

Spring 2021
Vol 31 No 248



Australian Plants

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Cover photo: *Actinotus forsythii*, the pink flannel flower, January 2021 at Mt Victoria. Harry Loots

Australian Plants articles

Australian Plants is published quarterly to promote knowledge of Australian plants.

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Australian Plants No. 248 Issue of Volume 31, which comprises issues 246–253.
Published quarterly and available nationally in 2500 copies by the Australian Plants Society NSW Ltd

© Australian Plants Society NSW Ltd 2021 ACN002680408 ISSN 0005-0008

Printed by Elect Printing, Fyshwick, ACT Print post approved 100009857

Editorial

Merle Thompson OAM

I am writing this sitting in the sun on an unusually warm winter's day in an area of immense scenic beauty, wonderful biodiversity and known as the "bird watching capital" of Australia. Two small plants of the rare grevillea, *G. obtusiflora* ssp *fecunda*, are flowering near the gate. Bliss!! And I met a wedge tail eagle on the drive home.



BUT this morning my state, NSW, reported a record number of COVID-19 cases and several deaths. Other states have cases and lockdowns. Over the past two years or so Australia has experienced severe drought and perhaps the worst fires and floods in living memory or maybe even since European settlement and records began. Plus cyclones, mouse plague and ... Our country has been hit hard; and it has hit us, the human inhabitants, hard. The impact on our flora and fauna is enormous. Even without fire "my" grevillea is in decline. There seem to be fewer plants along the so-called protected roadside.

I can't help thinking of Dorothea Mackellar's verse

*I love a sunburnt country ...
A land ... of droughts and flooding rains ...
Core of my heart my country; Land of the rainbow gold
For flood and fire and famine she pays us back threefold.*

In our cover photo the juxtaposition of beauty and terror – the beautiful carpet of pink flannel flowers under the burnt trunks of shrubs is stark.

Our land gives us our wonderful flora – around 30,000 (or latest estimate) special plants, so many of which are unique to our land. Surely the difficult times must be a stimulus to us to want to learn more about our plants and the impact of fire, flood and climate change on them, to want to conserve them and their habitats and to grow them for their beauty and also for their preservation. With COVID-19 our politicians have kept telling us to "listen to the science". We, and they, must listen to the science about loss of species, loss of habitat and the impact of our human lifestyles and of climate on our flora.

This un-themed issue has an eclectic range of topics. I hope something in the articles will inspire your desire to learn more about, protect, grow and enjoy Australian plants.

Filmy Ferns of the Highlands of the NSW South Coast

Kevin Mills

Dr Kevin Mills is a botanist and ecologist who has lived in the Illawarra for over 40 years. He and his partner ran an environmental consultancy for 30 years before retiring in 2019. He has studied the region's rainforests, and the flora of the south coast for many years. These include studies of all offshore islands on the South Coast, a review and field study of the ferns of the south coast and various rare plant surveys. Kevin has authored or co-authored several books including Native Trees of Central Illawarra, Rainforests of the Illawarra District and Native Trees of the NSW South Coast. He is involved in the rehabilitation of habitat on the Five Islands Nature Reserve off Port Kembla and of rainforest at the Minnamurra Rainforest Centre in Budderoo National Park.

The term filmy ferns, encompassing several genera, is a convenient name for the species of fern in the family Hymenophyllaceae. Filmy fern is quite appropriate for these ferns as the frond segments in this group are very thin and readily susceptible to desiccation.

Sixteen species are found in New South Wales. This compares with 42 species found in Queensland and nine in Victoria. By comparison, 31 species occur in New Zealand, where this group makes up 16 percent of the fern flora of that country. The south coast of NSW, that is south of Sydney, can account for 11 species of filmy fern in four genera. It is the highlands just behind the coastal lowlands where this group is at its most diverse and of greatest abundance. These areas are characterised by a high rainfall and a high altitude, and combined with dissected topography, provide the perfect moist, sheltered habitats for filmy ferns. The highest diversity of filmy ferns, and indeed ferns generally, is found in small gorges associated with the region's escarpments, particularly those just above the cliffs, where rainforest and mossy boulders dominate.

These delicate ferns grow only in the wettest of habitats, nearly always associated with creek lines and often with waterfalls. Filmy ferns are epiphytes, growing on other plants, and lithophytes, growing on rock (boulders and cliff faces). A few species may occasionally be found growing on earth banks, although this is not common. A feature of several species is their preference for growing on the trunks of tree ferns, most particularly the soft trunk of *Dicksonia antarctica*, which is common in the moist habitats described above.

The 2019 drought impacted this group of ferns in many places, as the watercourses and the damp environments preferred by the Hymenophyllaceae dried up, some species curled up their fronds

and remained dormant or died. The breaking of the drought in early 2020 once again saw these ferns reach their previous abundance. This fern group is probably the most susceptible to climate change, as a combination of drier habitats and the increased occurrence and intensity of bushfires threaten the damp habitat niches where these species are primarily found.

Species descriptions and habitats

Jungle Bristle Fern *Abrodictyum caudatum* (syn. *Macroglena caudata*)

A rare fern at moderate to high altitudes, usually growing on the trunks of tree ferns, either *Dicksonia antarctica* or *Alsophila australis*. Other Australian states: Qld, Vic.

Filmy Fern

Crepidomanes vitiense

A northern species recorded only at a few sites in escarpment gullies at moderate altitude; grows on mossy rocks. Other Australian states: Qld, south to the Minnamurra Rainforest, Budderoo National Park.



Crepidomanes vitiense

Austral Filmy Fern

Hymenophyllum australe

A relatively common filmy fern found in high altitude gullies growing on mossy boulders and wet cliff faces. Other Australian states: Qld, Vic, Tas.



Hymenophyllum australe

Filmy Fern

Hymenophyllum bivalve

A rare fern found in wet high-altitude gullies, growing on trees and mossy boulders. There are only a handful of records for NSW, most coming from the Illawarra region. Other Australian states: Qld, south to the Kangaroo Valley area.

Common Filmy Fern *Hymenophyllum cupressiforme*

This is by far the most common and widespread species, occurring in shady gorges and along creek lines at all altitudes, usually growing on mossy boulders and moist cliffs. Other Australian states: Qld, Vic, Tas.

Shiny Filmy Fern
Hymenophyllum flabellatum

A relatively large filmy fern, growing in moist shady gorges on large boulders and cliff faces. Other Australian states: Qld, Vic, Tas.



Hymenophyllum cupressiforme

Lyall's Filmy Fern
Hymenophyllum lyallii
(syn. *Sphaerocionium lyallii*)

This fern grows in high altitude gullies, growing on rocks and earth banks, where it may be moderately common; sometimes covering a relatively large area in a mat of small fronds. NSW and New Zealand.



Hymenophyllum flabellatum

Bordered Filmy Fern
Hymenophyllum marginatum

Rare and restricted to high altitudes, as with other species grows in shady, rocky areas on mossy boulders where it forms dense mats. Other Australian states: Qld, Tas.



Hymenophyllum marginatum

Filmy Fern *Hymenophyllum pumilum*

A very rare species endemic to NSW; found at high altitudes in the Blue Mountains and one record from the escarpment west of Jamberoo, Illawarra region. Occurrence: Sydney Basin, NSW and Lord Howe Island.



Polyphlebium venosum covering the trunk of *Dicksonia antarctica*.
All photographs taken by the author on the NSW south coast.

Narrow Filmy Fern *Hymenophyllum rarum* (above left)

Rare and restricted to high altitude gullies, where it grows on mossy boulders and wet cliffs. Other Australian states: Vic, Tas.

Veined Bristle Fern *Polyphlebium venosum* (above right)

A common fern at moderate to high altitudes, usually growing on the trunks of *Dicksonia antarctica*. Other Australian states: Qld, Vic, Tas.

Some Small Plants for the Garden that we are growing at Wartook Gardens

Royce Raleigh

Royce and Jeanne Raleigh first joined the Maroondah Group of the, then, SGAP in the 1960s and Royce became an active propagator. Jeanne's interest in native plants developed later but since the 1970s she has done most of the propagation. They were foundation members of Wimmera Growers of Australian Plants in 1976. Royce has spent many years as an office bearer while Jeanne has been a committee member and has supplied plant material for their many shows. In the 1990s Royce spent 3 years as State President of APS Victoria and is now an Honorary Life Member. He is currently Leader of the Goodeniaceae Study Group. Jeanne has been awarded an Impressa Award for Outstanding Service to Australian plants by APS Victoria.

When Jeanne and I moved from Montrose in Melbourne to Wartook on the northwest edge of the Grampians at the end of 1974, we had always planned to develop a large native garden. Our aim was to show the public that there are many beautiful Australian plants that we can grow, but generally the availability is a huge issue.

When we began the garden, we soon realised that winter waterlogging was going to be more of a problem for the plants than our long hot summers. We solved that problem by digging deep gutters around every garden bed and digging out all our pathways so that they become drains in heavy rain. All drainage then goes into one of our dams. This enabled us to immediately consider planting a much greater range of Australian plants than we may have at first considered.

It was soon obvious that rabbits, kangaroos, emus, frost as well the long summer dry and fire were all going to be problems more than we realised. We have kept the animals out with a rabbit proof 2.4m high fence around the garden. Although it took some time to realise that kitten rabbits easily get through "rabbit-proof" wire netting. We now have bird wire netting attached to the lower part of the "rabbit proof" netting. In the 80's, 90's and since 2000 we have had a number of years with no run-off into our dams. With both dams dry on numerous occasions, we watched many plants die during those summers. However, since 2013 we have been connected to piped water and the situation has greatly improved. Now to conserve moisture we have logged the edges of garden beds and mulched with scoria to help protect us from fire.

