



Autumn 2019
Vol 30 No 238



\$6.50

Australian Plants





Contents

Editorial	Merle Thompson OAM	3
Update on the <i>Terra Australis Garden</i>	Ben and Ros Walcott	4
The role of Aboriginal people in the dispersal of plants	Merle Thompson	7
From Songlines to genomes: Prehistoric assisted migration of a rain forest tree by Australian Aboriginal people	Dr Maurizio Rossetto et al	8
Wild horses & Kosciuszko's Workaholic Plants	Linda Groom	17
Travelling Stock Routes: Not just for livestock	David Carr	23
Native Orchids of the Blue Mountains	Sabine Hanisch and Ben Jasiak	29
The AusZen portable garden	Olga Blacha	36
In a Different Light – Australian Native Flower Photographs in Ultraviolet Light	David Oldfield	42

Cover photograph: Alpine herbfield with a mosaic of alpine grassland and heath in the harsh but spectacular environment of North Ramshead, Kosciusko National Park. Tony Brown

Australian Plants articles

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

Editors: John Aitken and Merle Thompson OAM

Layout: Lachlan McLaine

Contributions and offers to produce an issue are welcome. Please contact:

Editors, 'Australian Plants'

PO Box 263, Cremorne Junction NSW 2090

E-mail office@austrplants.com.au

All published materials are copyright, as directed, by the authors and photographers. Permission to reprint material must be obtained from the copyright holder.

Opinions expressed in this publication are those of the authors and may NOT represent official policy of the Australian Plants Society NSW Ltd

Australian Plants No. 238 Issue of Volume 30, which comprises issues 238–245.

Published quarterly and available nationally in 3000 copies by the Australian Plants Society NSW Ltd

© Australian Plants Society NSW Ltd 2019 ABN 87002680408 ISSN 0005-0008

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

Editorial

Merle Thompson, Co-editor, *Australian Plants*

Some years ago the Australian Plants Society NSW had a slogan; **Appreciating, Growing, Conserving, Promoting**. Native Plants Queensland has as its motto **Cultivation, Conservation, Education**. The range of articles in this issue brought these ideas to mind.

We have included an article by David Oldfield about ultraviolet photography which alerts us to the way some insects appreciate our flowers which is different from how we see them.

From a conservation perspective the articles included have a New South Wales focus. While specific concerns may be different in other areas, the overall concepts of habitat loss and localised threats apply across the continent. Linda Groom writes about the beauty and the flora of the Kosciusko area and of the threats to that area, including those caused by horses. David Carr explains the role Travelling Stock Routes (TSRs) have played in the preservation of species and of the potential loss of some species from impacts to TSRs.

Sabine Hanisch and Ben Jasiak help us to appreciate the beauty and diversity of ground orchids within the Blue Mountains area of NSW but in doing so also stress the threat to their continued existence, particularly because of habitat loss.

We have three articles of a very different nature relating to cultivation or translocation. Ben and Ros Walcott update us on the development and the official opening of the *Terra Australis Garden* in the National Arboretum in Canberra to which the member organisations within the Australian Native Plants Society Australia contributed funds. It aims to encourage visitors to appreciate and learn about our native plants and to understand that they can grow them in their own gardens.

Olga Blacha was one of five designers who were selected to create their design in a public garden as part of the Melbourne International Flower and Garden Show. This was a great honour even if she didn't win. Her design applied Japanese Zen principles to a garden of entirely native plants. And yes, the Wollemi pine featured in it was mine.

But did you ever think of plants being introduced to an area as a feature of traditional Aboriginal life pre European settlement? In a major article reproduced by courtesy of the lead author, Dr Maurizio Rossetto, your eyes will be opened to new concepts and learn that Aboriginal people did translocate species, especially edible species.





Update on the Terra Australis Garden

Ben and Ros Walcott

Ben is a former President of ANPSA and he and Ros are active members of ANPS Canberra. They worked with Lawrie Smith, Angus Stewart and others to source the plants for this garden

On November 25 2018, the *Terra Australis Garden* at the National Arboretum in Canberra was officially opened by Tara Cheyne MLA and Angus Stewart.



Above: Ben Walcott, Scott Saddler (Executive Manager Arboretum), Lawrie Smith, Ros Walcott, Tara Cheyne MLA, and Angus Stewart. (photo by the National Arboretum)



Left: The Terra Australis Garden (right end of gallery of gardens foreground) with a view towards the Margaret Whitlam Pavilion (drone photo provided by National Arboretum).

