# DEFENDING AND EXPANDING THE URBAN FOREST: OPPOSING UNNECESSARY TREE REMOVAL REQUESTS.

**G M Moore**
Burnley College, University of Melbourne, 500 Yarra Boulevard, RICHMOND, 3121

## Abstract
The removal of senescing trees or those which pose a genuine risk to health or property is part of professional urban tree management. However, there are many requests for tree removals that are not based on a genuine likelihood of injury or property damage, but rather on an unfounded fear of what might happen or where the tree is considered to be in the way of some other activity. Across Australia, about 97% of requests for tree removals made to local government authorities are ultimately approved. Such a high rate of approvals provides a threat to the fabric of the urban forest.

In many instances, the removal of sound and healthy mature trees has unexpected costs and consequences. The loss of shade can have an effect on the temperature experienced within a dwelling over summer and this may have health consequences in terms of heat related illnesses if the occupants are elderly. Swelling of reactive clay soils my be exacerbated by a tree removal, which can contribute to problems with footings and foundations and wind damage may also be greater after the removal of a tree than it was when the tree provided a filtering of and shelter from strong wind

Too often the consequences of removing safe and healthy trees are not fully considered when undertaking the cost benefit analysis associated with any proposed tree removal. This brief paper provides a framework for decision making that could be used in defending safe and healthy trees from removal and allows the identification of any unforeseen consequences from such removals.

## Introduction
It is not surprising that after major storm events, when windthrown trees figure so graphically in media coverage or when there is a tragedy involving serious injury or death from major limb failure, people react by questioning the safety of trees and in many cases by demanding tree removals. However, understandable as knee-jerk reactions may be, professional arborists and street tree managers, have to ensure that decisions concerning removal of trees in the urban forest are logical, supported wherever possible by data and take into account the longer term consequences of such removals.

The removal of unsound and senescing trees that pose a clear and significant risk of failure with the associated likelihood of damage to property, or worse, injury is always within the ambit of the competent tree manager's decision making. There is no doubt that from time to time trees making up the urban forest have to be removed for health and safety reasons, because they are senescing or because society has made a decision concerning other land use priorities. However, there are also illogical and sometimes irrational requests for tree removals.

This brief paper is intended to provide the practicing tree manager, especially one working for local governments, with some arguments and tactics for dealing with those people demanding the removal of safe and healthy trees at a time of climate change. In many ways, a knee-jerk reaction to tree related damage or injury that sees good healthy trees removed could result in increased property damage, reduced property values and an increase in heat related illness or deaths at some time in the future. Given that heat wave related deaths are a significant killer of elderly Australians over summer, tree removals as result of tree and branch failures could lead to a higher mortality than leaving the urban forest intact.
When a request for tree removal is made there are generally two possible outcomes (Figure 1) – the request is granted or denied. It is often assumed that if the request for removal is granted, apart from the costs of removal, the action of removal will remediate the problem that precipitated the request and that there will be no further costs. But this may not be the case as removal may not remediate the problem and there can be a number of unexpected or unforeseen costs. In this circumstance it is possible that things have been made worse by removal rather than better (Figure 1).

