

AUSTRALIAN INSTITUTE OF HORTICULTURE

hortinsights



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WHAT'S YOUR CALLING?

By Patrick Regnault FAIH RH

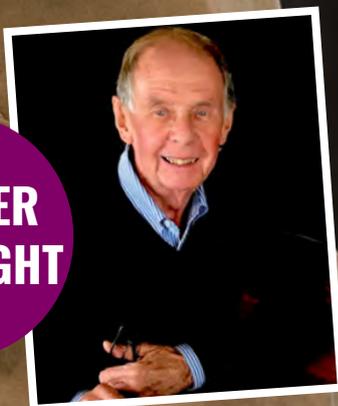
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EDITOR'S NOTE

Dear members and friends, as one year closes and another opens, we are all looking ahead to a safe and successful 2022.

In this new-look first edition of HortInsights for 2022, we take a closer look at the vocation that is horticulture, with stories designed to showcase our members, and their achievements and expertise.

At the Institute, we have seen a rise in the interest in horticultural careers over the last few years, as people evaluate their place in the world and look towards nature and the environment as a source of purpose and interest.

There are so many fascinating and diverse careers available in horticulture, and our own purpose is to share the opportunity and joy that creating beautiful places brings.

There is always demand for knowledgeable, experienced horticultural professionals and one of Australia's big challenges is to make better use of plants and greenery to improve our spaces and places.

We look forward to seeing you in 2022.

All the best,

David

David Thompson
Engagement Manager
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CONTRIBUTING AUTHORS

FEBRUARY 2022 ISSUE



PATRICK REGNAULT FAIH RH

Patrick is a Fellow of the Institute, a former National Councillor and Regional Convenor. Our aim is to create beautiful gardens that bring people and place together. We listen to what our clients want and use our expertise to create the best possible environment: places that are beautiful to be in and respectful of our surroundings.



JUDY HORTON OAM MAIH

Editor, freelance writer, radio horticultural adviser and multi award winning horticulturist. In 2018 Judy was awarded an Order of Australia Medal (OAM) for her contribution to the promotion of gardening.



STEVE MCGRANE MAIH RH

Steve McGrane is a guy with a sense of fun and passion for all things plants and biology – a seasoned presenter, speaker, writer and researcher, qualified in Horticulture, Biology, Ecology, Entomology, Soil chemistry, Agriculture Science (Ecological Agriculture) and Land Management.



WHAT'S YOUR CALLING?

by Patrick Regnault FAIH RH

According to Confucius, if we choose work we love we will not have to work a single day of our life. Under this statement lies a simple truth, choose to do something you love regardless of the material reward and happiness will be found.

This may sound idealistic and simplistic, and indeed it is on the surface. The alternative is to work for money, fame, glory all of which can be taken away in an instant by one's mistake or someone else's decision.

To clarify the matter we need to give a definition to the following terms, Job, Work, Career and Vocation.

A job is what you have to pay bills and have money for your spare time. The priority is on time off and personal leisure times.

Work may or may not be of your choosing, it is mostly to allow you to fulfil the requirement of daily life with some extra for spare time and allocated holidays.

Career is already different, the view being an upward progression towards greater monetary reward and a desire for greater responsibilities and perhaps recognition from the peers.

Vocation is very unlike the above, it is what some people refer to as a calling. Vocation does not negate monetary rewards or social recognition but those are not the primal driving

forces and the fulfilment does not require external approval.

Indeed, a vocation can change and evolve but the seed from which it grows, the curiosity to explore and dedicate time to a deeper understanding of a particular discipline, stays at the core of it.



CHOOSING

A vocation can be a choice or sometimes it is a matter of chance. We can feel our calling clearly or it may stumble upon it by chance. Our feeling of vocation may simply grow upon us as a slow realisation that what we are doing is just the right thing.

FOLLOWING

The real choice is to either follow our calling or to go on the well-trodden path that we think will bring us security and stability.

Following our vocation is not always the easiest path, we may get in our own way through overthinking it, having preconceived ideas, or listening to our projected fears or grandiose ideas.

