

Adding ecology to urban forestry: Melbourne's journey

The City of Melbourne is a world leader in urban forestry – combining an ambitious vision with outstanding delivery. Drastic water shortages and extreme overheating events were turned into incentives and organising principles for using trees and other plants to increase resilience to climate change and pursue world-class standards for liveability. There is a lot to learn from these achievements, as well as from the city's growing focus on urban ecology.

When queried about good references in urban forestry, Melbourne is typically among the first suggested by expert audiences. What has led to such notoriety? What can others learn from the City of Melbourne's urban forestry and wider urban greening work? Where is this work heading now?

The [millennium drought](#) (1997 to 2009), rising temperatures and an ageing tree population threatened Melbourne with an environmental challenge, one that could compromise its ability to achieve high liveability standards for a rapidly growing population. This created an imperative for city officials to take steps to manage the effects of higher temperatures and unpredictable climatic events.

One of the immediate responses to the drought was to control the use of water. As a result of its [Total Watermark: City as a Catchment Strategy](#) (first released in 2009), the city succeeded in reducing water demand per head by nearly 50 percent. The city administration also developed a [Climate Change Adaptation Strategy](#) for mitigating the effects of extreme heat and other risks induced by climate changes. Public realm trees were identified as a critical, yet threatened and underused asset. As a result, in 2012, a 20-year [Urban Forest Strategy](#) was launched. The strategy aims to double City of Melbourne's public realm canopy cover from its baseline level at 22% to 40% by 2040. It also aims to increase urban forest diversity, so that the city-owned tree population is composed of no more than 5% of any given species, 10% of any genus and 20% of any one family – a goal following an urban forestry good practice known as the "[Santamour rule](#)". Improving vegetation health, soil moisture, water quality as well as urban ecology while keeping the community informed and involved are additional objectives pursued.

As part of the development of the strategy, the City of Melbourne's 70,000 street trees were surveyed and mapped. The survey looked at species, size and condition to assess the useful life expectancy of each tree. All findings from this work were made available in an online map called the [Urban Forest Visual](#), and each tree assigned an identification number and email address to facilitate tracking and reporting, an initiative that attracted unexpected [worldwide interest](#). The associated database was also used to model how the canopy would evolve under different circumstances, including a "do nothing" scenario. The modelling showed that reaching the 40% canopy cover target would require planting at least 3,000 trees a year until 2040. The modelling did not focus exclusively on tree numbers but also considered how tree planting conditions would affect canopy size. Such analysis showed that achieving targeted increase in canopy cover would require footpath extensions, drainage reconfigurations and/or planting trees into carriageways beyond existing kerb lines, where there is adequate below and above space to accommodate root and crown development, and where it is much easier to give trees access to moisture.

Also supporting the strategy is a series of ten [Urban Forest Precinct Plans](#) that guide implementation in local neighbourhoods until 2022 (ie over the first 10 years of the strategy's anticipated lifespan). These plans were subject to the same official adoption process as the main *Urban Forest Strategy*. Each of them shows on a street by street level the current state of the local urban forest and the changes that will take place – whether replacement or new plantings. It also defines tree species choices, as well as possible opportunities for wider

street redesign work. The works identified are prioritised, with projects being allocated a timeframe for delivery either in year one to four, five to seven or eight to ten. This prioritisation was based on data collected on thermal hotspots, low canopy cover levels, concentrations of vulnerable residents, tree health and scale of opportunity. The Urban Forest Visual is updated on a live basis to reflect where projects identified in the precinct plans have been completed. As of July 2020, a vast majority of the projects identified have reached such completion stage.

Having detailed, council-endorsed workplans has proven critical in multiples ways, for enabling the delivery of such an ambitious programme.

It first and foremost guaranteed on-going political commitment to funding implementation, something other strategies devoid of similar politically endorsed workplans cannot rely on. The Urban Forest Precinct Plans have access to two funding streams: the capital tree planting budget, which funds the bulk of the plantings programmed in the precincts plans and a climate change adaptation budget, which can be used where there is scope to initiate a more ambitious street redesign. This might involve the reconfiguration of drainage to enhance tree access to water. It might also mean footpaths widening or any other reallocation of space that can provide an enhanced tree growing environment for large specimen, while also supporting the city's quality of life and sustainable mobility objectives. This set up gives the City of Melbourne's Parks and City Greening department the unusual ability to initiate significant streetscape works, rather than being confined to piggybacking on other department's work programmes.

