rather than developing it as the significant natural resource it is. The many exotics that are planted across the nation are usually the end products of long breeding and selection programs that have been conducted overseas. As a consequence these trees often provide considerable amenity value and have characteristics which are both well understood and which can be readily specified. It is no wonder that they are so widely and commonly planted! Furthermore, in this era of privatisation and sub-contracting, it is highly likely that exotics will be widely used because there is such good information on them and they can be precisely specified in tender documentation.

Australian native trees, apart from those of interest to the forestry industry have been subjected to little systematic and professional selection, and even less long term breeding for characteristics which suit them to the urban environment. Provenance selection trials, which are so common in disciplines such as forestry are rare in urban horticulture. A recent study by Williams (1996) of thirty two rainforest species and twelve provenances of the Queensland Brush Box (*Lophostemon confertus*), showed that certain plants, species or provenances had great potential for growing under the stresses of the urban environment. Even this study was under-funded and under-resourced, yet the findings had the potential to save many thousands of dollars for managers of urban landscapes.

**TABLE 7. BREEDING AND SELECTION CRITERIA FOR TREES FOR URBAN SITES, WHICH MIGHT BE INCLUDED IN TREENET.**

ASPECT OF TREE BIOLOGY FOR SELECTION OR BREEDING CANOPY/ABOVE GROUND	TREE BREEDING AND SELECTION CRITERIA
ROOT SYSTEM/BELOW GROUND	SUITABLE CANOPY STRUCTURE FOR SAFE USE IN URBAN SITES ABILITY TO RETAIN SAFE CANOPY STRUCTURE IN HIGH WINDS LOW INCIDENCE OF V-CROTCHING HIGH CAPACITY TO PRODUCE CALLUS AFTER WOUNDING AND PRUNING HIGH TOLERANCE OF REGULAR PRUNING CAPACITY TO COPE WITH POLLUTANTS REDUCED SUSCEPTIBILITY TO SUDDEN LIMB FAILURE APPROPRIATE ROOT STRUCTURE TO COPE WITH INTERACTIONS WITH THE HARD LANDSCAPE CAPACITY TO COPE WITH COMPACTED SOILS CAPACITY TO COPE WITH SOILS DEPLETED OF OXYGEN, MOISTURE AND NUTRIENTS CAPACITY TO ESTABLISH GOOD ROOT SYSTEMS IN SOILS WITH HIGH PENETRATIVE RESISTANCE CAPACITY TO GROW IN DROUGHTED OR WATER LOGGED SOILS LOW INCIDENCE OF WIND THROW

The situation concerning the breeding of Australian native trees for specific landscape purposes is even worse. Breeding of species for their capacity to tolerate compaction, water logging, drought or low oxygen soil regimes is almost non-existent. Furthermore, modern arboricultural selection criteria that relate to the trees capacity for compartmentalising, coping with pruning or disease, or capacity to produce callus after wounding are rarely used as a basis for selection and breeding programs.

Until native species are selected and bred to meet the objectives of urban planting and design, then the risks of poor specimens, poor canopy structures, unsatisfactory root structures and unacceptable establishment rates will remain high. Good urban landscapes require appropriate investment. They do not come cheaply, but the rewards of such investment will be an improved urban landscape and a more efficient and effective management regime.

### **3. Conclusion**

The future of urban vegetation is in jeopardy. There appears to be a series of major threats especially to trees in urban landscapes that could change the face of these landscapes for generations to come. It is worrying that the threats are not so much the consequence of a planned and deliberate campaign, but rather are the consequences of vested interests which place trees and other vegetation low on the scale of priorities.

It is the trees in particular which add the human dimension to created environments. The magnificent legacy of avenues, boulevards and parks and gardens that was left to this generation is under a significant and sustained attack from vested interests, bureaucrats and planners who have little concept of the consequences of their actions, or the sorts of environments they are creating for the future. Professional horticulturists and arborists do not advocate the philosophy of 'trees at any cost', but they do require that the real benefits that trees provide to the urban environment are recognised and properly costed in the decision making processes that effect them.

The stakes in relation to these matters are high, but so too are the possibilities. Arborists have a major contribution to make to the creation of the urban landscape by ensuring that the values and benefits of trees in these landscapes are both recognised and valued. Without their input there is a real risk that urban landscapes will be degraded and that future generations will be deprived of the wonderful assets that the current generation has taken for granted. By contributing to the decision making processes of today, positive outcomes for the next century could be assured. Few human endeavours have such long lasting consequences, so the effort is all the more worthwhile!

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# **TREENET & THE WAITE ARBORETUM**

**Jennifer Gardner**

In this presentation, I will give a brief background of TREENET and its mission and introduce the Advisory Board. I will explain the role of Waite Arboretum in TREENET and conclude by indicating some of the attractive species in the Arboretum which I think merit consideration for street trees.

## **Background of TREENET**

The need for a collaborative approach to urban street trees is clear. When David Lawry approached me with the idea of forming TREENET, I responded enthusiastically. The inspiration for TREENET followed a seminar, hosted by the Royal Australian Institute of Parks and Recreation on 'Trees in the Urban Environment' held at the Waite Institute in 1995 and a 'Visions of the Future' workshop held in 1996 which brought together a cross section of people who use the Waite Arboretum as a resource for research, teaching, training or as a reference collection for tree selection. At the same time the notion of forming cluster groups and partnerships with industry and government authorities was really taking hold in South Australia, supported by the SA Chamber of Commerce. In the earliest stages TREENET received strong support from Henry Polec at Transport SA and that Department provided start up funding.

## **Establishment of TREENET**

The inaugural meeting of the TREENET collaborative partners was held in February 1997 and brought together representatives of Local and State Government as well as the nursery industry, design professionals and the education sectors.

This year, with grants from Transport SA, Local Government and the Nursery Industry, TREENET has been able to employ a postgraduate student, Gareth Hodges, to develop a business plan, staff the office, and conduct a street tree survey.

The Director of the Waite Institute Prof. Malcolm Oades has generously allowed TREENET to have office space in historic Urrbrae House where the Arboretum office is also located, and we are very appreciative of this.

## **Mission of TREENET**

The mission of TREENET (**T**ree and **R**oadway **E**xperimental and **E**ducational **N**etwork) is to improve our streetscapes through better production, selection, establishment and maintenance of street trees and to broaden the palette of suitable species available which have the best qualities without attendant problems.

TREENET aims to provide a focal point for the exchange of information about street trees and to facilitate the gathering and dissemination of useful data by encouraging the establishment and monitoring of trial sites.

## **TREENET Advisory Board**

The 14 members of the TREENET Advisory Board have between them a wide range of expertise and interests relating to street trees. In addition to myself the members of the Board are as follows:

**David Lawry** (Chair) is the Director of Lawrys Landscapes and Nurseries specialising in growing advanced trees for streets and parks in an urban situation.

**Mark Adams** is presently Landscape Design Officer with the City of Salisbury. He brings to the Board knowledge of local government practices and experience in urban streetscape development.

**Malcolm Campbell** is a professional horticulturalist with 25 years experience. He is a radio and television presenter and a national gardening writer.

**Andrew Ciric** is the Senior Project Engineer - Strategic Services, City of Mitcham and brings to the Board both Local Government and engineering perspectives.

**Dean Cresswell** is Assistant Principal School Focus at Urrbrae Agricultural High School and is responsible for overseeing the school's specialist programs in horticulture and related studies. He also liaising with research organisations, post secondary education and industry groups on behalf of the school.

**Judy Fakes** has lectured at the Ryde College of TAFE since 1979 specialising in soils and arboriculture. She has developed specialist course in Tree Surgery and Tree Care for Electricity Workers and is a consultant to local councils and electricity supply authorities.

**Anne Frodsham** is the Nursery Industry Development Officer for South Australia. She oversees the implementation of the national nursery industry Best Practice scheme in South Australia and works to keep nurseries abreast of new developments and moving towards Best Practice.

**Kevin Handreck** is Managing Director of Netherwood Horticultural Consultant which provides information on potting media, soils, fertilisers and related matters to all horticultural industries.

**Dr David Jones** is Senior Lecturer in Landscape Architecture at Adelaide University and a prominent heritage landscapes and gardens consultant.

**Kym Knight** is an arboricultural consultant and runs a tree contracting business focussed on quality tree care. He sees his role on the Board as contributing arboricultural expertise in a broad context to the activities of TREENET.

**Dr Greg Moore** is Principal and Head of Burnley College of the Institute of Land Food Resources at Melbourne University. He has contributed to the development of Australian Standards in pruning and amenity tree evaluation, written a book and over 50 research papers relating to tree biology and management.

**Trevor Nottle** has come from a 30 year career in education in the schools sector of DETE. He is currently Manager - Education at the TAFE Horticulture Centre.

**Henry Polec** is the Senior Landscape Architect in Transport SA where his main activities include Project Coordination, Landscape and Irrigation Design, and Contract and Consultant Management.

## Waite Arboretum

The Waite Arboretum provides an ideal home for TREENET. The Arboretum, which was established in 1928, contains over 2,200 trees and shrubs from all over the world, grown under natural rainfall (an average of 625 mm a year). Assessing the suitability of trees for particular conditions of soil and climate takes many years. The long term security of the Arboretum is guaranteed by the terms of Peter Waite's gift of land to the University, and by the Arboretum's listing in the National Estate, State Heritage Register and The National Trust Register of Significant Trees. This ensures that the Arboretum will continue to be a good testing ground for years to come.

Not only is Waite Arboretum internationally recognised, but it also is part of a wider horticultural facility which includes the University's Department of Horticulture, SARDI (South Australia Research and Development Institute), PIRSA (Primary Industries Research SA) and CSIRO Division of Horticulture all located on the Waite Campus and the TAFE Horticulture Centre and Urrbrae Agricultural High School on the adjacent Urrbrae Campus. All these collocated institutions have the potential to make a significant contribution to arboriculture through research and training.

## Street tree suggestions from Waite Arboretum

I will conclude by presenting a selection of trees in the Waite Arboretum which have not been used or are uncommon in South Australia as street trees but which I think merit consideration. Some previous recommendations from the Arboretum are currently being trialed eg:



*Corymbia eximia*, yellow bloodwood (being trialed by the City of Onkaparinga);

*Flindersia australis*,  
Crow's ash -



- *Harpulia pendula* tulipwood



- *Caesalpinea ferrea* leopard tree

These are some of the many species being trialed in the City of West Torrens; as well as:

*Zelkova serrata* Japanese zelkova  
(City of Burnside).



Where TREENET trials involve species not already in the Waite Arboretum, reference specimens are planted there eg: *Cupaniopsis anacardioides* tuckeroo and *Elaeocarpus reticulata* blueberry ash which are being trialed in City of Port Lincoln.

The first group of suggestions are deciduous exotic species.



*Aesculus hippocastaneum* horse chestnut [#861 (B9)] from Greece and Albania is well adapted to our climate and has a show of pinkish white flowers in spring.

The smaller, more compact *A. x carnea* (*A. hippocastaneum* x *A. pavia*) red buckeye from SE U. S. A. [#261 (H9)] has spectacular sprays of deep pink flowers. Having large fruits these species may be more suitable for grassy verges.



*Pistacia chinensis* Chinese pistachio [#346 (F8), # 862 (B8)] from China and Japan is a very attractive shade tree and consistently produces a spectacular display of crimson foliage in autumn. The smaller *P. atlantica* the Mt Atlas mastic tree from Mediterranean also does well here.

There are now many commercially available selections of *Pyrus calleryana* callery pear some of which are represented in the Arboretum. But one selection which was made by Dr David Symon we are calling 'Lynington'. The original Arboretum specimen is no longer there, but the four trees in the garden of Urrbrae House were budded from that tree. Each year the spring blossoms are breathtaking and in some years the autumn colour is a rich golden flame. Being one of the Asian pea pears, the fruits are small (about 15 mm across) and hard. They remain on the tree for a long time and are generally eaten by birds before they fall. This cultivar is now being produced by several South Australian nurseries and Flemings in Victoria from budwood from these four trees.



Solar access in winter is often an important issue in the selection trees in close proximity to houses. However, if an evergreen tree is sought, there are a several attractive species in the Arboretum which do well in our climate.

*Vepris lanceolata* white ironwood [#372 (F9)] in the citrus family has attractive glossy green leaves with undulating margins. The fruits are very small and would not be a nuisance.

