the Propagator

International Plant Propagators' Society http://aus.ipps.org/
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BOTANIC GARDENS BONANZA

"Look deep into nature, and then you will understand everything better"
Albert Einstein

The International Plant Propagators' Society brings together like-minded plants people from across the globe. I've often said this diversity is one of the most appealing factors that leads me to renew my membership each year. There are associations for hydroponic growers, bodies for the nursery industry and societies with all kinds of plant focusses but IPPS rolls them all into one with the common theme of propagation. There is no other group like it.

This issue is a special edition, showcasing a group within our membership, fortunate enough to work in one of the most interesting avenues of propagation of all – propagation for botanic gardens. Far from the fast-paced world of mass production, botanic gardens propagators work in smaller numbers, experimenting with often uncharted propagation techniques and tasked with the responsibility of propagation to conserve species, finding the right propagation recipe is important.

Botanic gardens' propagators from across Australia and abroad have generously contributed to the pages ahead, to bring together a truly valuable and fascinating addition of the Propagator, just in time for Christmas. From ambitious grafters working with the world's biggest flower in Borneo and grafting cycads at the Royal Botanic Gardens Victoria to tinkering with seed smokers, 'mummy grafting' and more, the pages ahead exemplify innovation in propagation and you're guaranteed to learn something new.

Looking ahead into 2024, there will be further opportunities for themed issues of the Propagator, and I wouldn't want the mass production propagators among you to miss out, so if you operate in that space, expect a tap on the shoulder for an article, sometime in the new year. Until then, I hope you all have a fantastic Christmas and see you in the new year in Ballina.

Dan Austin - Editor

Seed smoker to rival pre-smoked products at RBGV
Image: Nicoletta Centofanti

THIS ISSUE

President's Report

I look forward to our next conference in Ballina in a little over 6 months' time. From all reports, planning is going well, and we can look forward to another great time of seeking and sharing.

It was indeed sad to hear of Ed Bunker's passing in October. As well as a founding president of our society in Australia, he was truly one of the greats in horticulture. I was privileged to travel to Redland Bay to represent our society and pass on condolences to the family from our region and the International Board.

Many thanks to Dan Austin for the outstanding job he is doing as our newsletter editor, he certainly has taken our humble newsletter to another level. Many thanks again to Norwood for printing this and to Pam and the team for getting them out to our members. Ranjith (our editor) has also been very diligent in chasing up our Geelong conference papers as well as making sure papers in the future are provided for proceedings.

David Hancock has reported at our last meeting, that we have two regional meetings planned in Southeast Queensland early next year, so look forward to further information closer to these events. It was also good to hear that we have a steady growth in membership.

On the awards committee side of things, we still need applicants for our GCP IPPS Six-pack award (closing date is in Feb. 2024) for Ballina next May, and for the Rod Tallis Award. Next year is special as we will be celebrating 21 years of our Six-pack award, focussed on giving youth in horticulture the opportunity to go to our conference and meet people from a variety of ages and backgrounds from across the country and overseas, and experience new ideas and learn from experts in their field.

Next year our South African Region will be hosting the international tour with their conference. I have been informed that following the closure of nominations, our committee has selected Josh Taylor from Victoria as the successful applicant for our youth exchange program. I am sure he will not be alone either with many other Aussies and others from across the world attending and contributing to what appears to be a great tour and program.

I wish you all a very Happy Christmas and a restful time over the season to renew your passion for plants, ready for the opportunities that 2024 will present to us.

Best Wishes,

Bruce Higgs.

Fostering a Giant at Bogor Botanic Gardens

Dan Austin
Lecturer/Author
TAFESA

Achieving the illustrious title of the world's largest flowers – *Rafflesia arnoldii* and more recently *Rafflesia tuanmudae* are sights to behold. The plants earned their common name because of the foul odour of rotting meat, the flowers emit to attract carrion-feeding pollinators, and with their fleshy red mass growing over a metre in width, the flowers could quite literally be mistaken for a corpse.

After many years of research aimed to assist in the preservation of this genera, propagation of the species has progressed in leaps and bounds, in the face of increasing deforestation. So, it is great to be able to report that the future for the plants in cultivation is looking up.

When fortunate enough to stumble upon a corpse flower among the moist leaf litter of southeast Asia's rainforests, it's almost as though something, somewhere, went awry, way back along the tree of life. The plant is entirely parasitic, void of any leaves or stems, and exists entirely within the tissues of its host until ready to reproduce. Highly specialised, members of the genus rely wholly on a specific genus of vines (*Tetrastigma* spp.) to act as hosts and supply all of their nutrient and water needs. Due to this parasitic nature, corpse flowers have long discarded the need to photosynthesise and one species from the Philippines, *Rafflesia lagascae*, appears to have evolved without the chloroplast genome altogether.

Many *Rafflesia* species are highly selective when it comes to which *Tetrastigma* spp. they will parasitise. *Rafflesia arnoldii* prefers *T. leucostaphylum,* while *T. tuberculatum* attracts several species of *Rafflesia*. With

Rafflesia pricei, of the parasitic corpse flower genera.
Image: Dan Austin

this selectivity in mind, *Rafflesia* species are working within a minute window of opportunity to achieve germination. Seeds must be deposited near just the right species of vine. It is thought this dispersal may be aided by small mammals that eat the fleshy fruit of the plants and ants that are attracted to a small protein-rich attachment on their seeds, known as an elaiosome. Even with the assistance of these seed dispersal agents, the successful germination of a plant is a miraculous feat against all odds.