For background on the intent and design of this garden, we refer the reader to *Australian Plants* Summer 2017/18 Vol 29 No 233 page 179 where there is an article describing the plan and the site.

The garden was under construction for about a month to create the topography and rockwork which is fundamental to this garden. As it is intended to demonstrate the geography of Australia in a small space, the Great Dividing Range, the basalt columns of the north, sandstone escarpments of the Sydney region and the granite boulders of the southeast are all installed.

David Elvin, who constructed the rockwork, created a small stream that flows down the sandstone escarpment to a pool at the edge of the garden. The garden has drip irrigation and predominantly inorganic pebble mulches. The construction took longer than expected and the majority of the planting had to be completed during a wintry gale on Thursday and Friday before the opening on Sunday. Many of the plants were generously donated by nurseries including the two large showcase specimens, one a *Macrozamia moorei* and the other a *Xanthorrhoea glauca* from Station Creek Tree Farm. These were planted earlier before the paths were completed as planting required a backhoe to lift the plants into place.

As part of the initial planting, we needed trees established to provide cover for the very exposed windy site. We planted an *Acacia fimbriata*,



View north showing on the right the granite of the southeast and on the left the flat plains of the southwest. *Dicksonia antarctica* are on the right while *Anigozanthos flavidus* are on the left.





View to the south with the stream and pool in the sandstone escarpment on the left and the basalt columns of the north represented on the right. The large *Xanthorrhoea glauca* and *Macrozamia moorei* feature here

Brachychiton populneus, three *Eleaeocarpus reticulatus* pink, a large specimen of *Eucalyptus leucoxylon rosea*, a *Eucalyptus pauciflora* ssp. *niphophila*, *Eucalyptus neglecta* and a *Eucalyptus puerulenta* 'Baby Blue'.

Most of the plants we have used have been small and it will take time for the plant material to significantly impact the visual aspect of the garden. The garden is planted with currently available cultivars such as *Adenanthos sericeus* 'Platinum', *Anigozanthos flavidus* 'Landscape Orange' and *Banksia spinulosa* 'Cherry Candles'. Species have also been used such as *Pimelea nivea*, an endemic to Tasmania and *Senna barronfieldii*, a widespread plant of the east coast. *Eremophila longifolia*, *E.* 'Beryl's Blue' and *E. glabra* 'Hello Cocky' are plants representative of more arid regions of the centre and west.



Already the garden is used by birds and *Scaevola* is flowering



The role of Aboriginal people in the dispersal of plants

Merle Thompson OAM, editor

For those whose interest is where plants grow and why, it is intriguing to consider the distribution of a species and wonder why it occurs in areas which do not necessarily appear to be consistent in geographical, environmental or geological terms. Thus it was with great interest that I read an article outlining the conclusions of a study of *Castanoperмум australe*, black bean, and the role of Aboriginal people in the dispersal of this species.

The lead author of the report, Dr Maurizio Rossetto, of the National Herbarium, Royal Botanic Gardens, Sydney, has permitted me to prepare an edited version of the report for inclusion in *Australian Plants*.

The introduction, some of the body of the report and conclusion are taken directly from the report. The research information is summarised for brevity and simplicity. The detailed work and references can be read in the scientific paper.

Another species which interests me in terms of its distribution is *Araucaria bidwillii*, the Bunya Bunya tree. The major occurrence is in South Eastern Queensland, where it occurs mainly between Nambour and Gympie and west to the Bunya Mountains, with a small occurrence in north Queensland on Mt. Lewis and at Cunnamullen Falls over 1600 km distant.

It was known as a food source for Aboriginal people with major gatherings occurring when the seeds were ripe. Some travelled very long distances to take part. To quote the National Arboretum website *It has been a sacred tree for indigenous Australians for a long time and an important source of food, timber and fibre. Indigenous Australians eat the nut of the bunya tree both raw and cooked. Traditionally, the nuts were ground and made into a paste, which was eaten directly or cooked in hot coals to make bread.*

Dr Rossetto has indicated that funding has been obtained for this species to be researched along the lines of that concerning *Castanoperмум australe*.



Bunya cones and nuts: Photo by Jan Sked.