*Nuxia floribunda* vlier [#369, #381 (F9)] is striking in flower and of good form, although the dead flowers tend to remain for some time, detracting somewhat from the appearance. Both species are from South Africa. I know of no commercial source of these species, and our *Nuxia* has never set seed.



*Vitex lucens* puriri [#334 (G8), #374 (E9)], a native of New Zealand has dense glossy green leaves and spreading branches making it a good shade tree. Distinctive clusters of rich red flowers are produced throughout the year, but are most abundant in spring. Formative pruning would be needed to lift the canopy.

The Waite Arboretum has a fine collection of oaks, and many of these I think have potential as street trees, especially those from homoclimes such as California and the Mediterranean. The disadvantages of oaks are that some species are slow growing or do not respond well to transplanting, although some are obtainable as containerised specimens to 1.8 m. Once established, however, oaks are long-lived and very attractive. Acorns can be a problem unless the trees are planted in a wide verge.

Evergreen oaks which I think merit consideration are:



*Quercus suber* cork oak [#431A, G12] from the Mediterranean which has the added attraction of its corky bark.

*Q. ilex* holm or holly oak [#409, F12] is another native of the Mediterranean and is very hardy and being of large size and dense foliage is an excellent shade tree and is suitable for coastal areas.

*Q. englemannii* Englemann or mesa oak, *Q. douglasii* blue oak [#202A, #281 (H11)], *Q. agrifolia* field oak [#485A & #486 (F11)] and *Q. wislizenii* interior live oak [#383A, #413A, #470 (F11)] all native to California are also evergreen species.

Attractive deciduous oaks include *Q. lobata* valley oak [#443A, #444, #477A (G11)] from California,



and *Q. ithaburensis* Vallonea oak [#383 (F10), #435, #430A (G12)] from the Mediterranean.



Australian natives worthy of consideration include *Brachychiton discolor* Queensland lace bark,



with its attractive big pink bells appearing in profusion before the leaves,

and *Melaleuca styphelioides* prickly paper bark [#157 (I11), #173, #179 (I12)] with its thick spongy white bark. The paper bark will thrive in moist brackish soils, but also does well in the hot dry summer conditions of the Arboretum.

Angophoras have much to recommend them, especially as the small fruits are more papery than those of *Eucalyptus* and do not represent such a hazard on footpaths.

The most successful angophoras in the Arboretum are:



*Angophora costata* smooth-barked apple-myrtle [#98, #51 (I13)] with its smooth pink bark and masses of creamy flowers,

and *Angophora subvelutina* rough barked broad-leaved apple-myrtle [#17 (J13), #50 (I12)],



which produces a flush of rose pink foliage in spring.

If a eucalypt is required, *Corymbia watsoniana* large-fruited yellow jacket [#139 (K12)], a native of Queensland is very attractive with soft papery bark and masses of creamy yellow flowers in spring.

It is closely related to *Corymbia eximia* yellow bloodwood [#1639 (C3)] which is currently being trialed in the City of Onkaparinga.



*Eucalyptus caleyi* Caley's ironbark [#84 (H13), #97 (I13), #1595 (D4)] has a dark trunk which contrasts well with the blue green leaves and pale cream flowers.



*Eucalyptus* 'Urrbrae Gem' is a chance hybrid discovered at the Waite Arboretum in 1936. The original tree [#1867 (K14)] is still extant. The female parent was known to be *E. erythronema* var. *erythronema* red-flowered mallee and the identity of the male parent has recently been confirmed by DNA studies as *E. stricklandii*. As so often happens, the

progeny from this hybrid was disappointing and of poor form. Several attempts have been made at the Waite's Department of Horticulture over the last 10 years to propagate material from the original tree using various methods of vegetative propagation. It has proved to be very difficult, but efforts are continuing. I hope that one day, this striking eucalypt with smooth whitish-grey trunk and showy red blossoms will be commercially available and grace our streets.

In some Council areas there is community pressure to plant indigenous species not only because they are well adapted, but also because they form habitat for our native wildlife.

In foothills of Adelaide, *Eucalyptus microcarpa* grey box has conservation status and is an attractive tree, but a very wide verge would be needed to accommodate it. There are several specimens of grey box in the Waite Arboretum which are thought to predate white settlement [#1621 (C2), #1627 (D4), #1208 (C3), #1216 (C4)].



Finally, I will mention a few species for regions with very low rainfall. Many of the Australian arid land species eg *Citrus glauca* desert lime and *Capparis mitchellii* native orange have the problem that they are very slow growing and the juvenile phase, which can last up to ten years, is multi-stemmed and often thorny. However, patience is rewarded by the adult form which is single trunked and has lost the thorny habit.



*Flindersia maculosa* leopard tree [#357A (F8)], a native of NSW and Qld which produces a mass of tiny cream flowers in summer

and has very attractive spotted bark.



*Atalaya hemiglauca* whitewood [#267, #268A (H9)] is widespread in the arid Australia and grows to a height of 5 - 10 m.



*Geijera parviflora* wilga [#4, #4A (J11), #922 (A8)] is another drought tolerant species, currently being trialed in the City of West Torrens.

I hope you will take the opportunity to visit the Arboretum and discover some of its treasures for yourselves.

# TREENET LOCAL GOVERNMENT SURVEY SOUTH AUSTRALIA

**Gareth Hodges**

The TREENET Local Government Street Tree Practice survey was originally designed as a tool for determining the areas in which TREENET can offer the most assistance. Without a concrete idea of the issues facing individual Councils and their street tree programs, it isn't possible to tailor our services in the most useful way.

With the recent release of the new Local Government Act (1999), a significant responsibility has been placed on Local Councils with regard to their trees. Section 232 of the Act specifies that it is an offense for any tree to be planted in a street without the approval of Council, and that tree planting must take into consideration the potential impacts, responsibilities and amenity of the street.

Section 245 of the Act also places property damage liability on Councils for trees which they have been notified are a hazard. In the light of these Sections, it is now critical for Councils to assess their street tree practices to ensure that the risk of litigation is minimised.

In light of these issues, it is not surprising the response to the survey was so good; of the 68 Councils coming under the Local Government Act in South Australia, 65 agreed to complete the survey, and 33 actually responded.

The survey will be redesigned for future use taking into account the feedback given by respondents, so that it can better represent the responding Council in an unambiguous way. Eventually, the survey will be available in electronic format on the upcoming TREENET website, so that it can be easily accessed and submitted. As TREENET expands into the national arena, it will be open to more than 700 Councils to respond, so an efficient delivery system and clear questions are critical.

Any suggestions, not just from Councils, on how to improve this survey would be of immense use.

To complement the Local Council survey, we hope to develop similar surveys for the other areas TREENET will interact with, such as Nurseries, Arborists, Landscape Architects, Urban Planners and Tree Training providers. Information given to TREENET in all of these surveys should be considered public domain information; we want to give free access to as much of the resources we have as possible. Part of the goal of TREENET is to provide a central place where everyone can come to find out how best to approach a street tree issue, and learning from the examples and mistakes of others is a useful process.

So, as far as the survey is concerned, it showed us some things we expected, and quite a few surprises.

## **Training**

The people who are making both day-to-day and strategic management decisions about Local Government street tree practices can benefit most by receiving the right training. All the advice in the world will not help if the person involved in the process does not see its value. TREENET can assist in bringing the latest research and

collaborations to the attention of the training providers so that Councils can make their improvements from the ground up.

The most common qualification was the Advanced Certificate in Horticulture, with 14 respondents, followed by the Diploma or Advanced Diploma in Horticulture. The responses also indicated that staff training represented in the Council or planned for the near future was primarily sourced from the TAFE system. As a vocationally oriented educational provider the TAFE system offers the skills and training that will allow Councils to maximise the value of their street tree assets. Private providers of training are also a regularly used resource

## **Budgets**

The average annual budget for street tree expenditure is just over \$200,000 per Council, with the least being none at all for several regional Councils. In these cases, the street tree system was either practically non-existent or entirely dependent on volunteers. The largest was almost 1.3 million dollars a year for a Council with 80,000 street trees and 25 full time staff. The majority of Councils have a stable budget allocation for street trees, most others are receiving more money to manage their trees each year. Each Council averages 20,000 trees, or (very roughly) one tree per resident, representing 30 different species of tree. Over 1000 trees are planted per year.

During the first three years of a street tree's life, Council will spend approximately \$220 on the tree, although some Councils may spend up to \$650. The mortality rate amongst these trees is 12% (with some Councils going as high as 40%!). So more than 10% of a Council's new planting budget goes into dead trees. If this figure was to change by only one percent, it would mean considerable savings for Councils.

65% of respondents believed their budget was adequate to their needs; 35% believed it was inadequate. Nobody thought their budget was excessive.

10% of budgets are set aside for contract work, and another 2% for education and training.

So, as far as the investment in street trees is concerned, making the wrong decisions about which tree to plant is a decision that can cost hundreds of dollars per tree. Making a few changes in the techniques used during the three years can not only save hundreds of dollars and trees over this period, but can increase the useful lifespan of the tree and save money in replacement costs.

## **Success Factors**

Every factor mentioned in the survey was deemed important to the overall success of a planting program;

- Information on suitable species
- Availability and quality of nursery stock
- Difficult site conditions
- Funding
- Human resources
- Specialist knowledge
- Vandalism

TREENET aims to be in the position to help with these factors. Information on species suitability will be determined through the trial site program and gathering of relevant research material in consultation with tree experts.

Nursery stock can be diversified as individual nurseries take on trees which have been shown, through trials and other information, to be in demand for street use.

Addressing the difficulties of poor site conditions can be part of the development of best-practice planting and maintenance models devised in conjunction with arborists and soil specialists.

In terms of funding, TREENET can assist Councils in the development of trial sites by, for example, collaborating to identify and submit grant applications to appropriate funding bodies. An example of this for regional Councils is the Department of Transport's Regional Solutions program, which offers up to \$500K for regional projects. TREENET, in association with a group of regional Councils, might prepare an application on their behalf to establish sites throughout the region.

Through its network of over 200 contacts, TREENET can find and refer specialists to a Council for assistance with difficult projects.

One of the interesting results in this survey was that of the 33 people who responded, only 2 said they were happy with the street tree program they had inherited from their predecessor. More than 60% were actively disappointed with the trees they became responsible for, with the most common complaints being infrastructure damage, high maintenance, incorrect cultivation requirements and liability risk.

These figures are very telling: when the people currently involved in street tree management come to hand over the reins, what will their successors think of the situation they've been given? There is an obvious recognition of the failure in the past to do the right thing with respect to street trees, but this recognition needs to be supported with the resources to make a difference. If TREENET can offer the information and opportunity to change this figure, we'll have done very well.

### **Personal Injury & Property Damage**

Far and away the most significant cause of injury and damage comes from displacement of kerbs, paving and roadways by tree roots. This is probably no surprise, but it reinforces the necessity to diversify street tree species into low-impact root systems. The presentation by Tim Johnson of the City of West Torrens details that Councils' experience with a range of newly trialed species.

### **Tree Inventories & Databases**

Half of the responses indicated that the Council did not have an inventory of their street trees. Interestingly, in 1998 the Australian Local Government Association required all Councils to conduct a measurement of their assets, including street trees, so technically every Council in Australia should have a record of this. This result indicates that either some Councils simply don't have the resources to conduct such a measurement, or that the information gathered in that process is not widely available or recognised within the Council. In either case, greater support for Council projects such as this is obviously required.

TREENET aims to provide to Council street tree departments as comprehensive and convincing a list as possible of reasons why their Council should support their tree improvement programs.

### **Tree stock**

Almost every Council sources some of their tree stock from South Australian Nurseries, and for many of them this is the primary source. Half draw upon their own nursery facilities for some component of their new plantings, and one third draw stock from interstate. Most of this stock is container grown, with a smaller portion being simple bare root stock.

### **Future Surveys**

In order to fully develop TREENET as a relevant and worthwhile resource, the broader stakeholder groups contributing to Street Tree issues will be surveyed and assessed.

We welcome any contributions, suggestions or feedback for this process, because it is by accessing the experience and knowledge already available that can make the TREENET program an effective and efficient resource.