Over the years we have learnt to understand much more about the growing conditions of many plants and are now planting many plants

that we would not have attempted in our initial planning. Pruning of larger plants has enabled us to tuck many frost tender plants underneath but still give them sunshine.

We firmly believe that APS Groups across Australia should be taking a much more active role in ensuring that many more of the colourful, and sometimes rare plants are introduced into public and private gardens.

Climate change has already changed the scope, and range of plants, that we can now try at Wartook Gardens. In our 5 acre garden, we are now able to successfully grow many species that would have been unthinkable 30 years ago.

With 1000's of species to choose from in our garden we have selected some that we are growing, knowing that we can only offer a taste of what many members will be able to grow. With many of today's gardens much smaller than in the past, we will concentrate on some of the smaller plants that can occupy a spot in most gardens. All photos have been taken in the garden.

There are many wonderful small and low growing *Acacias* and many of these are available through the Acacia Study Group seed bank.

Acacia lasiocarpa – a low growing rounded mound to 250 mm high and 1 metre across.

Acacia pulviniformis – a dense prostrate plant about 1 metre wide. A great plant for the edge of a raised garden bed.

Acacia varia is a delightful small shrub to 600 mm high, with very showy rod-like flowers. It is one of the earliest wattles to flower in our garden. Although the original plant will only last a few years, it sets copious quantities of seed and with our scoria mulch many seedlings are being produced each year. We have had plants in the same area of the garden for over 40 years and have spread them elsewhere in the garden.



Another group of plants not widely cultivated are the *Beaufortias*.

Beaufortia cyrtodonta – a low growing plant up to 1 metre from the Stirling Ranges.

Beaufortia purpurea – Although it can reach 1 metre, if regularly pruned it will not only flower better, but be a more shapely plant. Considered rare in the wild it should be more widely grown. We find that our plants respond well to summer watering, which greatly extends the flowering period.



Beaufortia schaueri – for us this plant has grown up to 1 metre with some plants now almost 40 years old. In WA we have seen this plant in flower in July- August, but it flowers for us in November and always makes a great display.



Calytrix fraseri – This is a spectacular plant in flower, and is one of those plants that you hardly notice until it bursts into flower. It can cope with our frosts and extended dry periods but with extra water you can greatly extend the flowering season.



Calytrix depressa – is a delightful dwarf to small shrub from WA, which over its range has a number of colour variations. It needs a well-drained situation and protection from our severe frosts.



For us, members of the *Conostylis* family, a wonderful group of tufted plants, are easier to grow than other members of the *Haemodoraceae* family. We have a number of them growing well. You can gain more plants by dividing the older clumps in the winter time as new white roots appear.

Conostylis bealiana

This grows naturally along the south coast of WA from Albany to Esperance and inland to Merredin. Many years ago Rodger Elliot introduced a white flowered form, which we grew for a number of years, but it seems to be no longer available.



Conostylis setosa

This has to be one of our favourites of this family. It is from the forested areas around Perth and has adapted well to cultivation. We lost our original plant after 40 years as it became too shaded. We have a number of others now doing well in semi-shaded areas.



Cooperhooikia polygalacea

Although this plant has had limited cultivation it is proving quite adaptable. Flower colour can be from white, blue through to pink. We lost our original plant after almost 30 years but we have a number of small plants now doing well. Plants prefer a well-drained situation with plenty of sunshine.



Dampiera adpressa

It is a lovely *Dampiera* from northern NSW and Qld, and evidently not widely cultivated. Our plants make a great display, and this is definitely one that should be more widely grown. We have seen wonderful swathes of this plant in the Pilliga.



Dampiera altissima

Although this plant can suffer a little from our severe frosts, it grows well in a sheltered semi-shaded position and we now have a number around the garden. Another that should be much more widely grown.



Dampiera sacculata

This is one of our favourite *Dampieras*, because of the density of flower, and the wonderful deep purple-blue to dark blue colour. Another of these lovely plants that is not common in cultivation, but should be.

Dampiera rosmarinifolia

This is almost a local plant for us as it is found in northern Victoria and South Australia. However, it does so much better in a garden. This particular patch is almost 3 m across. There are a number of colour forms, and we have pale-blue, white, mauve and pink in the garden.



Altogether we have over 30 different *Dampieras*, and when they are in full flower in the spring, we are often referred to as the “blue garden”. At the same time there are also lots of shades of blue *Lechenaultia* dotted throughout the garden.

Another group of plants that is not common in cultivation are the *Eremaeas*, and although many can be medium shrubs, *Eremaea violacea* is one that could find a spot in any small garden.

But maybe this and other plants will have to wait for another time.

Experimenting in the Nursery

Emma Brame

Emma is a horticulturalist at the Sutherland Shire Community Nursery where they propagate plants indigenous to the area that are planted in local bushcare sites, parks and reserves as well as for sale to the general public. She completed the horticulturalist trade certificate in 2015 while working in the indoor plant industry and an apprenticeship in Production Nursery with Council in 2017. Her interest stems from her family's interest, curiosity and enjoyment for gardening. She has also loved exploring the bush since childhood with fond memories of playing and exploring in the creek and bush near the family home.

Sutherland Shire Council's Community Nursery produces over 200 different species of local native plants. Most plants have been grown from seed, as this usually produces the best results, whilst others are grown from cuttings and divisions. We have had a lot of success with many difficult-to-grow species, but are always looking to improve the success rate and also introduce new species. Experimenting with different methods until discovering one that works is a common practice and often produces successful results.

Here are just a few examples of experiments that have been done:

When sowing seed, using a deeper tray to sow the seeds into has worked much better for particular species, such as *Lomandra* and *Spinifex*. Some species react better to being sown in particular seasons even when they are in the controlled environment of the poly tunnel with optimal growing temperature of 18 to 24 degrees, heated benches as well as misting and irrigation systems. For instance, *Persoonia*, *Imperata* and *Lomandra* have a higher germination rate when sown in the warmer months and in the cooler months, *Isopogon* and *Bursaria* have a better germination rate.

Different methods of cleaning, processing and storage of the seed are also used. For seed like *Persoonia* and *Smilax*, scarifying the seed rather than nicking them has led to a higher germination rate.

Bossiea heterophylla seed pods with ripe seeds inside. Pods are ready to pick when the colour changes from green to a brown/black colour and have a bulge. Seeds are hard coated and will require boiling water treatment prior to sowing.



Storing particular types of seed before cleaning and sowing also helps some species have an improved germination rate. For example, *Isopogon* and *Petrophile* seed that has been stored for six months before being cleaned have a much better result than if they were to be cleaned and sown straight away. The cleaning process for these particular species is also made much easier as the seed has fully ripened and the woody bracts of the cone shaped fruit have opened slightly more, making them easier to pry out. Normally, out in the bush the fruits remain on the plant and are only released after a fire or the death of the plant.

Temperature is another factor that is worth experimenting with. *Themeda australis* seed is stored in the fridge for six months before it is sown and has a very successful rate of germination. *Themeda* is a popular grass in the nursery and to allow us to store it in the fridge for the required six months, the nursery staff always have a bag of seed on the go being cleaned. A large piece of calico fabric is used to find the viable seed that stick to it. One step further to temperature is fermentation. Fermenting *Persoonia* seed for 12 months before sowing has been a wonderful success. This replicates the fleshy fruit being processed through the digestion system of an animal to then reveal the seed. The seed is then scarified (as previously mentioned) and sown in late spring. They then will start to germinate months later when temperatures drop and we have our first real cold night of the year. The seeds that do not germinate are not thrown out but instead are cleaned up, re-scarified and sown again as the seed seems to be viable for a long time. We have seed still germinating from as far back as 2016. *Persoonia* are notoriously hard to propagate so this is one to be proud of!



Successful germination of *Persoonia pinifolia*, two years after fruit/seed was collected.

As most Australian plant enthusiasts will know, bushfires are required in natural bushland for some plants to reproduce or regenerate. Heat from bushfires causes capsules or woody cones like *Banksia* species to open and release their seed. In the nursery, we have experimented over the years and have found the best way to replicate this is by burning the cones on a BBQ with a flame torch. This is done in a safe manner with PPE and very long tongs being careful not to “overcook” cones and keep the seed intact.



Replicating nature: Burning Banksia cones using a flame torch and BBQ to open up and release their seeds.

Smoke from bushfires can also trigger seed germination. Smoked water is often used in nurseries but we have found great success with using Eucalyptus leaves in a bee smoker to replicate this. This has proved very successful with *Grevillea* species and also the ever-popular *Actinotus helianthi*.



Left: Replicating nature: Smoking freshly sown seeds with a bee smoker.
Right: The ever popular *Actinotus helianthi*, AKA flannel flower in full bloom.

After the seed has germinated, they are ready to be tubed up. Different types and mixes of potting media have been trialled. For certain species like *Actinotus* and *Spinifex*, a 50:50 mix of potting mix and perlite (perlite for greater air flow and drainage) has led to healthier growth and greatly lessened the amount of loss in these species. This may be worth trialling on our *Grevillea* species as they seem to suffer with the amount of water being held in the soil. This is particularly evident after heavy rain falls.