BECOMING

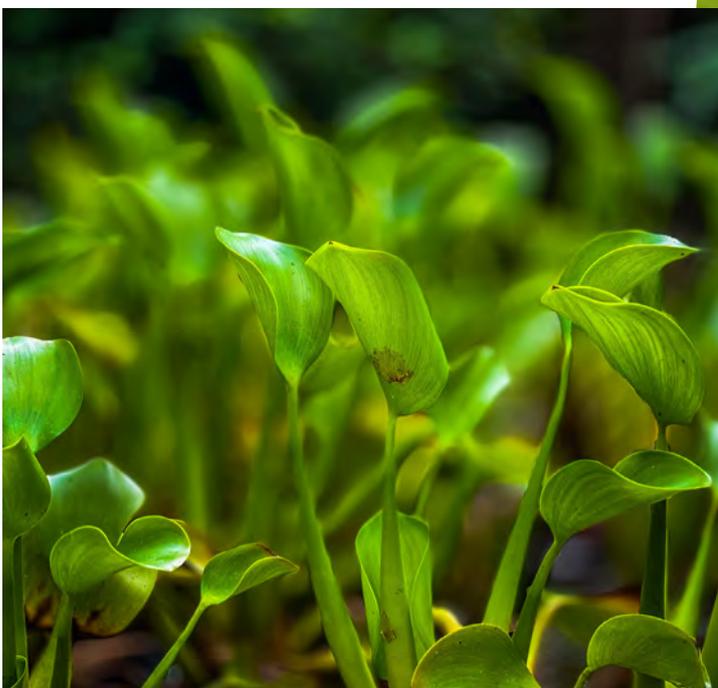
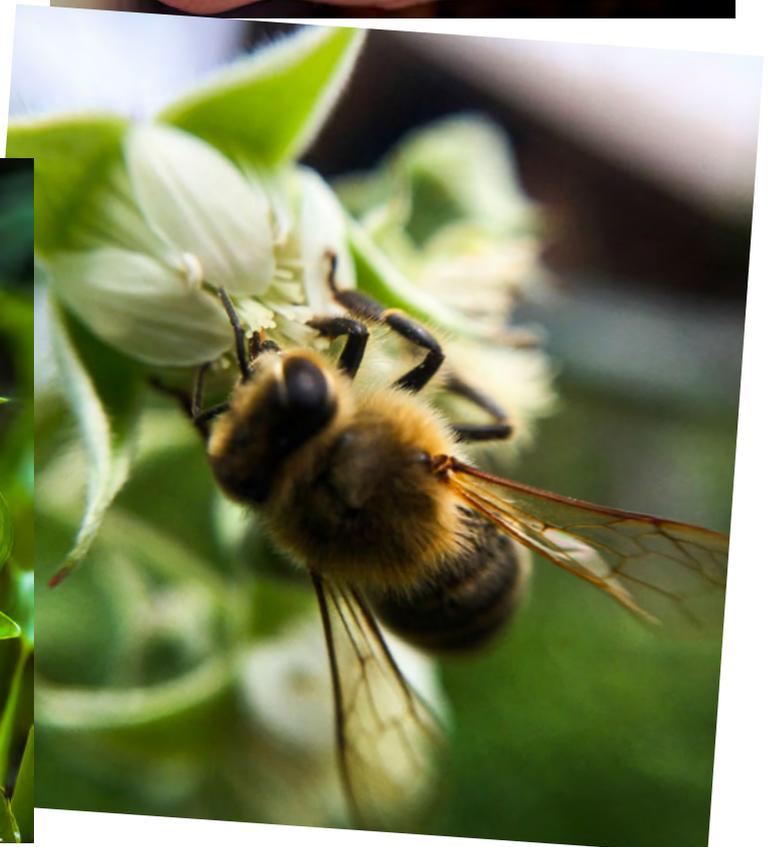
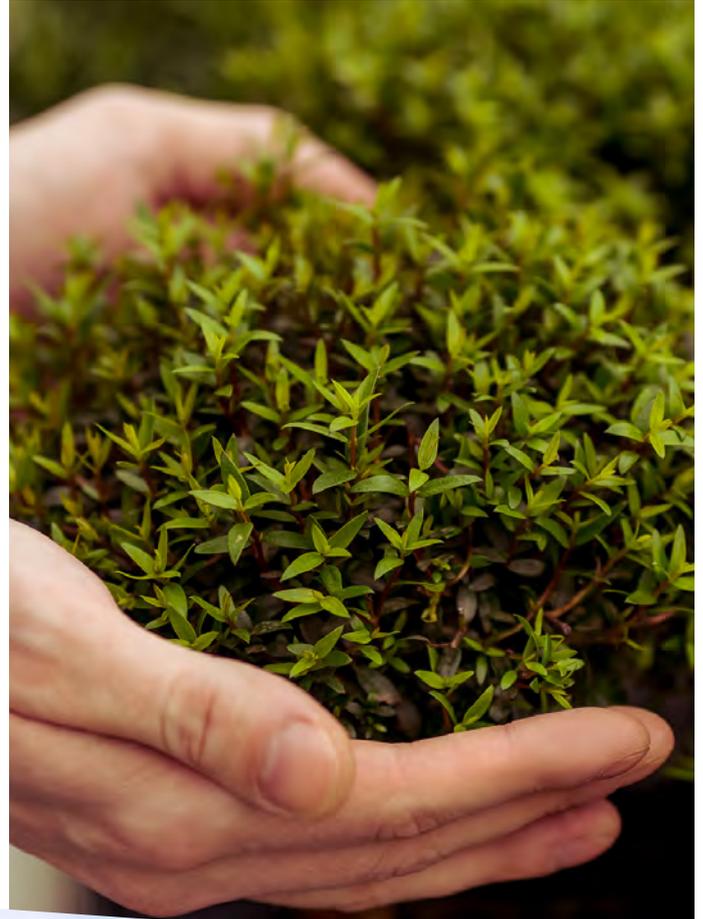
When we act in accordance with our life direction, we find that the flow may not always be smooth but the current is always helping us along.

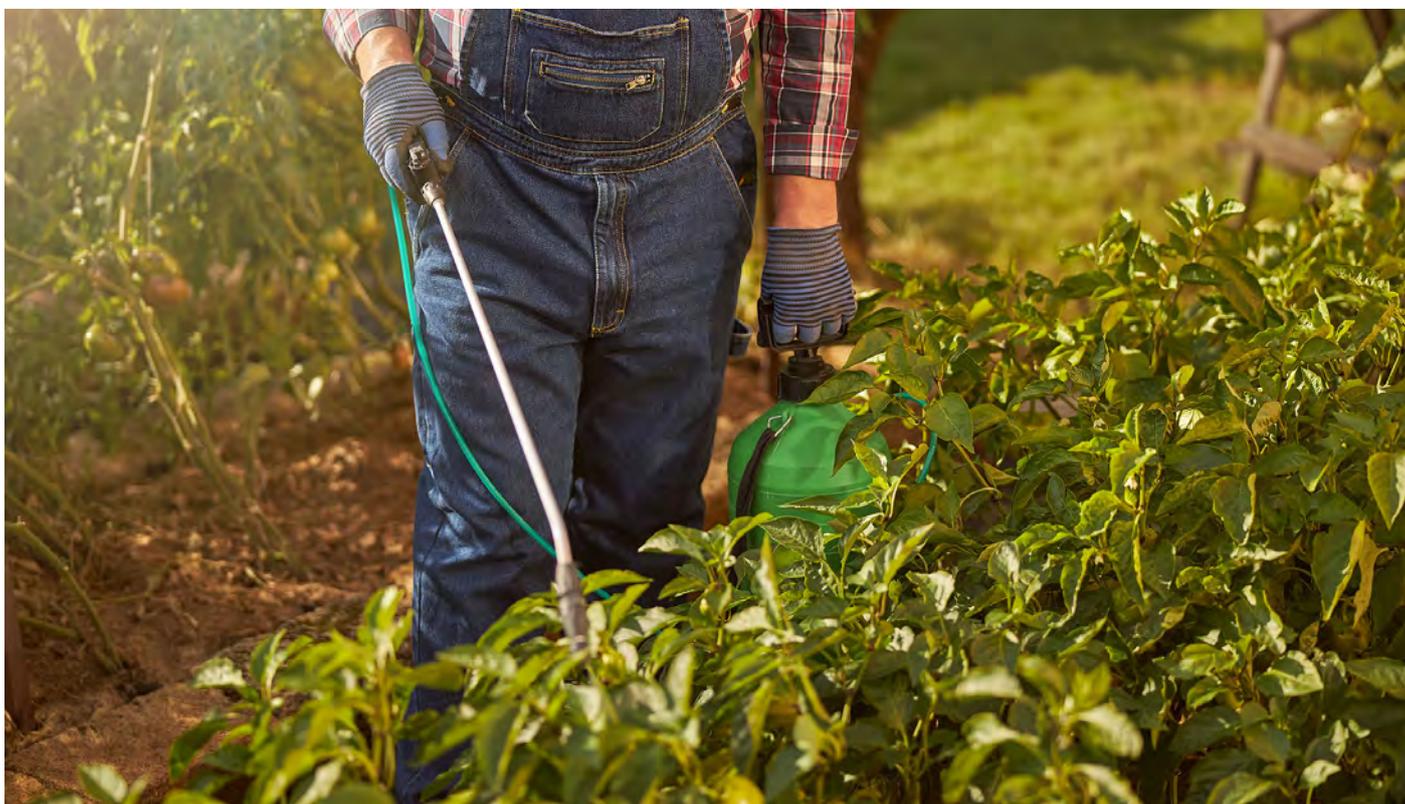
We are not a horticulturist, we constantly become one. It is a constant renewal, always fresh and invigorating. The childlike wonder is always there and is infectious to the people around us.

