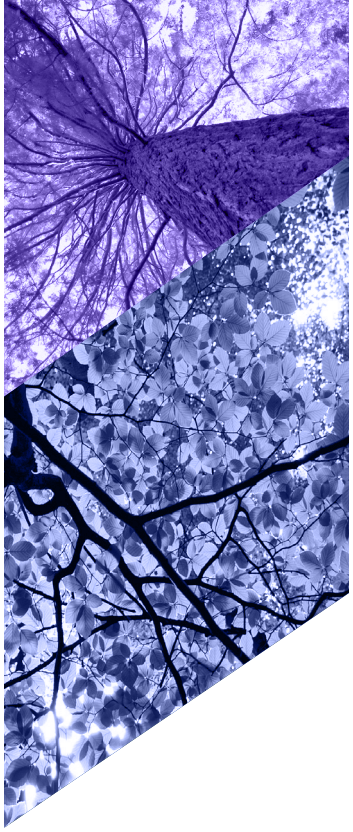

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Urban deforestation; it's here and it's going to hurt!

Paper presented at Sheffield Hallam University Conference Flooding and Water Management in the Landscape

BTC/26/2008

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Barrell Tree Consultancy provides specialist advice on trees in the UK planning system. We deal with over 500 new sites every year across England, which provides us with an experience-based perception of what is happening to our urban tree stock and how that is affecting landscape character. This paper summarises our subjective assessment of the state of the urban canopy, speculates on the reasons for its condition and sets out our suggestions for its future management. It is not a scientific paper in the sense that it is research based; it is experience based, but we are confident that research will confirm our observations.

Arboriculture is about managing trees near people; the common focus for arboriculturists is on minimising the conflicts arising through proximity whilst maximising the multiple benefits that trees have to offer. Typical conflicts include trees casting excessive shade, leaves blocking gutters and the mess from insects and falling debris causing inconvenience to people who live nearby. Out of sight below ground, roots are well known for causing structural damage, whilst above the ground, falling trunks and branches damage and injure in a more spectacular fashion. In their favour, trees provide a dramatic contrast to the harshness of the urban landscape and offer significant benefits to the wellbeing of city inhabitants. Very few would argue that trees are not good, indeed it seems to be an intuitive truth that they are, but the reality is that the closer trees and people cohabit, the more fraught the relationship becomes.

Set in the context of global warming, two of the most important emerging issues in urban sustainability are rainwater management and temperature regulation. Traditionally, rainwater has been treated as more of a problem than an asset, with the focus on draining it out of cities quickly rather than storing it locally as a resource. However, as the global warming induced extremes of droughts and floods become more frequent, the folly of this conventional wisdom is becoming obvious. Understanding the value of rainwater as a resource and the harm that rapid flow from urban areas causes is focusing attention on storing and using it where it falls to buffer its dispersal. Similarly, through the urban heat island effect, there are predictions that global warming induced temperature rises of 3–7° C are likely in many of our major cities during the next century (GLA,2006)). This is a dramatic increase that will have multiple impacts on all aspects of urban life, from increased bills for air conditioning to the decreased wellbeing and comfort of city inhabitants (Shaw *et al.*, 2007).

In addition to the rather intuitive benefit that grass, parks and trees improve the 'feel' of urban areas, there is increasing tangible evidence that green space intercepts rainwater and slows its flow into our traditional drainage systems. More specifically trees, through their size and leaf surface area, are particularly effective at slowing the rate that water reaches the ground and how much of it flows away. Furthermore, their capability to shade and reflect heat, combined with their verticality and large surface area in contact with the air, makes them very efficient at reducing temperatures in the extremes of summer (GLA, 2006). Indeed, there is emerging research to suggest that they are so effective at temperature buffering that an increase of just 10% in our present urban tree canopy cover would offset all but the most extreme temperature rises predicted through global warming (Gill *et al.*, 2007). Although not the answer to all urban sustainability problems in isolation, big trees are obviously part of the solution and there is an emerging body of opinion that we need more of them (Shaw *et al.*, 2007).