Experimentation is also used when we propagate by cuttings and division. When propagating by cutting, wounding or nicking particular species, such as *Grevillea*, *Elaeocarpus* and *Ozothanmus*, has resulted in a higher strike rate. As with seed, the time of year for cuttings is factored in for some of the harder-to-grow species. A few species have been trialled in the warmer months, like *Dillwynia*, *Elaeocarpus* and *Epacris*, and have had higher strike rates. Soft wood and hard wood cuttings have proved valuable to experiment with. Certain species have had improved strike rates with trialling between cutting types such as soft wood or tip cutting and hard wood cutting. Soft wood or tip cuttings are favoured for most of our local species we propagate here such as *Grevillea* species, *Correa alba* and *Platysace stephensonii*. Recently we have found success with *Epacris longifolia* using hard wood cuttings over soft wood cuttings. Soft wood cuttings of *Epacris* rot and don't have a high successful strike rate. Three different strengths of rooting hormone gels are used, purple, red and green. The difference is the amount of the active constituent, Indole Butyric Acid. The favoured purple gel is used most commonly, but we have found the red gel works best for *Grevillea*. The gel is easy to use and has a longer shelf life than hormone powders. For division, *Imperata cylindrica* has had some success in the warmer months although still very slow to propagate. Division, however, can be a very reliable and successful way to propagate some species. *Viola hederacea* and *Dichondra repens* are continuously propagated this way throughout the year.

There are always different techniques to master and experiments to be done when propagating natives in a nursery. Experimenting helps expand and diversify the range and to get these species out in to Bushcare sites and reserves. The staff at the nursery are always up for the challenge and look forward to seeing what else can be grown.

Native Bees in the Pollen

Phil Watson

As a long standing natural area planner and practitioner, Phil is fascinated by the diversity of connections between wildlife and the landscapes they inhabit. His career has provided fantastic opportunities to experience many natural places both in Australia and worldwide especially USA and UK where he experienced an inspiring insight into park management and interpretation thanks to his Churchill Fellowship. As Council's natural area planner he has successfully developed and implemented an extensive series of new natural area management plans based on extensive community consultation and scientific investigations. He has written and published extensively focussing on creating an awareness of the curious and interesting aspects of Australia's flora and fauna and sharing this in community landcare and Australian Plants Society.

Nature's super star pollinator

Across the vast spectrum of plant pollinators be it an insect, bird or small marsupial, native bees emerge proudly as the most efficient of all pollinators. The reasons are simple! Native bees are born as pollen and nectar addicts, with the females genetically driven to collect pollen and often nectar, not only for sustaining herself but more importantly for provisioning her brood cells. This is achieved during the flowering season by visiting hundreds of flowers often of the same species on each individual foray. By visiting a single species this markedly increases the likelihood of cross pollination.

From a native bee's perspective, it is easy to understand why they are inextricably linked to pollen and nectar. The oldest fossils of bees have been in amber being around 100 million years old. Fascinatingly this



Male bee (species unknown) sleeping in a *Dampiera purpurea* flower.
Photo: Tessa Barratt

coincided with the rise of flowering plants (angiosperms) enabling bees to gain floral rewards for pollination services necessary for the ancestral angiosperms to flourish.

Of the world's 2,500 native bee species, Australia's native bee fauna is notably large and distinctive from other continental bee fauna, consisting of up to 2,000 species (1,600 named) that occupy almost all terrestrial habitats but mostly in semi-arid regions.

Correcting the native bee myths

Stings or no stings?

Two mythical features commonly come to mind when native bees are mentioned, namely that they mostly live gregariously in hives just like honeybees (*Apis mellifera*) where they store a honey and secondly, they do not sting. Both these features are surprisingly very rare amongst our native bee fauna. Of all the native bee species there are only a couple of small groups of bees that do not sting. Stings are exclusive to females. As opposed to wasps, (from which native bees evolved) which sting to paralyse prey, female native bees only sting for defence and can do so repeatedly, never leaving the sting in the victim. Their hollow sting shaft (evolved from ovipositors) secretes venom with pain levels proportional to the size of the bee.

Social or solitary?

The other myth about their gregarious nature only applies to just 11 species commonly referred to as 'sugarbag bees' (*Austroplebeia* sp., & *Tetragonula* sp.). These species actually store honey differently to the honeybee. They construct and fill 100's of small pot-like vessels (size of grapes) with regurgitated nectar and pollen before capping with propolis, which is a mix of wax from their wax glands and plant resins. Their fairly runny honey is sharp and tangy with infused floral flavours derived from the propolis, distinguishing it very clearly from the sweet more concentrated honey we happily consume!

The immense majority are solitary native bees which nest by themselves and collect primarily pollen which they mix with nectar to provision their brood. Their brood (eggs and larva) develop in individual closed cells located in narrow tubular holes dug or drilled by mum into the ground or pithy wood etc. As these solitary mums need to work hard to collect enough floral pollen and nectar to feed their young, they do not have time to store it nor allow their rather watery supplies of honey and nectar to ferment and go bad.



Figure 1:
Male Banksia Bee guarding his
Banksia flower territory.
Photo: Michael Batley

Ways to win the mating game battle!

Although male native bees' noble objective is to guarantee females are fertilized, they could otherwise be considered as lazy! Males do not construct nests, collect pollen to provision the brood nor care for the brood until adults¹.

Males are constantly competing against other males to attract females. Once mated the female stores their sperm in readiness to fertilize eggs laid on a porridge of pollen and nectar in each cell. The female determines the sex of the egg in each cell by simply either fertilizing the egg (females) or not (males).

Simple techniques

The simplest techniques involve patrolling over preferred flowers or perching on fresh unopened flowers preferred by young females, days before they arrive. Others patrol over long-term nesting sites particularly where there are clusters of nests awaiting young virgins to emerge. There is a marked range in the male sizes resulting in larger males monopolising nesting burrow holes by vigorously defending their burrow holes from rival males. This forces the smaller males to patrol forage flowers or stay on freshly opened flowers likely to be visited such as the easily accessible flowers from the mallow family, *Malvaceae* including *Hibiscus* sps., native cottons, *Gossypium* sps. and the many species of mallow *Malva* spp.²

1 Zborowski, P., Storey, R.A: *Field Guide to Insects in Australia* 2nd Edition Published Reed New Holland

2 Aussie Bee Website: Aussie-bee.com

Specialised techniques including brute force, floral oils, and pheromones

Individual bee species have evolved various techniques to gain advantages such as the blue banksia bees which perch on banksia flowers and fan their wings to disperse pheromones, often engaging in violent skirmishes with rival males. Another captivating example is the orchid bee which busily collects strongly scented oils from local flowers and accumulates the scented oils on specialised hairs located on their legs. Since each male bee has a different collection of scented oils, they emit their own individual concoction of floral perfumed pheromones. They then perch at the edge of the rainforest and fan their legs with their wings to spread the scent towards where the young ladies emerge from their nests in the hope that their unique scent is the one that at least one lady prefers! Additionally, some of the bees that rely heavily on pheromone attraction have longer antennae with expanded tips to enhance both the dispersion of pheromones as well as providing improved warning of rival males.³



Figure 2:
Female masked bee (*Hylaeus amicus*) on *Callistemon* flower.
Photo: Tessa Barratt

Solitary males struggle for survival

Male brood cells tend to be smaller and closest to the entrance of their mother's brood nesting hole, ensuring males emerge early in the flight season ahead of any females. Once males have left their nests, they do not return, preferring to roost in dead twigs or leaves as well as inside flowers that close up at night akin to sleeping bags. These flowers include native blue bells, native pigface, and noon-flowers (*Wahlenbergia* sp., *Carprobotus rossii* and *Lampranthus glauca*) returning to the same roost each night. Some males do not like sleeping outdoors, instead sheltering in old nest holes or short burrows in soil. Observant bush walkers may have noticed the largest solitary male

3 Houston Terry, *A Guide to Native Bees of Australia*, CSIRO Publishing

4 Houston Terry, *A Guide to Native Bees of Australia*, CSIRO Publishing

5 Daley Elizabeth: *Wings an introduction to Tasmania's winged insects* Published Riffles Pty Ltd.

aggregations (1,000's) as a black mass clinging to the fronds of one single grass tree (*Xanthorrhoea* sp.) dispersing during the day (unless bad weather) before returning at night.⁴

Curious ways to gain floral rewards

All bees visit flowers primarily for pollen to collect precious proteins and fats for their brood. The pollen is gathered on specialised hairy legs or hairy abdomens. Nectar on the other hand is sucked up with their proboscis and stored in their crop or 'honey stomach'. As this nectar is initially just a watery solution of sugars it is converted into honey using evaporation. This is achieved by repeatedly regurgitating for a few seconds nectar drops onto their tongue, to allow for evaporation and then re-swallowing.⁵

The competitive challenges of open nectaries

The largest and most noticed native bees are the sparsely hairy **short tongued species** that have evolved in parallel with the *Myrtaceae* family; gums *Eucalyptus* spp., tea trees, *Leptospermum* spp., paperbarks, *Melaleuca* spp., and heath myrtles *Baeckea* sp. etc. These flowers have shallow cup-like nectaries ideally suited for short tongues. Other prolific nectar producers with easily accessible nectaries (akin to the



Figure 3:
Leioproctus bee collecting pollen from *Persoonia oblongata*. Photo: Michael Batley

magnolia's flowers) include the mallows, *Malva* spp. evening primroses, *Oenothera* spp., canola, rape, turnip, swedes etc *Brassicaceae* waxflowers, *Cheiranthus* spp., as well as the floriferous native box *Bursaria spinosa*.⁶

Unfortunately for the native bees, these also attract strong insect competition for pollen and nectar. To survive this cutthroat world, short tongued native bees have evolved coping strategies. These include foraging very early or in the case of the geebung, *Persoonia*, which have four rigid, fleshy tepals they prise open their flower buds.