From Songlines to genomes: Prehistoric assisted migration of a rain forest tree by Australian Aboriginal people

Rossetto M, Ens EJ, Honingh T, Wilson PD, Yap JYS, Costello O, Round ER, Bowern G (2017) From Songlines to genomes: prehistoric assisted migration of a rainforest tree by Australian Aboriginal people. PLOS ONE 12(11):e0186663. DOI: 10.1371/journal.pone.0186666

Introduction

Studies of prehistoric human influences on the Australian vegetation have primarily centered around broad-scale change associated with the practice and cessation of Aboriginal burning and the hypothesized cumulative effects of human-induced decline of megafauna. Within a broader context, the role of humans has been considered as an integral factor in the geographical spread and evolution of crops and agriculture. Evidence from Amazonian forests suggests that pre-Columbian dispersal of domesticated plants had an unforeseen role on how species are distributed in present-day rainforest assemblages. In the Pacific region, DNA-based evolutionary studies have documented the link between long-distance seed dispersal by Indigenous people and the current distribution of native crops. By integrating genetics, linguistics, and archaeobotany researchers have been able to investigate the prehistoric human settlement of the Pacific through the evolutionary history of traditional crop domestication. Evidence regarding dispersal of non-cultivated plants by prehistoric Indigenous peoples however, remains limited to ecological and archaeological circumstantial evidence.

The advent of new technological advances and the integration of multi-disciplinary data sources have the potential to innovate in the field. In Australia, the influence of assisted migration or human dispersal has been included in lists of possible explanations for the landscape genetic patterns detected for *Livistona mariae* in central Australia and *Adansonia gregorii* in the Kimberley region. In the absence of direct archaeological evidence, the corroboration of human-mediated dispersal hypotheses and the exclusion of alternative mechanisms, requires for further ethnographic and cultural research to be directly linked to interpretations derived from genetic patterns. For instance, a follow-up study on *A. gregorii* identified overlap between population-level genetic connectivity and regional linguistic variation and traditional local beliefs of Indigenous dispersal were reported within historical accounts related to the current distribution of *L. mariae*. However, these interpretative frameworks lack

corroboration from other sources and ethnographic information directly derived from Indigenous collaborations. Our study integrates from the onset, anthropological, molecular and ecological research to test if Aboriginal-mediated dispersal can explain the distribution of a valuable but non-cultivated resource tree, *Castanospermum australe* A. Cunn. ex Mudie (black bean; Fabaceae).

Castanospermum australe usually relies on hydrochory (water-dispersal) rather than ingestion-dependent mechanisms for range expansion. It has large and buoyant seedpods, exposure to saltwater does not hinder the germination of its seed and neither fruits nor the highly toxic seeds enclose disperser rewards. The distribution of this tree along riparian



Castanospermum australe at John Oxley Reserve, Murrumba Downs Photo: Lawrie Smith





habitats and close to the coast reflects its reliance on water dispersal. However, multiple populations are located among rainforest vegetation that is inland from the coast and at considerable elevation, implying dispersal through alternative means. Traditionally, Australian Aboriginal people used the highly nutritious seeds of *C. australe* as a staple food source after extensive treatment to neutralise the toxins. Once ripe (May-July) the seeds were often stored underground for several months.

Additionally, once prepared the ground *C. australe* “meal” could be stored for later use. Although archaeological studies identified strong links between the application of seed detoxifying techniques and the more intensive occupation of rainforest habitats of northern Queensland between 2,500 and 1,000 years ago, dispersal by Aboriginal people has not been previously investigated. We use an integrative exclusion-based framework to show that prehistoric Aboriginal-mediated dispersal explains the current distribution of *C. australe* within northern New South Wales (NNSW).

We focused our attention on this geographically well-defined area because of the paucity of local disperser fauna and absence of megafauna, our understanding of local rainforest dynamic and biogeographic processes, and because Aboriginal dispersal was proposed as a speculative explanation for the NNSW inland distribution



Castanospermum australe
foliage with unripe beans
John Oxley Reserve,
Murrumbidgee Downs
Photo: Lawrie Smith

of the species. To determine if deliberate dispersal by local Aboriginal people influenced the contemporary distribution patterns of *C. australe*, we aim to:

- 1) reveal prehistoric, historic, linguistic and ethnographic cultural evidence of use and deliberate dispersal;
- 2) analyse chloroplast and nuclear (ribosomal) genomic data to detect the genetic signature of recent, rapid expansion within NNSW;
- 3) exclude alternative explanatory scenarios through the integration of complementary sources of evidence, and by comparing the NNSW findings to a representative sample from the Australian Wet Tropics (AWT), where ecological and prehistoric cultural circumstances differ.



