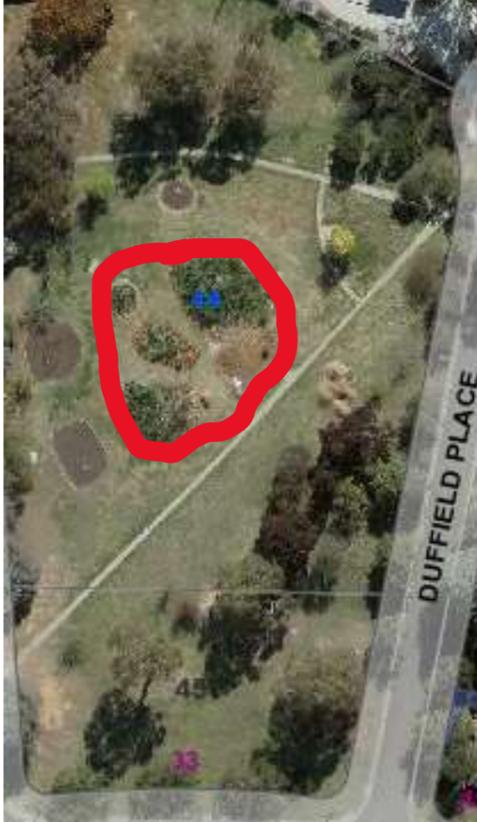


Trees for Canberra's Micro-forests

The Climate Factory, is a social enterprise formed in 2019 in response to Australia's hottest and driest year on record. It's founder, Edwina Robinson, set out to build a demonstration climate-cooling urban micro-forest in Downer, ACT. The micro-forest has a number of co-benefits including enhancing biodiversity of existing urban parks, enhancing community wellbeing and providing hope for the future. The Climate Factory has developed an eight step method of community leadership, decision making and community action to make it easy and clear for community groups to develop a micro-forest project in their neighbourhood park.

Micro-forests only take up a small proportion of a local park, leaving room for other revegetation and recreation activities. For example, the plants of the Downer Micro-forest cover 450m² of the Downer Park, a mere 5% of the almost 8500sqm area.



Downer Micro-forest plantings are occur within the red line. Image: ACTMapi April 2021

The Climate Factory's work is informed by:

- a report by the School of Forestry, ANU in 2019 for Canberra's urban forest in a hotter, drier future commissioned by the Environment, Planning & Sustainable Development Directorate
https://www.environment.act.gov.au/_data/assets/pdf_file/0008/1437047/urban-forest-tree-species-research-for-the-act-consultants-report-2019.pdf
- the ACT Government's Living Infrastructure Plan: cooling the city 2019.
https://www.environment.act.gov.au/_data/assets/pdf_file/0005/1413770/Canberras-Living-Infrastructure-Plan.pdf

Micro-forests act like urban oases and our located in urban parkland (with poor biodiversity values). The Living Infrastructure Plan states,

“As we continue to face the challenges of climate change, in particular increased temperatures and more frequent heatwaves, it will become increasingly important that our parks are able to adapt to the impacts of a changing climate. This includes ensuring appropriate planting, shading, provision of water features and suitable paving and surface materials. By upgrading our parks, we will support our community and ensure these valued public spaces will continue to remain attractive, useable and functional spaces for our community, and provide oasis in times of heat stress.” P28.





Micro-forest sponsor and business owner, Jenny Edwards, Light House Architecture and Science plants a *Casuarina* at the first working bee of the Downer micro-forest.

To measure the efficacy of the Downer micro-forest temperature and humidity loggers will be installed in December 2021. One will be installed within the micro-forest and one under an existing tree in the park. The Climate Factory and local volunteers will collect the data to establish the efficacy of the micro-forest and observe changes over time.

Most of the tree species were selected from a list prepared by the School of Forestry, ANU 2019 for Canberra's urban public spaces. The list of trees (were numbered from 1 to 200) in terms of their ability to withstand a hotter and drier future. Trees were also selected for low flammability characteristics – this was important after the 2019/2020 Black Summer Bushfires in the ACT and surrounding NSW, therefore no Eucalyptus were chosen for the Downer micro-forest (although one has been guerrilla planted).