Still, a lucky minority of seeds are deposited near a suitable host and when this occurs, the plants will germinate and enter the tissues of *Tetrastigma* species using modified parasitic roots known as haustoria. Once the plants have successfully colonised their hosts, they remain unseen, stealing food and water until they have accumulated enough stored supplies to attempt to produce the energy-intensive flowers for which they are known.

The production of flowers is not a quick process and many of the species produce blooms that take many months to reach maturity. Beginning first as a small swollen growth in the dermal tissue of the host, the buds grow to resemble something similar to a fleshy cabbage, before finally opening to a full bloom. Amazingly after months of development, these flowers are only open for a few days before shrivelling into decay.

Like seed dispersal, the budding stage of its lifecycle is a precarious time for the *Rafflesia* genus. It is the first time the plants visibly hint at their existence and requiring

several months to develop, they emerge defenceless against predation. The growing flowers are a favourite of caterpillars and a plethora of hungry insects, thriving in the tropical rainforest. As a result, bud mortality is high and only a small portion of the flowers survive to reach maturity.

At Indonesia's Bogor Botanic Gardens, staff have been working on more controlled ways of ensuring the conservation of the genus, rather than relying on wild germinations. Here a steady supply of flowers is achieved, and the techniques involved in accomplishing this feat are ingenious. To date, no one has been able to successfully germinate *Rafflesia* seed and have them colonise a *Tetrastigma* vine in cultivation, so behind the scenes at the gardens the plants have been being produced a little differently.

From top to bottom: ***Developing bud of Rafflesia patma, guide showing example of bud death in Borneo.***
Images: Dan Austin

Grafting is a common method of propagation that consists of implanting the parts of one plant (scion material) into the tissues of another (rootstock) and at Bogor it has been discovered that this process is a valuable tool for the ongoing preservation of the *Rafflesia* genus. By grafting portions of *T. leucostaphylum*, known to have been parasitised by *R. patma*, onto an unaffected *T. leucostaphylum*, researchers at the gardens have been able to produce a steady supply of domestic blooms over many years. The *Rafflesia* tissues develop internally within the *Tetrastigma* tissues moving to both sides of the graft and subsequently emerging *Tetrastigma* roots which are parasitised can then be used for future scion material. This success comes at a critical time and offers hope for the survival of this unique genus. It also offers hope to a world of plant enthusiasts aspiring to see the flowers up close, but who can't make the trip to the tropical rainforests of South East Asia.

Rafflesia are an elusive and enigmatic genus of plants that appear to survive in their natural environments against all odds. It is not surprising then, that propagation and domestic cultivation have come with similar challenges. Gardening with these tropical giants requires patience, perseverance, and ingenuity but the staff at the Bogor Botanic Gardens have got this recipe just right and the task ahead is in good hands.

Mummy Grafting for Success in Summer

Amanda Shade
Manager of Living Collections
Kings Park and Botanic Garden, Perth, WA

The Kings Park and Botanic Garden Nursery was established in 1962, several years prior to the opening of the Western Australian Botanic Garden (WABG). We grow roughly 50-60,000 plants annually for display in our many differently themed collections to the public within the WABG and wider parkland areas; for restoration and rehabilitation programs in our managed remnant bushland; for tree replacement programs; and for conservation programs managed by other WA state government departments.

We are slightly different from commercial and other production nurseries in the sense that we only really have one 'client' – Kings Park. We are still a primary producer, but our programs are very much dictated by the requirements of our state botanic garden, our parkland displays, and natural area revegetation/restoration programs – i.e., collections, conservation, and education as the driving influences.

Because of the nature of our activities, we have a defined main propagation season of spring and summer, when the majority of our production occurs. This is to allow for our 'client's' requirements of stock size and age for optimal winter planting.

As a botanic garden nursery, we are uniquely placed to be able to see exactly where the stock we've produced is planted and our location within a botanic garden means we are also able to monitor the establishment and performance of the plants once they leave the nursery. This often provides valuable data for us to enable constant improvements in our propagation programs and methods. It is also a great stock garden for sourcing future material. We are also privileged to potentially have access to the flora from the entire state of WA, which at last count was close to 14,000 taxa.

Rather than focus on a smaller number of species and grow large numbers of these we do the opposite – we regularly deal with a large number of species (around 3-4000) but tend to produce small quantities of each.

Corymbia ficifolia mummy graft onto Corymbia calophylla rootstock
Image: Dave Blumer

The diversity in both the species we work with and the intended outcomes, means we inevitably come up against a range of different challenges. One way we have overcome some propagation and in-ground plant establishment challenges is to employ grafting techniques to produce more robust plants that can withstand the various soil and climatic issues we have here in Perth. While we can graft certain genera year-round using traditional wedge or cleft grafting methods, summer here in Perth means mummy grafting time.

We employ mummy grafting for a range of species but have found it particularly effective for *Eucalyptus, Corymbia*, and genera from dry, arid natural environments such as *Verticordia* and *Eremophila*. The *Eucalyptus* and *Corymbia* we choose to graft are generally taxa that are threatened in the wild, hybrids, or those with a particular growth or colour form that we are hoping to replicate. The *Eremophila* perform better on a rootstock in our Perth soils as they are notoriously susceptible to nematodes, and the *Verticordia* species we graft are those we find can be a bit temperamental from other forms of propagation.