M Rossetto
learning black
bean preparation
for consumption
at an Indigenous
workshop.
(Photo: Emilie Ens)

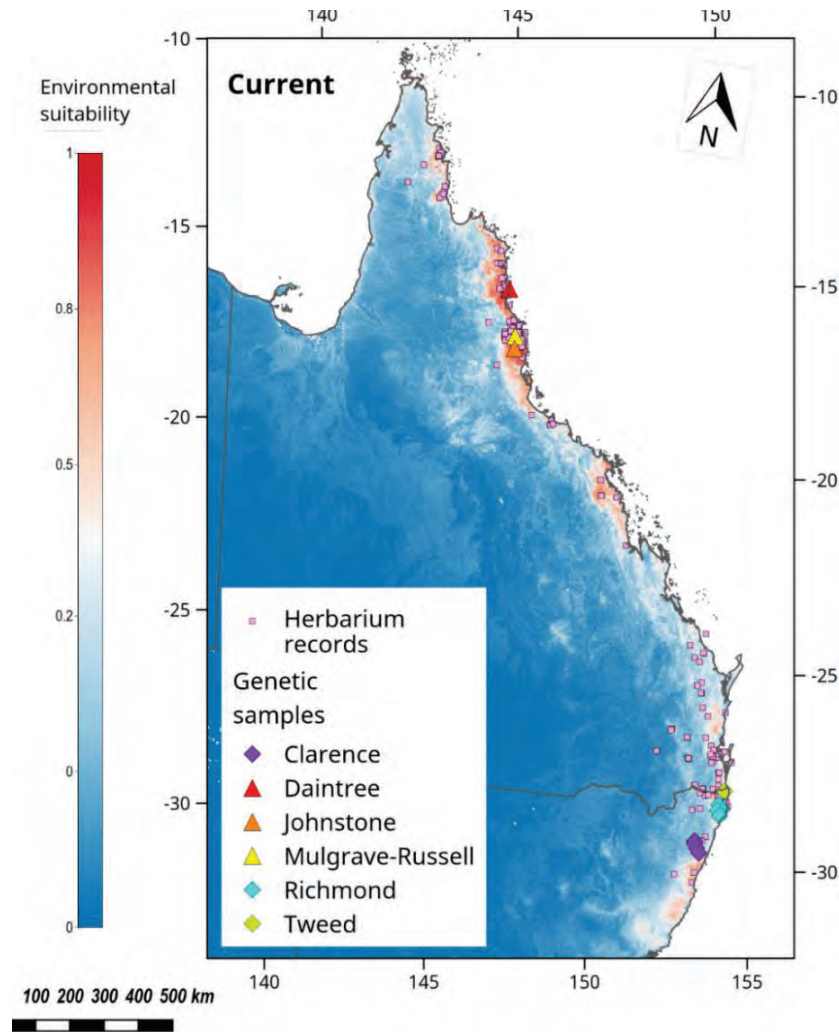




Materials & methods

Study species and sampling strategy

Castanospermum australe (black bean) is distributed along coastal eastern Australia, from Cape York to subtropical northern New South Wales. It is a large riparian tree (to 40 m) well represented in the understorey of old-growth forest that can also be found in tree-fall gaps and disturbed habitats. Seedling physiology suggests that this species can act as an early successional, as well as a mature-phase tree.



C. australe distribution map, showing distribution (herbarium records), sampled sites, and environmental suitability across its continental distribution. (image: PD Wilson, M Rossetto).

Black bean produces cauliflorous racemes 5–15 cm long, with orange to red flowers 30–40 mm long that attract both vertebrate and insect pollinators.

Seedpods, up to 20 cm long, contain three to five 3 cm wide seeds, and are buoyant and salt tolerant. The seed comprises large cotyledons with a non-photosynthetic role. After germination, long-lived seedling banks can be established.

The capacity of seeds to disperse across oceans is substantiated by the species' distribution, which extends across a considerable area of the south-western Pacific, from Eastern Australia to New Caledonia and Vanuatu, and by close phylogenetic and phytochemical relationship

between the monotypic *Castanospermum* and the South American rainforest genus *Alexa* (nine species).