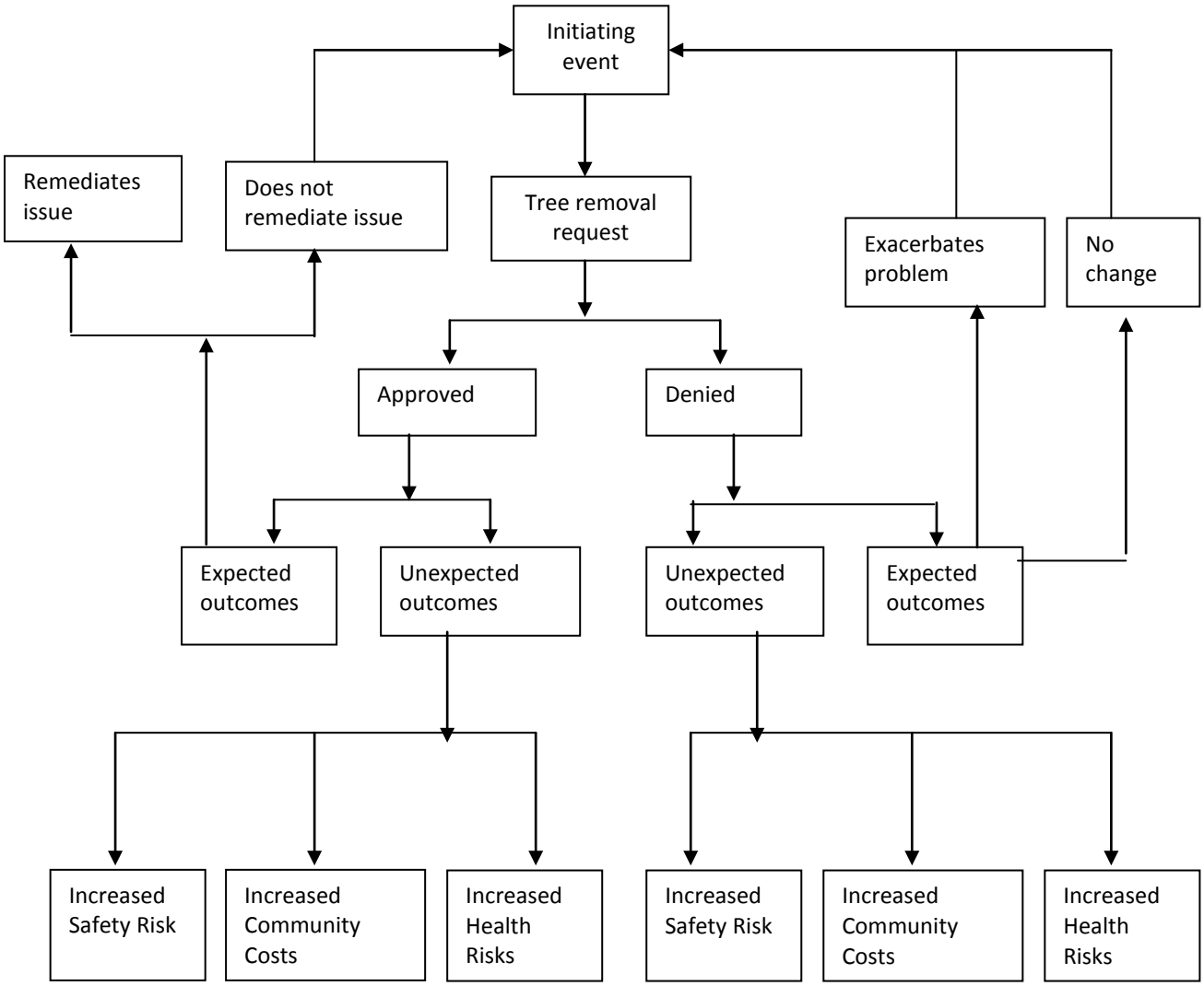


**Figure 1. Decision making protocol in response to a tree removal request, showing possible expected and unexpected outcomes**

In a similar way it is generally assumed that if a request for removal is denied, then the issue that precipitated the request will remain either unchanged or perhaps become worse (Figure 1). Things may remain unchanged, but there may be unexpected consequences from the denial which provide both benefits and costs. Consequently, a cost benefit analysis for any request for tree removal would seem to be worthwhile both from an economic and arboricultural perspective.

## The Value of Trees in the Urban Forest

Attempts to put a monetary value on urban forests have a history extending back over 30 year (Dwyer et al 1983; 1992; Rowntree and Nowak 1991;McPherson and Muchnick 2005; McPherson 2007). In several earlier papers (Moore 2007, 2009, 2012), attempts were made to place an economic value on at least some of the services provided by urban trees (Table 1). These values have been recently reviewed and updated (Moore 2014). An expanded list of some of these services is provided in Table 1 and could be used as a template by those managing street trees on public land for dealing with unreasonable demands for the removal of safe and healthy trees.

