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TREENET: A MANAGEMENT SYSTEM & CHOICES FOR AUSTRALIA

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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 19th 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

- LOSS OF PUBLIC OPEN SPACE
- LOSS OF PRIVATE OPEN SPACE
- INNER CITY RE-DEVELOPMENT
- OVERHEAD COMMUNICATION CABLES
- POWER DISTRIBUTION COMPANY POLICIES
- POOR PRACTICES FOR POWER LINE CLEARING
- LOSS OF EXPERTISE FROM LOCAL GOVERNMENT
- LACK OF DATA ON NATIVE TREE PERFORMANCE IN AUSTRALIAN REGIONS
- LACK OF DATA ON EXOTIC TREE PERFORMANCE UNDER AUSTRALIAN CONDITIONS
- LACK OF HORTICULTURAL INPUT INTO DECISION MAKING

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 treed 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).

LANDSCAPE VALUES • A SENSE OF SCALE • SOFTENING OF BUILT LANDSCAPE • FOCUS AND DIRECTED SIGHT LINES • LINKING & UNIFYING LANDSCAPE • A BUFFER TO UNWANTED NOISE • VARIETY OF COLOUR, FORM, TEXTURE & PATTERN • VARIATIONS IN SHADE AND LIGHT • AN EMPHASIS TO SEASONAL CHANGE • A CONTRIBUTION OF FRAGRANCE	CLIMATE AMELIORATION • SHELTER FROM THE WIND • SHADE/THERMAL INSULATION • TEMPERATURE MODIFICATION • HUMIDIFYING THE AIR • FILTRATION OF POLLUTED AIR • INTERCEPTION OF RAIN FALL • REDUCED RUN OFF & WATER TURBIDITY • ALTER EFFECTIVE PRECIPITATION • REDUCTION IN GLARE
RECREATIONAL BENEFITS OF TREES • PASSIVE RECREATION • LINKING OF HUMAN GENERATIONS • LINKS TO PARKLANDS • HUMAN PHYSICAL HEALTH • HUMAN PSYCHOLOGICAL HEALTH CONSERVATION VALUES • CREATE & PRESERVE HABITAT • PRESERVE FLORA AND FAUNA • CONSERVE GENETIC RESOURCES • MAINTAIN WILDLIFE HABITAT	ENVIRONMENTAL VALUES AND AMELIORATION • PRODUCTION OF OXYGEN • FIXING OF CARBON DIOXIDE • REDUCING EROSION • PROTECTING WATERSHEDS • ALTERING WINDFLOW PATTERS • NOISE ABATEMENT • REODORISING AIR • MODIFYING AMBIENT TEMPERATURE • PURIFYING THE AIR
EDUCATION AND INTERPRETATION • LOCAL NATURAL HISTORY • GARDENING AND HORTICULTURE • WILDLIFE/VEGETATION RELATIONS • ENVIRONMENTAL APPRECIATION	ECONOMIC BENEFITS • INCREASED PROPERTY VALUES • IMPROVED INVESTMENT • GREATER LEVELS OF TOURISM • UTILISATION OF TREE PRODUCTS • CARBON BALANCE BENEFITS • EFFECTIVE USE OF WATER • EFFICIENT MAINTENANCE REGIMES

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

- A SENSE OF SCALE
- AN ENDURING HERITAGE
- A SOFTENING OF THE CREATED LANDSCAPE
- A LINKING OF MANY HUMAN GENERATIONS
- THE CAPACITY TO LINK LANDSCAPES
- AMELIORATION OF HARSH ENVIRONMENTS

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	TREE BREEDING AND SELECTION CRITERIA
CANOPY/ABOVE 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 SUSCEPTIBILTY TO SUDDEN LIMB FAILURE
ROOT SYSTEM/BELOW GROUND	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 ESTABISH GOOD ROOT SYTEMS 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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