The seeds of *C. australe* contain high concentrations of alkaloids and saponins that can deter seed predation. These compounds have received significant



C. australe cauliflorous flowers (left) and seedpod (below) (photos: M. Rossetto)





scientific attention in connection with their antiviral properties, as well as in relation to their toxicity.

Our sampling strategy within the context of local Aboriginal dispersal focused on sites representing the species' southern distributional margin in northern New South Wales (NNSW, Australia) and was not intended to exhaustively represent all populations to explore continent-wide connectivity, or broader biogeographic questions. The objective was to ensure sufficient geographic representation across the main NNSW catchment areas in order to investigate genomic homogeneity vs. genomic heterogeneity hypotheses. Highly homogeneous maternally-inherited plastid genomes across the study area, would suggest rapid and recent dispersal from a small founder event, while plastid heterogeneity would suggest lengthier local persistence and / or multiple founder events. The focus on NNSW was influenced by the current paucity of local disperser fauna and absence of megafauna, and by our understanding of local rainforest dynamics and the impact of environmental and biogeographic processes on species distribution and community assembly.

Representative sites from the Australian Wet Tropics (AWT, northern Queensland) were also included as a comparative northern, latitudinally disjunct sample from the rainforest region with the highest flora and fauna diversity in Australia (including the remaining rainforest megafauna representative, the Cassowary: *Casuarius casuarius johsonii*). This northern area also has an extended archaeological record of the use of *C.australe*'s seeds. Eight mature individuals were sampled from each site (for a total of 96 individuals across 12 sites), care was taken to avoid sites impacted by modern human activity and sampling was restricted to reserves or conservation areas

Anthropological data collection

A desktop literature search was conducted during 2015 and 2016 to compile historic documentation of early colonial European observations of Aboriginal use and movement of *C. australe* as well as any linguistic or cultural information (e.g., legends, Songlines). Sources searched included JSTOR, Google Scholar, Google, and the Australian Institute of Aboriginal and Torres Strait Islander studies MURA electronic databases using the scientific and common names (black bean, Moreton Bay chestnut, bean tree) and NNSW Aboriginal tribal names (Bundjalung, Githabul, Gidabul, Bandjalang, Widjabul and spelling variations of these names). We also investigated Aboriginal language dictionaries and any other historical documentation from NNSW including the

private and extensive library of Tweed Valley Aboriginal history expert Ian Fox. In 2016, five Aboriginal knowledge custodians from NNSW were interviewed about their knowledge of *C. australe*. Semi-structured interviews were facilitated by Oliver Costello and Emilie Ens.

Although post-colonial non-Aboriginal terminology of Aboriginal knowledge, songs and dance are often described as "Dreaming" stories or legends, these forms of expression often contain knowledge that is founded on past observations, actions and lessons that have been encoded over millennia in orally transferrable and memorable forms. They should not be discounted as myths or fairy-tales. Western scientific thought has told us that the truth must be separated from religious or spiritual interpretations, which has resulted in modern misunderstanding and misinterpretation of many traditional or Indigenous knowledge systems across the world.

Chloroplast genome and ribosomal DNA sequencing

This was a major component of the scientific work but is more technical than appropriate for a general readership.

Results

Anthropological evidence of use and dispersal of black bean seeds

The findings include:

- Several sources including Songlines (Dreaming tracks) describe the deliberate movement of this species by Aboriginal people.
- Numerous historical records from the early Australian colonial period describing detoxification and food preparation methods of *C.australe* seed by NNSW Aboriginal people.
- Numerous ethnographic records also describe other uses of *C.australe* by Aboriginal people from the AWT including: using bark fibre for fish and animal traps, nets and baskets; wood for spear throwers; seed pods as toy boats; and as a seasonal cue for jungle fowl hunting.
- The usefulness of black bean as a food resource was corroborated through ethnographic interviews with five NNSW Aboriginal knowledge custodians.
- The Nguthungulli Songline tells that Nguthungulli (an ancestral spirit likely to represent a real person) carried and left "bean tree" seeds as he journeyed inland from the east coast to the western Ranges, a route which accords with the sampling sites for the



genomic analyses and represents the NSW distribution of the species.

- The genomic studies revealed that all sampled NSW populations are derived from recent dispersal events sourced from one or a small number of very closely related maternal lineages and other causes of rapid expansion did not seem plausible.