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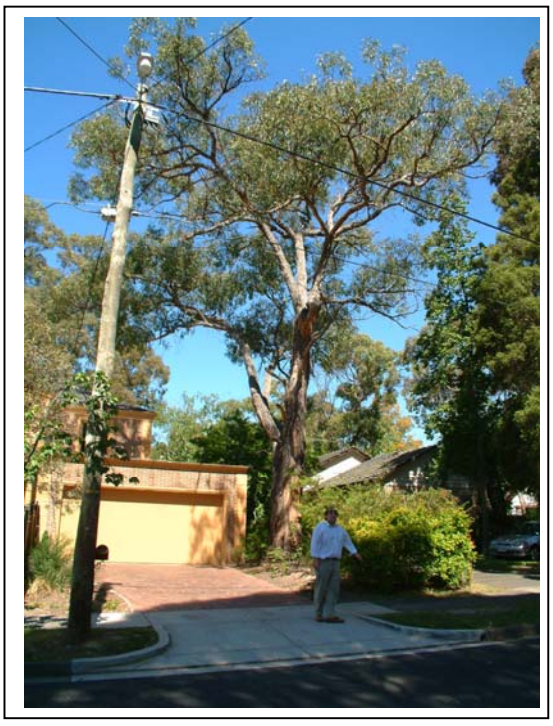
THE UNCOMFORTABLE TRUTH

In the hotter parts of the world, people have long been aware of the obvious benefits of trees, with strong traditions of incorporating green space into their urban infrastructure. However, in the UK, mitigating the effects of hot summers has not been a familiar experience and other seemingly more pressing requirements such as increased housing densities and minimising costs has resulted in trees being given a low priority when allocating funds. UK residents have not had much experience at coping with the heat of hot summers, which has resulted in a public not particularly tuned into what a significant impact trees can have on temperature. Against that background, although there is resistance to the idea of tree loss, the reality is that it happens slowly with short-lived public outcry and is soon forgotten. This low level of awareness of the importance of trees is fostering the gradual erosion of our urban canopy without a full public appreciation of the scale of the loss when considered in total. Urban deforestation is occurring before our very eyes, but the process is so slow that no one has noticed.



Australians highly value trees because of their obvious temperature buffering benefits. In contrast, the UK mindset of wanting more sun rather than less has resulted in a gradual erosion of canopy cover.

One of the most obvious contributions of trees to the landscape is visual; individually, they impose because of their height and width, but as groups, they can dominate even the grandest landscape features. Thanks to the Victorians, a common theme of our urban landscape is large houses set in substantial gardens with sufficient space to live and have big trees at the same time. Although they may not have had a precise understanding of tree benefits, they intuitively appreciated trees were important and made sure they featured strongly in their planning. This principle was formally recognised during the subsequent evolution of planning policy and is still with us today in the current Town & Country Planning Act (HMSO, 1991), and its supporting government guidance. However, whilst the principle and framework for its implementation is intact, our experience is that the collective will to actually use it to increase the level of tree canopy cover is not in such good shape.

As arboricultural consultants, we spend much of our time advising on planning matters around the country where trees are an issue. In our travels, we have noticed a significant erosion of our urban tree canopy over the last 30 years that we estimate to be a 10–20% reduction. Although there are islands of excellence where canopy cover is increasing, the nationwide trend seems to be in the opposite direction. Almost without exception, every village, town and city is losing large significant trees with either no replacements, replacements that die or new trees without the landscape potential of those they replace. The result is a dramatic change in landscape character over time; from a heritage of oak, beech and pine, there has been a gradual shift to a future of cherry, thorn and rowan. Very pretty for a few weeks of the year and very few problems compared to their bigger cousins, but with absolutely no capacity to sustain the landscapes we had the privilege to grow up with.

Landscape character is changing: the traditional large mature trees (left) are being replaced by smaller varieties with no potential to contribute to the wider setting in the same way (right)

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It is almost as if 40 years ago there was a collective psychological decision to abandon the idea that trees are good and adopt the mindset that trees cause problems. In the absence of a strongly established national psyche favouring trees, it is easier to remove them rather than embrace the complications of trying to understand the problem. Whilst this is surprising in the context that we have national planning policies advocating tree planting and loss mitigation, what is alarming is that those policies are not working very well. Trees are being shuffled to the bottom of the heap of priorities and no one seems to care. In the context that most trees take 30–40 years to mature to a size where they are most effective at delivering their benefits, failure to address the problem will take that length of time to put right. New trees planted today will take 30–40 years to deliver the temperature buffering benefits that will be needed to negate the anticipated temperature rises from global warming. With the heat being expected much sooner than that, time is running out to get this process started.