# CITY OF SALISBURY: STREETSCAPE REVIEW

Colin Pitman

- The City of Salisbury has been propagating and planting an average of 50,000 trees per annum, with a peak planting season in 1997, totalling 212,000 plants in a year.
- The plantings were principally Eucalypts.
- Plantings in streets in most cases were tall varieties, ie., *Euc. Sideroxylon* and *Euc. Intertexta*.
- Many plantings in older suburbs were undertaken by developers, using poor planting techniques. There are no planning controls on subdivision landscape.
- Footpath damage was caused by trees in the majority of cases.
- Current expenditure on maintenance and footpath repairs is \$560,000 per annum, 90% of which is due to failures caused by tree damage.
- Expenditure on this type of maintenance is \$1.7 million per annum.
- There is an increasing public concern at damage to homes caused by clay shrinkage attributable to tree-related desiccation.

Community requests for action are interesting:

- 4,600 per annum for trees.
- 900 per annum for footpaths.
- 40 per annum for damage to houses.
- 400 per annum for kerb damage.

ACTION:

1. To undertake an internal review of the current position by a cross-functional team comprising:
  - Landscape Architect.
  - Traffic Planner
  - Engineer
  - Horticulturalist.
2. To halt street tree planting pending completion of the review.

The following Recommendations were made by the team:

## **Recommendation 1:**

That a review be conducted of Engineering and Horticultural techniques required to maintain streetscape vegetation.

## **Recommendation 2:**

Undertake a review of existing policies, procedures & practices linked to any relevant legislation/guidelines affecting streetscape.

**Recommendation 3:**

Development & Implementation of a standardised Q.A. system that incorporates a policy & associated procedures for the selection, propagation and planting of streetscape species.

**Recommendation 4:**

Undertake a review of current Council procedures for establishing new sub-divisions in order to develop a clearly defined process that takes into account all streetscape elements at planning stage.

**Recommendation 5:**

Review existing methods for the provision, construction & maintenance of footpaths.

**Recommendation 6:**

That the City of Salisbury develop a set of guidelines that relate to the planting & maintenance of vegetation on traffic control devices.

**Recommendation 7:**

To develop a City of Salisbury Verge Policy which incorporates a clear set of procedures for all elements within the verge.

**Recommendation 8:**

Review existing guidelines for verge development by residents and the framework for their implementation, maintenance, and enforcement.

**Recommendation 9:**

To define all key City of Salisbury responsibility areas relating to the streetscape.

For example:

- What is our responsibility if plantings damage houses ?
- What is our responsibility to balance built form with soft form?
- What is our responsibility in managing developer landscapes ?

**Recommendation 10:**

The development and implementation of a planned and systematic training & education program. The success of all recommendations made by the streetscape team is dependent on this.

Strategies recently developed include:

- With the assistance of the Local Government Research Fund, the University of South Australia research arm has been engaged to undertake additional research to develop a policy for the establishment of streetscape at a location where the likelihood of tree damage to housing exists.
- The road reserve width included in AMCORD have been reviewed in accordance with on-site experience.
- Street tree types have been scaled back in ultimate height and base diameter. Planting of *Euc. Sideroxylon* have now ceased.

- In new subdivisions where we have been unable to achieve a street width to accommodate appropriate plantings, a distribution of trees to residents is proposed, accompanied by a set of guidelines on preferred location for planting, which is currently being developed.

#### CONCLUSIONS:

- A mass plant-out of trees, as carried out in Salisbury in previous years should be undertaken with an eye to the potential public concern relating to tree type, potential damage and maintenance costs.
- The debate on this issue is multifaceted, and will continue as long as hard and soft landscape elements are in conflict.
- The mass plant-out of trees as carried out in Salisbury in previous years should be undertaken with an eye to the potential public concern relating to tree type, potential damage and maintenance costs.
- To ignore the impact of trees on hard elements is not an appropriate strategy.
- The Development Plan should include provision relating to street-scape to afford councils control over the type and form of landscape.

#### What of the future ?

The following is an example of an integrated landscaping approach at Mawson Lakes:

- The principal driving force for integration was due to the sustainability principles in the Development Plan for Mawson Lakes.
- Commenced with a Master Plan for landscape, taking into account water consumption, water quality, landscape style and form, and the market target.
- The balance was achieved by:
  - a water cycle plan which recycles 100% of water off the site - including stormwater and wastewater.
  - Subsurface irrigation
  - a balance of green and brown areas.
  - a choice of plantings, achieving diversity of colour and form.

Thank you for the opportunity to contribute to the ongoing debate on "hard" versus "soft" landscape.

# ARBORICULTURE AS A PROFESSION

Kym Knight

The most commonly accepted traditional definition of Arboriculture is:

*The selection, planting, care and management of trees, (including palms) woody shrubs and vines in the urban landscape.*

*(Richard Harris- Arboriculture, the integrated management of landscape trees, shrubs & vines.)*

## **The role of the modern Arborist is expanding:**

- Arborists are no longer just Technicians.
- We are innovators adjusting and developing practices to suit changing needs.
- Many arborists are also educators, if not professionally then in the work place with employees and clients.
- Many contribute to research or better understanding of tree culture through exchanges of ideas and observations at several levels of practice.
- Arboricultural technicians are also artists. The difference between "best practice" pruning and "technically correct" pruning, lies in the artistry of the work performed and the final appearance of the tree. Technically correct pruning can still produce an ugly tree, just as good work artistically is not necessarily technically correct. Quality tree maintenance practices are a combination of many skills honed over years of practice.
- Arborists must be environmentally aware. We work on a public perception threshold of environmental destruction. Well trained Arborists have a good understanding of the importance of trees in the landscape and strive to maintain their health and safety to the best of their ability. However, all trees have a beginning, a middle and an end and it up to us (the industry) to ensure this fundamental issue is understood by all people affected by our work.
- These days the majority of Arborists must also be good businessmen or women to succeed in the industry. Competition is strong in all facets of arboriculture. The demands on arboricultural businesses have never been greater and so being a good Arborist is not enough to guarantee success professionally.

## **.....Training needs.....**

Thorough training of Arborists would ensure trainees develop a 'holistic' understanding of trees and how they interact with the surrounding environment, as well as the people affected by them and vice versa.

**Arborists** must have the right balance of underpinning knowledge and skills in a wide range of areas to be successful. These will include;

Soil/plant interactions

Soil/water relations

Tree biology, interaction with pests and diseases

Tree identification and plant selection skills

Tree structure & function,

Tree safety and hazard assessment

Tree protection and management on difficult sites

Report writing and data collection,

Safe work practices and employee and business management skills

Combined with the practical skills tree pruning & removal, planting & transplanting, rigging, & aerial rescue, etc.

Members of the **Arboricultural** profession study and work with tree issues daily. We have the experience, information and tree management skills needed by others who interact with trees, to assist in making that interaction successful.

**All Arboricultural tasks fall into three fundamental categories:**

**Providing information:**

to promote understanding and appreciation of the ecological complexity, physiology, importance and needs of trees in the urban landscape.

**Converting that information into practical solutions:**

There are vast array of problems which assail urban trees in many different circumstances from wet boggy sites to parched compacted urban deserts, from high rise developments to suburban backyards. Each situation must be assessed on an individual basis for the best course of action to achieve the desired result.

**Implement those solutions:**

The solutions to many tree management issues are often effected over long periods of time, are highly specialized, can be difficult or dangerous, and must always be done in a professional and safe manner.

The Arboricultural industry has been gaining momentum in recent times on the back of a **growing environmental awareness** and **greater accountability** of those responsible for tree management. The laws in South Australia have recently changed. Councils no longer have the protection of the local government act, and are liable for negligence where it occurs just as an ordinary citizen would be.

The introduction of the new Development Amendment Act 2000 has placed greater emphasis on the importance of trees in the landscape, by defining tree work as development and subjecting it to planning controls via local government. This change has already impacted strongly on our industry through tighter tree removal and pruning controls, as well as a host of other effects which combined have placed higher costs and lengthy delays on many of the industries activities. The need for additional training of industry members has been one of the most positive outcomes of this legislation.

There have been limited training opportunities here in South Australia, up until just recently.

**In 1997 The International Society of Arboriculture-Aust Chapter formed. (ISA-Aust Chapter)**

**In the same year the South Australian Society of Arboriculture (SASA) formed:**

Both of these Arboricultural organizations have played an important role in education, nationally and locally through their work with;

- The development and ongoing improvement of the National Training Competencies for Arboriculture,
- Behind the scenes work on education, professionalism, and safety in many different ways. i.e. Running seminars and conferences across the country on a wide range of topics, or Running Tree Climbing Championships, Arborcamps etc.
- Running accredited training courses in South Australia (SASA) through the use of registered training providers such as Arbortrim Training & Consultancy (Vic.)
- As well there are a few privately operated registered training providers in SA, as well as some TAFE Colleges, offering both short courses and traineeships to all levels of the competencies.

### **SASA Training**

SASA has successfully run many short courses in the basics of Arboriculture and is currently working on a fully structured arboricultural course to level 4 of the competencies, to be offered early next year.

It is hoped this course will fill the void in training here in SA for a cohesive approach to the training of Arborists.

Run in two streams, one aimed at contractors and the other at council employees, the success of this course will depend upon financial assistance through training subsidies and solid commitment from prospective students.

### **Another exciting prospect for the future: The ISA Certification program**

Certification guarantees a minimum level of knowledge through exams run by the certification committee across all areas of Arboriculture.

As well, there are stringent requirements for ongoing improvement of that knowledge to retain certification currency through a points system. This ensures participants in the program are continually having their arboricultural knowledge expanded and improved, unlike present educational systems. There are currently over 10,000 certified Arborists worldwide.

### **In conclusion:**

With new educational developments and particularly with improved training opportunities, I believe Arborists are now even better placed to deal with urban tree management issues, and that the time of Arboriculture, as a valued and respected profession in this country, is only just beginning!

# PRACTICAL ISSUES IN LINE CLEARANCE AND STREET TREES

Judy Fakes

## Abstract

This paper considers the issue of managing trees under powerlines. The management of trees under powerlines is difficult due to the complex nature of streets, community attitudes, government regulations, previous pruning techniques and often poorly selected species of trees. It is very easy for an ill-informed public to be highly critical of management techniques such as removal and directional pruning. However it is essential that the many facets of the problem be discussed in order to appraise and, if necessary revise current management practices.

The causes of conflict and the problems which arise have been outlined and the available strategies assessed. Emphasis is placed on co-operation between local government authorities and the electricity supply authorities to work together to determine economically viable long term solutions. Education and training play a significant role in the management of the problem. On going training of tree workers is essential due to high staff turnover. Education of the broader community and those in positions of responsibility within the local government or supply authority system is also necessary if the conflict between trees and powerlines is to be resolved. Examples are from experience gained in NSW however all States and Territories have the same problems.

## 1.0 Introduction

The management of trees under powerlines is an extremely complex issue. Whether the trees are in streets in towns or cities or along rural roadsides and paddocks, their management involves the public, local government and all levels of the electricity supply authorities. In many instances it has been a major cause of conflict between all parties.

In all States there is a statutory duty placed on all electricity supply authorities to keep vegetation clear of powerlines. Minimum clearances have been established by all electricity supply authorities depending on the location of the tree (urban/ rural/ bushfire risk) and the voltage and type of the line.

These clearances are required to allow the lines and poles to be maintained in a safe manner and to prevent unauthorised contact and or fires. The implementation of these clearances may lead to some problems for trees, the community and the electricity supply authorities.

## 2.0 The Problems

### 2.1 *Economic pressure.*

Throughout Australia, millions of dollars are spent annually by electricity supply authorities and local councils in keeping trees from powerlines. Energex in south-east Queensland has recently increased its annual budget for vegetation management from about \$3-4M to about \$18M. Pressure can be applied to the authorities by insurance

companies; for example failure to reach the clearances by a certain date may incur a loss of public liability insurance.

## 2.2 *Aesthetic concerns.*

Traditional lopping practices and unskilfully executed "gully cutting" set phones ringing in council offices and provide sport for the local press. Even relatively sensitive methods of pruning which differ from more radical methods will receive "bad press", particularly from older residents who have grown used to "neatly" trimmed trees on both sides of the street. Other people demand to see trees left alone regardless of what species they are, where they are located, the condition they may be in or the problems they may be causing. It is important to remember that if a tree is genetically programmed to be bigger than the space provided for it ( under wires, adjacent to roads and on narrow footpaths) then even with sympathetic and minimal pruning it will never have an entirely natural appearance. Compromises must be accepted by the public and tree workers to ensure a reasonable appearance whilst allowing wires to be maintained.