Conclusions

The new, combined evidence presented supports the deliberate dispersal of *C. australe* by prehistoric Aboriginal people as the most parsimonious interpretation for the species' distribution in NSW. Previous research suggested that in the AWT, the expansion of Australia's rainforest-dwelling people during the late Holocene (between 2,500 and 1,000 years ago) could have been facilitated by the development of detoxifying techniques for rainforest nuts such as *C. australe*, which became critical technologies aiding survival in areas where these resources were available. We demonstrated that the inverse is also true: local Aboriginal communities developed food preparation technologies that had a deliberate impact on the distribution of culturally important rainforest species. In Australia, with the exception of obvious fire-related impacts, Aboriginal influence on the distribution and assembly of species was largely ignored by early European colonists. Our and similar studies can help expand cultural heritage management practices by promoting the need to maintain living biotic heritage (in this case *C. australe* groves) in collaboration with Aboriginal knowledge custodians.

Evidence of prehistoric Australian Aboriginal people dispersing plant propagules for their direct need and benefit also significantly challenges assumptions of "natural" plant distributions, requiring reassessment of distributional interpretations that omit the possible impact of prehistoric human intervention. Current debates on the role of human-assisted migration and other active management options could also benefit from the acceptance, from conservation practitioners and the general public, that Aboriginal people deliberately dispersed species in the past. This is particularly relevant since current measures of restoration success are often based on historical (pre-European) reference systems. Now that the role of Aboriginal dispersal has been established regionally for *C. australe*, future studies can explore broader biogeographic questions including possible dispersal routes along eastern Australia and across the Pacific Islands. A scenario of long-distance dispersal by ancestors from the north was independently put forward by Aboriginal knowledge custodian Uncle Ron Heron.

Wild horses and Kosciuszko's workaholic plants

Linda Groom

In Linda Groom's most recent volunteer position as Convenor of Save Kosci Inc, she organised the Save Kosci protest walk from Sydney to the summit of Kosciuszko. She is also a past president of the Canberra Bushwalking Club.



Figure 1: View from Main Range towards the Sentinel in January.

'Isn't that pretty' is a common response from visitors to Kosciuszko National Park in late spring. They arrive at the top of the chairlift from Thredbo in droves, start their pilgrimage to Australia's highest peak, and gasp at the displays of wildflowers. Photographers are delighted to find foregrounds full of white daisies (mainly *Celmisia* and *Leucochrysum* species), yellow billy buttons (*Craspedia* species) and delicate mauve eyebrights (*Euphrasia collina*) with backgrounds of blue ridges fading into Victoria. If they stray off the Kosciuszko track to investigate a snow-drift, they will usually find a nearby *Ranunculus anemoneus* begging for a close-up image.



After 40 years of bushwalking in Kosciuszko National Park I have come to see the alpine flora as more than just pretty. This has been informed by untutored observation – I cannot claim any botanical qualifications – and through my involvement in the Save Kosci campaign which has given me the opportunity to absorb information from botanical experts. I now see alpine plants as important as well as beautiful. Important because they

Ranunculus anemoneus





have work to do. And important because they are an index of damage caused by feral animals.

On my first visit to Kosciuszko National Park, as a young bushwalker freshly arrived from Queensland, I was amazed by the creeks. Some of them raced down hillsides – apparently straight – but with no sign of erosion. I say ‘apparently’ because they were so buried in vegetation, it was hard to see their precise course. Then they often arrived in a high but flat valley, where they adopted a meandering course through swampy areas that I have since learnt to call fens. I had, till then, associated meanders only with a river’s last few coastal kilometres. I was also surprised to find myself walking through squelchy country on steep slopes. Swampy land should be flat, I thought. What was a swamp doing on a slope? Could this strange tangle of unfamiliar, soggy plants be part of the answer? That was the beginning of a realization that alpine plants are also hard-working engineers.

Human engineers, in the discipline of hydrology, are trained to manage river flows. Some are employed in river restoration. They take a stream or river that has become unnaturally straightened, and put meanders back in.¹ One of the useful effects of meanders is flood mitigation. Hydrological engineers also install baffles in streams and rivers. Baffles help prevent erosion and trap sediment.²



Figure 2: An example of human-engineered stream flow – ramp with baffles (UK)



Figure 3: Plants working as natural baffles, near Mt Anton, KNP



Figure 4: Soft-leaved plants working as natural baffles, near Mt Anton, KNP

In Australia’s alpine areas, plants play a pivotal role in preventing erosion, trapping sediment and mitigating floods. The two previous images were taken near Mt Anton in a part of Kosciuszko National Park where there are as yet few hard-hooved feral animals such as horses. The images show the variety of plants that function as natural baffles.