Persoonia bees, *Leioproctus* (*Cladocerapis*), are specialist pollinators of the *Persoonia* or geebung flower. These bees have shiny smooth faces that help them reach deep into the flowers' nectary and are aided by dense bristles on their forelegs used to rake out the pollen from special grooves in the flowers.

Others nibble at flower buds to gain access to pollen on their stamens. Intriguingly, some of the more robust bees, such as the blue banded bees, even lever off the cap of gum flowers to get to the highly prized pollen.

As pollen ranges in size, some bees specialise in fine grained pollen whilst others have adapted the hairs on their legs (setae) to be wider apart and more robust to collect and carry the coarse-grained pollen. For example, the hibiscus family *Malvaceae* has very coarse-grained pollen.

Special adaptations to access concealed nectaries

Many native bees inadvertently gather pollen of the peas (*Fabaceae*) and milkwort (*Polygalaceae* sp.) because of being lured by colourful bee guides to their nectaries. The bees land onto the keeled petals. The weight of a small native bee is sufficient to press down on the keel releasing stamen which are cocked up between the two petals allowing pollen to be trapped on the belly of the nectar seeking bees.

A conspicuous challenge comes when the nectaries are deeply located at the base of tubular flowers such as the native heaths (*Epacridaceae*). Evolution has enabled some bees to be small enough to scramble inside the corolla whilst other bees have evolved long tongues for the task. For example, many of the net bushes, *Calothamnus*, and emu bushes, *Eremophilas*, (recently been transferred to the figwort family *Scrophulariaceae*), have a tight constriction near the base of their tubular corollas. Although long tongued bees can access the nectary it stymies short tongue bees, except for few highly adapted emubush specialist bees. A good example is the male banksia bee which possess elongated



Figure 4. *Lipotriches phanerura* buzzing *Dianella* flowers.
Photo: Michael Batley

mouth parts (technically known as labial palpi) which are additional to their short tongues (proboscis)). These labial palpi enable the sucking up of the nectar by a particular species of banksia bee.

As an aside, this male banksia bee also has a curious way of attracting females. He perches on top of flower heads that are likely to be visited by females where he vigorously fans out his pheromones made of floral oils. Unfortunately, he must struggle to hold his advantageous position often resulting in territorial combats with other competing males.

Sophisticated ways of gathering pollen

Buzz pollination is the bees' favourite

Buzz pollination particularly favours bees when the flowers have specialised characteristics such as no nectaries, fine grained pollen and flowers that have large, exposed anthers with terminal pores or slits that open to expose the pollen.

Unfortunately, the technical word called '*sonification*' needs to be applied to the simple name 'buzz pollination' to fully comprehend the process. This is purely a native bee thing, where the native bees such as the blue banded bee, the carpenter bee and many members of the large short tongued megachilids group, hunch over the tips of the anthers and vibrate or shiver their flight muscles. This catapults the pollen from the pores or slits onto the bee's belly. Inadvertently this shivering also causes the bees folded wings to resonate and emit a noticeable buzzing sound. Hence the term *sonification* which describes this sound.

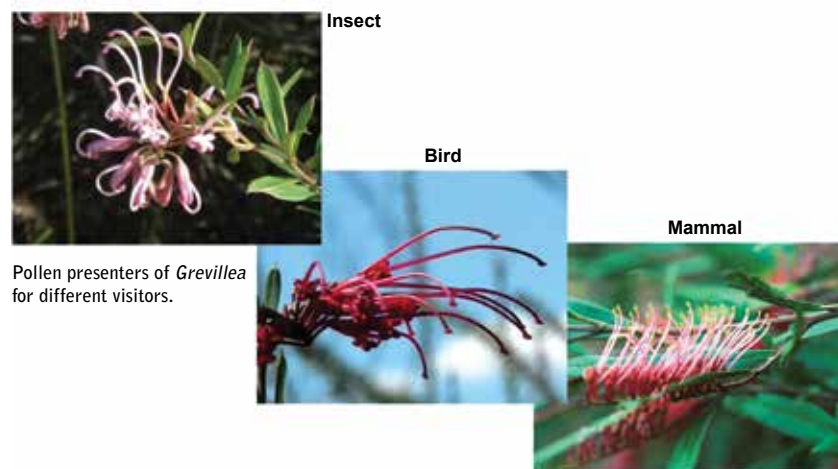
Interestingly honeybees and bumble bees do not cause sonification when buzz pollinating. However, surprisingly a vast number of commercially important plants do benefit from *sonification* including tomatoes, capsicums, chili, potatoes etc from the *Solanaceae*. This introduces the vexed question of the need for bumble bees given that they displace native bees and even small honeyeaters that also provide the same pollination services.

There are also a very large number of native plants which possess what are known as **vibratile** anthers that enable them to be buzz pollinated. These include fringed lilies *Thysanotus* spp., pink bells *Tetralathea* spp., flax lilies *Dianella* spp., native primroses, *Hibbertia* spp. and kurrajong family *Sterculiaceae* just to name just a few.

Proteas deliver pollen from the ends of their styles

Proteas not only attract birds and small marsupials but also cater for native bees using a unique form of pollen presentation known as 'style end presentation'.

Many native *Proteaceae* such as *Banksia* spp., *Grevillea* spp. needle bushes *Hakea* spp. geebung *Persoonias* spp. guitar plants *Lomatia* spp. etc, benefit from this technique where the anthers burst open whilst still in the flower bud as do kangaroo paws, *Anigzanthus* spp. As the style begins to unfurl in bud it collects pollen as it brushes past the open anthers and once fully unfurled the style grows longer presenting the pollen laden apex to both small honey-eating birds and the bees. Several female native bees specialise in *Proteaceae* having evolved an ability to clean the pollen from the style ends.



Stiff hairs on the heads of two *Leioproctus* species that specialise in visiting flowers like *Scaevola parvibarata*.
Photo: Michael Batley

Native primroses have their own form of secondary pollen presentation

Native primroses such as *Velleia* spp., *Lechenaultia* spp., *Scaevola* spp., *Goodenia* spp., and *Dampiera* spp. have fascinating and unique ways of presenting their pollen to native bees in exchange for their pollination services. In a similar way to the style end presentation of the Proteas, the native primroses release the pollen from their anthers whilst still in bud. However, this is scooped up by the cup-shaped end of the style known as an 'indusium'. When the flower finally opens the style-end bends down allowing it to dab pollen on the backs of nectar feeding bees. Curiously, native primrose specialist bees have evolved stiff, erect hairs with hooked ends on the backs of their heads that collect the pollen in readiness for the bee to groom it off once back at their nests. Other native bees such as a halictid species rake pollen from the indusium using their bristles on the lower sections of their back legs (tarsi).⁷



A female *Homalictus* sp. enjoying the joys of the Banksia flower.
Photo: Tessa Barratt.

⁷ Houston Terry, *A Guide to Native Bees of Australia*, CSIRO Publishing

The trigger plant relies on the strangest of all pollination techniques.

Anyone who has interest in native plants would know of the trigger plants' (*Stylidium spp.*) tricky way that the cocked column (fused male and female organs of the flower) located on one side of the flower snaps across and dongs pollen on the native bee when it alights on the open flower. Interestingly the column slowly resets several times, to allow it to revert to capturing pollen from backs of bees that were dinged by another trigger plant flower.

Conclusion

As discussed in this article, native bees possess unique abilities and adaptations to meet the challenges associated with pollination of Australia's unique native flora. It is for this reason that they deserve to be recognised as the pollination superstars. A significant percentage of indigenous plants are totally reliant on the various pollination methods employed by our rich diversity of native bee. Hence Australia's flora would be decimated by any significant demise of our native bee population. The understanding of pollination ecology which focusses on the special relationships between pollinators and native flora is essential to safeguarding the health and wellbeing of our native bee population.

In parallel with this, maintaining floral diversity within our extensive native forests, woodlands and grasslands and the habitat it sustains is the essence to protecting and enhancing Australia's native bee population.

For many of us that live in suburbia, our nearby remnant urban and peri-urban bushland patches provide wonderful opportunities to protect and boost our local native bee richness and their homes. This can be achieved by not only protecting from development pressure and taking care of these remnant patches, but also by re-planting indigenous and endemic floral species that may have disappeared or are likely to disappear from their landscape.

Editor's notes: Phil has written some other articles which are too long for this journal. Some have delightful titles:

Ants in the Plants

Beetles around the Bush

Flies in the Pollen

Tessa Barratt's series of photographs of native bees can be found at www.flickr.com/photos/125933031@N05/albums/72157712675899268

Rare Experiences

Merle Thompson OAM Co-editor

In 2004 I wrote an item for the Blue Mountains district group newsletter and entitled it "A Rare Experience". The photos were my very earliest attempts with a digital camera. The text read: "A number of our members have recently enjoyed something that most plant enthusiasts in the Blue Mountains only experience on a few occasions in their lifetime – a mass flowering of the pink flannel flower, *Actinotus forsythii*. In the 1984 book *Native Plants of the Upper Blue Mountains* by members Margaret Baker, Robin Corringham and Jill Dark they describe it as rare, its flowering as sporadic and call it a 'very special annual'. Seeing it is such a special event that one member of the Society, when I told her about it and even though by then it was well past its prime, was prepared to drive from Newcastle to Blackheath just to see it.

I understand that it flowers for one season a year after a fire if there has been rain. This year it flowered at Hargraves Lookout in Blackheath. The photo which we have from time to time used in our rare plants and Blue Mountains plants displays in the Reserve was taken by Jill Dark at Narrow Neck some years ago and it has also been found on Kings Tableland – all exposed heath areas of the upper Mountains."