Having detailed and adopted workplans also granted the City of Melbourne's urban forestry workstream the transparency and visibility needed to facilitate the cross-departmental collaboration required for large-scale public realm tree planting or replacement, especially where changes to the street layout are involved. A streetscape coordination committee was established bringing together, on a monthly basis, the Traffic and Parking, Capital Works and Parks and City Greening departments. The committee ensures that, wherever capital or refurbishment work is being planned in the streetscape, adequate green infrastructure provision is integrated into the projects, following the priorities and principles defined in the Urban Forest Precinct Plans. It also enables budgets and community engagement efforts to be shared across teams. Similar coordination takes place with the urban design team, when new developments make contributions to public realm improvements.

Finally, such thorough detailing and endorsement of workplans has given the City of Melbourne's Parks and City Greening department the ability to respond very quickly to any unforeseen funding opportunities with readymade projects supported by evidence, community approval and political backing. For example when the State of Victoria issued emergency funding to tackle the unemployment crisis generated by the 2020 Covid-19 pandemic, Melbourne's Parks and City Greening team was able to develop and submit in less than two weeks a funding application for a suite of ['rapid greening' projects](#) that could put 64 people back to work. These projects involved the planting of no less than 150,000 small trees, shrubs and grasses, designed to create 24,000m² of understorey habitat across a range of parks, open spaces and streets. Shovels hit the dirt on this project within four weeks of application.

Another important enabling factor in Melbourne's success was its early focus on plant suitability and plant quality. Any large-scale urban greening programme, whether focused on trees or other vegetation types require resilient, responsive supply chains, delivering suitable plants.

Upstream of its procurement programme, the City of Melbourne's Parks and City Greening department has worked with academics such as Dr Dave Kendall at the University of

Melbourne's School of Ecosystem and Forest Sciences to assist with identifying [climate suitable trees](#) under different climate scenarios anticipated for the city. This identified a wide range of suitable potential species from Australia or further afield, many of which, it turned out, were not being used or even commercially produced. This work was conducted with support from the Royal Botanic Gardens and [Nursery and Garden Industry Victoria, the professional body representing plant growers – including tree nurseries – in the State of Victoria](#). The Royal Botanic Gardens assisted with the sourcing of seed and other plant materials identified in the study. This collaboration also involves the planting of some species on test sites along low-key Melbourne streets, where suitability for the street environment is being monitored and assessed prior to City committing to their wider use.

The City of Melbourne's Parks and City Greening department works closely with tree nurseries, involving them in research projects involving the sourcing and testing of new species, as exemplified by the project described above. Nurseries are also brought into all industry events the City organises and solicited as part of team building exercises conducted for City staff. When procuring trees intended for high-profile projects or when new species are involved, the City enters into contract growing arrangements with the supplying nurseries. Tighter controls are being exercised with all tree suppliers to insist on compliance with the Australian standard for nursery-grown trees ([AS 2303:2018 Tree stock for landscape use](#)) and any other additional specification the City might have requested. Contract-grown stock is inspected on a quarterly basis, and all trees procured are subject to inspection by a City member of staff after reception in the contractor's yard and prior to planting into the landscape. This collaborative approach between nurseries and local government means that trees planted in the city have great chances for long term success.

Organisational structure also plays a role in the Melbourne's city administration ability to reliably deliver on its urban greening aspirations. The Parks and City Greening team (about 50 staff) has advocated to have its strategic staff alongside its operations unit, thereby placing full control of strategy development and responsibility for delivery under one roof. It is believed that such integration gives the staff involved in day-to-day maintenance work greater ability to provide feedback and influence the strategic work. Those driving strategy feel they have a good understanding of the reality of delivery, which they credit for their success to date.