## 2.3 *Declining tree health.*

Repeated lopping often results in the decay of branch stubs as well as the production of weakly attached epicormic shoots. The structurally weaker tree is more prone to failure in storms. Regular removal of photosynthetic tissue puts pressure on stored food reserves and places the tree under stress. Gully cutting may pre-dispose trees to sunburn and further secondary problems. Street trees are usually growing in very inhospitable environments; they are subject to pollution, suffer mechanical damage from vehicles, mowers and vandals; have to cope with drought, poor quality and shallow soils; and suffer repeated root damage from trenching, replacement of kerbs and gutters, paving, gas leaks and herbicides. In fact the most significant damage to street trees occurs to their roots.

All of these factors place trees under considerable stress affecting their ability to resist both disease and insect attack. Many of our street trees are already old and declining at a rapid rate due to these stresses. The net result is that trees do not last as long as they should so need to be removed and replaced more often. There is nothing that we can do to make trees live longer than their genetically predetermined life spans, however there are many things that we can do to shorten their lives. This is a cost to the community. Many of these declining trees could be considered hazardous and should be considered in terms of public liability and risk management.

## **3.0 The causes.**

### 3.1 *Lopping.*

One of the most significant causes of all three major problems ie. economic pressure, aesthetic concerns and tree health, is incorrect pruning or lopping. Lopping in this instance is defined as the removal of branches to a designated clearance and not to a branch collar or other growth point. This approach seems cheap in the short term but the rapid regrowth necessitates many return visits and is therefore expensive in the long term.

This practice is less common now, but was once the prescribed method for clearing branches under power lines. Old lopping practices will dramatically influence the pruning technique required for current clearances.

The effects of lopping on the tree include rapid production of weakly attached vertical and vigorous epicormic shoots. In field work throughout NSW and Queensland, it has been observed that the rate of regrowth is commonly between 10 and 30 times the normal growth rate for that species in that situation. It is always extremely useful to look for normal extension growth and point this out not only to the tree workers but also to the supervisors and engineers who may be responsible for the works.

The practical significance of this style of pruning is that trees are debilitated over a long period of time and may become hazardous and or unsightly; the natural habit of the tree is destroyed; the rapid regrowth requires many return visits; large volumes of material must be tipped or chipped (ongoing expenditure or major capital outlay); and due to hormonal imbalances between shoots and roots, root growth may be stimulated thus causing other problems such as pavement upheaval and drain blocking. The removal of horizontal or lateral branches, extremely functional branches on street trees as they provide most of the shade and screening, leads to difficulties in reworking the tree. Even trees well chosen for the site and mature height and width can be rendered an ongoing maintenance problem by repeated heavy lopping (eg. *Prunus* spp, *Callistemon viminalis* ).

The human impact is one of conflict between the public and the tree workers; many electricity workers have been threatened verbally or with various weapons. Most tree workers consider lopping to be a frustrating and never ending chore. Few tree workers really feel good about leaving the trees as stubs on a trunk. However, a significant problem is that to the average non-discerning "person in the street" the fact that the trees eventually "come back" and have a "neat" appearance seems to reinforce the idea that this is an acceptable practice. Many people have come to expect (and sometimes demand) that street trees look like "apples on a stick". The quantity of the regrowth belies the poor quality of the branch framework.

### 3.2 *Poor species selection and planning.*

Perhaps the other major cause of the problem is that the wrong trees were planted under wires in the first place. The Australian native revival era of the 1970s saw many *Eucalyptus* spp, *Melaleuca quinquenervia* and *Casuarina* spp planted directly under existing powerlines. Other single leader (excurrent) trees such as *Liquidambar styraciflua*, *Grevillea robusta* and *Araucaria heterophylla* are commonly found under wires throughout the State. Inappropriate species combined with lopping have led to a no win situation of ongoing pruning costs and hazardous, unsightly trees. It is extremely difficult to directionally prune a *Eucalyptus citriodora* away from powerlines yet these and other Eucalypts continue to be selected and planted under wires by local councils and individuals.

Broad-domed (decurrent) trees are the best shape for under-wire planting and lend themselves to early training and directional pruning. Unfortunately, early training and maintenance are often neglected by those responsible for tree planting.

In many suburbs and country towns there seems to be an extraordinary number of streets in which the only significant trees are on the same side as the powerlines. However it is not always that tree planters get it wrong. The location of new services

should involve avoiding conflict with trees as much as possible. Existing trees should be considered when designing street lighting.

### 3.3 *Blanket clearances for all species.*

Whilst the clearances set down by the Electricity Council of NSW and other authorities are guidelines only, most electricity authorities have adopted them. The traditional measure of the clearance plus "three years regrowth" appears to have been based on regrowth after lopping. Many engineers believe that trees grow at phenomenal rates. In some Sydney suburbs it was common to find clearances of 5 metres under low voltage lines. In other areas bushfire clearances are taken to the suburbs. Some species that in most localities would barely reach the low voltage if left alone (eg. *Prunus cerassifera* 'Nigra', *Callistemon viminalis*, *Lagerstroemia indica*) are stimulated to grow into the wires after lopping. Whilst technically these trees will grow into the clearing space they require only minimal pruning if they do approach the wires. Similarly the slow growth rate of most conifers does not necessitate radical pruning and huge clearances. It is essential that tree workers be trained to identify natural extension growth.

### 3.4 *A dynamic streetscape.*

Another important point to consider is that whilst many trees may have been well suited to their positions when they were planted decades ago, road widening, increased traffic flow, larger vehicles in streets, sealed road shoulders, sealing of pavements, renewal of kerbs and gutters, replacement and maintenance of underground services as well as unsympathetic pruning may now mean that the species is unsuitable in this altered environment due to its deterioration or the loss of available space. The costs of maintaining these trees may outweigh the benefits derived from them.

### 3.5 *Lack of training and understanding.*

Imagine in these days of multi-skilling that you are told to be a mechanic for a week. You are given the cars with the instructions that they must be fixed by the end of the week. However no-one has told you how a car functions and therefore how to deal effectively with the problems. This has been the case for many electricity workers (linesmen, linesman's assistants and labourers) for many years....here are the trees, here are the clearances, get on with it. To make matters worse these workers are often abused by their supervisors, the public and the press for simply doing what they were told to do. In many cases the tree is then seen by the worker as the enemy and is treated accordingly. Nobody wins. .

Likewise engineers, the public and the press are also generally ignorant of the biology of trees. The public also has little knowledge of the requirements of maintaining their power supply. In fact all of our problems with trees and powerlines are really 'people problems'.

### 3.6 *Poor specifications and lack of skilled supervision.*

In the past, the required clearances were shown as straight lines across the tops and or sides of trees. This was then taken very literally by those people doing the work. The next phase of diagrams drawn up by electrical engineers or supervisors have shown the centres removed from trees often perfectly concaved. More recently better

specifications have been drawn up by a few organisations using people with some horticultural background and experience in line clearing which show a range of appropriate options. However unless these guidelines are followed and supervised in the field, the pruning habits of many operators will never change. A significant problem in many county council depots is that an "old hand" who was very much a "lopper" is now the leading hand responsible for the supervision of the tree work. Despite attendances at courses, old habits die very hard.

#### **4.0 The management options.**

There are a number of management options which need to be considered. There is no one solution which can be applied to all trees. It is extremely difficult to manage something if you don't know where it is, what it is and what condition it is in. The most logical starting point in this complex tree/ powerlines/ street management problem would be to carry out a full inventory of all trees (street trees and those in adjacent properties) in relation to powerlines, poles and street lighting. The most systematic and practical approach with a large population of trees would be to assess them on a street by street basis rather than on an individual tree basis (although individual trees must be considered when establishing the condition of the street population) and then apply the most appropriate treatment for example removal and replacement, aerial bundled cables, pruning, training etc. In all cases the treatment should reflect the cause.

All management options will incur some cost. The challenge is to deal with the problem in the most cost-effective manner (particularly in the longer term) with the limited financial resources that are available at any one time.

##### *4.1 Trained operators and supervisors.*

A major key to dealing with the conflict between trees and people and powerlines is to train and educate people in the ways of trees. Since 1984, Ryde College of TAFE in Sydney has been directly involved with the training of many local and county council employees throughout the State. The initial request came from Sydney Electricity who had received much flack from the public after pruning for greater clearances after the "Ash Wednesday" fires of 1983. Initially the course was based on a pre-existing Arboriculture short course of 72 hours. After courses in Sydney and Tasmania this was honed down to the present 30 hour "Tree Care for Electricity Workers" course.

My colleague, Bruce Macleod, and I have delivered over eighty courses to many electricity supply authorities throughout NSW, Queensland and Tasmania and we are convinced that the format provides a good basic understanding and appreciation of trees in the landscape whilst providing a sound theoretical basis for the practical component. Originally, the course was directed at linesmen and other electricity workers or local council employees who were skilled in electrical matters but had little knowledge of trees. Most electricity distributors have moved away from using their own electrical staff for line clearance and have engaged private contractors. The "Tree Care for Electricity Workers" course is now the minimum arboricultural training required by Energy Australia, Great Southern Energy, Integral, Northpower and Energex for any contractors engaged in line clearance.

The pruning technique carried out in the course is described below but essentially involves the selective removal of terminal shoots back to the branch collars of lower laterals, ie. reduction pruning. American literature describes the technique as lateral,

natural or drop crotch pruning (Goodfellow *et al*, 1987, Johnstone, 1988 and Harris, 1992).

In addition to the training sessions for the workers, it is also recommended that a brief seminar be held for engineers and supervisors from both the electricity supply authority and the local councils as well as elected councillors and other interested parties. The aim of this session is to present an overview of the problem with possible management strategies from an independent viewpoint. These have been successful in opening up lines of communication and demonstrating goodwill between the various parties. In fact one of the most frequent comments by participants in the full course is that "the boss" should hear the same story otherwise work instructions are unlikely to change. It is essential that anyone responsible for the supervision of the pruning be up to date with the latest techniques.

The most successful courses have been for electricity supply authorities who have taken the problem seriously and have supported it from the General Manager through to the labourers on the tree crew.

The rewards for co-operation and communication between local council and electricity supply authority are savings in tree trimming costs. A documented example is from Central West County Council for the town of Forbes. The tree trimming budget was 600 hours to prune the trees in the town. After the first course it was carried out in 320 hours and has since averaged around 150 hours. It was obvious to the superintendent that there would always be some pruning but that it was more manageable. Three added bonuses were that there was much less material to be disposed of at the local tip (no chipper), there were no calls of complaint from the public and the people doing the work were much happier working on the trees. However if the rewards are to be truly long term, ongoing training for new staff and refresher courses for others is essential.

#### 4.2 *Correct pruning techniques by trained operators.*

Pruning can be defined as the directed and purposeful cutting of a plant towards a predetermined end. It is the selected removal, for a specific reason, of any part of a plant. In this case, the removal of branches which do or may interfere with powerlines, poles or street lights. All pruning is at a biological cost to the tree so all pruning should only target the problem area.

In the early days of the "Tree Care for Electricity Workers" course the learning curve for us was extremely steep. Horticulturists are vocal critics of most street tree pruning as the result often looks nothing like the tree in the textbook; there is nothing like having to make real decisions on a site to change one's perspective. The early methods involved removing stubs and branches back to branch collars with particular emphasis on the area beneath the wires. This tended to leave a relatively bare centre with 'wings' ie. a technique sometimes referred to as "gully" cutting. This technique allowed lots of light into the centre which encouraged more epicormic shoots. Whilst these epicormic shoots were perhaps slightly less vigorous than those from lopped stubs they still presented a problem. The general response was to remove them entirely.

By returning to the same areas it became clear that leaving large gaps was unsatisfactory on two counts - light and regrowth as well as aesthetics. Since about 1986 we have been training tree workers to 'tip back' shoots to lower laterals, ie to use the practice of "reduction" pruning as defined in AS4373 *Pruning of Amenity Trees*. This process is described below. Another step in the learning curve has been to realise

the significance of the timing of the tip pruning particularly if the tree has been heavily lopped.

If trees have not been pruned, early training or formative pruning of suitably shaped young trees is the most successful long term method of pruning under powerlines. This involves removing the central leader and other apically dominant shoots down to lower lateral branches. However, for this method to be successful it requires sound knowledge of the growth characteristics of the particular species.

This method of pruning appears to be most successful with most species that are apically controlled in their juvenile phase and which then become co dominant in maturity - the most common examples would be *Platanus*, *Fraxinus*, *Pistacia*, *Pyrus* etc.