The mummy technique employs all the same principles as standard grafting, with the added step of removing all foliage from the scion and wrapping the entire scion and graft union in grafting tape (or in our case, laboratory film, which we find more suitable for our purposes). The other difference is the environment the completed grafts are placed into – our standard grafted plants go into a high-humidity fogging facility that has regulated temperature, humidity levels, and water application via capillary matting. Our mummy grafts are placed into a very hot glasshouse, in an area we have modified to be able to reach temperatures of up to 60 degrees on a hot Perth summer day. The rootstock are watered regularly to prevent drying, and we often see bud burst in a week in some of these species. While we don't have scientific data (yet!) to prove why this happens, anecdotally the increased temperatures are likely leading to increased cell activity, allowing the cambium to fuse at a greater rate than it normally would.

Our success with this method is enabling us to produce greater numbers of previously harder-to-propagate species, meaning we can broaden our display collections for public appreciation and education, but also vastly improve some of our conservation collections of threatened species. We hope to increase the suite of species we propagate in this way, so we are continually adding to our database of information which we are more than happy to share with others.

From top to bottom: ***A grafted x impensa specimen growing in WA, Eucalyptus x impensa flower.***
Images: Amanda Shade

Homemade Seed Smoker at RBVG

Nicoletta Centofanti
Propagator/Horticulturist (Nursery)
Royal Botanic Gardens Victoria

How can smoke treatment of Australian native seeds be more accessible in nursery settings? This was a question that resulted in many sleepless nights during my first month as a propagator in the Royal Botanic Gardens of Victoria's nursery.

In April this year, 340 species of seed were sourced from Western Australia to be grown for our Australian Drylands project. Of these, 50 species required some form of smoke pre-treatment.

Even after species-dependant scarification treatment, soaking in a mixture of liquid smoke diluted with warm/boiling water and topping with smoked vermiculite, multiple propagation attempts provided very low, to no germination at all. So, an attempt was made to use physical smoke. The initial setup was quite crude; an upturned plastic tub and a few terracotta pots, but it did prove to be highly effective.

From this, my homemade 'Seed Smoker' was born. Made on a Sunday afternoon, out of a 44-gallon steel drum. It features three cut-out doors; the top two open to mesh shelves on which anything from punnets of sown seed to entire seed pods can be placed. The bottom opens to a vented space in which leaf litter can be burned, allowing the smoke to travel through the shelves and out of two pre-existing holes at the top of the drum. It now serves as a permanent piece of equipment that can be used readily with very little set-up required.

The combined heat of the fire and the smoke from native leaf litter have proven to be extremely effective for germination. I am now in the beginning stages of a case study into the germination success rate of seeds treated in my smoker in comparison to those treated with smoke products.

From left to right*: smoker shelves, loading the smoker.*
Images: Nicoletta Centofanti

52nd IPPS Conference 2024

Ballina RSL, Ballina

Wednesday 22nd to Saturday 25th May, 2024

'Propagation – A Breath of Fresh Air'

More information and registration form available at www.ipps.org

REGISTER NOW and we will invoice you in February.

Contact Pam Berryman – pam@ipps.org.au for more information

LAST CHANCE

Applications are still open for the chance to be a Six-pack member at our Ballina conference.

You must be 18 years of age, and be nominated by your employer or lecturer using the IPPS nomination form found here: https://ipps.org/uploads/docs/0_six_pack_nomination_form_2024.pdf

Applications are also still open for the Rod Tallis Award

The winner will have completed a research project, written an article or series of articles, or developed a new process or product. They will then write up their work in a paper to be presented in Ballina where they will also receive airfare, accommodation, and conference registration paid for. They will also receive one year's membership to the IPPS and a commemorative plaque.

Apply using the application form found here: https://ipps.org/uploads/docs/rod_tallis_award_2024.pdf

Come and join 20 other passionate plants people on a 2.5-day tour of Mt Tamborine/Lismore regions. Visit some of the region's leading growers, eat fantastic food, visit an interesting region, and drink some fantastic beers and wines. We will start at Coolangatta airport and drive to Mt Tamborine where we will spend the night, eat some good food, and hear an interesting presentation. Next day we will visit four local nurseries and a historic mill before settling down for the night at a local beach resort. Day three involves a visit to the inspiring Limpinwood Gardens and Nursery followed by lunch at a quintessential country pub. After lunch, we will visit a nursery with a prehistoric name but a 21st-century production system—Gondwana Nursery. The day will finish with a visit to an essential oil farm and then a seafood dinner in Ballina. PCT members will have a bus ride back to Coolangatta airport on Sunday (post-conference) at 10.00 am (ex Ballina)

Cost is $495/$570 members/Non-members twin share ($190 single supplement). Includes 2 nights' accommodation, all lunches and dinners, all drinks, and all travel. Join us for fun two-and-a-half days with great food, lots to drink, and visits to some of Australia's best-hidden nurseries. You will learn lots and have the time of your life!!!!

IPPS means to Seek and Share

We know that conference papers are a great way to learn about the science of propagation but the only way to truly 'seek and share' is to participate in the 2024 PCT visits to SE Queensland and NSW northern rivers nurseries. The nurseries will be informative but the on-tour discussions are the real learning spots.

Trial Grafting of Cycads at RBGV

Tim Uebergang
Team Leader, Gardens Central
Royal Botanic Gardens Victoria

As curator of the Cycad Collection at the Royal Botanic Gardens Melbourne and co-chair of the Global Conservation Consortium for Cycads (GCCC) in Australia, I hope to broaden the awareness of the planet's most threatened plant group. The GCCC in Australia was established this year because Australia holds the world's greatest diversity of the plant group, four genera of cycads: *Bowenia, Cycas, Lepidozamia* and *Macrozamia* occur in Australia, around 80 species overall. We are hoping to increase opportunities to see these plants recover in the wild and secure their future with a normal reproductive capacity.