In finding and following our vocation we transcend the limitations, real or imaginary, imposed upon us. The internal freedom cannot be contained.

Perhaps Confucius could have been translated as “Find your *vocation* and you will not have to work a single day of your life” ■

“Find your *vocation* and you will not have to work a single day of your life...”





COPPER BASED FUNGICIDES

by Steve McGrane MAIH RH

What are they? Are they safe for the environment? How to use copper effectively in a horticultural setting.. the alternatives..

Fungal infections can be highly impactful to many plants, including vegetables, fruit and ornamentals.

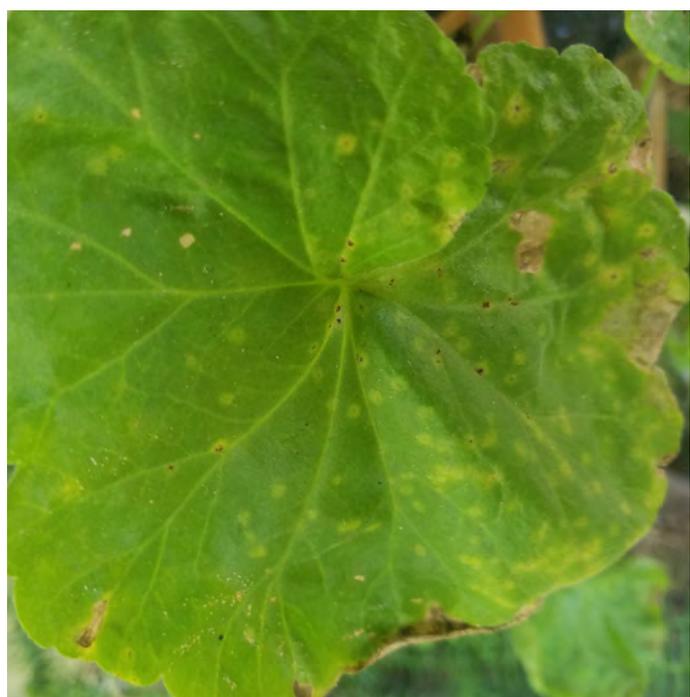
Copper is an effective fungicide for controlling fungal, viral and bacterial infections. However a large body of research indicates copper fungicides have a considerable impact to humans and the environment.

The reality is, many treatments used in horticulture have detrimental effects. We can't entirely stop the use of such chemicals so being 'well informed' and understanding effective alternatives, is the most practical course of action.

HOW DOES COPPER WORK AS A FUNGICIDE?

Copper impairs cellular functions in viruses, fungi and bacteria through 'peroxidation' (oxidation) of cells leading to inaction by lipids resulting in the collapse of cells walls, attacking virus structural integrity, inhibiting protein and enzyme chemical disruption by binding to surfaces.

These actions either prevent fungal spores from completing essential metabolic functions or cause desiccation (drying out) through destruction of cell walls.



► FUNGAL INFECTION ON A GERANIUM Image/ Steve McGrane



A fungal disease that attacks kangaroo paws (Anigozanthos) is *Alternaria alternata*.

This disease can be controlled in perennial varieties of kangaroo paws (having a rhizome), by cutting back leaves to within a cm of the soil, post flowering.

Copper is also effective in addressing a single attack of the disease. However subsequent infections are better controlled through seasonal removal of infected leaves.

► FUNGAL DISEASE ON A KANGAROO PAW (ANIGOZANTHOS) Image/ Steve McGrane

IMPLICATIONS OF USING COPPER IN HORTICULTURE

Copper is a Heavy Metal

Copper is a naturally occurring element termed a *heavy metal*, and generally occurs at very low levels in the natural ecosystem but accumulates in the environment largely through horticultural and commercial activities.

Note: A heavy metal is best described as an element that is dense in volume and resistant to break down. While copper can bind with proteins and remain biologically bound, it can become 'free' (as occurs in the use of copper fungicide preparations) and becomes toxic. Copper accumulates in soils, seabeds, humans and plant tissue.

Low Levels of Copper Kills Soil Biota

At very low levels copper becomes toxic to plants, humans and importantly, soil organisms, including worms. Relatively low concentrations prove toxic to soil organisms (Helling et al. 2000).

Copper sprays are harmful to all aquatic life (including fish), livestock and soil biota. Small elevations of copper in the soil reduce beneficial mycorrhizae associations (Liao et al. 2003).

Fungi are essential for symbiotic relations with plants. Copper sulfate kills soil biota and, insects (e.g. bees) when sprayed as an anti-fungal (Bogomolov et al. 1996, Böckl et al. 1998).

Impact on pollinators highlights the need to be aware of timing of applications. Spraying fungicides when pollinators are present is counterproductive and environmentally irresponsible.

Copper Anti-Fungal Compounds Encourage 'Pest Resistance'

Research shows disease and pathogenic fungi develop resistance to copper treatments making copper fungicides ineffectual over time and we should therefore have a mix of chemical and cultural strategies e.g. rotate crops or improve air flow in the garden or nursery. Refrain from overhead watering.

Copper Stays in the Soil

In most soils, copper residues are likely to remain indefinitely, and will continue to influence the health of the soil. This has implications for future land management and human health.

Organic Matter Does Not Lower Copper Levels in Soils

Thrupp (1991) found that copper, arising through Bordeaux application, tended to be associated with areas of high organic matter build-up. Hence even good levels of organic matter, **will not** assist in reducing copper toxicity but rather exacerbate. Hence the message is, use copper sparingly because you can't put the genie back in the bottle.

Using Fungicides Effectively

Apply fungicides before the development of buds, or after in the case of liquid copper and 'certified organic' fungicides that are potassium based or other compounds such as milk that do not have a corrosive effect on plant tissue.

Applying fungicides before bud burst is also necessary to prevent fungal spores' transferring to the plants androecium (male sexual parts of the plant) after buds open and develop further during fruit set and fruit development.

Liquid copper (discussed further below) can be applied after bud burst without damaging tissue.