In the image above, you can see the way silt is deposited near the plants, allowing the flowing water to remain clear. You can also see that



Figure 5: Undamaged stream banks, Jagungal Wilderness Area



Figure 6: Currango Creek, KNP, formerly fringed by knee-high vegetation, showing effects of wild horse presence over many years.

some of the plants that act as baffles are quite soft; their vulnerability to trampling by hooved animals is clear.

The bends in meandering creeks in Kosciuszko National park are usually protected by a fringe of complex vegetation. Protection of the outside edge of a meander is particularly important, as that is where stream velocity is highest, with consequent higher risk of erosion. Figure 5 shows a slow-flowing section of a stream in the Jagungal Wilderness Area, where wild horses are only just starting to make their appearance. Here, vegetation grows right to the water's edge. Figure 6 shows Currango Creek, an area occupied by horses for some decades. Fringing plants are almost non-existent. Streambank collapse and consequent siltation is imminent.

In the undisturbed parts of the catchments of the Murray and the Snowy Rivers, hard-working plants are pulling their weight as natural baffles and as stream bank supports. They also have a vital role in water retention. Probably the most well-known water-retaining plant is the hummock moss *Sphagnum cristatum*. Sphagnum bogs cover 3,656 ha of Kosciuszko National Park.³ Sphagnum's mechanism for absorbing water relies on small perforations in its leaves. It can retain almost 20 times its own weight in water.⁴ It often holds water above the level of the water table – which accounts for the 'swamps on slopes' that so puzzled me when I first started walking in Kosciuszko National Park.

There is almost no end to the good work that sphagnum bogs do. Sphagnum soaks up water during heavy rain and later releases it – the advantages of this for plants and animals both in the bog and downstream of it are obvious. It provides a home for the critically-

endangered corroboree frog. The moist peat that accumulates under sphagnum bogs preserves plant roots after a bushfire; the bogs are often the scene of the earliest re-sprouting after fire, providing food for native animals.⁵ And the bogs and underlying peatlands are excellent carbon sinks.⁶ Researchers have calculated the area of the larger sphagnum bogs of the Kosciuszko National Park at around 3,700 hectares.⁷ They have also calculated that the sphagnum bogs of the Snowy Mountains store over 10,000 kilotonnes of water.⁸

At the latitude of Kosciuszko National Park, sphagnum requires 30% shade.⁹ Plants such as Candle heath (*Richea continentis*), sedges, grasses and daisies¹⁰ protrude through the sphagnum, giving it the necessary shade and receiving in return a reliable water supply. The often vivid yellow-green of the sphagnum with its garden of helpful plants is a wonder to behold. Sphagnum, however, is easily crushed and broken up by trampling and wallowing by horses, causing channels to form which carry water rapidly out of the bog.¹¹ Researchers have identified trampling as the chief threatening process for sphagnum bogs and fens in the Australian Alps.¹² A single horse track through a sphagnum bog can drain it, having much the same drying effect as a channel deliberately cut by humans.

As well as managing Kosciuszko's water flow, plants do other engineering work. In winter, they have a structural function – they hold the snow pack off the ground. In this sub-nivean space, small animals such as the broad toothed mouse can move around, protected from the elements and predators. Horses eat grasses and sedges down to the ground, preventing the sub-nivean space from forming.

Since I retired from my own version of being a workaholic – discovering in the process how much paid work had interfered with bushwalking – I have become increasingly aware of the environmental damage caused by feral animals, particularly horses, in the Kosciuszko region. I organised a protest walk from Sydney to Kosciuszko, which ended on 8th December, and since then have been supporting the Reclaim Kosci campaign (reclaimkosci.org.au). This has involved me in thousands of conversations with people about the feral horse issue. In assembling arguments to convince the general public of the need for stronger government action to reduce the damage, it has been easy to gather sympathy for the plight of the animals whose survival is threatened by wild horses, such as the tiny, brilliantly-coloured corroboree frog, and the cute and furry broad-toothed mouse. When I get a chance, I move the conversation on to the horse-threatened plants. There is considerable interest and concern in the fate of the vulnerable orchids – Keltons Leek orchid *Prasophyllum keltonii*,



the Kiandra Leek orchid *Prasophyllum retroflexum* and the Alpine Striped Sun Orchid *Thelymitra alpicola*. If the listener has plenty of time, we might get on to my favourite vulnerable species, the Leafy Anchor Plant *Discaria nitida*, with its intriguing square flowers, shaped like tiny pieces of origami. It is rare, however, to have the time to explain the way in which Kosciuszko National Park is such an intricate water management system, and the crucial role that the hard-working plants play in that system. I don't think it is an exaggeration to say that the roof of Australia is held together by plants, and they deserve all the protection they can get.