Cycads are the world's oldest seed-bearing plants; they are organisms slow to mature and are becoming increasingly threatened in the wild. Threats for cycads range from plants being taken from the wild, loss of their natural habitat, (something that disrupts the plant and pollinator), and of course our ever-changing climate.

With the loss of habitat and pollinators that are essential for natural reproduction, certain species now rely on human intervention for their long-term survival. Common methods for propagating cycads for either the nursery industry or conservation purposes have been limited to the removal of pups from a host plant, stem, and even root cuttings, as well as from seed.

Grafting cycads though, is a practice totally new to the horticultural industry and it was Simon Lavaud who trialled this in his nursery in Southern France around 2018. This method which has never been recorded prior was demonstrated to a small group of us who attended the Cycad Horticulture Workshop at Nong Nooch Botanical Garden in Thailand in 2019.

As a thorough admirer of cycads, the practice of grafting fascinated me, and the ability to grow Northern Australian species in Melbourne is somewhat reduced due to climate requirements. A few years back, I was fortunate to be donated wild collected seeds of *Cycas cairnsiana* that I nursed to three leaf seedlings in my poly-house to a size that grafting might be attempted.

Why Australian Cycas species? Australian species in the genus *Cycas* are unarguably the most beautiful in the genus with their feathery blue upturned leaves, and spe

From top to bottom*: Cycas root system, exposed rootstock.*
Images: Tim Uebergang

cies such as *C. calcicola, C. furfuraceae, C. desolata*, *C. cupida* and the very blue *C.cairnsiana* are a sight to behold. These species thrive in tropical environments making them virtually impossible to grow in cooler Mediterranean climates. For example, *Cycas cairnsiana,* that we have chosen for our trials, is a species that naturally occurs in central Queensland and receives an annual rainfall of around 800mm during the hotter summer months. Although these plants can be grown with controlled conditions, they are incredibly slow growing due to our southern cold wet winters when plants need to be kept dry. Any moisture combined with cold will certainly encourage fungal disease, usually resulting in their swift demise.

To begin with, we sourced two plants of similar stem diameter. The rootstock in this instance are seed grown *Cycas revoluta;* a very hardy species that can tolerate around minus 6 degrees and our tropical *C.cairnsiana* as the scion. We began by bare rooting the *C.cairnsiana* making it easier to clean up before cutting this perfectly healthy plant in half.

This was followed by cutting the rootstock (*Cycas revoluta*) at a similar junction through the caudex of the plant that we did with the *C.cairsiana*. The two plants were then glued together using Super Glue, the product that among other things saved lives during the Vietnam war by closing wounds of injured soldiers on the battlefield.

A slightly larger rootstock is desirable because if the scion grows quicker than the rootstock, it can put down new roots over the graft risking the introduction of pathogens. The day after the procedure, we did notice the exposed open wound of the rootstock had de hydrated a little, causing the surface to contract, so to prevent this from interfering with the graft junction and to eliminate any water being trapped on the surface, we chamfered the edge of the rootstock, making it a cleaner and more presentable surface area.

We aim to learn plenty more over time about this new method of grafting cycads, observations about the growth rate of the two species stems, long-term attachment success, and eventually coning, will hopefully allow these species, rarely seen in botanical gardens, to be shared with a larger audience and perhaps may even play a role in the conservation of species in the future.

From left to right*: Glueing the plants together, the final product.*
Images: Tim Uebergang

I Know let's Visit the Waite!

Dr. Kate Delaporte assisted by Mrs. Erica Boyle
Curator
The Waite Arboretum & Waite Conservation Reserve

The Waite Campus and the Waite Arboretum arose from the bequest of the Urrbrae Estate of fifty-four hectares to the University of Adelaide by Peter Waite in nineteen fourteen. Protected by the Deed of Gift, which specified that the University hold the eastern half of the estate together with the mansion house and other buildings for the teaching and study of agriculture, botany, zoology, veterinary science, entomology, horticulture, forestry and related fields, and that the western half be held in perpetuity as a park or garden for the recreation and enjoyment of the public.

In 1923, the University came into full possession of the Estate on the deaths of Peter and Matilda Waite, and it was recommended unanimously that an Arboretum would be created, to demonstrate the kinds of trees that may thrive in the State. Urrbrae House and the gardens surrounding the main house and numerous outbuildings were part of the Estate gifted to the University. Gardner and Delaporte (2023) provide an extensive history of the establishment of the Waite Arboretum, and I recommend you seek that article for more in-depth information.

Now, to the joys of Waite! Much of the campus land is given over to the noble pursuits of education and research, with the University of Adelaide's School of Agriculture, Food and Wine based on the campus, plus several co-location partners such as SARDI, AWRI, and CSIRO, and the largest concentration of agriculture and wine research and teaching expertise in the southern hemisphere. The campus totals over 184 hectares located in the Adelaide foothills with views to the city and the sea.

Apart from teaching and research, the Waite is the home of the Urrbrae House Historic Precinct, Urrbrae House Gardens, the Waite Conservation Reserve and of course, the Waite Arboretum.