I went on to quote references and describe this plant and the other members of the genus with which I was familiar – *A. helianthi* and *A. minor*. The quotes included: *The Flora of NSW* says that *Actinotus forsythii* "grows in damp areas in sclerophyll forest and heath on skeletal soils over sandstone, south from Newnes Plateau; usually seen only following fires." It lists its occurrence as South Coast, Central Tablelands, Southern Tablelands and Victoria. I concluded with "The plants were growing among re-generating *Casuarina nana*, *Banksia ericifolia* and *Xanthorrhoeas*, some with long flower stems."



It was not until January 2013 that I had another encounter with this species. As is so often the case it was flowering amidst the burnt black trunks of dead or re-generating shrubs. The scene was even more eerie because I went when the area was enveloped with thick mist.

I had been advised by a friend and was so determined not to miss this beautiful flowering that I went in the teeming rain on the Australia Day holiday. As advised, I found them along the Cliff View walk at Katoomba near the landing place of the Skyway which takes tourists across the valley. At ground level the re-growth was quite lush. Alerted by a little boy to whose parents I was talking, I found that they were massed on the ledge below the lookout and quite spectacular despite the mist (but not easily discerned in a small photo). What I didn't find was the one my friend had seen with no pink. Another friend, Jill Dark, did see one without pink and she also photographed the fascinating bud.



Encounter number three was in 2015 at Dobbs Drift in the Lithgow area not far from my new home. There hadn't been flower there for 15 years. This followed the horrendous "State Mine Fire" of October 2013. The Drift is in an area where there are the amazing pagoda rock formations. The carpet of flannel flowers under burnt trunks seems incongruous enough, almost "spooky", but the powerful pagodas looming nearby made it almost surreal. The other people there at the time were not

there to look at the flannel flowers. They were considering the site for filming an Armageddon movie with two men wandering to see if they were the only ones left in the world. And we were giving the director a botany lesson. Bizarre!

I told members of the Central West Group that I was taking them to see a rare plant and one friend suggested I go and water it so it would last until they got there. I thoroughly enjoyed seeing the looks of amazement on their faces when they saw the incredible carpet of flowers spread across the hillside.



Photo: Lyn Burgett

In December 2019 this area was again severely burnt in one flank of the Gaspers Mountain megafire, resulting in another flowering in the summer of 2020/21.

This was not the only area to suffer incredible damage in that Black Summer. Large areas of the Blue Mountains were greatly impacted. In the aftermath *Actinotus forsythii* flowered profusely in more areas than probably ever known including Mount Hay, Narrow Neck and Mt Victoria. There were other areas besides the Blue Mountains including as far south as the Budawangs. Some of the areas had not been burnt but had been subject to smoke which supports the theory that it is smoke, not fire, which triggers germination.



Narrow Neck, Katoomba. Photo: Tomoko Ward

And it caught the imagination of people who might not ordinarily be interested in plants. There was a major article with photos in the *Sydney Morning Herald* and the flowering was featured in an item on climate change in the ABC's 7.30 report.

This is not a rare plant. It is what is known as a "fire ephemeral", only germinating after fire. What is rare is people's experience of it. This year that was shared by many, many people. The Blue Mountains National Park rangers had the rare experience of having to "traffic manage" the



On the Ikara
Head Track
Photos: Mariko
Ward

volume of walkers at Narrow Neck and on the Ikara Head Track at Mt Victoria where there would usually only be a few at a time.

In some places the flowering was later or longer. Julie Favell took the photo below in May at Cape Horn in Ben Bullen State Forest.



Do I want others to share this experience? If it is in the same areas, I say NO. Other species in the areas, such as *Banksia ericifolia*, are dependent on seed for re-growth and may take up to eight to ten years to reproduce. Based on experience from a less ferocious fire in 2014 in a nearby area it may take far longer than that for

enough viable seed to be produced to sustain this keystone species through the next fire. Too frequent, and intense, fire could make these species locally extinct and change the ecology of the area.

Can you grow *Actinotus forsythii*? Lithgow Community Nursery has succeeded and Lloyd Hedges of the Menai group has made a special feature of this. He uses smoke water. Treat it as an annual.

In my report of my 2015 experience I included the following: “There are two other species which occur in NSW but I know nothing of either of them. *A. paddisonii* is a prostrate herb which occurs out in the Bourke to Lightning Ridge area. *A. gibbonsii* is apparently widespread along

the coast and tablelands. Looking at the photo on Flora Online, it also has an umbel of pink flowers but the bracts are not as obvious.”

To my delight I read in the Blue Mountains Conservation Society newsletter “The Hut News” in July this year the following item by Alan Page called *A Fourth Flannel Flower*. “A few years ago Ian Brown and I went in search of the fourth flannel flower that grows in the Greater Blue Mountains – the Dwarf Flannel Flower (*Actinotus gibbonsii*). The other three are the Sydney Flannel Flower (*A. helianthi*), the Lesser Flannel Flower (*A. minor*) and the Pink Flannel Flower (*A. forsythii*). But although we searched in the general area where it had been recorded, we were unsuccessful. It then dawned on us that it may be similar to the Pink Flannel Flower and only grows in the summer following a bushfire. That is, its dormant seeds are awakened by enzymes in the smoke and then need some good rain. This theory was strongly supported when earlier this year Ian found a patch of Dwarf Flannel Flowers. He took me there a few days later and although he exclaimed ‘here we are’, I couldn’t immediately see them because they are mainly prostrate and unlike the Pink Flannel Flower, they blend into their surroundings. The flowers are about 10mm across – half that of the Pink Flannel Flower. We didn’t publicise our find back then in order to protect this uncommon but delightful plant.” Alan has permitted the inclusion of his photo.



Actinotus gibbonsii. Photo: Alan Page

Rainfall: there is nothing average about the average

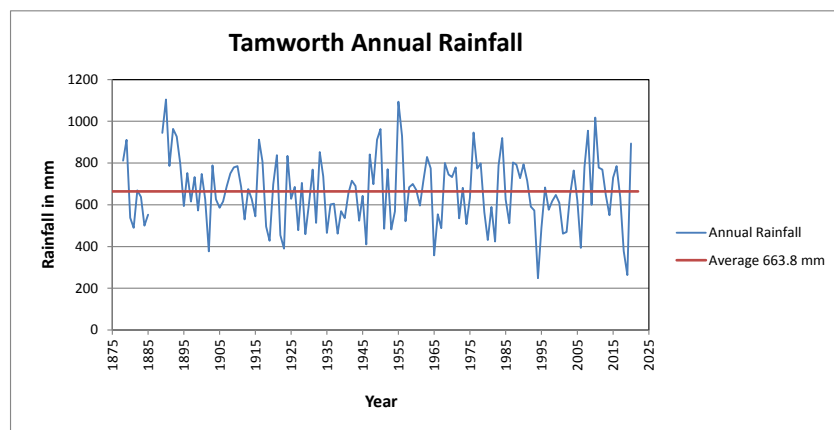
Martin O'Rourke BSc, Grad Dip Eng Geol, MSc.

Martin O'Rourke is a hydrogeologist by profession. He has a keen interest in Australian Plants being a member of the APS Tamworth Group NSW. The variability of rainfall is also one of his many interests.

Many people look at a list of rainfall figures spreading over the years and ask, what is average? What is above average? What is below average? How do I understand them? When we return to normal rainfall all will be well. What is normal rainfall anyway?

If you consider Tamworth NSW the annual rainfall data from the BOM can be extracted. The average annual rainfall across all data is 663.8 mm per annum. [Climate Data Online – Map search \(bom.gov.au\)](https://climate.bom.gov.au/)

By combining the Tamworth Airport (No 55054) 1876 – 1992 and Tamworth Airport AWS (No 55325) 1993 – present giving a total record from 1876 to 2019 the annual rainfall can be plotted thus.



Note Tamworth Airport (No 55054) and Tamworth Airport AWS (No 55325) are about 1.2 km part.

A nice graph, but what does it mean? It can be seen that some years are wetter than others and some years are drier than others. No one year gets the exact average (662.2 mm 1876 to 2019) as none actually plot exactly on the average line. How can I see trends?

In the hydrogeological world we look at trends in rainfall. A technique we use is a graph called the cumulative deviation from the mean (residual) graph. This is a statistical graph that can be used for any set of numbers which has data that is higher or lower than the average.

You take a set of numbers, say the annual rainfall, and list them in year order with the year in one column and the annual rainfall in the second column. You then determine the average or mean of the annual rainfall (sum of all years divided by the number of years). Then working down row by row and in the third column you subtract the average from the rainfall for that year. Then in the fourth column you add the figure in the third column with the row above in the fourth column, see below:

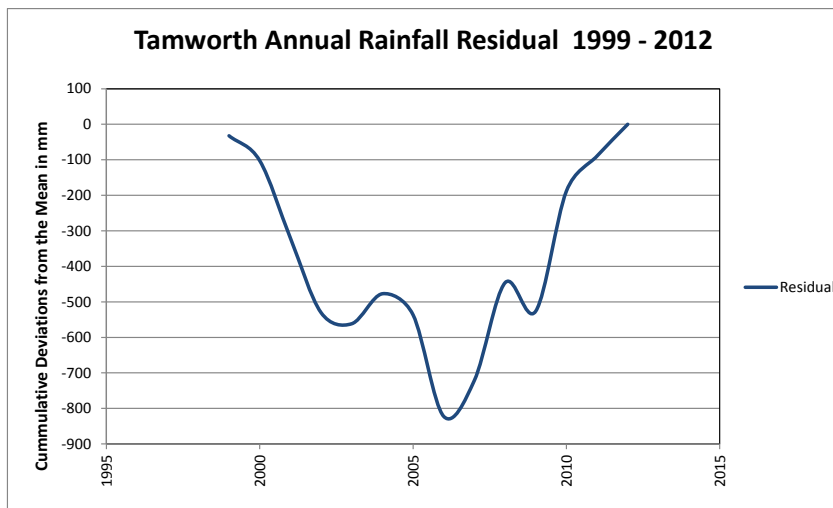
Rainfall data for Tamworth Airport AWS.