(This method is not recommended for *Jacaranda mimosifolia*. The pruning of Jacarandas is best left until they are within 1-2 metres from low voltage lines. In most parts of New South Wales this species will be in its mature form by then - that is broad-domed and the growth rate relatively slow. At this stage smaller branchlets can be removed back to branch collars without opening up the canopy too much and therefore stimulating vigorous epicormic shoots.)

Early pruning takes little time, leaves small wounds, requires unsophisticated equipment such as pole-pruners, creates little rubbish and achieves long term time savings in future pruning but unfortunately is rarely carried out by the people responsible for planting the trees.

Reduction (lateral/ natural/ drop crotch) pruning is much more difficult to achieve in trees which have been lopped for decades. In this case the aim is usually to slow down the rate of growth and to attempt to rebuild a framework of lateral branches within the tree. In a severely lopped tree, the procedure may include the removal of dead or unproductive stubs from immediately beneath the wires, the thinning of the most vigorous regrowth from other stubs and or the "tipping back" or reduction of some shoots to lower laterals or buds. Whenever possible all horizontal branches and non-problem branches are left alone and an effort is made not to open the canopy too much. This process is repeated on all return visits.

Selective reduction pruning of regrowth leaves the tree looking more natural than lopping or gully cutting however it is inevitable that there will be a dip beneath the powerlines. To satisfy the desire for "neatness", that is to trim or "round over" the entire tree, could not be considered cost effective. Reduction pruning leaves no stubs, minimises suckering, eventually slows the growth rate to normal, removes less foliage, recognises aspects of tree health, has less impact on roots and stored reserves and is generally a more satisfying pruning practice to use. The long term aim is to reduce the number of return visits to the tree and or the time spent at the tree. It is important to realise that reduction pruning does not negate the need for future work.

It is difficult to achieve the final desired effect after one pruning and the process may take several years. Unfortunately few of the electricity supply authorities have kept accurate records of gains in productivity as a result of improvements in pruning practices. Most would agree that savings have been made, however other innovations such as bundled cable and tree replacement programmes have also contributed to overall improvements.

Two overseas trials demonstrate the savings that are possible and provide a sound basis for producing planting and pruning guidelines for local authorities. Johnstone

(1988) reports on a study of productivity gains achieved over 5 years due to improvements in scheduling, supervision and lateral pruning rather than lopping. Another study by Goodfellow, Blumreich and Nowacki (1987) looked at the branch and sprout response of six species of street trees over a number of growing seasons following different pruning techniques. Not only did this confirm that pruning to laterals reduced regrowth when compared to lopping it also highlighted a number of species where regrowth was too rapid, even after lateral pruning, to be considered economically viable to retain in streets.

The absence of local data reinforces the need for a much more systematic approach to information collection and processing. In particular attention should be paid to surveying the tree population - age, species, condition, previous pruning/ growth regulator treatment; detailed recording of tree-related power failures - whole tree failure, branch in storm, 'summer branch drop', included bark, tree species and age, other factors such as root damage; and relating this information to other activities which may be happening in the street through the activities of the local council and other service authorities. This would enable more efficient scheduling of appropriate works (removals, bundled cable, pruning), identification of problem species, targeting of hazardous trees, and opportunities for cost sharing if major redevelopments were scheduled for particular areas.

#### 4.3 *Selection of appropriate trees.*

Overhead powerlines are a major constraint in planning street plantings. An easy way out is to plant low growing shrubs however shrubs generally do not allow adequate visibility nor do they provide enough scale in the landscape. Single leader trees are inappropriate as are tall-growing, open-habit eucalypts. The best shaped tree is domed as it not only provides shade but, due to the branching habit, allows any necessary pruning to be carried out early and in a more sympathetic manner.

The selection of trees is in itself a complex process as there are many other constraints within a streetscape and many aesthetic and functional requirements to be considered. Local councils have hundreds of kilometres of trialing grounds at their disposal (streets, parks, reserves, schools) where many potential new street trees can be tested under local conditions. Perhaps botanic gardens could be approached for new and exciting material to broaden the generally boring and conservative pallet of trees in most suburbs. Many rural towns and cities have shown greater imagination than their urban counterparts.

In a number of joint ventures, several electricity distributors in NSW and Queensland and the relevant Nurseryman's Associations' have developed a plant tag indicating the suitability of tree species for planting under powerlines, These should be placed on small growing trees rather than on small shrubs. Integral Electricity has established a display planting of its recommended "Low 50" trees and shrubs and other distributors are planning similar plantings.

It is important to mention that a species of tree is not necessarily a problem if the reason for its failure is due to poor management techniques such as lopping. To discard a species because it regrows quickly after lopping is certainly to "throw the baby out with the bath water".

#### 4.4 *Removal of inappropriate trees.*

Trees that no longer serve a function in the landscape or which are too expensive to maintain or which are beyond redemption by selective pruning or those which are hazardous may need to be removed. All things die and street trees tend to deteriorate more quickly than trees growing in more ideal environments. Whilst this option appears to be unpopular with many people there is no escaping its inevitability. Trees have the wonderful advantage of being a relatively easily renewed asset. It is possible and indeed necessary to start again. It is, however, necessary to define what constitutes a tree that is beyond redemption!

Any removal option considered by the electricity supply authority requires consent and consultation with the local council. Advertising the intent to remove trees to the public and the reasons for doing so are also important. Depending on the constraints in the landscape it may be decided not to replant. The trees in question may be adjacent to a park or a school with well established large trees and so it may be unnecessary to put new trees into the street.

#### 4.5 *Power supply options.*

Many people say "Put the wires underground." In new sub-divisions this is the usual option with the additional cost borne by the developer. However, where existing overhead wires occur the cost of placing those services underground is approximately five to ten times more expensive than conventional overhead wiring. The reality of undergrounding in an established residential area is that trenches would be dug on both sides of the street, across roads and into private properties (ie. through driveways, footpaths, tree roots, other services etc). Considering the number of pre-existing underground services, locating new ones may be a problem in some areas. In 1993, the then Prospect Electricity estimated that it would cost \$1.96 billion to convert their 300,000 domestic customers to full undergrounding of existing overhead systems (Anon, 1993b). This could only have been achieved by doubling consumer's electricity bills for the next ten years and so it was not a viable option. In a few instances where the cost can be justified, poles and wires may be relocated to avoid trees. Improving technologies such as directional boring may see the undergrounding of powerlines becoming more cost-effective.

In a policy statement by Sydney Electricity in 1993 it was stated that it was pursuing a programme of converting overhead 11kV (high voltage or HV) to underground in instances where reliability of supply is in doubt particularly where four or more tree failures occur annually and where the recurrent costs for repairing storm damage are high. Where undergrounding is required by a local council in the broad community interest such as around foreshores, historic areas and similar then it is done on a 50/50 cost share basis with the council. At that time almost 62% (4709km) of the existing high voltage mains have been undergrounded. All new HV construction in urban areas will also be undergrounded.

Perhaps the most potentially useful innovation is the use of aerial bundled cable (ABC). The policy of most electricity supply authorities is that all new low voltage (LV) overhead construction will use ABC. New generations of both low and high voltage ABC are being developed and trialed. Standard HVABC is particularly heavy and expensive so its use has been generally limited to densely treed locations. However Integral has adopted HVABC as its standard overhead conductor for new lines and augmentations in urban and rural residential areas up to 11kV (Anon,

1993a). Projects are underway with individually coated and insulated high voltage lines which are less expensive.

ABC has a number of advantages in terms of tree management; clearances range from 0 - 500mm depending on branch diameter; cross arms are eliminated from poles thus reducing the extent of side clearing; and in some cases the poles are removed entirely and the cable placed on buildings. However, the installation of bundled conductor is not costeffective for trees beyond remedial pruning.

#### 4.6 *Co-operation between electricity supply authorities and local councils.*

In many towns, cities and suburbs it appears as though the electricity supply authorities have had to assume responsibility for the management of trees in the proximity of powerlines. Many electricity distributors get no help from their constituent councils, financial or otherwise, in tree management activities. This situation hardly seems fair when "ownership" of most trees in streets would be vested with the local council.

Both Energy Australia and Integral Electricity have developed initiatives to foster cooperation between themselves and their local constituent councils. These have included offering local councils subsidised rates on the replacement of existing open-wire constructions with ABC. Other initiatives have been to fund tree removal and replacement programmes and, in the case of Integral Electricity, the establishment of Customer Environmental Liaison Committees.

A similar approach taken by Seattle City Light has been documented by Barnes and Greenlee (1991). In 1988 this electricity supply authority established a Citizens' Advisory Forum on Tree Replacement. The forum was charged with the development of policy recommendations for the removal and replacement of trees that interfered with powerlines. The recommendations they made included an inventory of all trees, analysis of the information with respect to current and alternative pruning practices, guidelines for deciding when to remove a tree, the establishment and implementation of a tree replacement programme, development of training programmes for inspectors and pruning crews, customer involvement and responsibility as well as funding options. Test site locations have been established to put these recommendations in place and these continue to be monitored and the programme modified as needed. The overall conclusion by those involved was that everyone in the community need to be involved and committed to take some part in correcting the conflict between trees and powerlines.

#### 4.7 *Lost opportunities.*

How much effort, energy and money are we expending on depressingly mismanaged mistakes. A quick look around any suburb or town would reveal many opportunities for tree planting where there are few constraints. Wide grassy nature strips with no overhead powerlines, edges of playing fields and schools are all available for exciting plantings of a diversity of trees and shrubs to bring nature and interest back into the city. In these times of Greening Australia, Landcare and greater environmental awareness perhaps these areas could be targeted by local councils and electricity supply authorities as multifunded community projects. This is an area in which TREENET clearly has a role.

## 5.0 Conclusions.

There is clearly no easy answer to resolving the conflict between trees and powerlines. At present the balance of the responsibility for managing trees beneath powerlines appears to be borne by the electricity supply authorities. Most of the initiatives be they staff training, improved pruning techniques, community liaison, removal and replacement programmes or aerial bundled cable have come from the electricity authorities rather than local Councils. Is this reasonable?

A much more systematic and mature approach to tree management is required by all parties concerned. The benefits of carefully planned, implemented and updated tree inventories cannot be understated. The identification of those trees which have little function and that are a continual drain on limited budgets should be targeted for removal and if necessary replaced. Similarly those areas where pruning costs can be off-set by the installation of aerial bundled cable should be high on the agenda. Responsible tree planting by local councils, particularly exploiting the lost opportunities of areas without powerlines, would also contribute significantly to better and more cost-effective streetscapes.

What is clear is that gains have been made in the last decade and with on-going training, greater and more fundamental co-operation between electricity supply authorities and their constituent councils, and education of the general public that the situation can only improve.

(Note: This paper is an edited and updated version of "Powerlines and Trees can Work Together" presented by Judy Fakes at the 1994 RAIPR Conference in Canberra.)

A more detailed account of the pruning techniques used in the "Tree Care for Electricity Workers" course can be found in Fakes, J (1997) "Pruning for Powerlines", *Arbor Age*, Vol.2 No. 2 pp 18-24.

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# TREE PLANTING NEAR POWERLINES: WHAT SPECIES?

**Bob Amezdroz**

## Introduction

Since November 1988 the Electricity Act and Regulations have made restrictions to what could be planted under and near the powerlines throughout South Australia. Concerns were raised since this date over the plants that were chosen because of their size, shape and how they reacted to the different soils and climatic conditions throughout our state of South Australia.

## Questions most asked

### Where can we plant and what is the prescribed area?

The prescribed area is the distance from the centre line (an imaginary line on the ground directly below the conductor if one conductor, if more than one conductors it is the equidistance from the outside conductors.) to a point parallel to the centre line. This area can vary from 6m across under low voltage or 240 volt lines in a non-bushfire risk area to 25m across under 275,000 volts lines in a bushfire risk area. Within this area planting restriction apply, outside this area there are no restrictions applying to powerlines.

### What and who is the Technical Regulator?

The Technical Regulator has many functions, one being the administration of the provisions of the Electricity Act relating to the clearance of vegetation from powerlines. At present the regulator is Rafael Orschulok, Principal Engineer Electrical, Office of Energy Policy. The Regulator can approve or disapprove any exemption.

### What can we plant?

New species of plants are being found each year and there are existing plants that could fulfil the local governments idea of an ideal urban street trees. Local Government personnel have the best knowledge of local plant growth and the environmental conditions. Because some of these trees do not fall within the prescribed list of recommended trees being planted near or under powerlines, what options do you have?