The feature tree of the micro-forests is *Brachyciton populneus*, also known as Kurrajong. It grows locally on low hills of Murrumbidgee River valley. This tree is ranked as the No 1 by the ANU as the most likely to thrive in a hotter, drier future. The ANU Report says, "When species have a wide distribution, choose provenances that reflect Canberra climate change future, i.e. hotter and dryer. For example, *Brachyciton populneus*, attempt to use seeds and nursery stock from provenances from areas west of Canberra with hotter dryer climates such as Griffith or Condobolin (Figure 32)". This is what we've done – refer to Tree Species table notes on provenance.



Kurrajong tubestock sourced from Binnaway near Coonabarabran.

Below is a list of native trees that may thrive in a hotter and drier future – these trees are being trialled at the Downer Micro-forest, planted over 2019-2020 and in the Watson Micro-forest planted in November 2021. Two deciduous species will be introduced into nature play areas at the Watson Micro-forest to allow for solar access in winter.

The Urban Forest Tree Species Research for the ACT says

"Urban forests are increasingly important forms of urban living infrastructure as urban population densities increase and environmental conditions within urban areas become harsher. They serve many functions, many of which are not easily visible or quantifiable (Figure 1). However, while heat-island effects (Figure 2) and increasing extremes in temperature and rainfall are making the ameliorative effects of urban living more important, they simultaneously

make establishment and maintenance more difficult. Furthermore, current and projected climate change threatens the longevity of established living infrastructure (e.g. Kendal et al 2017).”

“Canberra’s urban forest is a cornerstone of maintaining Canberra’s aesthetic, biological and environmental assets. As living infrastructure, the urban forest also presents substantial ongoing planning and management challenges. The ACT Climate Change Adaptation Strategy - Living with a Warming Climate (EPSDD, 2016) calls for delivery of a ‘Living Infrastructure Plan’ as part of land sector actions to meet a net zero emissions goal.”

“Collaborative action between Environment, Planning and Sustainable Development Directorate (EPSDD) and Transport Canberra and City Services (TCCS) has identified that research is necessary to determine which tree species will survive and thrive and continue to deliver the suite of services currently provided by Canberra’s urban forests. Specifically, the current list of tree species used on public land needs immediate review to assess its capacity to meet projected future climate variability and extremes. **That is, changes in ACT’s climate may mean that species currently used in Canberra may either not survive or continue providing ecological, aesthetic and other amenity benefits.** Furthermore, species not previously used in the ACT may provide opportunities to maintain or increase the palette of planting options.”pp 8-9.

Nurse trees or shrubs have been used extensively in the Downer and Watson Micro-forests. The nurse trees, include species like *Acacia dealbata* and *Acacia mearnsii*. The ANU report says

“A nurse tree is a larger, faster-growing tree that fosters the growth of another smaller, slower-growing tree or plant. A nurse tree can provide shade, shelter from wind, or protection from animals who would feed on the smaller plant. Fast growing, short lived species such as Acacias and Albizia can be used as nurse trees to shade, shelter and create a more habitable micro climate for slower growing, longer lived trees species during their establishment. As fast growing species populate/occupy site space quickly, they can also rapidly improve site aesthetics and provide shade in a short period of time. Once these nurse species have reached their lifespan generally between 5-15 years, they can be removed leaving the healthy, established slower growing, longer lived tree urban tree.”p66-67.

The ANU Report concludes that both native and exotic trees can play a role in Canberra’s future. “It is clear that both introduced and native species, especially eucalyptus, are suitable for Canberra’s Climate Change future.”p59.

In an article published in the RIoTACT, ANU Forestry Professor Peter Kanowski commented on the cooling potential of micro-forests and that there is not one way only to regreen our city.