Year	Yearly Rainfall	Yearly Rainfall minus Average	Residual
1999	647.4	-32.4	-32.36
2000	609.8	-70.0	-102.31
2001	461.8	-218.0	-320.27
2002	469.8	-210.0	-530.23
2003	648.4	-31.4	-561.59
2004	764.2	84.4	-477.14
2005	620.4	-59.4	-536.50
2006	393.8	-286.0	-822.46
2007	781.2	101.4	-721.01
2008	954.6	274.8	-446.17
2009	599.8	-80.0	-526.13
2010	1017.8	338.0	-188.09
2011	778.6	-32.4	-89.24
2012	769.0	-70.0	0.00
Average	679.8		

This shows that for some years the yearly rainfall is above the average and other years the yearly rainfall is below the average. If the residual is plotted against the years, the graph overleaf is the result.

This shows that from 1999 to 2006 there was a falling trend, a period where the rainfall was drier than average and from 2006 to 2012 there was a rising trend, where the rainfall was higher than average based on the data presented.

Even for the surrounding area around Tamworth the average rainfall varies across the landscape. The following data is derived from the

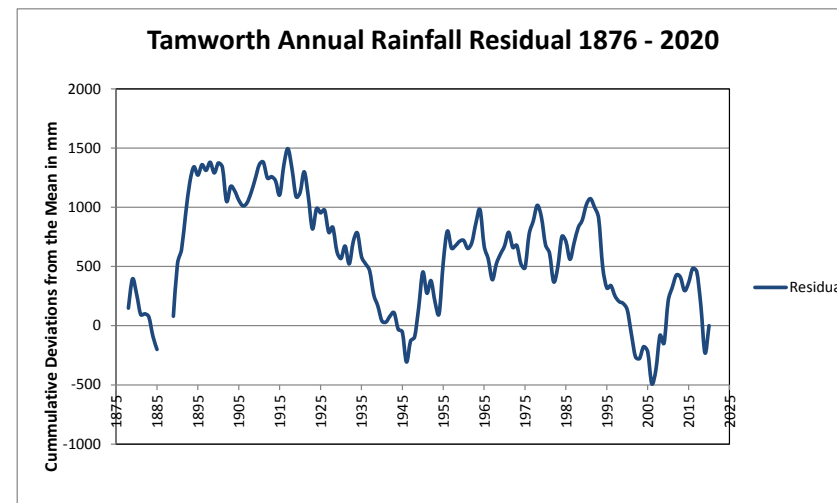


Bureau of Meteorology web site. The annual average across the various years ranges from 611.7 to 719.8 mm per year.

Site Name	Station Number		Years of Record	
Tamworth Airport AWS	55325	Open	1993 – Present	634.9
Duri Post Office	55311	Open	1984 – Present	722.9
Tamworth Airport	55054		1876 – 1992	673.6
Tamworth West	55222		1880 – 1945	617.7
Tamworth Dominican Convent	55221		1900 – 1925	611.7
Nemingha (Nemingha (Cressfield))	55160		1958 – 2016	690.9
Moonbi (Bellevue)	55143		1958 – 2015	701.4
Tamworth (Bahreenah)	55166		1958 – 2008	668.4
Moor Creek (Orroroo)	55141	Closed	1958 – 1976	718.0
Kootingal (Gate St)	55148	Closed	1961 – 2012	699.7
Tamworth (Oxley Lane)	55327	Closed	1993 – 2015	666.3
Moore Creek (Elizabeth Drive)	55022	Closed	1999 – 2015	632.8
Duri (Riverlodge)	55329	Closed	2002 – 2015	719.8
Tamworth (Warrawee)	55330	Closed	2003 – 2014	719.0

So, you ask yourself what is average? Statistically speaking, the longer the record the better the data is. The better the data, the better the average is.

For the total rainfall of Tamworth combining the Tamworth Airport (No 55054) 1876 – 1992 and Tamworth Airport AWS (No 55325) 1993 – present giving a total record from 1876 to the present, the residual curve is below. (Note No 55054 and No 55325 are about 1.2 km apart)



What does this tell us?

- From 1885 to 1895 it had a rising (wetter than average) trend,
- From 1895 to 1900 it was fluctuating around average,
- From 1900 to 1906 it had a falling trend (drier than average – the millennium drought of the 1900's),
- From 1906 to 1917 it had rising and falling trends (sort of average),
- From 1917 to 1946 it had a falling trend (drier than normal including the drought years of the 1930's),
- From 1946 to 1964 it had a rising trend (wetter than normal including the bumper years of the 1950's),
- From 1964 to 1991 it had rising and falling trends (sort of average),
- From 1991 to 2006 it had a falling trend (drier than normal including the millennium drought of the 2000's).
- From 2006 to 2016 it had a rising trend (wetter than normal)

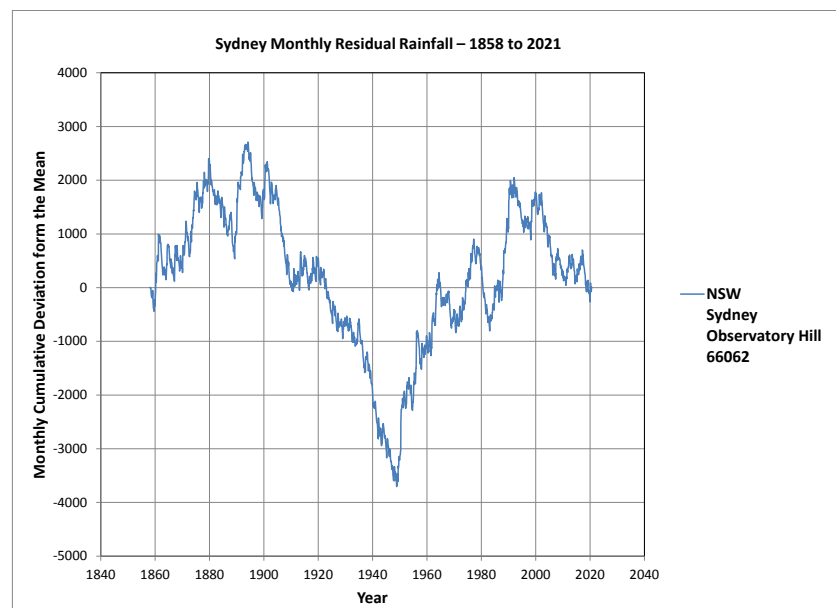
- From 2017, 2018, 2019 it has been drier than normal 635.4 mm, 378.6 mm and 263.6 mm vs long term average of 663.8 mm.

People say when we get back to normal rainfall things will be better. So, what is normal? There is nothing normal about the average.

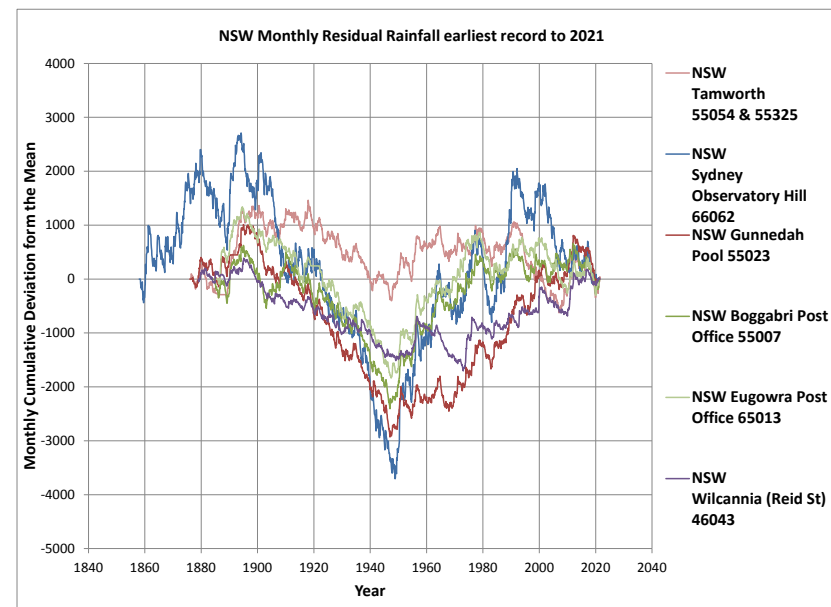
If you plot the rainfall residual graphs for several locations across the state, you see pretty much the same thing, but it does vary. What it does show is that generally the first half of last century was drier than average and second half of last century was generally wetter than average. This does not consider temperature fluctuations but that is another story.

The following slides are from the talk given by Martin O'Rourke at the APS Get Together 2016 held at Tamworth, updated to July 2021. Instead of plotting annual averages the cumulative deviation from the monthly averages were plotted. This demonstrates a finer plot, but the long-term trend is still there.

Observatory Hill in Sydney has the longest record in NSW from 1858 to the 31 Aug 2020. The cumulative deviation from the monthly rainfall follows the same trend as the inland. The latter half of the 1800's being wetter than average, the first half of the 1900's being drier than average, the second half of the 1900's being wetter than average and the 2000's seem to be following the same trend, i.e., drier than average.