The Waite Arboretum covers around 25 hectares with over 2,400 specimens of plants from all over the world, representing more than 900 species from 220 genera and 60 Families. Planting began in 1928 and continues, with the latest planting plan being developed to ensure the health and vitality of the Arboretum collection forward into an uncertain climate future. With a focus on homoclimes, key collections include the eucalypts (299

From top to bottom*: Waite's Garden of Discovery and Sensory Garden*
Images: Erica Boyle

sp from three genera plus numerous hybrids), *Acacia* (23 sp), *Banksia* and *Hakea* (35 sp), *Pyrus* (22 sp), *Quercus* (47 sp), *Ficus* (14 sp), *Pinus* (13 sp) and an extensive collection of palms and cycads (over 300 specimens from 41 different taxa).

The Arboretum is laid out to be a self-guided stroll as the fancy takes you; all plants are labelled, and the Arboretum App is a most useful tool to enhance your visiting experience (free to download from your App Store).

The Arboretum is a cultivated planting – the whole site was cleared of native vegetation over 150 years ago. Thus, the invertebrate and faunal biodiversity is lower than we'd like. To support and encourage the insects and birds to return to our site, we are establishing biodiversity Gardens, where we focus on low-growing grasses, small herbaceous perennials, and shrubs that provide habitat and food resources. Our most successful is the "Bee, Butterfly and Bird Garden" with over 45 different species and 1,200 plants showcased alongside the water course.

In close proximity to the Arboretum, and almost encircling Urrbrae House, (the historic home of Peter Waite and his family), are the six gardens collectively known as the "Urrbrae House Gardens". Starting to the east of the House, is the new First Nations Food Garden (47 taxa), where edible Australian plants are being grown to provide learning opportunities for the community and budding agricultural scientists. This garden leads to the Sensory Garden. Its purpose is to create a special garden that stimulates different senses and is designed to incorporate plants with captivating colours, textures, aromas and tastes. Within this garden are exciting artworks and plantings that provide a tranquil, informative, humorous, and stimulating recreational space, with a focus on purple, white, yellow, orange, and red. Like all gardens, this garden continues to evolve. It is a haven for birds, butterflies, and for you!

Tucked away behind the historic Coach House (built in the early 1800s) lies the protected Coach House Garden, reflective of gardens past and beautifully shaded. The garden has a venerable *Morus nigra* that defies its advancing age, and a secret garden of elk horns high in the Box Elder. Walking onwards, the pathway leads to the Garden of Discovery; designed with pathways soundscapes, outdoor books and interpretive signage, the site highlights some of the internationally significant achievements of South Australian Scientists in environmental and agricultural science at the Waite Campus. The garden itself is predominantly Australian plants that thrive in the Mediterranean climate of Adelaide (70 taxa).

Heading westwards, you are led to the aromatic and stunning 20th Century Rose Garden and Heritage Rose Gardens, with more than 1,500 plants from 200 cultivars and species, it's a truly amazing collection. The 20th Century Rose Garden traces the development of roses from 1900 to today with roses significant to each decade.

There is much to enjoy at the Waite, and we at the Arboretum office would be happy to hear from you at arboretum@adelaide.edu.au if you have queries regarding plants, information or guided tours. The Waite is one of Adelaide's best-kept secrets, and our beautiful Gardens and majestic Arboretum are ready for your visit. https://www.adelaide.edu.au/waite-historic/

Gardner J.A and K.L. Delaporte (2023), Waite Arboretum – An enduring gift, Swainsona 30:69-76. Board of the Botanic Gardens and State Herbarium (Adelaide, South Australia)

Urrbrae House Rose Garden's Rose Arbor
Image: Erica Boyle

Propagation of *Wollemia nobilis*...

Matt Coulter
Senior Horticultural Curator, Nursery
Botanic Garden and State Herbarium of South Australia

Wollemia nobilis is listed by the IUCN (International Union for the Conservation of Nature) as a critically endangered tree species. The species is commonly known as Wollemi pine and is, in fact, not a pine but a member of a 200-million-year-old plant family Araucariaceae, predominately a southern hemisphere plant family including *Araucaria, Agathis,* and the monotypic genus *Wollemia.*

The species was known from fossil records and was thought to have gone extinct up to two million years ago. In 1994, a National Parks Ranger with the NPWS NSW, David Noble, was abseiling in the Wollemi National Park in a deep remote rugged canyon 150 kilometres Northeast of Sydney and came across these unusual, tall coniferous trees that were very different from anything that had seen before.

Wollemia nobilis dates to the Jurassic and Cretaceous periods around 200 million years ago, hence it is sometimes known as the dinosaur tree. It is thought that there are fewer than 100 mature plants in the wild population. It has been described as one of the most significant botanical finds in 100 years and conservation of the species is an incredibly important procedure for

From top to bottom: ***Wollemia nobilis showing the polar cap, cold protection for bud, Rooted cuttings after 8 weeks***
Images: Matt Coulter

botanic gardens around the world.

The Botanic Gardens and State Herbarium of South Australia (BGSH) have been involved in the ex-situ conservation of *Wollemia nobilis* since the year 2000, when they received 2 plants that were germinated from the wild populations that Royal Botanic Gardens Sydney (RBGS) had grown on and distributed.

One tree was planted at the Adelaide Botanic Garden and one at the Mount Lofty Botanic Garden, as the two gardens exhibit quite different climate parameters including temperatures and rainfall. The two original trees, still growing in the original sites, were initially caged, as was instructed until the commercial propagation of the species could be undertaken. Around 2005, commercially propagated plants were distributed in Australia and around the world, and the cages were removed.