Failed tree planting strategies are not new. This 1970s development had real potential for big trees with space to mature, similar to those that can be seen on the skyline. Instead, it delivered a landscape of cherries and rowans, with no potential to contribute to the wider setting.

More specifically, our experience suggests that overall urban canopy cover is reducing for the following reasons:

Planning

- Tree valuation is complicated so it is difficult to reliably factor their true value into cost-benefit analyses in decision-making. Trees are being unreasonably lost because they are not being given realistic weight compared to other planning considerations.
- Existing trees are not being properly protected on development sites. Trees identified for retention are prematurely lost because of ineffective protection.
- New tree planting to comply with planning conditions is not effectively enforced so there is a very low survival rate. Planned urban canopy mitigation is not being successfully established.
- Inappropriate tree species are being used so the new trees that do survive do not have the potential to make a meaningful landscape contribution. It is common for the smaller species such as cherries, thorns and rowans to be planted where much bigger species would be feasible.
- Weak and inconsistent interpretation of the legislative provisions by planners to maximise the potential for new tree planting. Many new developments with space for new trees, have none.
- Ineffective use of existing mechanisms by planners to allow off-site mitigation planting where trees are lost and there is no space for replacements. Off-site contributions for social housing and public open space are concepts that could be easily applied to tree planting but do not feature in mainstream planning.
- The potential for the dual use of space for parking and trees is not fully exploited. Parking areas are ideally suited to large trees and yet this is the exception rather than the rule in many small-scale developments.
- The potential for using trees with form suited to challenging site conditions is not fully exploited. Tall, thin trees, with the ability to provide vertical green space with a small footprint, are widely available but not commonly used.
- Emerging technology for establishing and sustaining trees in difficult conditions is not being effectively utilised. Products for improving the below ground conditions significantly widen the scope for successful tree establishment in previously unsuitable locations, but are not commonly used.
- Poor documentation and availability of best performing species in urban conditions. There is no co-ordinated record of emerging best-practice experience of the best species for urban conditions and so unsuitable species are still widely planted, resulting in high failure rates.

Highways and street trees

- Highway engineers often perceive trees as being a problem they would rather not have and there is no active policy to replace those removed. Indeed, our experience is that there is a presumption not to replace removed trees. Where mature trees are replaced, there is

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evidence that they are being replaced with smaller varieties (GLA, 2007).

- There also seems to be a presumption not to allow new tree planting in adopted highways despite the availability of tree pit designs to minimise the risk of problems. This means many potential sites in parking areas and other surfaces are not planted, which is a lost opportunity to increase canopy cover.

There is robust resistance from highway authorities to planting trees in and near the highway despite tried and tested methods of doing so.

Land in council, private and institutional ownership

- Areas of open land that could accommodate trees without any obvious conflicts but are not planted. Many areas of land with little potential for development have a great potential to support trees but are not used because there is no initiative to do so.
- Poorly conceived and implemented tree planting on council owned land, which cannot achieve its full potential. Councils should be setting the example and yet it is common to see inappropriate trees planted ineffectively on their land.
- In some civil subsidence claims, the judiciary have implicated trees in damage with very low levels of evidential support. This results in councils being reluctant to resist demands to fell from allegations of subsidence damage; trees are removed, despite very little evidence that they caused damage, because it is too risky to go to court.
- Insurers are not factoring tree values into subsidence cases, which often results in high value trees being removed to deal with low value claims.

A recent council development with great potential for large tree species. Instead we have cherries, thorns and rowans, with no potential to contribute to landscape in the same way as the trees over the road.

There are obviously many reasons why trees are

being lost and not effectively replaced. Slowly but surely all those losses are adding up, but it is only when they are considered together that the cumulative impact can be fully appreciated. Furthermore, this is not a localised trend; almost invariably, we see it in every town and city we go to. It is significant and has resulted in a countrywide decrease in urban tree canopy creeping up on us without anyone really noticing. We are witnessing a widespread change in the quality and character of our urban landscapes. Less obvious but equally important, this decrease in canopy cover is damaging our capacity to mitigate the anticipated temperature rises we will all have to face in the next few decades.