**Table 1. Some of the many benefits that tree provide in your garden (expanded from Moore 2012)**

| | |
|---|---|
| Shade can reduce roof temperatures by up to 8° C. This cools the house in summer and reduces air conditioner use and electricity consumption | Vegetation cools the area around houses. This reduces the urban heat island effect (UHI), cools cities and saves on water and electricity consumption |
| Trees can reduce storm wind speeds reducing the damage to roofs and other structures during storms | Absorption of water can reduce the risks of local flooding and removes the need for larger storm water gutters and pipes |
| Trees stabilize soil on steeply sloped blocks of land reducing building cost by thousands of dollars | Vegetation increases urban biodiversity so that there is more urban wildlife |
| Trees humidify air, which can help reduce the effects of hayfever and asthma and other respiratory ailments | Plants help off-set your carbon emissions and so reduce your contribution to the greenhouse effect and global warming |
| Trees remove airborne pollutants especially in cities and along major roadways, which helps keep levels lower and reduces health risks | Noise abatement is not easily achieved by trees alone, but a mixed planting of trees and evergreen shrubs with a high leaf area index (LAI) can reduce noise levels |
| Vegetation provides many human health benefits, such as reducing blood pressure and improving the quality and longevity of life | Vegetation provides social benefits. Green and leafy suburbs tend to have lower rates of vandalism, violence and graffiti |
| Vegetation, especially trees, encourages both active and passive recreation by people, thereby improving their health and lowering health costs | The shade provided by trees lowers water evaporation from the soil saving water and helping to reduce the UHI effect |
| Vegetation, particularly trees slow the front of flood waters and can be used as part of flood mitigation | Reduced water speed in floods also minimizes the erosion of river banks and the down stream silting of waterways and estuaries |
| Green and leafy suburbs, especially those with tree-lined streets, have a higher property values and so add to a property owners capital value | Reduced stream flow rates during storm events can be used in litter management, by allowing litter collection on land after the flood waters retreat. It is cheaper than trying to collect litter in waterways |
| The shade from trees protects children and adults from harmful radiation, reducing the risks of sunburn, skin cancer and melanoma | Trees contribute to the aesthetics of the landscape giving a sense of scale, providing screens for unsightly aspects of the urban landscape and acting as focal points. All adding to real estate value |

The original estimate of $179 per annum for the value of an Adelaide Street tree inspired by and reported to the TREENET symposium in 2002 (Killicoat, Puzio and Stringer 2002) has also been reviewed and now stands at $424 per annum (Brindal and Stringer 2009; Planet Ark 2014). There would seem to be an ever increasing number of scientific papers on the value of trees in the urban forest, which provide a wide range of excellent data that should enable an urban tree manager to defend the current extent of the urban forest and defend safe and healthy individual specimens from ill-founded removal requests. The same data in most cities provide an excellent basis for arguing for more trees and an increase in canopy cover.

Given that requests for tree removals tend to spike following windthrow of trees and major branch failures that result in property damage or injury, it might be wise to advise people that unnecessary removals of safe and healthy trees do not come without the likelihood of increased cost, and possible increased risk to life and health in the future (Table 2). Similarly, the removal of trees to provide access to light for solar panels is usually based on a simple assumption that there is a cost to the owner if solar cells are shaded, but even at an individual level, this may not be the case when shading in summer is considered and it makes little economic sense from a community perspective.