BGSH evaluated the growth and performances of the two plants across the two sites and found that plants growing within the Mt Lofty Botanic Garden performed better than the Adelaide Botanic Garden and this site would be the preferred location for more plantings. Furthermore, it was found that specific micro-climates within the Mt Lofty Botanic Garden site were an important parameter to identify. The area known as Fern Gully is a dark moist gully growing fern collections and other shade-loving plants and was found to be an ideal area for Wollemi pines to thrive. There are 29 living trees recorded on the BG-BASE botanical database with their own accession details.

Initially, new plants were either purchased or donated to BGSH to be planted within Fern Gully at Mt Lofty Botanic Garden, but later it was decided to propagate known provenance instead of purchasing material of unknown provenance. The nursery staff of BGSH decided to initiate a trial to understand if plants could be propagated from the original two trees from RBG Sydney, of which extensive data of the provenance was known.

Propagation material was sourced from the original tree planted at Mt Lofty Botanic Garden and careful consideration was undertaken to select shoots coming away from the main trunk that showed an apical dominant bud

Cuttings were prepared as set out with standard

From top to bottom*: Advanced Wollemi Pines growing at BGSH Nursery ready for transplanting from cutting propagation, Wollemia nobilis in-situ at Mt Lofty Botanic Garden, Fern Gully*
Images: Matt Coulter

operating procedures developed by the nursery where stem cuttings are cut into 10-15cm cuttings, lower leaves removed, and the cut made just below a node.

The cut end is dipped into a commercially formulated IBA gel formulation at 3000ppm, the cuttings are then planted into a community pot of propagation material (80% perlite/20% coir peat) and placed into a humidity tent where at least 75% humidity is retained utilising ultrasonic fog and intermittent misting onto bottom heat beds set at 25 degrees C.

The cuttings remain in the propagation humidity area until roots have formed and are first checked at about 8 weeks after planting the cuttings.

Individual rooted plants are potted into a 100mm standard pot using a premium potting mix. The material that was used was variable in quality, however, excellent results were achieved and a success rate of 90% or better was reached with this method, and once potted on, the quality of the trees produced was high.

Many of these plants that were propagated have been planted and are now growing at Mt Lofty Botanic Garden. The plants were grown in root pruning and root training pots so when they were planted, they had a good extensive root system which would help in their development.

Later trials were undertaken to show cuttings can be successfully rooted from horizontal branches; however, the shoots do not grow vertically but instead grow horizontally, which is not a desirable trait for the tree.

More trials have been carried out utilising propagation material from the original tree from the Adelaide Botanic Garden using the apical dominant shoot method as described above. The main difference was to evaluate this material against the horizontal shoot method.

The horizontal cutting method produces a plant with undesirable attributes to be planted out, however, these plants are kept in the nursery as teaching examples for our trainees and staff.

Subsequent propagation trials have shown to have similar results where cuttings with good quality apical dominant shoots successfully make adventitious roots on cuttings, and when carrying out good nursery practices, high-quality planting material can be achieved.

Some recent work has been undertaken by RBG Sydney where individuals of wild populations have shown to have genetic variability. These trees have been identified and plants have been propagated and sent to botanic gardens around the world.

BGSH of SA have six new plants in our nursery waiting to be planted in autumn 2024. These plants are very important and over the next six months, staff will be evaluating sites where they can be planted out. These individuals have a lot of data documented about them, which will be recorded on BG-BASE and their subsequent performance and growth will be evaluated.

Highlights of the IPPS International Tour

Sarah Miller, John Messina and Brie Arthur

It was way back in 2019 that the IPPS International tour through Queensland wrapped up. Tour participants bid goodbye to each other, expecting to meet a year later in the Western Region of the USA. None of us could imagine what the world would go through in the next few years, and both the Western Region and Japan, despite all efforts, were unable to host an international tour. So, after four years it was with great excitement that IPPS members from around the globe gathered for the 2023 international tour. The responsible region was Southern USA, and the tour was organised to travel from Washington DC through the beautiful Mid-Atlantic region and into the Blue Ridge Mountains and North Carolina.

The first stop of the tour was Merrifield Garden Centre in Gainesville, Virginia. It's one of three stores in the Merrifield chain of garden centres, servicing the Northern Virginia and Washington DC metro areas. With three sites and over 500 staff, the business is a major retailer to home gardeners, and also provides landscape design and installation services. It was founded in 1971 and is still in the hands of the founding families today. This visit was a great start to the tour, as it gave us an idea of the scale of horticulture in this part of the world, and the quality of product on offer.

Some of the huge range of seasonal annuals on display at Merrifield Garden Centre.
Image: John Messina

Our next visit was to Green Springs Gardens. It's a 31-acre park featuring demonstration gardens, a horticulture centre and library, and a historic house built in 1780. This was home to a number of prominent people over time, including Beatrix Farrand, the first notable female garden designer in the United States.

The day ended with a tour of Mount Vernon - the historic estate of America's first president George Washington. This 500-acre property on the banks of the Potomac River is immensely popular, with a million visitors a year gaining an insight into the fledgling days of the nation. We were guided around the estate by horticulture director Dean Norton. And we finished with dinner served in the restored barn. Dean served us his homemade ice cream for dessert, and a tasting of whisky which he distils himself. To cap off this first day in style, we were treated to a demonstration of Dean's other after-hours hobbies. His home-built potato cannon and trebuchet! The video clip of these demonstrations is worth finding on the IPPS International Facebook page.

Before leaving Washington DC to continue our tour, we spent a day exploring the greater metropolitan area and the horticulture it has to offer. The Smithsonian Gardens are a part of the Smithsonian Museum, which itself has 13 separate museum facilities. These gardens surround the museums and form a "museum without walls". All are designed to complement the museums and to enhance the overall experience.