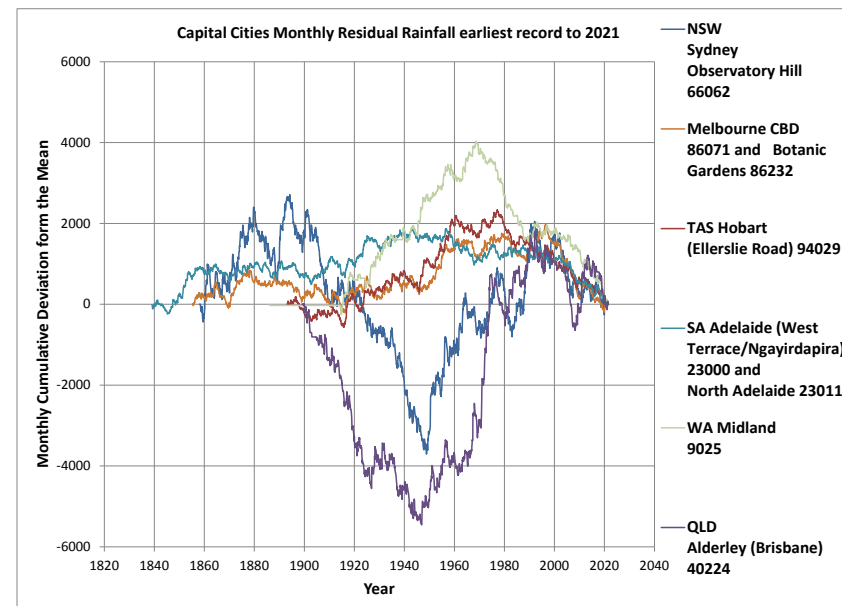


NSW generally follows the trend for most places.



NSW generally follows the trend for most places.

The capital cities are the most interesting. The oldest record is for Adelaide commencing in 1939. But it has a more subdued trend compared to Sydney and Brisbane. Adelaide and Melbourne are combined plots from two nearby stations in each city as there was no one site with a complete record. Both show relatively stable climates.





Cockburn River looking downstream Nemingha bridge March 2018, near Tamworth NSW.
Photo: Martin O'Rourke

Not all capital cities follow the trend of the NSW. Perth demonstrates a rising trend for the first half of the 1900's and a falling trend for the latter part of the 1900's and into the 2000's. Brisbane has the largest swing down in the first half of the 1900's.

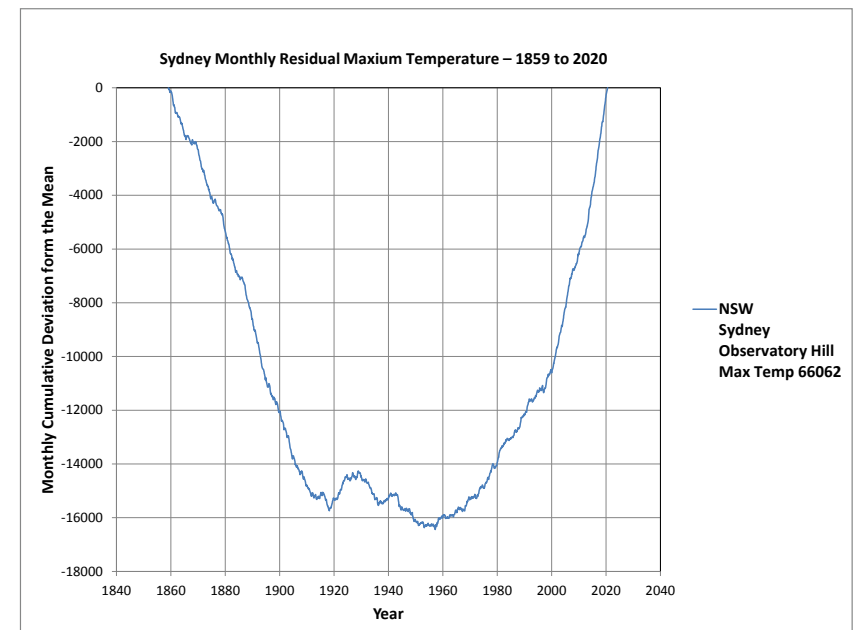
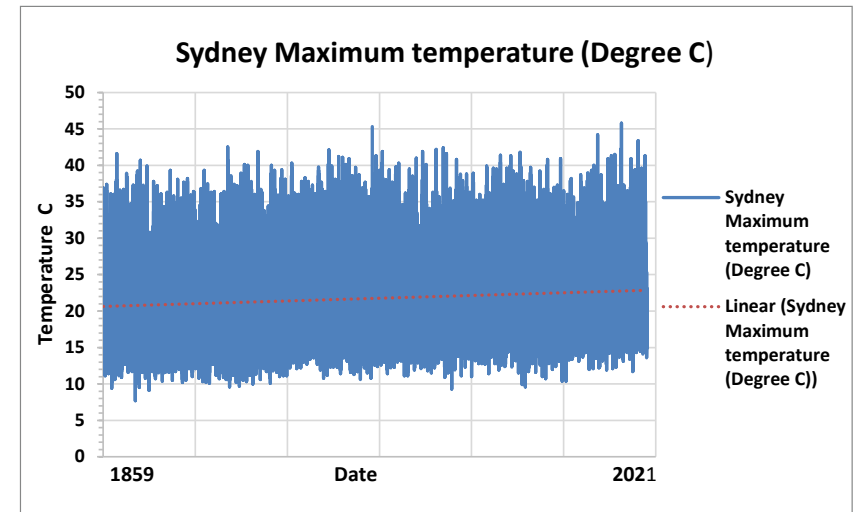
In conclusion it can be said that there are wetter periods and drier periods of rainfall and there is nothing average about the average.

As an endnote people often ask what about temperature. The daily maximum temperature at Sydney at Observatory Hill is plotted previous page top with a linear trendline.

The cumulative deviation from the monthly mean (residual) is plotted previous page below.

This demonstrates that over the years the monthly mean temperature is slowly rising. The logic behind is that from the years 1859 to about 1960 the average monthly temperature was less than the average and hence

a downward curve. From about 1960 the average monthly temperature was above the average and hence the curve is rising. There are some bumps along the way, but the general trend is there. This indicates a warming climate, as agreed by most the world's climate scientists.



Saying it with Flowers

John Aitken

John is past president of APS NSW and is co-editor of Australian Plants. Besides a love for Australian plants, he has a fascination with ephemera from WWI. All the postcards are from John's personal collection.

During WWI, over 330,000 Australians served overseas at Gallipoli, France, Belgium and the Middle East. Due to the tyranny of distance and the lack of personal contact by the electronic means we enjoy today, letters and postcards were the main methods of communication between those serving overseas and their loved ones and friends in Australia. A large number of the cards sent by soldiers and their families and friends featured floral tributes in the form of embroidered postcards, handkerchiefs, cushion covers and other souvenir items. Flowers have always been a special way in which we show others that we care for them. The relationship between people and flowers is very special. It has been said that *there is nothing that you can't say with flowers – when you send flowers, it says everything*.

Many of the cards sent from Australia to loved ones and friends serving overseas, featured Australian native flowers and leaves, especially gum leaves. My mother met my father in England during WW2. Dad was a bomber pilot in the RAAF and had been invalided to England.

He used to meet up with fellow Australians in a local pub. Mum fondly remembered that many of the letters the aircrew received from home contained gum leaves. The men would crush the leaves, and after smelling them would pass them around to their friends. The distinctive smell of the eucalyptus oil, which we all know so well, evoked memories of their families and friends and the country they hoped to safely return to.



WWI Australian made Christmas card, featuring a gum leaf designed for children to send to their fathers serving overseas.



Other cards featured Australian flora such as the card on the left, which shows a bouquet of Australian native plants, wattle, waratah and flannel flower surrounded by a wreath of laurel leaves on top of crossed rifles with a blue Australian ensign. Below is the following verse.

*Love and wishes I now send
To you, my dear, the absent friend,
Your safe return is my one care,
For which I oft times breathe a prayer.*

Greeting cards from Australia often contained pressed flowers which had been lovingly gathered by the sender and arranged onto blank pages. These cards would have had special significance for the soldiers receiving

them as they would have known that they had been lovingly made by those who meant so much to them.

An example of such card is shown below. It was sent by Leslie to her loved one serving in France in 1917.

The cover has the inscription 'With Heartiest Greetings from Australia', with a spray of Australian dried wildflowers, including wattle and ferns on an inside page.





A dried acacia (wattle) leaf with *Coo-ee 1917* written in gold paint on it with a red, white and blue ribbon tied to the stem (petiole). The leaf and the word 'Coo-ee' are iconic Australian symbols and would have evoked fond memories of home amidst the horrors the soldier was experiencing in the trenches of the Western Front.

For Australians serving overseas, embroidered silk postcards soon became one of the most popular ways for them to send their love back home. Originally hand-embroidered and then machine embroidered by women in France and Belgium, the postcards provided not only much



needed income for native civilians but also a beloved keepsake for troops and their families. Their beauty comes not just from the skill of the female embroiderers, but the love conveyed in the messages they bear, although the vast majority that survive today don't bear personal messages.

While flowers were selected for their beauty, some also had special meanings of a personal nature that were well known from the Victorian period. These could help express the feelings of those separated for long periods, without always needing to use words.