“... micro-forests had the potential to lower temperatures in urban parts of Canberra. I think we should expect to see more of these as part of the sort of diversity of ways that we add greenery to our cities, and that we use that greenery to deliver multiple benefits for the environment, but also for urban residents and communities,” he said.

"I think the big picture is that we sort of need all hands on deck in our urban areas, because of the increasing average temperatures and the increasing frequency of heat waves."He said as cities became more densely populated, they lost the benefits of backyard gardens on the urban temperature.

"But then, you know, there are little pockets of land in our densifying suburbs where micro-forests could be a great solution," he said. One example, he said, could be putting a micro-forest to the west of a children's playground, which could directly cool that space.”

<https://www.abc.net.au/news/2021-07-08/act-micro-forests-in-canberra-offer-hope-against-climate-change/100274670>

Creating community-led micro-forests aligns with two of the goals of the ACT Government’s Living Infrastructure Plan – Cooling the city of creating a climate-wise city and a healthy city. The goal of a climate-wise city is “to reduce the risks from the key climate change impacts of heatwaves, droughts, storms and bushfires, through resilient living infrastructure.”p5. And the goal of a healthy city is “ To promote community-wide health and wellbeing through access to nature which provides recreational, fitness and relaxation opportunities, and improves mental health”.p5.

“The changing climate also has implications for what are the most suitable tree species for future plantings” Environment, Planning & Sustainable Development Directorate 2019, p 14..

The ACT Government faces a number of challenges it faces:

- Reducing urban heat island effects and increasing access to shade
- Retaining water in the landscape and using rainfall better.

The Climate Factory has addressed these challenges by planting micro-forests in urban parks and incorporating water harvesting systems to capture rainfall and direct it to plants roots where its needed most.

TREE SPECIES LIST - Downer and Watson Micro-forests

Species	Common Name	Climate Weighted rank (ANU 2019)	Recommended based on advice from councils and National Arboretum Canberra (ANU 2019)	Height x Width	Flammability	Notes
NATIVE LARGE TREES >10M HIGH						
Brachyciton populneus	Kurrajong	No 1		11 x 9	Low	Tubestock sourced from Bilby Blooms near Coonabarabran. The nursery experiences -9°C – 49°C (pers comm Anthony O’Halloran 2020). Planted Forest 79 Arboretum. This species occurs locally on low hills of Murrumbidgee River valley.
Brachyciton rupestris	Qld Bottle Tree			18 x 7	Low	Deciduous in ACT (ANPS). Specimen growing well entry to ANBG.
Casuarina cunninghamiana	She-Oak	No 2		19 x 13.5	Low	Found locally on banks of Murrumbidgee and lower Molongo River and away from rivers on limestone outcrops.
Cupaniopsis anacardoides	Tuckeroo		X	10x5	Low	Trees died Downer. Species of dry rainforest.
Grevillea robusta	Silky Oak		X	15 x 8	Low	Trees hit by frost. Regrowing Spring 2021. Planted Forest 51 Arboretum.
NATIVE MEDIUM TREES < 10M HIGH						
Allocasuarina littoralis	Black She-Oak	No 50		10x4	Low	
Eucalyptus mooreii	Little Sally	No 186		7 x 6	Medium	5x Planted at Watson from Canberra Native Nursery.
Geijera parvifolia	Wilga		X	9 x 8	Low	1x mature specimen gifted by Dom Galloway. Looking poorly.
Melia azedarach ‘Elite’	White Cedar	No 43			Low	Deciduous. Fruits poisonous. Non fruiting form ‘Elite’ not available. These trees can be attacked by caterpillars causing defoliation. Species of dry rainforest.
EXOTIC LARGE TREES > 10M HIGH						
Acer ‘Autumn Blaze’	Maple	No 164		13 x 10		Nature play area – Watson Micro-forest
EXOTIC MEDIUM TREES < 10M HIGH						
Lagerstroemia ‘Natchez’	Natchez Crepe Myrtle	No 32		8 x 6	Low	Nature play area – Watson Micro-forest