Close by the Smithsonian is the United States Botanic Garden. Established in 1820 it is the oldest continuously operating botanic garden in the United States and houses more than 45,000 individual plants. At the heart of the gardens is the conservatory. An impressive multi-level ornate glass structure divided into climatic zones of the world.

The next stage of the tour saw the group head out of Washington DC towards the east coast of Maryland, and to our first production nursery of the tour. Marshalls Riverbank Nurseries produces a large range of landscaping plants on 200 acres of nursery ground, spread over 5 different sites. After a long career with Chesapeake Nurseries nearby, long-time IPPS member Dick Marshall and his son John started Marshalls Riverbank Nurseries in 1999. Now Dick's grandson is involved, making it three generations of Marshalls running the business. It's a great example of the large production nurseries we were to see on the tour, well-staffed and expertly managed to ensure success.

We headed south into Virginia for our next nursery visit at David's Nursery. Over 35 years IPPS member David Tankard has produced more than 250 cultivars of trees, shrubs, and perennial plants. Self-propagation of more than 500,000 cuttings takes place in 100-foot tunnel houses. There are nineteen of them used at peak production.

Two more nurseries were on the itinerary for the next day of the tour, and they were both special ones. First up was Bennett's Creek Nursery, a large nursery supplying plants, mulches, and hardscape materials to garden centres and landscape contractors. It is nearing its 50th anniversary and is in its third generation of leadership. Production occurs over 275 acres, using forklifts to pick up, put down, and space plants. We also viewed the potting line which includes a pot printer, allowing pots to be labelled directly onto the pot as they pass down the line.

From top to bottom*: Tour participants pose for a group photo on George Washington's back lawn, About 100 acres of David's Nursery is used for Pot-in-Pot production of large container-grown trees.*
Images: Brie Arthur and John Messina

Lancaster Farms was the other visit that day. It is renowned in the IPPS as the business of Southern Region founding member and industry legend Charlie Parkerson. It covers over 250 acres and has up to 125 staff. After starting his career at Bennett Creek Nurseries (the nursery we had just visited), Charlie founded Lancaster Farms in 1969. Propagation has been at the heart of the business, and Charlie has shared a lifetime of innovation, experimentation, success, and failure with the world through IPPS. Just a few of the key innovations pioneered over time at Lancaster Farms have been mechanised potting machines, structureless greenhouses, the pot-in-pot growing method, and direct sticking of cuttings into grow tubes. We spent the best part of the day here being shown in detail many of their operating practices and principles. And at sunset, we headed to Charlie's home where he and his wife Maggie hosted us for a wonderful dinner.

It was then time to head back west, away from the Atlantic coast and into the Blue Ridge Mountains with their stunning autumn foliage. Here we visited Cros-B-Crest, a small (at least by USA standards) family business. They grow many assorted bedding annual selections including spring and autumn annuals as well as holiday poinsettias. These are supplied to retailers, nurseries and landscapers regionally.

One of the finest examples of an indoor plant nursery is The Plant Company, just out of a little town called Stuarts Draft in Virginia. It is a relatively new nursery, established in 2019 by the Van Wingerden family. They have taken a European approach, with a state-of-the-art facility, consistent year-round production, and strong marketing of their product. There are currently 220,000 square feet of modern glasshouse production and a huge 72,000 sq ft despatch shed. We arrived amid construction which will see the business expand to 460,000 sq ft of growing space and 124,000 sq feet of shed! In partnership with a major plant variety management company, they have launched the 'Leafjoy' brand which will see their plants sold through garden centres around the country.

Located in the foothills of the Blue Ridge Mountains in Nelson County, Virginia, is Edible Landscapes. It's a small fruit tree nursery started in 1979 by Michael McConkey, growing a huge range of fruiting trees and vines. The vast array of varieties requires a range of propagation techniques – grafting & budding, cuttings, division and

From left to right*: Our own Tony Vanderstaay gets hands on with the Bennett Creek Nursery potting line. The 'Code Tech' in-line pot printer can be seen in the foreground, Direct sticking of cuttings is a Lancaster Farms innovation.*

Images: John Messina

seed. Michael has an organic approach to production, and proudly lays claim to being one of the first nurseries to ship plants via mail order. Michael is truly passionate about what he does, and eagerly showed us around his mother-stock orchard. There is a huge array of trees and vines, many of them rare and harder-to-find. And many had ripe fruit ready for tasting.

Also in Nelson County is the nursery of our tour leader and IPPS international president Tom Saunders. Saunders Brothers was started in 1915, and Tom and his 3 brothers are the third-generation custodians of the business. There is a fourth generation actively involved, as part of over 150 staff. It comprises a large nursery, an orchard and fruit packing business, and a retail farm market/gift store selling plants, fruit, and other items like homemade jams and ice cream. The nursery is made up of 150 acres of field (bare-root) production, which is mainly *Buxus* species. And 100 acres of container production of a wider range of ornamentals. There are more than 400 greenhouses producing container stock. Each house has to be covered for winter, when they are gas heated. They then need to be uncovered every spring. Such is the scale of production that they manufacture their own greenhouses on-site. Buxus is the primary crop, and Saunders Brothers send their stock into 16 states of the USA, primarily in the northeast.

These were just some of the highlights of an amazing tour. Our thanks go to Tom Saunders and his team in IPPS Southern Region who organised the trip.