▶ LIQUID COPPER Image/ Steve McGrane

Examples of Common Copper Fungicides and Their Uses

A copper formulation used pre-emptively for the treatment of fungus (mildew and botrytis) is *Bordeaux*.

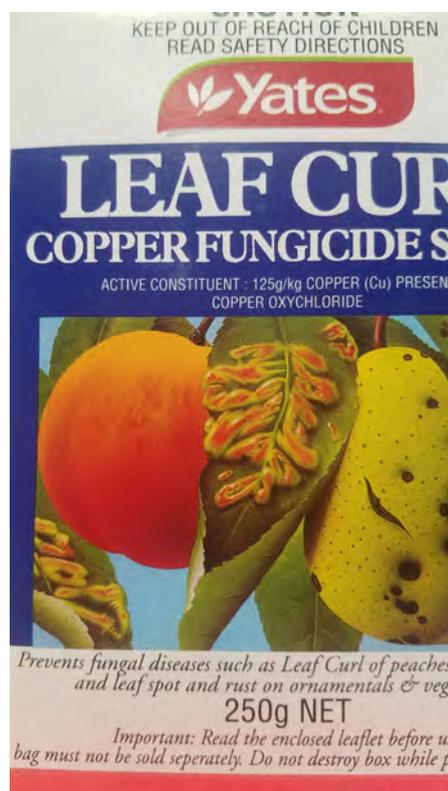
Bordeaux uses copper ions and a slurry of lime to prevent fungal spores from germinating by

blocking an essential enzyme. Bordeaux is typically applied to deciduous trees in winter.

Note: Alternatively, 'organically certified' Bio Dynamic Pastes, are an effective alternative to Bordeaux when applied in winter.

Another common copper fungicide, Copper Oxychloride, controls fungal and bacterial attacks on trees and vegetables; This includes diseases like mildew, anthracnose, banana leaf speckle, leaf spot, septoria leaf spot, black spot, melnose, lemon scab, smoky (sooty) blotch, brown rot, collar rot and pink disease etc.

Since copper oxychloride becomes toxic in the soil, use *removable* mats under plants when spraying, to avoid contamination of soil.



▶ COPPER OXYCHLORIDE A HISTORICALLY EFFECTIVE TREATMENT FOR FUNGAL ATTACK. Image/ Steve McGrane

More recently 'liquid' forms of copper (copper hydroxide), have become popular as anti-fungal treatments. Liquid copper is more effective due to its inter-laminar nature (nano in size, entering leaf tissue) and therefore more persistent and less affected by wet weather. However it is also more persistent in soils.

Note: Fungicides are only *disruptive* but not a cure, as fungal spores survive treatments.

Copper, Can Be Too Much of a Good Thing, Even For Plants!

Although copper is required in the soil for plant health, it easily becomes toxic causing iron chlorosis (yellowing) or stopping photosynthesis turning leaves dark green before becoming white. Excessive copper, damages roots causing wilt or death.

Note: ‘Lesser quality’ copper supplements, or anti-fungal products, may contain high levels of undesirable heavy metals such as arsenic, mercury, lead and cadmium.

ALTERNATE FUNGICIDES

Effective antifungal treatments with minimal environmental effects are as follows (Alva AK, Huang B, Paramasivam S, 2000):

- Use ‘covers crops’, to reduce pathogenic fungi as an alternative to copper.
- Ensure good air flow around plants and prune fruit trees in winter.
- Apply a Bio Dynamic Tree paste after pruning each year (4 parts cow manure, 2 parts diatomaceous earth or silica, 3 parts potters clay, or garden clay, add rain water to make a slurry which is applied with a brush)
- Use a potassium based fungicide pre and post ‘bud burst’.
- In the nursery or garden, use drip irrigation instead of overhead watering to reduce fungal growth.
- Add regular amounts of compost and inoculated compost (beneficial fungi strains that attach to pathogens).
- Surfactants and bio surfactants (oils or fats used to lower surface tension and discourage leaf fungi) e.g. Eco Oil.
- Compost teas (good bacteria prevent harmful fungal spores establishing).
- pH modifiers and bicarbonates (changing the pH prevents fungal spore germination) calcium and silicone sprays e.g. Milk products, create an alkaline surface not conducive to fungal spore germinations.
- Molasses; mixed at a rate of 1:10 in water and sprayed on plant leaves.
- Essential oils:
 - o Citronella oil
 - o Jojoba oil
 - o Nimbin (neem oil)
 - o Oregano oil
 - o Rosemary oil
- Wettable Sulphur.



► COMBINE A ‘POTASSIUM BASED’ FUNGICIDE WITH PLANT OILS FOR STRONGER EFFICACY. Image/ Steve McGrane

Acknowledgements:

October 26, 2017, Society of Environmental Toxicology and Chemistry

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NSW Department of Primary Industries, June 2017

Kay T. Ho et al, Effects of micronized and nano-copper azole on marine benthic communities, Environmental Toxicology and Chemistry 2017.

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MEMBER SPOTLIGHT

THE LEGACY OF AN INDUSTRY LEGEND - STUART PITTENDRIGH FAIH RH

by Judy Horton OAM MAIH Images/ Stuart Pittendrigh and Judy Horton

At the AIH NSW Christmas party in December 2021 I had the privilege of sitting next to Stuart Pittendrigh. While we were eating dinner I asked Stuart about the progress of his *magnum opus*, the Barangaroo Reserve on Sydney's foreshore.

This led to Stuart generously offering to give me a tour of the now six-year-old landscape and we spent a pleasant morning walking the site, with me marvelling at the growth and establishment of the landscape.

On the way back I asked Stuart about his life story and this led me to thinking it would be a great opportunity to share this with AIH members so we could appreciate the great legacy this man has bequeathed to us all and to the city of Sydney.

CHILDHOOD

Stuart was almost the eldest of four children. Why 'almost'? He has a twin sister who was born half an hour before him. 'And she never lets me forget it,' he laughs.

They spent their early years in Wattle Flat near Bathurst where his father worked as a coachmaker and signwriter for Cobb & Co.

When it came time for high school education, the family moved to Sydney and Stuart enrolled at North Newtown High School.

EARLY CAREER

As typical of the time Stuart left school at 15, started work straight away and undertook an apprenticeship in Fitting, Machining and Welding.

But much of the groundwork was laid for his future career by his father, who fostered an interest in art and nature by regularly taking each individual child on day trips to visit art galleries, parks and Sydney bushland. With this continual exposure to art and nature, Stuart describes his as a 'privileged background'.