A final trait that sets Melbourne's approach to urban forestry and urban greening apart and seems to contribute to its success is its approach to communication. The thorough consultation process undertaken for the development of the Urban Forest Precincts Plans is an obvious illustration of this approach, as well as the development and on-going use of the *Urban Forest Visual*. The City of Melbourne puts a lot of information in the public domain about its urban greening initiatives in a format that is engaging to lay audiences and professionals alike, including all the studies that inform its work. This effort includes a shift away from working with private consultants and increasingly engaging with universities under consulting arrangements. This allows the city administration to get the research questions it needs answered addressed in a report that is tailored to their needs, while also seeing a peer-reviewed academic publication resulting from the commission. The latter provides an effective way to share the city's latest thinking and findings with wide-ranging knowledge networks, thereby nurturing a pool of expertise and wider research programmes it can tap into at a later date, something city departments can greatly benefit from and yet are structurally ill-equipped to do.

Where are the City of Melbourne's greening initiatives headed next?

One direction is to place a greater emphasis on getting the private sector to make stronger contributions to the City's urban greening effort, an area where the municipality's performance is not as strong as some of its neighbours in the Greater Melbourne Area. Such

comparisons have become easier now that a [metropolitan scale initiative has been launched](#) to align around common minimum standards the different urban forestry and greening initiatives undertaken by local city administrations. The City of Melbourne is looking to adopt [a greening factor](#), comparable to that in use in [Seattle](#), in the US or in [Berlin](#), in Germany or [London](#) in the UK. In the associated calculation tool, tree canopy, especially from trees planted directly into the ground, is given the highest score.

Another key direction is an increased focus on urban ecology. Enhancing urban ecology was identified in the 2012 *Urban Forest Strategy* as the next logical development of the City's urban forestry work. Trees are part of wider ecosystems, which need to be healthy for trees to thrive. This includes soils, companion vegetation, and the associated fauna – birds, insects and other species that can help control pests and diseases. Implementation of the actions identified in respect to urban ecology in the *Urban Forest Strategy* led to the publication of the [Nature in the City Strategy](#) in 2017 and the hiring of a dedicated urban ecologist to oversee its implementation. Daily collaboration between ecologists and tree experts is resulting in better ecosystem outcomes for the city.

One of the flagship projects undertaken as part of the *Nature in the City Strategy* has been the prototyping of streetscape plantings for biodiversity. This has been led in partnership with academics from the University of Melbourne's Green Infrastructure Research Group specialising in urban ecology (Nick Williams) and horticulture (John Rayner). This collaboration aimed at developing and testing the impact of an understorey plant palette that would enhance biodiversity in city streets by providing resources for birds, bees and butterflies. As with other urban greening projects led by the City of Melbourne, a [large amount of documentation](#) is publicly available about this work, including a [comprehensive case study](#) documenting the circumstances and lessons learned from the first four pilot streetscapes as of Spring 2020. The available documentation also includes [the plant palette](#) the research team identified to meet the horticultural and biodiversity criteria defined for the project. The goal is to enable and encourage other professionals, including other city departments and private sector landscape designers, to use such plant palette.

From a horticultural standpoint, the plant selection focussed predominantly on native perennial herbs, grasses and shrubs that were aesthetically attractive, required little maintenance and had high environmental tolerances, including to drought, waterlogging and compaction. The plant selection was further narrowed down based on scientific evidence that they could provide resources for birds, bees or butterflies – such as nectar and pollen for pollinating insects and small non-aggressive birds; larval food resources for local butterflies; seed and fruit for birds; nesting material for birds and solitary bees; and protection for small birds, for example, plants with dense and prickly foliage. The four first trials showed encouraging results on an ecological level, with a notable increase in the total number and diversity of bees observed. The bird population didn't show any significant change, however, this was expected given the short timeframe involved: some of the shrub that can provide bird habitat is likely to be still too small to become attractive. However, the project also revealed some challenges in plant procurement and management.

With short timeframes to implement the proposed designs, the contractors who carried out the implementation didn't have time to consider contract growing the plant materials. Many species proved impossible to procure in the amounts needed for the projects. Substitutions had to be made that weren't always satisfactory. The streetscape created also proved difficult to look after for the private contractors in charge of maintenance. Most are not used to recognising native plants (easily assimilated with weeds) or with management practices allowing natural dynamics such as self-sowing. The City of Melbourne ended up dispatching to the biodiversity streetscape pilot sites the maintenance contractor in charge of Royal Park, Melbourne's largest inner-city park and the richest in native plantings. The long-term efforts that were made on supply chain and contractor management in support of the City of

Melbourne's tree-focused work will need to be extended so that its urban ecology aspirations can be successfully scaled-up.