The next international tour is taking place in South Africa. Details are up on the website at https://ipps.org/event-detail/event-163/IPPS-International-Tour-and-Conference-2024.html

Propagator or Grower - News for You ....

Just like that, along with 2023, another issue of the Propagator comes to an end. A huge thank you to all of this issue's contributors – what a read! Merry Christmas again all.

Dan Austin - Editor

Plant Protection Series Available Free

The Plant Protection series of four textbooks by Ruth Karuish has always been regarded as the Bible of pest and disease identification and has now been made available in free PDF by the Australasian Plant Pathology Society. It can be downloaded here:
https://www.appsnet.org/Publications/Kerruish/index.aspx

Propagation for Space Exploration

It might not help you in your day-to-day propagation activities but the space race is heating up and plants are front and centre. The link below offers an interesting read but is just a taste of what is happening around the world.
https://createdigital.org.au/mission-plant-seeds-lunar-surface/

The Bounty of Bacteria

The more we know, the more we know we don't know. Plant growth-promoting bacteria (PGPB) are gaining traction as a way to reduce a reliance on chemicals and if you want to know how useful they can be read on:
https://blog.nutri-tech.com.au/the-bounty-of-bacillus-the-beauty-of-on-farm-brewing/

One of the many spans of High-tech greenhouse at The Plant Company.
Images: John Messina

Executive Officer's Report

Well Christmas is nearly open us once again. I wish everyone a Very Merry Christmas & Fabulous New Year. Stay safe and well over the Christmas Season.

Membership Subscription Renewal 2024
Membership Renewal Notices will be sent out throughout the month of January 2024. Credit Card or EFT are the preferred payment options.

2024 BALLINA CONFERENCE – 52ND IPPS Conference, Ballina RSL – 'Propagation - A Breath of Fresh Air' Wednesday 22nd to Saturday 25th May 2024 – Make a note of this date in your diary and calendar.

Conference Registration Forms, along with information, will be available for downloading shortly on the International website: www.ipps.org

I look forward to seeing more Members this year in Ballina 2024.

Contact Details
To ensure Office records are kept *'up to date'* I would appreciate it if members could please notify me of any changed contact details. In particular, if you have changed your telephone provider recently, *please* remember to forward your new email address to me at pam@ipps.org.au
Pam Berryman

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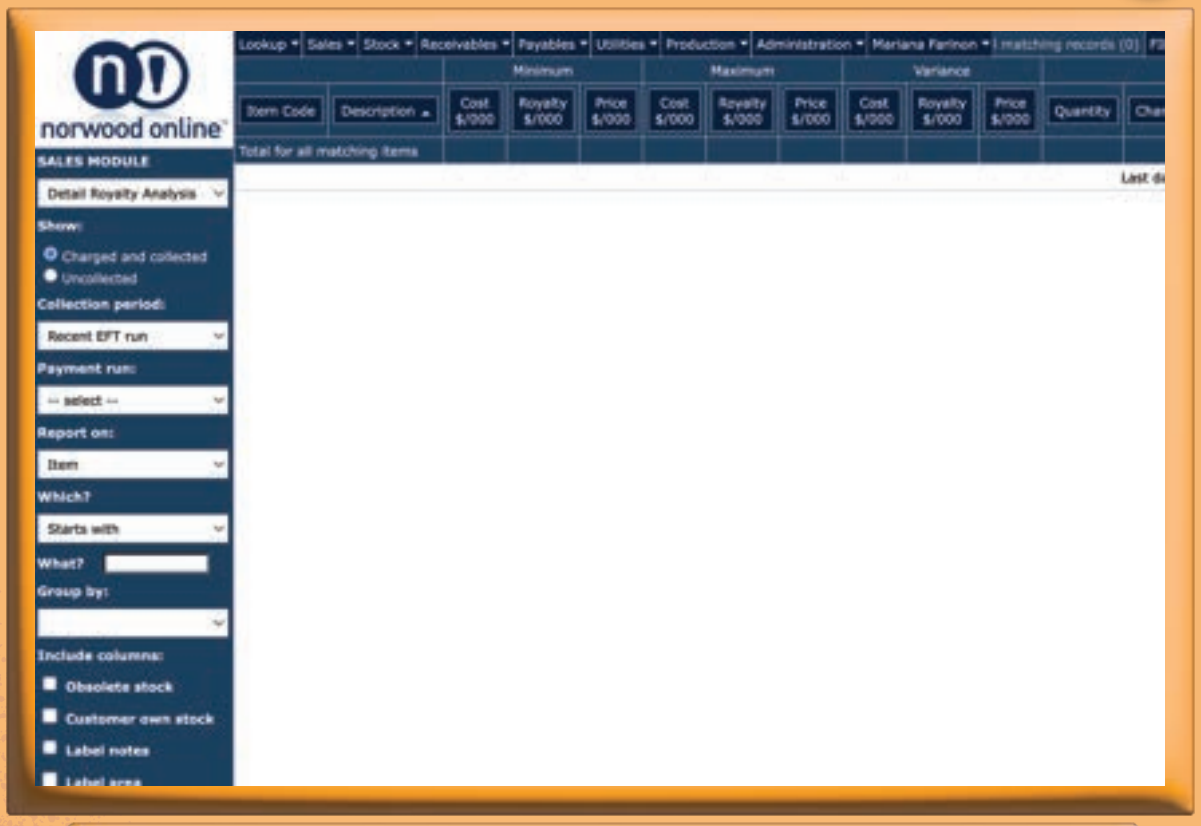

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