**Table 2. Some of the triggers for tree removals with expected and some unexpected outcomes.**

| Reason for Tree Removal Request | Expected Outcome | Unexpected Outcome(s) |
|---|---|---|
| **Falling branches from council street tree** | Avoid damage from falling debris | Lifting of tiles in storm |
| | | Major limb shed from specimen tree on property now exposed to wind |
| | | Loss of real estate value |
| **Root damage from nature strip tree** | Minimize damage | Multiple suckers from root system |
| | | Loss of real estate value |
| | | Swelling of clay soil after tree removal, causing cracking of fence and footpath |
| | | Localized flooding |
| **Shedding leaves into swimming pool** | Abatement of leaf litter nuisance | Loss of summer shade |
| | | Swelling of clay and damage to pool |
| | | Lifting of tiles from exposed roof |
| | | Loss of real estate value |
| | | Localized flooding |
| **Access to solar panels** | More electricity generation | Higher electricity charges |
| | | More electricity use in summer |
| | | Loss of real estate value |
| | | Net financial loss |

Similarly tree removals for site development works or even utility service access can be countered by considering the beneficial impact that trees have on property values and peoples' perceptions of the neighbourhoods within which they live. In short, tree managers have many defensive strategies for defending sound and health trees, preserving the cover and density of the urban forest and advocating its expansion. Some of these are now considered in greater detail below.

## Major Storm Events

With more frequent major storm and strong wind events predicted as a consequence of climate change, there are going to be more media images of whole trees and large limbs falling and doing significant damage to property and occasionally causing serious injury. After such events, there is usually a significant spike in requests to councils for tree removals. However, are such requests reasonable and if trees are removed do they achieve the aim of reducing risk and hazard?

Many other and often larger trees withstand the force of the storm. In a typical storm event usually somewhere between 3 and 10 trees out of a population of around 100,000 trees are windthrown. The numbers are very small, but the images of fallen trees are graphic and memorable. So what are the dangers if we accede to the spike in tree removal requests, remembering that Australia-wide 97% of tree removal requests are ultimately approved?

Trees in windbreaks can reduce wind speeds by up to 90%. If individual trees are planted in the right place around a house, they filter and slow the speed of the wind which reduces the uplift forces on house roofs and so can reduce the risks of having tiles and sheeting lift from the roof. Thus unnecessary removal of safe and healthy trees could lead to more rather than less storm damage (Table 1). Wholesale tree removal from a suburb could lead to widespread damage of a district from strong winds.

Furthermore, the reduction of shade with tree removals could result in a rise in the urban heat island (UHI) effect. Any increase in the UHI would have the usual economic consequences of the removal of services provided by trees such as an increased air conditioner and electricity use and higher evaporation rates due to the warmer temperatures. There would also be an increase in heat related ambulance call outs, hospitalizations and deaths as the climate warms and the Australian population ages (Table 1). It is possible to envisage a scenario where a local government removes trees in response to citizen requests and then is held accountable for a heat related illness or even death when the loss of shade is deemed by a court to be excessive.

## Access to sunlight

People have a right of access to sunlight and it was one of the earliest elements of modern building codes over a century ago with the aim of preventing the diseases, such as "rickets", which is now known to be associated with vitamin D deficiency. Today with the current increased interest in the role of vitamin D in many aspects of human health, people are only too aware of the importance of exposure to proper levels of sunlight.

However, in summer people should also have the right to suitable levels of shade and the protection that it provides from sunburn, skin cancer and melanoma. Such protection is particularly important for young children with more sun-sensitive skin as they play in streets, school grounds and public playgrounds, as well as in the surrounds of their homes. It is amazing how often people successfully argue for the removal of a tree in the depths of winter only to regret the loss of the shade it provided a few months later when the first sunny days of late spring and early summer arrive – a classic case of act in haste and regret at leisure.

There are also a growing number of demands for tree removal based upon solar access for solar panels and the assumption that any shade from trees reduces generation capacity and so costs the owner of the solar panels (Table 1). The Office of the Commissioner for Sustainability and the Environment, Canberra (2011) report on the Canberra urban forest found that there could be some loss of solar efficiency when panels were shaded by trees. However, the situation proved to be somewhat more complex than the simple assumption that shade costs might imply.