A French made silk Christmas card sent by Private Robert King to his wife, Harriett, eight days before he was killed by enemy artillery on 28 October 1917.

The following two French made silk postcards were sent by Private Walter Butler, 'B' Company, 33rd Battalion, A.I.F. to his wife Charlotte, and his five children. Sadly, Walter was killed in action during the Battle of Messines, which raged from 7-10 June 1917. He was buried in the Toronto Avenue Cemetery, Ploegsteert, Wallonie, Belgium, along with 77 of his comrades of the 33rd Battalion who also died during the battle. Three of Walter's nephews were also killed in France during WWI.



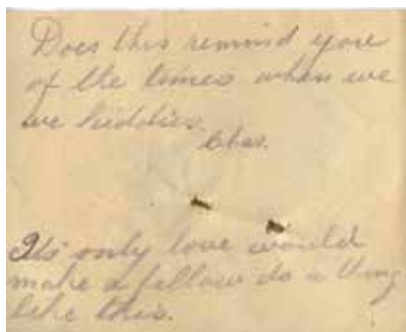
Many soldiers made their own cards using pressed flowers which they collected where they were stationed to send to their loved ones. The following two cards of pressed flowers and one of a pressed ivy leaf were sent by Private Charles (Chas) Poynton Laver, 11th Australian Field Ambulance, to his childhood sweetheart and wife Kitty. Charles returned safely to his wife following the end of the war.



Written on the back: *These flowers are growing just outside our tent.*



Flowers collected around Villers-Brettoneux, May 1918, when the A.I.F. was defending the village from the Germans



A beautiful Christmas and New Year card, sent in 1917 from France by Billie to Dot wishing her a Merry Christmas and a Happy New Year. It features the flowers and leaves of a red eucalypt and was designed for the Australian Engineers by Corporal Laurence Hotham Howie, 13th Australian Field Engineers Company whilst serving on the Western Front.



A card sent by Arthur Redman Hindley, a Gallipoli veteran, of 27th and 53rd Australian Infantry Battalions to his mother shortly before he died on 25 July from wounds received during the disastrous battle at Fromelles on 19 July 1916. Hindley most likely purchased this card in Egypt following the withdrawal of Australian troops from Gallipoli in late December 1915.

Prior to enlistment, Howie was the Chief Assistant at the Adelaide School of Arts where he supported the movement to Australianise design, using native floral motifs; his 1910 waratah vase, a *tour de force*, is in the Sydney Museum of Applied Arts and Sciences.

He continued painting and sketching at the front and was appointed an official war artist after hostilities ended. Howie worked with the AIF. War Records Section in London under the Australian born sculptor C. Webb Gilbert and in 1919 returned to France to make studies which were later used to construct dioramas at the Australian War Memorial, Canberra.

A personal addendum

Merle Thompson OAM, Co-editor

John has written of the depiction of plants in postcards from the wars. I have few memorabilia of the participation of members of my family in war but it is fascinating to realise how much plants feature in those few items which have come to me.

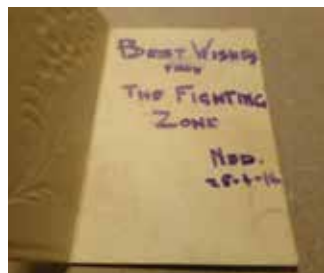
World War I

Among my father's keepsakes I found a small blue envelope. It was addressed to him, then aged 11, and posted from Glasgow on 9th May 1918 by his brother. I have no idea whether the small items assembled in it were all sent at once or to whom they were sent. I have no recollection of Dad ever showing me these items and he never discussed his brother's war experiences which included being a later reinforcement at Gallipoli and then the even worse horrors of the Western Front. The envelope must have been posted after he completed his tour of service or during leave. It was six months before armistice.

The contents were a French five francs bank note, two very small photographs, a small piece of ribbon and a small piece of fabric resembling a miniature Turkish carpet. From the perspective of plants, most significantly there were five pressed leaves, probably from northern France, and a very small card (c 1½" x 2") with an embossed picture.



The flowers resemble wattle but not the foliage. The wording in white embossed print says "My Darling I am always for you". Inside is printed with a purple pen "Best Wishes from the Fighting Zone Ned 25-4-16". How absolutely incredible that it was written on the first anniversary of the Gallipoli landing. And



how would he have acquired a card with English text when in the fighting zone in France?

World War II

My sister had a small blue card with writing on one part and, as with the leaves from the Western Front, pressed plants from a war zone. It was sent from Palestine by our uncle. In printing it said "Flowers from the Holy Land". The writing wished her "a full stocking for Christmas and all good marks for the coming year". She would have been about 8 at the time. Just before her death she asked me to give it to his son which I did and that meant a lot to him.

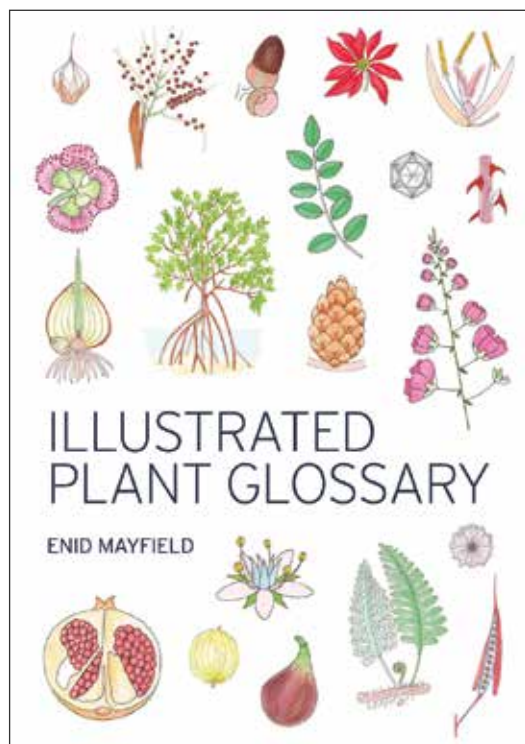


Two wars, two young men. The only connections between them are that they grew up in the same Sydney suburb, but 17 years apart in age; the young brother of one married the older sister of the other (my Dad and Mum) and the two sets of parents became friends. But both while embroiled in war included plants and depictions of plants in what they sent to their families.

Ned trained as an engineering draughtsman and lived to his 80s. Alan's health was affected by the tropical diseases contracted on Kokoda and died in his 50s.

Plants not only are important for life, they are important to us as people and in our connections with each other.

Illustrated Plant Glossary: Book Review



Have you tried to use a plant identification key or understand a plant description that uses unfamiliar plant terms such as spreading crisped hairs, pulvinus to 1mm long, pods pruinose or funicle filiform? (and yes, the description of *Acacia beadleana* in the *NSW Flora Online* **does** use these particular plant terms and they are all explained and illustrated in this glossary).

Have you ever looked up a plant term and found that you still don't understand its meaning after reading the explanation? If so, then this glossary is for you!



This glossary explains more than 4,000 plant terms in words. It is the diagrammatic drawings accompanying most of these explanations, however, that allow you to fully understand each plant term. The author uses the drawings to emphasise the key features of the plant terms and deliberately uses familiar examples in her drawings, often of easily recognisable plants including many native Australian species.

The author has spent seven years perfecting this illustrated glossary of plant terms. She has previously contributed artwork to the *Flora of Victoria* and published two illustrated books on the flora of the Otway Plain and Ranges.



Acacia beadleana at Gibraltar Range NP NSW.

The topics covered in this glossary include anatomy, angiosperms, bryophytes, chemistry, cytology, family specific terms, ferns and fern allies, flowers, fruit, genetics, gymnosperms, habit and growth, habitat and ecology, indumentum, inflorescence, leaves, reproduction, roots, seeds, systematics and more. Terms are arranged alphabetically, with cross-referencing enhancing the explanations.

The author wanted this work to be exceptional, excellent and the very best available. Moreover, she wanted this glossary to be useful for anyone who works in, or researches, or is passionate about plants, no matter their level of knowledge or where they are in the world. To my mind, she has succeeded admirably in all of these aims.

I am happy to recommend this glossary to all ANPSA members.

This book is available from CSIRO Publishing (332pp)
RRP \$69.99.

Reviewed by Dr Sue Bowen

Dr Sue Bowen is a botanist and was one of the late Emeritus Professor Noel Beadle's Honours students at UNE, Armidale, NSW. She is president of the North Shore Group of APS-NSW.

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ANPSA Biennial Conference, 10 – 16 September 2022



APS NSW is excited to be hosting the next ANPSA Biennial Conference in Kiama in September 2022. We aim to bring you a wide range of interesting speakers and enjoyable activities. We will be operating at the highest Covid standards to keep ourselves safe and healthy.

Theme: Australian flora – past present future. Explore the flora of 40,000 years ago, understand opportunities and threats we face now and consider how the future might unfold, along with our role in that.

Location: Kiama, on NSW's magnificent South Coast, with the conference to be held at the Kiama Pavilion.

Excursions: Robertson Rainforest, Fitzroy Falls, Wollongong Botanic Gardens, Minnamurra Rainforest, Royal National Park, Kamay Botany Bay National Park, Bulli Grevillea Park and native plant reserves in Southern Sydney. A complimentary tour of the Kiama region on Saturday 10 Sept, with a market fair and plant sale on the Sunday.

Pre and post conference tours: Lord Howe Island, Warrumbungles and the Pilliga, Blue Mountains, Sydney and the South Coast.

For further information, and to register interest in the conference or tours, visit the APS NSW website: (www.austplants.com.au/ANPSA-Biennial-Conference-2022) or send us an email: office@austplants.com.au