Stuart flourished during his four-year apprenticeship and in 1958 was encouraged by his employer to study for a Diploma of Mechanical Engineering. His job expanded, with a large part of his role providing job estimations for clients all over the country. This gave him huge exposure to many different manufacturing operations (in the days when Australia had such things).

CAREER CHANGE

He married Jan in 1963, bought land, built a house, acquired a mortgage and had two children. During these busy years he became very interested in plants and gardening.

Having observed Stuart's growing horticultural enthusiasm, Gordon Morling and Ralph Groves, owners of Five Dock Nurseries, offered him a job.



► **STUART ASSESSING THE HEALTH OF A FIG TREE (FICUS RUBIGNOSA) CLOSE TO THE WATERFRONT.** Image/ Stuart Pittendrigh, Judy Horton

Jan agreed to support his change of career on condition that they always kept £1000 in the bank. Neither has ever regretted this decision.

Five Dock gave Stuart experience in virtually all aspects of horticulture: wholesale, retail, growing plants and landscape construction (at the time Five Dock was the largest landscaper in Sydney). With his plant knowledge, artistic flair and drawing skills Stuart became more and more involved in landscape design.

STARTING HIS OWN BUSINESS

After he left Five Dock in 1971 he formed Stuart Pittendrigh & Associates Landscape Design (later Landscape Architects) and Horticultural Consultants and practised successfully for 17 years.

During these years at Five Dock and in his own business he was continually learning. He achieved qualifications in horticulture, arboriculture, landscape design and landscape architecture.

In 1988 Stuart accepted an appointment as Managing Director of Landscan - Landscape Architecture, then became a founding director of PSB (Pittendrigh, Shinkfield and Bruce).

He retired in 2008 but remained a consultant to the practice. He maintains friendly relationships with both Jon Shinkfield and Angus Bruce.



► **BARANGAROO RESERVE IN SYDNEY HARBOUR.** Image/ Barangaroo.com

BARANGAROO RESERVE

After retirement Stuart found himself still much in demand as a horticulturist, arboriculturist and landscape design expert. He lectured and mentored horticultural students and was called on to advise in many court cases. And then, in 2010, came Barangaroo.

Barangaroo Reserve, named after the Cammeraygal woman who lived in the area at the time of white settlement, is a massive transformation of a disused shipping terminal and industrial site that fronts Sydney Harbour on the western edge of the CBD.



► THE SANDSTONE BLOCKS THAT STEP DOWN TO THE WATER WERE ALL QUARRIED ON THE SITE. Image/ Stuart Pittendrigh, Judy Horton



► IN SIX YEARS THE BARANGAROO LANDSCAPE HAS BECOME WELL ESTABLISHED. Image/ Stuart Pittendrigh, Judy Horton

When the Barangaroo Delivery Authority accepted the tender of US-based Peter Walker & Partners and leading Australian landscape architects Johnson Pilton Walker to design the reserve, Stuart was engaged to advise on the selection, planting and maintenance of the 75,000 plants required for the site.

He took Peter Walker and his team on trips to Muogamarra Reserve and Bobbin Head north of Sydney and other natural sites where they could see – and be astonished by - the amazing diversity of the flora associations that existed in Sydney in 1788.

Since the reserve opened in 2015 Stuart has been retained to conduct monthly horticultural assessments on the plants throughout the entire Barangaroo Precinct and report back to Infrastructure NSW.

His contract has just been renewed for another year so he will be continuing his regular visits and solving the small number of problems.

He has been delighted with the way the plants are flourishing.



► BARANGAROO RESERVE. Image/ Wpcpey, CC BY-SA 4.0 via Wikimedia Commons.

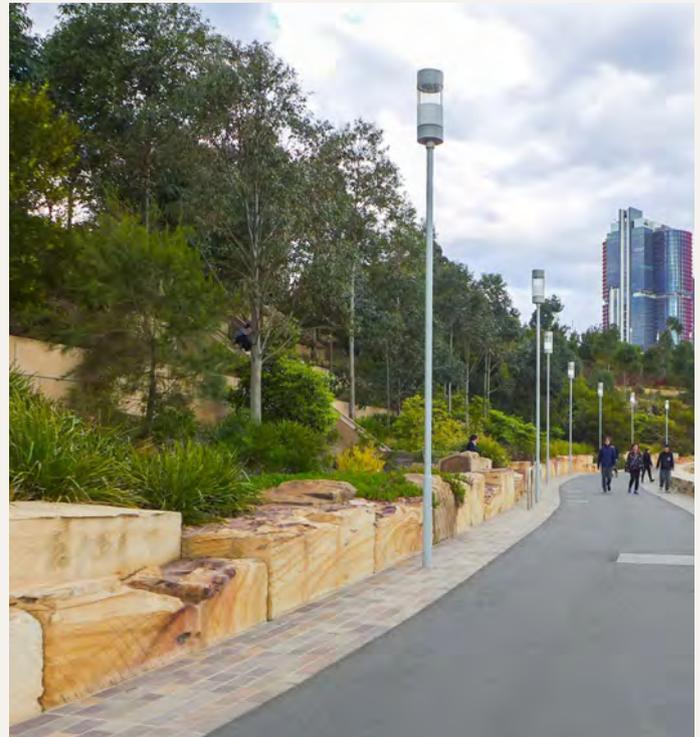
VALUABLE ADVICE

As we walked and talked, I began to learn more of this remarkable man's take on life and landscape.

Here are a few of the gems I remember:

- It's important to gain experience in as many fields of horticulture as possible. I regret that some - not all – landscape architects and designers sit in offices drawing on computers and never get out to learn or look at plants.
- Integrity is important in business. I have never had a serious bad debt or had to call upon the services of a solicitor. If I made a mistake, I admitted it and fixed it.
- Have a business plan that works well and don't have any prima donnas in your business.
- Delegation is important – don't waste time by getting bogged down in details that others in your team can do as part of their role. Don't get involved in things that you don't need to get involved in.
- Books are forgotten resources. I still get my most valuable information from books. I have five Edna Walling first editions on my bookshelf and I've told Jan that when I croak, they're not to be thrown out.
- It's vital to rely on your own observations – look at plants all the time. Know and love your plants.
- Barangaroo is not a garden, it's a landscape. The idea is to get it established and turn off the water. I still get a buzz every time I go there.