Modern solar panels are much more efficient than early generation models and so are more efficient with some level of shade. Furthermore, while there may be some loss of electricity generation capacity, this has to be considered in light of the cooling effect of the shade provided by trees in summer with the likelihood of lower electricity use for cooling. In short the loss of generation capacity due to shade may be offset by the cooling effect of shade in summer. The removal of a tree, or trees, to provide solar access for panels could be to the economic detriment of the home owner if they have air conditioning and use it over summer.

## Property Value

It has been estimated that a good tree in a good front garden can add some $5,000 to domestic property values, and others put the value as high as $50,000 or 5% of the property value (Boyd 2010). Turf Australia after surveying 114 estate agents across the nation, estimated that people were prepared to pay an additional $75000 for a house with a green lawn (Williams 2014). There is also a strong likelihood of having a positive return if you spend wisely on landscaping (Anderson 2012). It is clear that the real estate industry does recognize the value that trees, both specifically and generally, add to properties.

The Planet Ark (2014) survey, Valuing Trees: What is Nature Worth, reported that for a house valued at $500,000 Australians would be prepared to pay an extra $35,000 for a house in a green and leafy area and 34% would be prepared to pay an extra $100,000. Other survey results were that 73% of Australians want a backyard and that for 57% of respondents, having a park within a 5-10 minute walk of their home is important to them. Earlier work had estimated that a tree-lined nature strip added 30% to properties in streets that had trees compared to similar houses on treeless streets just two streets away (Gonzalez 2007).

In Melbourne, in many of the green and leafy suburbs, there have been many permit applications for townhouses and multi-unit developments on large blocks full of mature trees, in which some developers are driven to maximize their yield on a particular site, and ignore the community's valued, local characteristics. Property prices have been affected by these tree removals and tree felling definitely has an effect on the value of properties (Table 1), particularly in areas known for their leafy character (Gonzalez 2007).Given that these are significant financial considerations, the unnecessary removal of a safe and healthy tree from a streetscape could precipitate legal action by a resident for the loss of property value.

There is also an indirect but significant financial benefit for a local council in increased house prices. Residents prefer leafy tree-lined streets with large specimens and the higher prices for these properties are reflected in the council property rates that are linked to the value of the property. A conservative estimate of 5% increase in property values can translate to millions of dollars for councils (Dwyer et al. 1992). So excessive tree removals in a particular council area or in part of a council's area of control could impact on its income when properties are next valued for rating purposes

Once again care must be taken that in a short term reaction to a particular tree related incident, trees are not unnecessarily removed which could leave local authorities exposed to legal action. It would seem prudent then, for such authorities to have sound decision making processes and criteria for one off tree removals that ensure that only trees that pose a risk to human health, are in poor condition or pose a significant risk to property are removed. Similarly, it would seem sensible to have street tree replacement strategies in place so that purchasers are aware of any short term tree replacement programs when they purchase a house.

## Damage from tree roots

It is not uncommon for a tree removal request to be made because of alleged tree root damage to pipes, footings and foundations, pathways or utility services. More often than not, the tree targeted for removal is selected by virtue of its close proximity to the damage and often there is little, if any, direct evidence that it is the roots of that particular tree that are causing the damage – it is more guilt by association. Sometimes, however, the association of tree roots and damage is both clear and demonstrable.

Tree removals for alleged root damage are common, however, there can be unexpected consequences. One of the more common outcomes is wholesale suckering from the roots of the removed tree (Table 1). Such a response is species-dependent and in some instances many hundreds of suckers may result that can be a far greater nuisance than the tree that was removed ever was. Suckers may even develop under the floor of a house where they can be seen emerging between the floor and skirting boards. The many rapidly growing suckers can also reduce soil moisture levels in reactive clay which can worsen shrinkage and exacerbate damage to footings and foundations.

Even without sucker growth the removal of a large old tree from a reactive soil may result in greater swelling of the soil and a greater extent of swelling and shrinkage which may make a pre-existing problem of cracking worse. A similar situation may arise with the removal of a tree resulting in very wet soils due to poor drainage at the site once the moisture uptake by the tree has ceased. In both cases, the removal of a tree can have an effect virtually opposite to that intended by its removal. If a number of trees are removed from a lowland area of a council district, one of the consequences could be an increased risk of local flooding.