While the four streetscape biodiversity pilots gave insightful answers to the question: "how can we increase ecological connectivity in the city?", it still left unanswered the question of where such an approach would offer the greatest impact? A partnership between the City of Melbourne and researchers from the Clean Air and Urban Landscapes Hub (CAUL) was formed to help provide this information. CAUL is a consortium of four Australian universities funded under the Australian Government's National Environmental Science Program. In the [Linking Nature in the City](#) study, CAUL provides a method for spatially prioritising projects for different guilds of animals.

The ambition for the upcoming years is for this exploratory and research-driven work on streetscape ecology to inform a new generation of Urban Forest Precincts Plans. As mentioned above, the existing precincts plans are nearing their completion date, scheduled for 2022. Preparations of a new generation of plans will start soon with the belief, rooted in experience, that incorporating the findings from the urban ecology studies and pilots conducted to date will provide a reliable mechanism to turn such emerging practice into business as usual.

Further information:

Delivery partners:

- Client (project sponsors): City of Melbourne Parks and City Greening Department
- Advisors: multiple universities
- Horticultural maintenance professionals: Serco, Nature Links, Citywide Trees,

Funding mechanisms:

- Between \$2 and \$2.3 million AUD drawn from the City's annual capital works program are allocated each year to the implementation of the Urban Forest Precincts Plans.
- The streetscape for biodiversity project draws from the urban ecology capital works budget and by integrating with other capital works projects. Considerable in-kind support in the form of advice, writing and editing was provided by researchers.

Plants and plant suppliers in numbers:

- A minimum of 3,000 trees are planted across the city's public realm each year. Numbers allocated specifically to Precincts Plan streetscapes vary each year, but typically make up about 10 percent of that number. This might sound low, but it is important to note that precincts plans streetscape enhancements generally involve significant improvements to the growing environment and layout which means the canopy cover outcomes for these will be much greater than typical plantings.
- Trees are typically sourced from five different nurseries in Victoria and two others interstate, but the City of Melbourne's Parks and City Greening team is always exploring new options for diversifying its supply chain.

Further reading:

- City of Melbourne's web page on its Urban Forestry Programme (provides links to *Urban Forest Strategy* and associated Precinct Plans) www.melbourne.vic.gov.au/community/greening-the-city/urban-forest/Pages/urban-forest.aspx
- City of Melbourne's *Urban Forest Visual* <http://melbourneurbanforestvisual.com.au>

- Flinders Street: Example of street redesign project, initiated to facilitate tree replacement scheduled as part of the implementation of the City of Melbourne's *Urban Forest Strategy*
<http://urbanwater.melbourne.vic.gov.au/projects/greening-projects/projectsgreeningprojectsflinders-street-tree-replacement-soil-volume/>
- City of Melbourne's *Nature in the City Strategy*
www.melbourne.vic.gov.au/community/greening-the-city/urban-nature/Pages/nature-in-the-city-strategy.aspx
- City of Melbourne's *Biodiversity Visual*
http://biodiversity.melbourne.vic.gov.au/insects/index.html?_ga=2.123931786.1449631675.1595583201-954565358.1595583201#/
- City of Melbourne's Streetscapes for Biodiversity project
<https://qirg.science.unimelb.edu.au/development-and-assessment-of-a-streetscape-biodiversity-planting-palette/>
- City of Melbourne's *Urban Nature Planting Guide*: the plant palette identified for bird-, butterflies- and pollinators-friendly understory planting identified through the Streetscape for Biodiversity project
www.melbourne.vic.gov.au/community/greening-the-city/urban-nature/Pages/urban-nature-planting-guide.aspx
- *Living Melbourne*: a metropolitan-scale strategy for Melbourne's urban forest and other urban greening initiatives
<https://resilientmelbourne.com.au/living-melbourne/>