- Change of overhead bare conductors to fully insulated or just insulated conductors.
- Relocation of conductors to a different position.
- Undergrounding of overhead conductors.
- Exemptions for plants under conditions from the Regulator.

Local government is responsible for maintaining clearances to powerlines at own expense.

What do the local ratepayers want and are they prepared to pay for unsuitable plants?

### Are we still planting the wrong species?

'National Tree Conference 1994'- Truths and myths about the use of eucalypts. Eucalypts usually have a life span of around 35 years in the urban environment. With the cost of maintenance and issues of public liability and safety, are we prepared to have 3 trees planted in the same spot every 100 years or are there more suitable trees like an Ulmus, Platanus or Quercus a better choice lasting over 100 years with minimal costs?

### Planning for the future, short, medium and long term strategies

What aims do Local Government have towards trees and powerlines? Have all powerlines put underground so areas can have large avenues of tree lined streets and at what cost? Insulate all low voltage cables for minimal clearances? Involving the community for plant species being planted? Relocate powerlines away from trees?

### **Present costs for options**

All options have approximate costs and you should have ETSA Technical staff give true costings to any project.

- Low voltage 'ABC' 40m span (no replacement of poles) approx. \$2000
- Low voltage only, undergrounding, approx. \$350.00 per metre.
- Low and High voltage undergrounding, approx. \$500 - \$800 per metre.

### **Underground Cable Restrictions**

Other than 66,000 volt cables and easements around Transformer and Switching Cubicles there are no restrictions on what can be planted over the top of underground cables. Over the top of 66,000 volt cables List 1 plants are only allowed.

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# EXPERIMENTS AND EDUCATION: THE ROADWAY AHEAD

Judy Fakes

## Abstract

The long-term success of street tree plantings is the end result of a complex process involving many players. To date it would seem that there has been a fair amount of good luck rather than good management. As streets and roads become more intensively developed the number of constraints to be considered in the tree selection process increases. Community expectations continue to broaden. Society is becoming more litigious. Managers must be more accountable financially, environmentally and commercially. All of these factors make it more important than ever to develop a systematic process of tree selection and establishment that delivers the benefits to which we all aspire. TREENET can play a pivotal role in this process.

For this process to be successful, all of the stakeholders must be aware of the complexities within this process. The role of education in this process is essential and undeniable.

## 1.0 Introduction

In any field, the pursuit of knowledge requires thought, planning and a systematic investigation of all factors involved in the process being investigated. The process of selecting, installing and managing street trees is very complex indeed. The establishment of TREENET is a very important step in applying a more systematic approach to a process which has often been based on subjective rather than objective factors. There would be many examples around the country where the species chosen has been the favourite tree of the person planting the tree (or that of a local councillor). Similarly, the use of certain species has reflected what was in stock in the council nursery or what the local nursery had left over. In many areas it is simply luck that has left us with a legacy of well-grown and established street trees.

This is certainly not to say that "experiments" and trials have not occurred. Even Governor Arthur Philip "experimented" with trees such as *Quercus robur* and *Pinus* species in the earliest days of Sydney. Plantsmen such as Charles Moore, Joseph Maiden, Ferdinand von Mueller, Walter Hill, Charles Weston and Lindsay Pryor amongst others introduced a wide range of species over a wide range of environments. Some of these introductions have become the essence of the character of the landscape in many urban and regional areas.

## 2.0 The process and problems of tree selection and establishment

As anyone who has tried to do it knows, selecting street trees is extremely difficult. There are an increasing number of constraints, particularly in urban areas, and an increasingly litigious community. Whilst the community has the expectation that street trees exist to provide shade and beauty, they are becoming less tolerant of shedding leaves and fruit and are more likely to sue if they trip over pavement which

has lifted due to root growth. We all know that there is no such thing as the perfect street tree but search is on for the most appropriate plant for the particular site.

It is not only the successful selection of trees which often appears as a random event, so too is the establishment process. The ability to plant and maintain trees requires skill and thoughtfulness. It also requires that whoever is responsible for these seemingly simple tasks has some view of the future and a commitment to making a long term contribution to the environment. Unfortunately, poor stock quality, sloppy planting practices and little to no follow-up are the norm in many local government areas. This may be partly due to inadequate staff who may or not be trained and increasingly tight budgets. How many well planned and planted streetscapes have been destroyed by the careless use of mowers and whipper-snippers?

The people who manage our streetscapes must have a handle on all aspects of tree selection, establishment and management. How do you manage something if you don't know what it is, where it is or in what condition it is? The answer is that it is very difficult and that the usual result is crisis management and more seemingly random events.

The end result of this type of process is a very conservative approach to tree selection and "management" ie. stick with what we've always used, bung it in the ground and hope for the best. It also produces a limited palette of species that people are prepared to use and therefore growers are prepared to produce. Landscapes become predictable with a sense of sameness from region to region. Poor establishment practices lead to a visually degraded landscape. Community expectations of trees may not be achieved and those in control of budgets may see landscape as an unreliable expenditure.

Australia is a huge country with many regional differences which should be celebrated and enhanced through the selection of species that perform to their best.

### **3.0 Experimentation and Education**

So where do experimentation and education come into this process. Education is essential for all stakeholders, the extent and detail being dependant on their role. Clearly those that select, those that plant and maintain, and those that manage our street trees must have the latest information on the best arboricultural practices. One hopes that this information can be provided by the many public and private institutions which purport to be able to do so.

Plant users should also be aware of the problems faced by plant growers (and vice versa). Plant growers should also be aware of the latest developments in producing plants of the highest quality in an economically viable way.

Similarly, "tree" people must also be aware of the other users of the street. Authorities who install, maintain and manage services, roads, transport and other infrastructure have their own legal and logistical issues which are no less important. The community's expectations of the reliability of these services would probably outweigh their expectations of the landscape. As above, these authorities also have an obligation to manage their assets in an environmentally sensitive manner.

The community must also be made aware of the complexity of the environment in which they live. Most people are blissfully unaware of how their power, water and gas materialise in their houses. Likewise they are largely unaware of the difficulty of selecting, establishing and maintaining their street trees.

I firmly believe that increasing everyone's awareness of the requirement of all players leads to a more constructive debate and the achievement of a sensible compromise.

It would be great to think of TREENET as a clearing house for the dissemination of information. The basis of this appears to be well under way in South Australia with many influential people on the Advisory Board. The challenge will be considerable for other larger and diverse States but hopefully not impossible. There is now a network of tree-related organisations throughout Australia which could instigate and manage a number of planting trials.

For many years I have suggested to students and others that most councils have hundreds of kilometres of trialing grounds at their disposal - streets, parks, reserves and schools where many potential new street trees can be tested under local conditions. Botanic Gardens are often just zoos for plants. Whilst I don't think Botanic Gardens are good trialing grounds for street trees as the level of care is too intense, they undoubtedly hold many species that should be tested under more rigorous growing conditions. It was love at first sight when I first visited the Waite Arboretum. Here is a place where the trees are essentially left up to their own devices in a climate which is pretty tough.

Places like Centennial Park in Sydney once had a role in experimentation but changes in management which reflected the change in park usage have let that role slip. The new Tree Master Plan for the park should go some way to restoring that role.

The scope for arboricultural education is the best it has ever been. My concern is that there are still many horticultural myths and legends being promoted and practiced. Arboricultural knowledge has increased exponentially over the past decade. It is essential that those who consider themselves educators in the field of arboriculture are up to date.

As diploma, undergraduate and post-graduate courses in arboriculture and urban forestry develop there will be more opportunity to involve students in the design and implementation of tree planting programs. It would be very useful to involve people from forestry schools. Part of the success of Canberra's street trees is based on the early involvement of foresters.

#### **4.0 Conclusions**

I have said nothing new in this ramble but the time is right to start applying a more systematic approach to tree selection and to explore the enormous diversity of trees that we have on this planet. Apart from species that are related to the tried and true but ubiquitous street trees we already use, what about the exciting cultivars that we can read about in nursery catalogues but rarely see in the field. I also find it extraordinary as to how little we have explored and used our own flora as street trees.

What lies ahead is exciting stuff but lots of hard work. It will certainly take some inspiring individuals to start the ball rolling. I think that the arboricultural industry and the educational support which now exists in Australia has reached (or is reaching) a critical mass from which ventures such as TREENET can take off. The increase in arboricultural knowledge has increased exponentially over the past decade and educators in the field must continue to work hard at spreading this knowledge to all who need it.

# GREENING THE CITY OF WEST TORRENS

**Tim Johnson**

The following notes summarize the presentation given at the TREENET Symposium in September 2000. The presentation summary included:

- the current state of established street trees in the City of West Torrens
- the City's historical approach to greening
- issues and problems in greening a highly urbanized area with a culturally diverse population
- recent greening works
- trials of a range of relatively unknown tree species to determine their local suitability for street use

The northern boundary of West Torrens follows the River Torrens, the Glenelg tramline forms part of the southern boundary. Soils range from heavy clay to loam & sand. Average annual rainfall recorded at the airport is 450mm

- ***Agonis flexuosa***

Halifax Street Hilton & Henry Street Plympton are examples of typical streetscapes occurring throughout West Torrens. Many streets have narrow nature strips, severely restricting the range of tree species which can be planted.

Many existing street trees were planted in response to publication of the schedules included in Regulation 12 of the Sewerage Act of 1929-1977. The *Agonis flexuosa* in Goldfinch Avenue at Cowandilla are one example, they were removed during autumn 2000 and replaced with *Acer buergerianum*

- ***Eucalyptus tessellaris* and *Eucalyptus cneorifolia***

*Eucalyptus tessellaris* in Selby Street Kurralt Park is an example of an inappropriate species for street use. Structural hazards & infrastructure impacts at 20 years of age required that they be removed.

*Eucalyptus cneorifolia* and some other species planted following preparation of the Sewerage Act regulations and schedules remain quite healthy but their contribution to the amenity of streetscapes is frequently questioned. They are generally unpopular with residents.

- ***Eucalyptus diversifolia* and *Eucalyptus stricklandii***

Many of the species approved by service providers have very limited suitability to the West Torrens built environment, *Eucalyptus diversifolia* and *Eucalyptus stricklandii* being two examples. *Eucalyptus nicholii* & *Eucalyptus stricklandii* have very limited suitability to the majority of sites in West Torrens, though both were widely planted in the 1970's.

- ***E. spathulata* and *M. armillaris***

*Eucalyptus spathulata* and *Melaleuca armillaris* are both listed in schedule B of regulation 12 of the Sewerage Act, approving their planting no closer than 3.5 meters from sewers.

Both species are responsible for many problems with sewers. *Prunus* sp. deteriorate rapidly beyond 20 years of age, hundreds have been removed from Plympton over recent years.

- ***Ceratonia siliqua* and *Ficus hillii***

While Council has statutory authority to control planting in streets, problems arise when plants set seed or when residents undertake unauthorized works. Carob, Ficus and olives are common problem trees in streets.

Deliberate and malicious vandalism hinders our greening work, as does inappropriate arboricultural practices employed by some well-meaning residents.

Council has established avenues throughout the City, many with *Eucalyptus leucoxylon* ssp. *megalocarpa* and *Koelreuteria paniculata*. The amenity & longevity of these species ensure they will remain popular though Council frequently receives complaints about the litter they produce.

- **Queensland box**

There are over 150 mature avenues of Queensland box trees in West Torrens. Council receives hundreds of complaints concerning this species every year, the majority of them relating to litter.

Our experience and familiarity with these species tells us we're going to have problems due to the size of the Ficus, but the size of the Queensland box isn't an issue in western Adelaide. It is this familiarity with trees growing under local street conditions which we aim to increase through our involvement with TREENET.

Would we have ever contemplated planting Queensland box trees if our experience of them was derived from specimens growing under natural conditions reaching up to 50m tall? Unless we plant & monitor the performance of tree species under our environmental conditions we'll never be sure of how they perform locally and we may unnecessarily limit our urban forest's diversity.

The amalgamation of the Town of Thebarton and the City of West Torrens in 1997, subsequent restructuring including the merging of workforces, and the implementation of a Continuous Improvement Policy brought a change of direction to the Greening of West Torrens. While the quality and scale of works was maintained, a focus on research was also included. Much of the innovation in the greening programs since 1997 has resulted directly from the research and ideas of Council's horticulture staff, primarily the team leaders of the Landscape Development and Arboriculture teams.