## Conclusion:

Climate change presents the prospect of more frequent storms with higher wind gusts for many Australian cities and regional towns, and despite lower overall annual rainfall these storm events will often be accompanied by heavy localized rainfall. There will also be warmer summers with a significant increase in days above the thresholds for heat related illness. The urban forest has much to offer in providing environmental services that have the capacity to ameliorate some, if not all, of these occurrences.

While many of the services provided by trees in the urban forest are substantially undervalued, if valued at all, at present, this will change as the impact of climate change becomes clearer. Similarly, the contributions of individual trees to the cover of the urban forest are also often undervalued. Consequently, the request of the removal of any safe and healthy trees must be subjected to a proper cost benefit analysis, especially of any unexpected consequences of the removal. There is a real risk to the urban forest and the cover it provides through attrition by the unnecessary removal of trees, one specimen at a time.

Consequently, it would seem prudent that each time a request for a tree removal is received, a proper cost benefit analysis for the removal should be undertaken. An analysis that considers both the expected and unexpected outcomes of the removal would go some way to ensuring that the integrity of the urban forest is maintained in the face of unnecessary tree removals.

## Acknowledgements:

Dr E Moore, linguist, is thanked for reading the manuscript and her many helpful suggestions.

## References

Anderson S (2012) The Value of Greenery, The Age, Domain, 22nd November 2012.

Anon (2010) The Value of Trees, San Antonio News, www.mysanantonio.com/real_estate/.../The-value-of-trees-782839.php.

Boyd C (2010) Money Grows on Trees, The Age, Domain, 20th November 2010.

Brindal M and R Stringer (2009) The value of urban trees: environmental factors and economic efficiency. Lawry D, J Gardner and S Smith Editors, Proceedings of the Tenth National Street Tree Symposium, University of Adelaide/Waite Arboretum, Adelaide, ISBN 978-0-9805572-2-0.

Dwyer J F, E G McPherson, H W Schroeder and R A Rowntree (1992) Assessing the benefits and costs of the urban forest, Journal of Arboriculture, 18: 227-234.

Dwyer JF, G L Peterson and AJ Darragh (1983). Estimating the value of urban trees and forests using the travel cost method. J. Arboriculture, 9: 182-195.

Gonzalez C (2007) Why a tree-lined nature strip can add 30% to you property value, The Sydney Morning Herald, Domain, 9th March 2007.

Killicoat P, E Puzio and R Stringer (2002), The Economic Value of Trees in Urban Areas: Estimating the Benefits of Adelaide's Street Trees. Proceedings Treenet Symposium, 94-106, University of Adelaide.

McPherson E G (2007) Benefit Based Tree Evaluation, Journal of Arboriculture & Urban Forestry, **33:**1–11.

McPherson EG and J Muchnick (2005) Effects of street tree shade on asphalt concrete pavement performance, Journal of Arboriculture, **31**:303–310.

Moore G M (2007) Tree Management for Carbon, Energy and Drought Efficiency, Lawry D, J Gardner and S Smith Editors, Proceedings of the Eighth National Street Tree Symposium, 26-30, University of Adelaide/Waite Arboretum, Adelaide, ISBN 978-0-9775084-9-5.

Moore G M (2009) People, Trees, Landscapes and Climate Change, in Sykes H (Ed) Climate Change On for Young and Old, p 132-149. Future Leaders, Melbourne.

Moore G M (2012) The Importance and Value of Urban Forests as Climate Changes. The Victorian Naturalist, **129**: 167-174.

Planet Ark (2014) Valuing Trees: What is Nature Worth, Planet Ark, 47 pages.

Rowntree R A and DJ Nowak (1991) Quantifying the role of urban forests in removing atmospheric carbon dioxide. Journal of Arboriculture,**17**: 269-275.

Williams S (2014) Just add a garden and watch your value grow, The Age, Domain, 14th February 2014.