Stuart was the AIH Horticulturist of the Year in 2015 and had AIH fellowship conferred in 2018. His other awards, affiliations and recognitions are too numerous to list here. He has been a longtime supporter of AIH and we are honoured to have him in our association. ■



► **BARANGAROO RESERVE WULUGUL WALK.** Image/ Wpcpey, CC BY-SA 4.0 via Wikimedia Commons

OVERVIEW OF STUART PITTENDRIGH'S BODY OF WORK

RESORT & LEISURE

- Riverside Oaks, PGA National, NSW
- Peppers Guest House, Pokolbin, NSW
- Hunter Resort, Pokolbin, NSW
- 'The Ridge' golf, equestrian and leisure facility, Cattai, NSW
- Nan Li Lake, Hainan Island, China
- Holiday Inn, Terrigal, NSW
- Impiana Resort, Cherating, Malaysia

COMMERCIAL/OFFICE

- Thomas Holt Drive, North Ryde, NSW
- Amway Corporation, Castle Hill, NSW
- Australian Geographic, Terrey Hills, NSW

INSTITUTION

- Sacred Heart, Hospice, NSW

TRANSPORT

- Sydney Light Rail & North West Rail
- Link, part Canberra Light rail
- Arboricultural / Horticultural reporting and assessment for Sydney & SE Metro.

PARKS & RECREATION

- Fitzroy Avenue, Balmain, NSW
- Simmon Point, Balmain, NSW
- Blackwattle Bay Park, NSW
- White Bay Park, Balmain, NSW
- Fagan Park, Arcadia, NSW
- Cordeaux Heights Estate, Unanderra, NSW
- Barangaroo Reserve, Sydney, NSW

Horticultural and Arboricultural Consultant to BDA, JWP Architects & Peter Walker Partnership Landscape Architects USA and NSW State Government.



► THE STORES, WALLINGTON, HERTFORDSHIRE, FORMER HOME OF GEORGE ORWELL. Image/ Jason Ballard, Alamy

OTHER PASSIONS: GEORGE ORWELL'S ROSES

by David Thompson, Engagement Manager

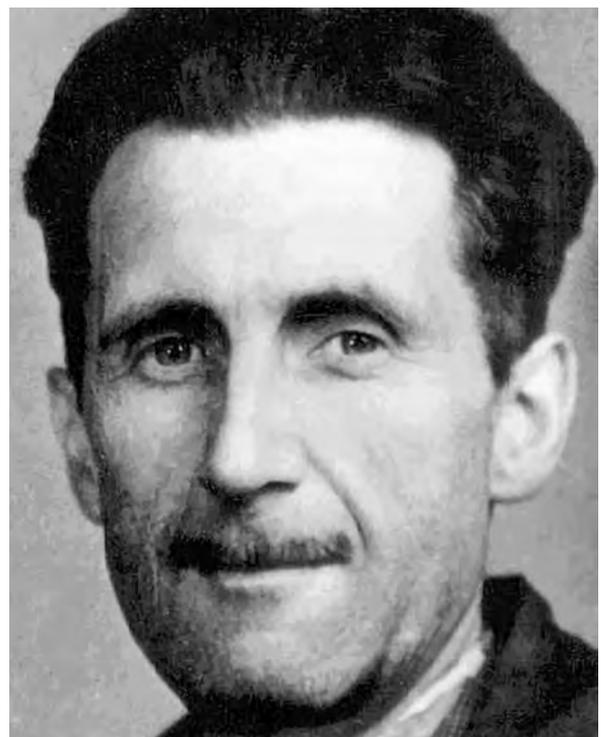
Author Rebecca Solnit has recently published her new book 'Orwell's Roses' an interesting mix of history around Orwell's retreat to gardening and horticulture along with views on ecology and climate change.

"In the spring of 1936, a writer planted roses" – so begins each chapter with a variation on this central theme.

Best known for his biting, satirical novels, *Animal Farm* and *Nineteen Eighty-Four*, Orwell spent the longest part of his life living at this cottage in Wallington, Hertfordshire. As well as writing, he also sold basic groceries from the property to support his writing efforts.

"Orwell's biggest passion was his gardening", explained Rebecca.

"He was well-known as an anti-fascist but less known as a nature-lover and keen gardener. Prior to taking up residence at Wallington, Orwell had worked reporting from the northern-English industrial heartland, and moving to Wallington and its garden represented a return to nature for him".



► GEORGE ORWELL

Even in his last days, afflicted with severe tuberculosis, Orwell and his son travelled to the remote Scottish island of Jura, where he penned *Nineteen Eighty-Four* between convalescing and then tilling four hectares of crops on the harsh and windswept island.

Many of those original roses are still growing at the Wallington cottage, part of British literary, and horticultural, history.

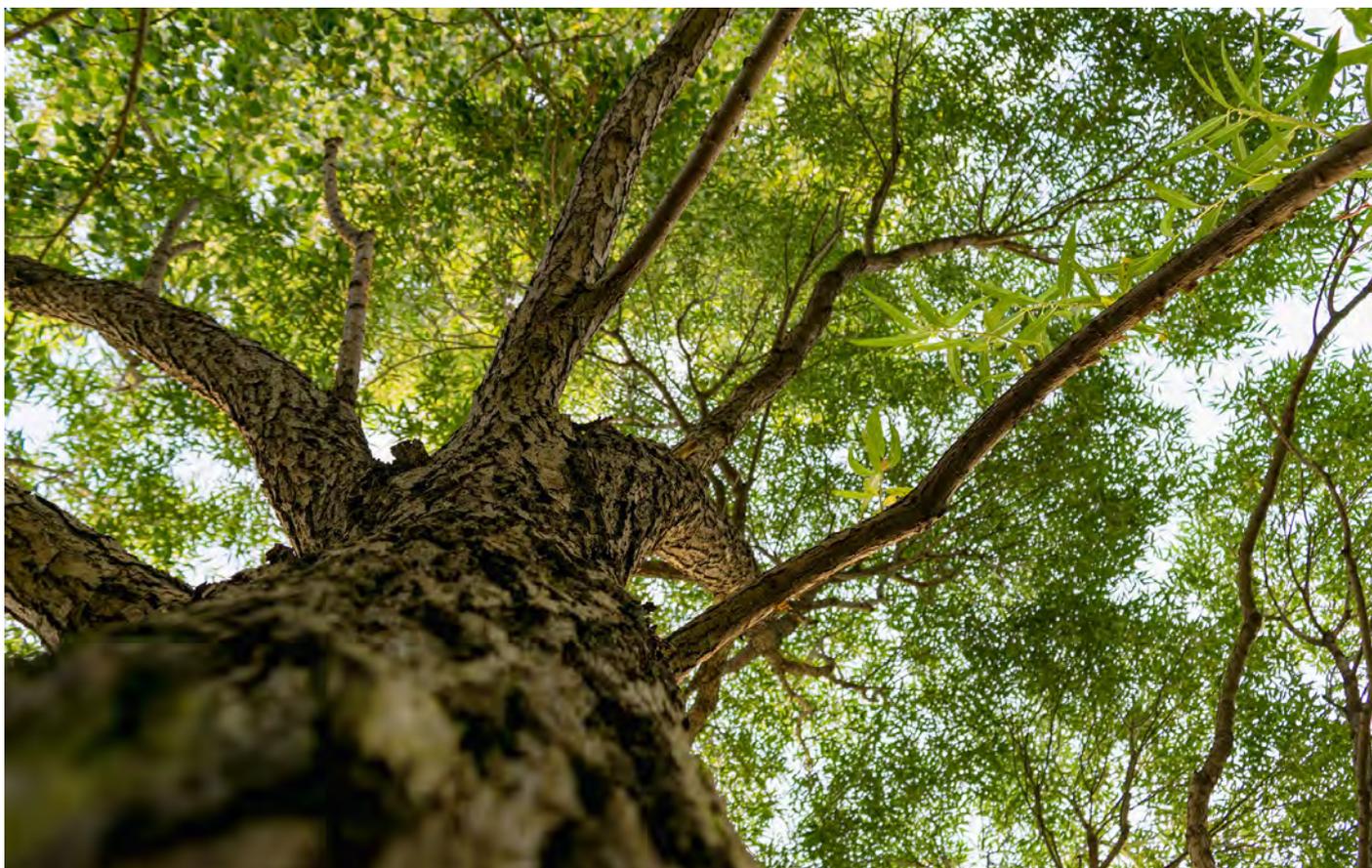
At a time when the themes from Orwell's literature are perhaps more relevant than ever, it is a timely reminder to follow Orwell's philosophy of appreciating the small details in life.