Initially research commenced at the University of Adelaide's Waite Arboretum. Local libraries and the internet also proved to be valuable resources. Nursery stock lists were studied closely for species which had potential but had not been tried locally as street trees. Our experience with Queensland box and their potential size

under natural conditions suggested it may be worth planting small numbers of other rainforest species to see how they perform locally.

- *Flindersia australis*

The Crow's ash at the Adelaide Botanic Gardens has a trunk almost two meters in diameter. The species would normally be considered too large for street planting.

**The mature Crow's ash at Plympton Primary School is about 7 meters tall & has a trunk caliper of about 300mm. It has no obvious problems or negative impacts on its surroundings, this specimen would make an ideal street tree in some situations.**

59 Crow's ash were planted in three streets in 1998, sites include loam & clay, pH 5.5 to 7.5. Stock ranged in size from \_\_\_\_\_, in 500mm and 330mm spring ring containers.

TREENET sites:       Allchurch Avenue North Plympton  
                              Howden Road Fulham  
                              Tennyson Street Kurralta Park

- *Acer buergerianum*

One of the goals of our research is to determine a greater number of species which will thrive under local conditions, provide good amenity and mature at a height below overhead powerlines. Research suggested the Trident maple would be a useful species- being the right size, growing on limestone & probably surviving on our rainfall.

The City of Prospect has had success with establishing the Trident maple in some fairly harsh areas. On Prospect Road they are thriving in red earth over limestone, with reflected heat and moderate levels of pollution from traffic.

Initially 156 trees were planted in the six streets selected as trial sites in 1998. Stock was bare rooted, 1meter tall with 10mm caliper. Sites range from sand to heavy clay, pH range from 6.0 to 7.5. All have performed well to date except those in sandy soils of pH 6 at West Beach, these died over a two year period and have since been replaced with *Acer pseudoplatanus*. (*Acer pseudoplatanus* were planted as a trial in 1998 on the opposite side of the road, they have thrived.)

TREENET sites:       Berrima Street Glenelg North  
                              Byron Avenue Netley  
                              Garfield Avenue Kurralta Park  
                              Goldfinch Avenue Cowandilla  
                              North Parade Torrensville  
                              Woodhead Street West Beach (trees replaced winter 2000)

- *Acer campestre* "Evelyn"

166 *Acer campestre* "Evelyn" were planted in four streets in winter 2000. All stock was advanced bare-rooted supplied by Flemings Nurseries.

TREENET sites:       Brook Street Plympton  
                              Halifax Street Hilton

Henry Street Plympton  
Raffles Crescent Plympton

- *Acer pseudoplatanus*

Texts may suggest the Sycamore maple will grow to a massive size and will sucker and set seed prolifically. The species is known to be an invasive weed in areas of Europe and the U.S.A.

The specimen of *Acer pseudoplatanus* at the Waite Arboretum is about 5m tall and looks like a small plane tree. It was planted in 1941 and survives to this day. A second and very similar specimen planted in 1929 died and was removed recently. A third mature specimen can be seen at Lockleys Garden Center on Henley Beach Road near Airport Road, it has developed to a size similar to the examples at the Waite Arboretum. None of the established examples show any signs of the problems mentioned in texts.

117 trees were planted in 6 streets in 1998. Stock was bare rooted 1.8-2meters tall x 20mm caliper, it was supplied by Freshfords Nurseries. Sites range from sandy to heavy clay, pH range 6 to 7.5. The species appears hardy but growth has been slow and steady at all sites.

TREENET sites:        Berrima Street Glenelg North  
                              Castlebar Road Lockleys  
                              Daringa Street Mile End  
                              Garfield Avenue Kurralta Park  
                              Pine Avenue Novar Gardens  
                              Woodhead Street West Beach

- *Acer monspessulanum*

The example of the Montpellier maple at the Waite Arboretum, and research through a number of texts, suggests this species will suit our local conditions and be useful for planting in relatively small areas and beneath powerlines. The species appears to be rarely propagated and difficult to source, though seed is readily available from the specimen at the arboretum.

10 *Acer monspessulanum* were planted in 2000 in Lily Street at Hilton. Stock was supplied in 10 liter bags by Freshfords Nurseries.

- *Acer x freemanii*

Anyone seeing the “Jeffersred” hybrid maple in full autumn color can’t fail to be impressed, but local experience with many of the North American maples suggests it is unlikely to survive on the Adelaide plains. As Fleming’s Nurseries product information described the variety as the most “drought resistant” of the hybrids we planted some on a trial basis though we weren’t confident it would suit our conditions.

10 trees were planted in 3 locations (sites selected were relatively “soft” with ample space and a good cover of mulch), stock was advanced bare-rooted at 3 meters tall x 30mm caliper, Stock was supplied by Fleming’s Nurseries.

TREENET sites:        Marion Rd Plympton, near Elizabeth Avenue  
                              Autumn Avenue Lockleys, traffic island at terminus

Also two trees planted at Thebarton Neighbourhood House, 10 Falcon Avenue Mile End

At the Marion Road site the *Acer* was closely planted between *Pyrus calleryana* "Bradford" (45 liter bagged stock) as the *Acers* were not expected survive the summer. Following a typically hot January the "Jeffersred" appeared in better condition than both the *Pyrus* and the advanced *Platanus x acerifolia* which had been planted on the opposite side of the road. Following this result trials of this variety will be extended.

- ***Backhousia citriodora***

Council planted 12 *Backhousia* in winter 2000. Stock was supplied by Lawry's Nursery in 330mm spring ring containers.

TREENET sites:      Craig Street Richmond  
                             Carlisle Street Camden Park

- ***Buckinghamia celsissima***

*Buckinghamias* make good street trees in Brisbane & Sydney but we expected frost, drought & alkalinity problems in Adelaide. 40 trees were planted in 3 streets in 1998. Stock was supplied by Lawry's Nursery in 200mm pot & 500mm spring ring containers. Sites ranging from sand to heavy clay, pH range 6.5 to 8.

TREENET Sites      Allchurch Avenue Plympton  
                             Concord Avenue Netley  
                             Wyatt Street Plympton

The results after 2 years in Wyatt Avenue are surprising, as *Agonis flexuosa* struggled and died in this location 7 years earlier. The larger stock has nearly doubled in size and has flowered twice each year while smaller stock performs poorly. Small stock is more susceptible to frost damage, vandalism and herbicide spraydrift.

The 200mm potted stock looked healthier at planting time but struggled during winter.

The view along Wyatt Street in February 2000 shows larger stock flowering in the distance while smaller stock is dead in the foreground. The smaller stock was severely burnt by frost but died following contact with Roundup spray drift.

- ***Caesalpinia ferrea***

The example of *Caesalpinia ferrea* at the Waite Arboretum suggests it will develop into a graceful small tree with ascending branches and fine bipinnate foliage. 26 trees were planted in 3 streets in winter 2000. Stock was supplied in 330mm spring ring containers and was provided by Lawry's Nurseries.

TREENET sites:      David Court Lockleys  
                             Edward Davies Street North Plympton  
                             Muirfield Street Novar Gardens

- ***Castanospermum australe***

The specimen of *Castanospermum australe* at the Adelaide Botanic Garden is broader & shorter than the specimen in the above photograph, suggesting that under local conditions the species may meet the requirements of a street tree.

29 trees were planted in the 1998 program. Stock was supplied in 200mm pots by Lawry's Nurseries. Soil is clay, pH 6.5-7. Growth has been slow, better in bare earth or dolomite verges. This species responds well to regular fertiliser application.

Treenet site: Talbot Avenue North Plympton

- ***Corymbia ptychocarpa x ficifolia* "Summer Red."**

65 trees were planted in 3 streets in 1999. Stock was supplied by Heyne's Wholesale nursery in 150mm pots. Additional trees were planted in 2000 to determine suitability to sandy soils in Netley.

TREENET Sites: Burbridge Road Brooklyn Park (1999)  
Elsie Street Netley (2000)  
Florence Street Netley (2000)  
Lancaster Street Lockleys (2000)  
Lorraine Avenue Lockleys (2000)

- ***Cupaniopsis anacardioides***

Research suggested the Cupania may be a suitable small evergreen native suitable for planting under powerlines. 41 trees were planted in 1998. The species appears suited to local conditions, with good average growth rates recorded.

TREENET sites: Hayward Avenue Torrensville  
Lorraine Avenue Lockleys  
Rawlings Avenue Torrensville

- ***Elaeocarpus reticulatus***

Research suggested the Blueberry ash may be another small evergreen native suitable for planting under powerlines. 17 trees have been planted at two sites. Stock was supplied by Lawry's Nurseries in 330mm spring ring containers.

TREENET sites: Selby Street Kurrulta Park  
Carlisle Street Camden Park

- ***Eucalyptus leucoxylon* "Australflora Euky Dwarf"**

The Euky dwarf is apparently unpopular with residents, it has been subjected to vandalism. Few of the 50 trees planted remain.

TREENET site: Myzantha Street Lockleys, single specimen

- ***Flindersia xanthoxyla***

Due to the species' potential size at maturity, the site selected for trial of *Flindersia xanthoxyla* is spacious and far from private property. 31 trees were planted in 1998. Stock was supplied in 200mm pots. The species appears to be slow growing & therefore prone to vandalism.

TREENET site: Airport Road median, Brooklyn Park

- ***Fraxinus velutina***

Research suggests a hardy species which may grow well under local conditions. 101 trees planted in 4 streets in 1998, all have clay soils in pH range 6 – 7

TREENET sites: Allen Avenue Brooklyn Park  
Chatswood Grove Underdale  
Lewis Street Brooklyn Park  
Talbot Street North Plympton

- ***Geijera parviflora***

The wilga is a small evergreen native from northern New South Wales, it is approved by ETSA for planting beneath powerlines. It looks like being an excellent street tree but is slow growing & prone to vandalism. Examples at the Waite Arboretum and Adelaide Botanic Garden have had minimal pruning and consequently are quite bushy. The specimen growing to the northeast of the rotunda at the Adelaide Zoological Gardens may be a better example of how the species will mature if given additional water and formative pruning.

64 trees were planted in 4 streets in 1998. Stock was supplied in 200mm spring ring containers by Lawry's Nurseries. Soils range from sandy loam to clay, pH 6.5 – 7. Additional trees have been ordered to extend our trial of this species but they will not be planted until at least 1.5 meters in height, thus requiring several years in the nursery.

TREENET Sites: Argyle Avenue Marleston  
Carlisle Street Camden Park  
Lasscock Avenue Lockleys  
Garfield Avenue Kurralta Park

At Lasscock Avenue as elsewhere the best growth rates were recorded where trees were planted in bare earth verges. Trees planted in lawn performed poorly & many have been replaced (with *Cupaniopsis*) in response to pressure from residents.

Many wilgas were planted in kikuyu lawns in Lasscock Avenue and Argyle Avenue. In all cases wilgas have performed poorly under such conditions.

- ***Harpullia pendula***

In the texts *Harpullia pendula* is described as a tall rainforest species, but it appeared to have potential as another small to medium evergreen native suitable for street planting under our conditions. The specific name suggests possible problems or maintenance issues relating to a pendulous growth habit. 17 trees were planted in Wyatt Street Plympton in 1998. Stock was supplied in 330mm spring ring containers by Lawry's Nurseries.

*Harpullia pendula* has suffered badly from frost & cold during winter. Greatest growth rate was observed in January/February 2000 during 2 weeks of high relative humidity & 50mm rainfall.

- ***Harpullia hillii***

37 *Harpullia hillii* were planted in Basnett Street in 1998. Stock was supplied by Lawry's Nurseries in 200mm pots & 330mm spring rings. Soil is sandy loam with a pH of 8.0. Growth rates have been variable, with larger the stock performing better. Smaller stock appeared to be less tolerant of frost & cold.

- ***Lagerstroemia indica* x *fauriei*, "Indian Summer" varieties.**

20 "Tuscarora," 20 "Biloxi" and 3 Natchez varieties were planted in 1999 & 2000. All appear to thrive under local conditions. Growth rates are reasonable, much quicker than *L. indica*. "Tuscarora" and "Biloxi" varieties were selected for their upright form, they flower in their first or second year & consequently are popular with residents. Trials of these varieties will be extended.

TREENET Sites: Samuel St Fulham  
Cygnet St Novar Gardens  
Basnett Street Kurralta Park  
Stonehouse Avenue Camden Park, near Anzac Highway

- ***Pistachia chinensis***

The *Pistachia chinensis* shown in Herbert Road Ashford appears ideal as a small street tree. It was planted by residents in 1964, is of good size & shape & has no observable impacts on infrastructure. There are several examples planted in local gardens, where they appear to mature at about 8-10 meters in height.