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Today's developments without trees are likely to become tomorrow's slums.

CAN THIS TREND BE REVERSED?

In the absence of detailed knowledge on the implications of tree loss, it is understandably easier to lose a tree to save time and trouble now, even though deep down we all know that there is likely to be some dark consequence in the future. There must be some truth in this because the landscape degeneration is so widespread. But, how hard would it be to reverse that trend and would it be so difficult that it is not realistically feasible? Our experience shows that there are many reasons for decreasing tree canopy and each of those reasons in itself is actually quite minor. We believe this is cause for optimism because it indicates that a workable solution could consist of lots of minor changes and adjustments, rather than one big fix. Big changes are tough to do because they cost money, existing legislative frameworks need updating and people have to alter their lives. In contrast, small changes are not so hard; an adjustment here, increased emphasis there, better understanding of the reason to change and a co-ordinated approach are not going to have a dramatic impact on everyday lives. However, together their cumulative impact could be very effective indeed. Localised big changes are not necessary; widespread and co-ordinated small changes are a low impact strategy with the potential for a high impact result.

In principle, small changes in our approach to trees have the potential to increase urban canopy cover, with very little impact on our daily lives. But, who has to do what and what is required to make it all come together; it has not happened in the past so what will make it happen in the future? Of course, the driving force has to come from government by formally identifying the need and directing that appropriate emphasis is given to it. Politicians should not find it difficult to align to such an obvious good cause; there is increasing scientific support that it is necessary and the idea of temperature buffering connects straight to the public. On the ground, nurserymen, tree managers and product designers have the expertise to develop solutions, but the incentive to do so in a co-ordinated way is missing at the moment. With government acknowledgement providing the strategic impetus and the practitioners developing solutions, the middle managers will have little option but to give trees more weight in the decision making process. A joined up approach to urban management, with trees as an essential element of sustainable development, will outlaw the '*fell it now and worry about it later*' attitude that has resulted in the current urban deforestation crisis.

Here are some small changes that will result in increased urban canopy cover:

- **Politicians:** Central government to acknowledge the temperature and rainwater runoff buffering benefits of trees and their contribution to sustainable development. Modify existing government guidance to ensure that increasing canopy cover is given significant weight in the planning process. Regional and local government to incorporate urban canopy cover targets into their structure plans.

- **Planners:** Factor urban canopy into planning decisions and consider off-site planting mechanisms where new tree planting is not sustainable on-site. Improve enforcement of planning conditions relating to new tree planting and protection of existing trees.

- **Architects:** Give canopy cover significant weight in new designs where trees will enhance the architecture and improve the quality of living conditions through their temperature buffering benefits.

- **Urban designers:** Incorporate designer trees into urban areas where special forms and growth characteristics make them more sustainable than traditional species. Place greater emphasis on the dual use of space in parking areas by incorporating trees through the increased use of special below-ground preparation.

- **Tree officers:** Provide specialist backup to local politicians, planners and urban designers on tree species and forms that reduce inconvenience to future occupants and

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maximise the efficient use of available space. Identify unused urban planting sites to tie in with off-site planting arrangements relating to high-density developments that cannot accommodate new trees.

- **Landscape architects:** Identify and publish guidance on the importance of tree size potential as a strategic objective of new planting schemes. Review traditional planting strategies and compile revised species lists based on maximising size potential for the space available whilst minimising the inconvenience for future users.

- **Nurserymen:** Seek feedback from maturing planting projects to identify the species and forms most successful in tough urban conditions. Trial non-traditional species that have a track record of tolerating greater temperatures and coping with the harshness of the urban environment. Identify, promote and supply species and forms that are likely to be most suited to sustainable urban development.

- **Highway engineers:** Review traditional approaches to trees in highways; assess the feasibility of replacing all lost trees and encouraging the establishment of new trees where there is a low risk of problems. Encourage a positive attitude towards the evolution and use of adoptable planting pit designs.

- **Hydrologists:** Incorporate the emerging technology of soil cells for the dual use of growing trees and buffering rainwater runoff.