In one of his last essays, Orwell wrote "Our job is to make life worth living on this earth, which is the only earth we have". ■

'Orwell's Roses' is published by Allen and Unwin by Rebecca Solnit.



► GEORGE ORWELL'S GRAVESTONE IN SUTTON COURTENAY, OXFORDSHIRE. Image/ Mark Hodson, Alamy



RESEARCH FUTURES: WITHOUT URGENT ACTION, THESE ARE THE STREET TREES UNLIKELY TO SURVIVE CLIMATE CHANGE

by Dr Renée M. Prokopavicius, Postdoctoral Researcher in Plant Ecophysiology, Western Sydney University, Prof David S. Ellsworth, Professor, Western Sydney University, Assoc Prof Sebastian Pfautsch, Research Theme Fellow - Environment and Sustainability, Western Sydney University

Cities across the world are on the front line of climate change, and calls are growing for more urban cooling. Many governments are spending big on new trees in public places – but which species are most likely to thrive in a warmer world?

Numerical targets such as “one million trees” dominate tree-planting programs in cities such as Los Angeles, New York, Shanghai, Melbourne and Sydney. But whacking a million trees into the ground won’t necessarily mean greener suburbs in decades to come.

Often, not enough attention is paid to selecting the right trees or providing enough water so they survive a hotter, drier climate in future.

In our recent research, we assessed the effects of extreme heat and drought on urban tree species.

Some much-loved tree species, widely planted across our cities, did not handle the conditions well. It shows how important decisions must be made today for urban greening programs to succeed in a warmer world.

A HOTHOUSE EXPERIMENT

In January 2020, following several years of drought, Penrith in Western Sydney hit 48.9°C – the hottest temperature ever recorded in Greater Sydney.



► WE MUST PAY MORE ATTENTION TO ENSURING URBAN TREES SURVIVE CLIMATE CHANGE. Image/ Shutterstock

Researchers later assessed about 5,500 street trees and found more than 10% displayed canopy damage. Exotic deciduous species fared the worst.

The event showed how simultaneous intense heat and drought can damage urban trees.

Trees cool down in hot temperatures by losing water through microscopic openings in their leaves called stomata. Sufficiently watered trees can often tolerate extreme hot temperatures, while drought-stressed trees may struggle to survive.

Our research involved stress-testing 20 broadleaf evergreen tree species from habitats ranging from tropical rainforests to semi-arid woodlands.

Seedlings were grown in a coordinated glasshouse experiment. After the plants were established and acclimatised, half of them – five plants per species – were exposed to a gradual, five-week drought.

In the final week of water deficit, all plants were exposed to conditions simulating a six-day heatwave.

WHAT WE FOUND

The 20 plant species varied widely in their ability to handle these conditions.

Of the plants exposed to both heat and drought, two species suffered modest crown dieback (a

decline in health of the canopy) and another four species suffered extensive crown dieback.

Most plants resumed growth after the heatwave but several individual plants died: two swamp banksia (*Banksia robur*) and one crimson bottlebrush (*Callistemon citrinus*).

Species with dense wood and small, thick, dense leaves use water efficiently and are drought-tolerant.

The species which fared best in our study included orange jasmine (*Murraya paniculata*), inland rosewood (*Alectryon oleifolius*) and Australian teak (*Flindersia australis*).

Even when plant species had access to water, their tolerance of heat stress varied widely. Swamp banksia (*Banksia robur*) and powderpuff lilly pilly (*Syzygium wilsonii*) suffered extensive crown dieback even with access to water. This shows warmer heatwaves may threaten urban trees in both wet and dry years.

While some species may fare well in heat and drought, they may not necessarily be the best choice for cooling our cities.

Many drought-tolerant species such as leopardwood (*Flindersia maculosa*) grow slowly and have sparse foliage that provides little shade or cooling. But these species could be planted in sunny, dry areas to create habitat and improve biodiversity.

So what about trees like the weeping fig (*Ficus microcarpa*) and London plane tree (*Platanus x acerifolia*), which are widely planted in Sydney, Melbourne and other Australian cities?

These trees are at greater risk during heat and drought, because they have soft, low-density wood and thin, large leaves that are vulnerable to heat. But they grow quickly and form extensive canopies that help cool urban areas.

So these trees should be planted where water is available, either from rain or through active management such as irrigation.