285 trees have been planted in 8 streets in 2000, a representative sample will be monitored for inclusion in TREENET.

*Pistachia chinensis* planted in: Avon Street Kurralta Park  
Bignell Street Richmond  
Devon Street West Richmond  
Glenburnie Terrace Plympton  
Murdoch Avenue Plympton  
Neston Avenue North Plympton  
Selby Street Kurralta Park  
Talbot Street Hilton

The example of *Pistachia chinensis* in the Waite Arboretum was planted in 1929, showing that the species can become quite large under local conditions.

- ***Pyrus calleryana* cultivars**

Council has planted "Redspire," "Bradford" & "Winterglow" varieties over the past 6 years & more recently "Capitol" & "Chanticleer." All appear reliable & well suited to local conditions. Monitoring through TREENET will be of use to determine long term impacts related to fruit, litter and structural integrity with age. *Pyrus calleryana* is approved by ETSA for planting beneath powerlines. Ash white fly problems have been observed & all cultivars appear to suffer form aphid infestations in some years.

- ***Sapium sebiferum***

*Sapium sebiferum* is occasionally seen growing in domestic gardens. As it is a small species it may be useful for planting beneath powerlines. 45 trees were planted in Dudley Avenue Plympton in 1999. Stock was supplied in 25 liter bags by Freshfords Nurseries.

- ***Toona ciliata***

The Toonas at the Adelaide Botanic Garden are massive specimens but are grown under moist conditions in enriched soils. The specimens at the Waite Arboretum are much smaller, some show signs of stress toward the end of a typical Adelaide summer.

35 *Toona ciliata* have been planted in West Torrens in 1999-2000. Stock was supplied in 10 liter bags by Lawry's Nurseries and has been planted in Airport Road median at Brooklyn Park and in various parks & reserves.

- ***Zelkova serrata***

The two specimens of *Zelkova serrata* were planted in the Waite Arboretum in 1938 and 1944. They are an excellent shade tree, similar in size and habit to *Celtis occidentalis*.

51 trees were planted in 3 streets in 1998. Stock was bare rooted seedling variety and was 1.2 meters tall when planted. The species has shown to be surprisingly hardy and vigorous.

TREENET Sites:      Washington Street Hilton  
                         Sarah Street Marleston  
                         Wakefield Place Brooklyn Park

Similarities between *Zelkova* & *Celtis* are obvious & both have similarly high maintenance requirements in their early years.

- **TREENET**

As well as being a valuable opportunity to be involved in vital research, TREENET has provided West Torrens with a valuable opportunity to promote developments in Council's horticultural practices & goals. Council has freely presented information about its involvement in TREENET to residents & positive feedback from the community is quite common.

- **Fact Sheets**

Council provides information on tree species in the form of factsheets, they are made available on request or can be downloaded from the website. Where possible, factsheets are provided to all householders in each street involved in Council's annual greening program. Providing such information and initiating discussion during the planning stages of Council's greening programs has been effective in increasing community support for greening works and for the care of street trees.

Many of the greening programs of previous decades have been ineffective, frequently utilizing inappropriate species with have obvious impacts and major maintenance

concerns whilst providing limited benefit to the community. Consequently, many members of the community have a low opinion of local government's horticultural knowledge and ability.

Including a short note about the TREENET Program on the relevant factsheets immediately raises Council's horticultural credibility through the link with the University of Adelaide. Many residents appreciate the fact that Council is affiliated with such an organization and is making use of resources like the Waite Arboretum.

Residents have occasionally raised concerns with respect to Council's involvement in TREENET trial planting. Their concerns fall into two main categories:

1. Trees may fail to perform & may require replacement within a few years.

Many of the Wilgas in Lasscock Avenue at Lockleys for example were replaced after two years. Residents frequently take a short-term view, often demanding trees which improve amenity quickly.

2. Trees may grow more than expected and may become too large.

Both of the above risks can be minimized by planting an appropriate number of trees and through careful selection of trial sites. For example: *Pyrus* generally perform reliably so extensive trials of new varieties could be planned. If there is considerable doubt about the suitability of a particular species only a small number of trees should be planted.

If there is reasonable concern that a species may develop into a large tree under local conditions its trial site must be carefully selected. A reserve frontage may provide a suitable site for trials of potentially large species. Trees could be planted on the reserve toward the road frontage to approximate street tree conditions, but they could be grown to maturity without the adverse impacts from limb reduction, root pruning etc. which arise when such trees are grown in close proximity to private properties.

There will always be some risk in dealing with unknowns and in time it may be shown that some species have been planted inappropriately through our TREENET trials. Few people would consider planting *Melia azedarach* as a street tree, but even fewer would consider removing established avenues. Planting a melia avenue would be considered irresponsible by today's standards, but the amenity that mature avenues currently provide is exactly what many people want from a greening program.

The mature melia avenues in West Torrens are sixty to seventy years old, they will not survive beyond a few more decades. We have a good understanding of issues relating to melias as street trees because we are so familiar with them, but we risk losing this familiarity in future. To ensure we retain this familiarity, melias should continue to be planted but in appropriate numbers and locations.

# ASSESSING THE SOILS OF TREENET SITES

**Kevin Handreck**

TREENET sites need to be chosen so as to simulate the soil environment in which the trees will eventually grow. This is probably impossible in detail. But some data must be collected so that different sites can be compared. Then, when different sites give different responses in a particular species, it may be possible to determine the cause of poor growth or specific symptoms of unthriftiness, or of good growth. Every area has a variety of soil types. Many urban situations are highly disturbed.

## **Factors to consider in a TREENET trial site**

- Topography
- Position of trees on slope - top, middle, break, bottom
- Drainage lines
- Compaction level at surface and depth (measure using a penetrometer)
- Free lime levels at various depths
- Have soil (from several parts layers of the profile) analysed using the SASPAS Soil Kit - ask for:
  - texture
  - pH
  - salinity
  - exchangeable cations
  - exchangeable sodium percentage
  - available phosphorus
- Assess drainage from the colour of the soil
- Evidence of seasonal waterlogging from soil colour
- Depth to groundwater; salinity of the groundwater
- Look at existing trees in the area. Are there any problems? If there are, describe the symptoms.
- Heat load
- Root restriction
- Water supply
- During the life of the trial site, assess seasonal soil conditions and the response of the various species planted.

## **APPENDIX 1:**

### **SPEAKER PROFILES & CONTACT DETAILS**

#### **Judy Fakes**

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Ryde College of TAFE,  
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#### **Kevin Handreck**

Netherwood Horticultural Consultants Pty Ltd,  
2 Birdwood St,  
Netherby, 5062.

**Phone/Fax:** 08 8272 3371

Kevin Handreck is Managing Director of Netherwood Horticultural Consultants based in Adelaide. Netherwood provides information on potting media, soils, other growing media, fertilisers, plant nutrition and related matters to all horticultural industries, including hydroponics.

Kevin retired from CSIRO three years ago. He chairs Standards Australia committees that set the standards for:

- Potting Mixes
- Composts, Mulches and Soil Conditioners, and
- Soils for Landscaping and Garden Use

Kevin has written two books - Growing Media for Ornamental Plants and Turf, and Gardening Down-under, as well as over 150 scientific papers and articles for industry publications.

#### **Tim Johnson**

City of West Torrens  
Technical Officer Parks & Gardens.

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#### **David Lawry**

TREENET Chair and Director, Lawrys Nurseries

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**Mobile:** 0411 880 066  
**Fax:** 08 8270 7711  
**Email:** lawrys@world-link.com.au

David Lawry is an Agricultural Science graduate from the University of Adelaide Waite Campus, majoring in horticulture and economics. He had his first practical experience with planting street trees during Uni holidays – working for the Mitcham Council. After three years teaching he commenced his business as a nurseryman in 1975, specializing in the production and sale of native trees & shrubs, and later landscape construction.

The decision to focus on the production of street trees 20 years later led David to reevaluate his contributions thus far to the urban landscape and the verdict wasn't good! All of those Prunus and Queensland Box trees he planted 30 years earlier for Mitcham were either long gone or in the process of removal. In the late 70's his evangelical zeal for anything native and his reassuring sales pitch contributed to the planting frenzy of vigorous Eucalypts, Willow Myrtles and Melaleucas in the streets of South Australia and elsewhere.

Whilst happy to have provided work for so many in managing his inappropriate selections of Australian forest trees for confined urban precincts he prefers to think that his future business activities will have a more positive and enduring outcome.

To that end, together with Dr Jennifer Gardner at Adelaide University, he founded TREENET in February 1997 and continues to serve as Chairman of the Board of Advisors.

### **Gregory M Moore**

Principal, Burnley College

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The Boulevard,  
Richmond 3121

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Greg Moore has been Principal and Head of Burnley College of the Institute of Land Food Resources at Melbourne University since 1988. Prior to that he had been a Senior Lecturer and Lecturer in Plant Science and Arboriculture at Burnley from 1979.

Apart from a general interest in horticultural plant science and ecology, Greg has a specific interest in all aspects of arboriculture, which is the scientific study of the cultivation and management of trees. He has contributed to the development of Australian Standards in pruning and amenity tree evaluation and has been a major speaker at conferences in Australia, Hong Kong, USA and New Zealand in recent years. He was the inaugural president of the International Society of Arboriculture, Australian Chapter.

He has been a member of the National Trust of Victoria's Register of Significant Trees since 1988 and has chaired the committee since 1996. Greg has been on the Board of Greening Australia (Victoria) since 1989 and has been an active member of

various sub-committees of that organisation. He has been involved with the Agriculture and Horticulture subject at VCE level since its inception and has been involved in the setting of all the examinations in that subject. He has also served on a number of industry and TAFE sector committees, especially those that deal with curriculum and accreditation matters.

He is currently supervising eight post-graduate students and continues to pursue an active research profile in any matters that relate to trees in the urban environment. He has written one book, contributed to another and has had some 50 research papers and articles relating to tree biology and management published.

### **Colin Pitman**

City of Salisbury

**Phone:** 08 8406 8222

**Email:** cpitman@salisbury.sa.gov.au

Qualifications: Immediate Past President of Institute of Municipal Engineering  
Bachelor of Technology in Civil Engineering  
Local Government Engineers. Certificate  
Master of Business Administration in Town Planning.  
Building Surveyors Certificate.

Colin Pitman is currently employed as the Director Contract Management for the City of Salisbury (previously "City Engineer").

Colin is a qualified Civil Engineer, and holds a Master in Business Administration. His background includes work in both the public and private sector. His interests are in developing innovative Local Government techniques for managing and improving assets.

Colin's current position is responsible for overseeing a budget of approximately \$32 million per annum. In addition, he is responsible for capital and recurrent works programmes for construction of roads, buildings, drains, street infrastructure, traffic management and external project management.

Recent activities of significance include the following.

- Project Manager of design and construction of 15 wetland systems
- Construction of the first major aquifer recharge programme for metropolitan Adelaide.
- Project Manager for design and construction of Cobbler Creek Dam
- Chairman of the Local Roads Advisory Committee of the Australian Road Research Board
- Past President of the Local Government Engineers Association of South Australia
- Advisory member to the Roadside and Road Responsibility Austroads Committee
- Advisory member for the production of the Local Government Asset Management Manual, Accounting and Physical Assets

Colin Pitman was previously employed by the City of Enfield and prior to that was Project Manager for building sites associated with construction of small to medium industrial complexes, industrial steel building construction.

He is Immediate Past President of the Institute of Municipal Engineering, holds a Bachelor of Technology in Civil Engineering, Local Government Engineers

Certificate, Master of Business Administration in Town Planning, Building Surveyor's Certificate and is currently the South Australian Representative of the Australian Road Research Board and the Asset Management Sub-Committee of the Institute of Municipal Engineering.

**Randy Stringer**

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Randy Stringer is the Deputy Director, Centre for International Economic Studies, School of Economics, University of Adelaide. Over the past twenty five years, Randy has taught, published and conducted applied research, environmental evaluations and policy analysis on forestry, water, food and agricultural resource issues in Australia, the Asia/Pacific, Europe, and Latin America. From 1983 to 1989, Dr. Stringer was an Associate Research Scientist and Lecturer in agricultural and development economics at the University of Wisconsin's Land Tenure Center. From 1990 to 1996, he worked as an economist with the United Nations Food and Agriculture Organization, Policy Analysis Division, in Rome.