- **Insurers:** Agree minimum levels of site investigation with other professions for implicating trees in subsidence damage. Factor realistic tree values into claim settlement.

- **Judiciary:** When implicating trees in subsidence damage, be mindful of the value of trees and, if appropriate, place significant weight on the evidential requirements set by the appropriate professions and the local incidence of damage. For every case of damage, there are many more similar relationships where damage has not occurred; being big and close to damage, does not automatically implicate.

- **Public:** Lobby local councils about canopy cover strategies, register their views where tree issues are a part of planning applications and plant their own trees where appropriate. Register disapproval when insurance companies remove high value trees to solve small value problems and the judiciary sanction tree loss on weak evidence.

Great foresight in Poundbury, Dorset. Apart from its obvious aesthetic benefit, this plane will mature with a crown well above the rooftops, offering valuable shade in the summer without restricting too much light in the winter.

DEEPROOT CASE STUDY

Our experience is that most, if not all, of the solutions are out there as ideas and products, but have not yet been promoted, explained and made accessible for those who need the information. One such product is the silvacell from DeepRoot, a company based in the US where the role of trees in temperature and rainwater runoff buffering is being extensively researched. The silvacell is an emerging experimental product with very good potential for improving the success and viability of new trees in the toughest urban environments. It is a steel-reinforced plastic frame that is installed beneath hard surfacing and capable of supporting normal vehicle loading. Its high proportion of voids are filled with soil, which allows roots to grow and trees to flourish where they would have failed using traditional planting techniques. The cells can be stacked in almost any configuration and provide a continuous rooting environment that can be tailored to the specific requirements of each site. What is particularly relevant about this product is that, in addition to providing a rooting medium, it is also designed to take rainwater runoff to buffer the gluts after storms. This slowed water release mimics the flow from natural areas without surfacing. More information on the product with very useful picture series of its installation in the US and Canada can be found at www.deeproot.com. This is a technical solution to a practical problem that has prevented

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many urban sites being planted, and just one illustration of creative ideas delivering multiple benefits.

Sustainability in practice: the silvacell installed below ground in Redwood City, California. Rainwater from the roof and hard surfacing is collected in soil-filled cells beneath the drive and street, buffering the immediate flow into the main drainage system and watering the street tree planted into the soil.

WHERE DO WE GO FROM HERE?

It has been known for some time that trees will play an important role in mitigating the adverse impacts of climate change in our cities, and that there is increasing evidence of a trend of urban deforestation. It is also widely accepted that more trees need to be planted, with some significant emerging initiatives working piecemeal towards that goal. Perhaps understandably, there is a strong focus on numbers, which seems an intuitive and reasonable test of performance. However, successfully increasing urban canopy cover is more likely to be influenced by the calibre of the tree survivors than too much reliance on the measure of numbers planted. Understanding the issues in depth and co-ordinating meaningful initiatives will be an important element of a successful approach to the problem. Getting all the interested parties working together, with a focus on what to do, where to do it and who does what, seems to be lacking at the moment.

In response to that need, a group of arboriculturists have established the UK Urban Canopy Initiative, dedicated to reversing the trend of urban deforestation and increasing canopy cover. In a two phased approach, the first task is to explore all the barriers to increasing tree cover and identify the detail of the solutions, so that everyone who wants to help knows how to do their little bit to gain a big benefit. The second phase will focus around collating all those solutions so they are easily accessible in one place, probably a central website. With the means of delivering increased canopy cover spelled out, an effective strategy for implementation will rely on a simultaneous drive from politicians making it a strategic objective and a surge from enthusiasts on the ground insisting it can be done.

The first phase begins on 10 July 2008 with a landmark seminar organised by the Treework Environmental Practice (TEP) called *Trees: the key to climate proofing our cities (Part 1) (Strategic urban planning to mitigate climate change risk)* to be held at the Royal Geographic Society HQ in London. An impressive international line-up, led by the UKs Professor Chris Baines, will explore how trees can help and what needs to be done to unlock their benefits, as the first step towards achieving the objective of increased urban canopy cover. If you are interested in finding out how you can help, then visit the TEP website at www.treeworks.co.uk. Although arboriculturists are driving this initiative, it will only be successful with multidisciplinary support and everyone doing their little bit towards a very big end.

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