LOOKING AHEAD TO A HOT FUTURE

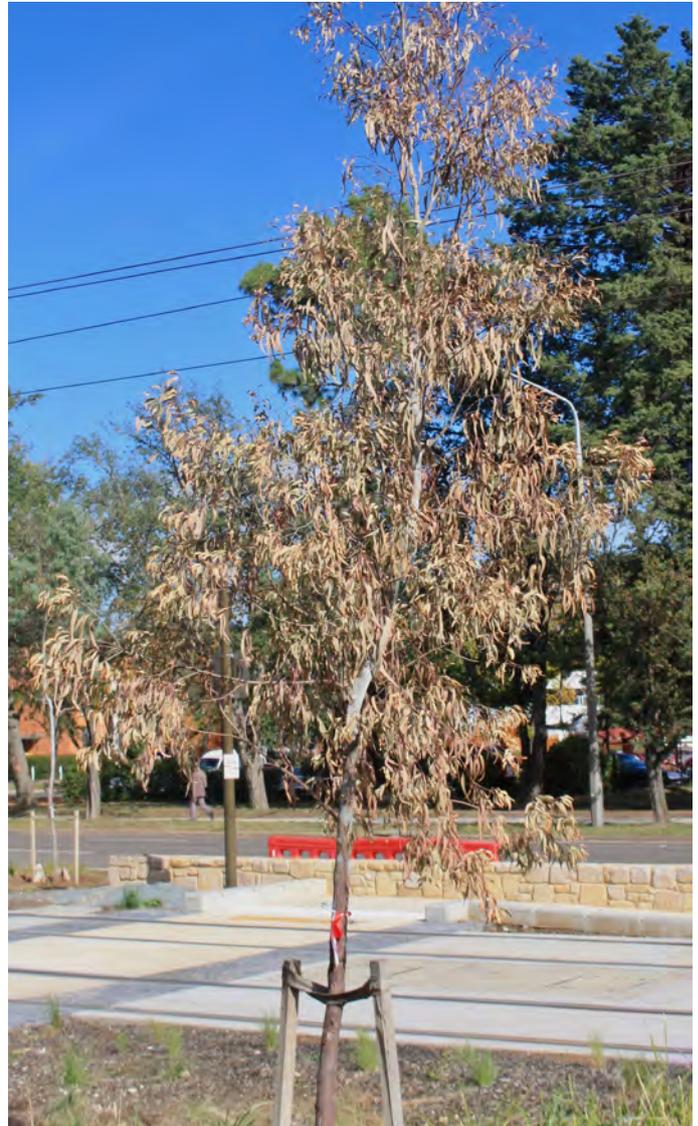
Our research highlights how access to water is crucial for the survival of urban trees during hotter and drier summers.

That means urban greening programs must also incorporate elements of so-called “blue” infrastructure – retaining water in urban landscapes via engineered solutions and making it available for plant uptake. Such infrastructure comes together under the umbrella of “water sensitive urban design”.

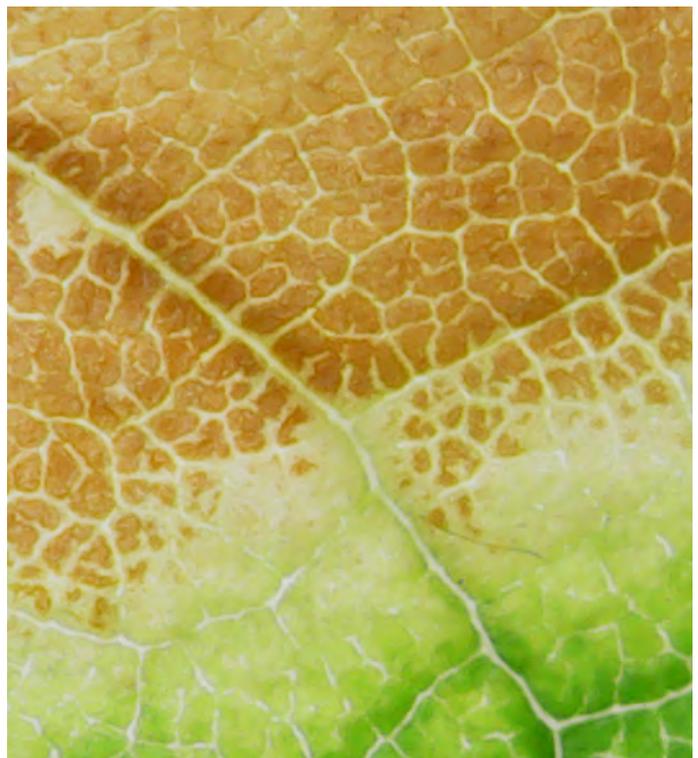
Examples include passive irrigation (where trees draw water from storage pits containing stormwater) or raingardens – garden beds that filter stormwater runoff. Planting young trees in locations where such design is applied will improve their odds of survival.

Such methods offer multiple benefits: increasing the health of trees, helping prevent flooding during storms and reducing the need for additional irrigation from local water supplies.

Across the world, extreme heat in cities will affect citizens, infrastructure and natural environments. Effective planning for urban trees is needed now to strike the right balance between trees that cool our cities and those that will survive increasingly harsh conditions. ■



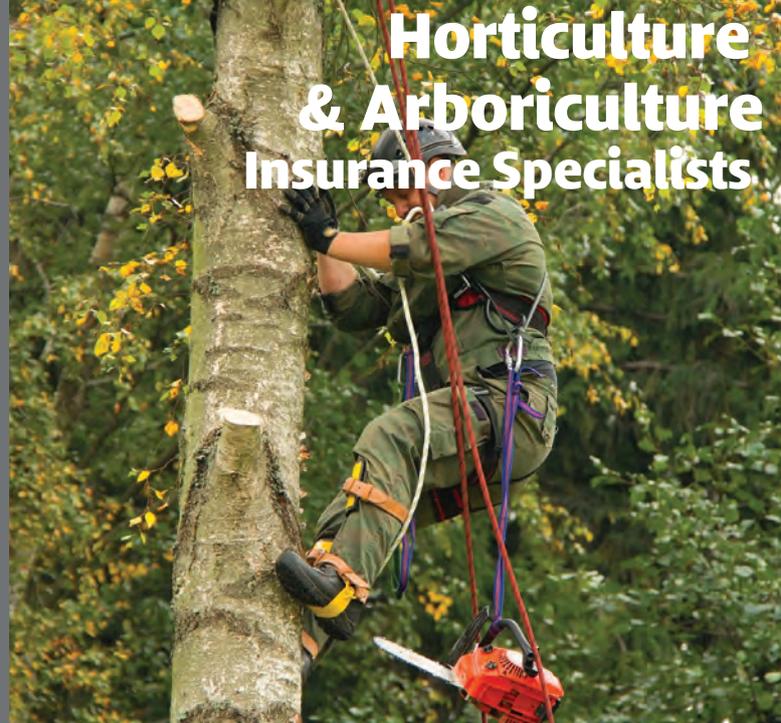
► INTENSE HEAT AND DROUGHT CAN DAMAGE URBAN TREES. Image/ David Ellsworth



► MICROSCOPIC IMAGE OF LEAF DAMAGED BY HEAT IN THE GLASSHOUSE STUDY. Image/ Dr Agnieszka Wujeska-Klaue

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