- 1 In-river flood management in Appropedia, www.appropedia.org/In-river_flood_management
- 2 Using Baffles to Improve Sediment Basins in NC State Extension Pubs, content.ces.ncsu.edu/using-baffles-to-improve-sediment-basins
- 3 Geoffrey Hope. Peat-forming bogs and fens of the Snowy Mountains of NSW. Office of Environment and Heritage, 2012. Page [i], Summary.
- 4 Sharon Brown. Sphagnum cristatum / Australian National Herbarium, www.anbg.gov.au/gnp/interns-2002/sphagnum-cristatum.html
- 5 Geoffrey Hope. Op cit, Page 1, Introduction.
- 6 Ibid, Pages 43-49.
- 7 Ibid, Page [i] Summary
- 8 Ibid Page 49.
- 9 Prof Geoff Hope. Personal communication during field trip 2 Feb 2019.
- 10 Sphagnum and water/ Australian National Herbarium, www.anbg.gov.au/cryptogams/underworld/panel-10/index.html
- 11 Australia. Department of the Environment. National Recovery Plan for the Alpine Sphagnum Bogs and Associated Fens. 2015. Page 17.
- 12 Geoffrey Hope. Op cit, Page 60.

Photos by the author unless otherwise indicated



Figure 7: *Discaria nitida*, one of 10 plant species listed as threatened by wild horses in KNP.

Travelling Stock Routes: Not just for livestock

David Carr

David Carr is a botanist and ecologist running his ecological consultancy business 'Stringybark Ecological' from Armidale in northern NSW. He works on a diverse range of projects from ecological surveys to hunting for rare plants to tracking koalas. With others he has been advocating for TSRs as significant conservation assets for many years. David has written several plant identification books for the Northern Tablelands and North West Slopes and Plains of NSW.

As you drive through regional New South Wales chances are that the road you are on is within a Travelling Stock Route or TSR. These linear corridors of Crown Land were established in the nineteenth century so livestock could be moved from property to property or from property to saleyard or railway siding. In the days before truck transport, graziers would employ drovers to move large mobs of sheep or cattle over large distances, stopping each night in larger Reserves where rivers, dams or bores provided water for the stock.

When not being used by travelling stock, the TSR network was usually left ungrazed, except in times of drought. When drought struck, as it does on a regular basis, the TSRs provided an emergency stock food source, with animals turned into 'the long paddock' to follow the feed where they could.

The formal gazettement of TSRs usually came after regular use of an overland route by graziers, bullock teams or travellers. Prior to European settlers using these routes, they had been used for thousands of years by Aboriginal people for trade or seasonal migration. Many stock routes follow natural paths such as ridgelines or rivers and would have been the obvious route for anyone travelling through the landscape.

While TSRs are Crown Lands, they are primarily managed by a specific agency. For many years this was the Pastures Protection Boards and later, the Rural Lands Protection Boards. These statutory bodies were governed at a local scale by elected boards of local graziers. Rangers employed by the boards would manage the network of TSRs; collecting fees for stock movements (per head per day), building and maintaining water points and fences, and managing weeds. Recently, the management of TSRs has been handed to a government agency, Local Land Services (LLS), which operates in 11 regions throughout NSW.

While TSRs have always been important as drought reserves, their use for the movement of stock has declined sharply over the last century.



Firstly, trucks carried animals to railway sidings where they would be shipped by rail to abattoirs such as Homebush in Sydney. Nowadays, most animals are moved entirely by truck, whether to abattoirs, saleyards or other properties. As a result, many of the routes fell into disuse. Some were sold off to adjoining landholders, while others were just quietly assimilated by taking down the fence.

Today, NSW still has over 500,000 ha of TSRs managed by LLS (see www.lls.nsw.gov.au/livestock/stock-routes).



Picture 1: Cattle grazing on a TSR near Casino, NSW.

At this point you may be wondering if you are reading 'Australian Plants' or if you have accidentally picked up the 'Farmers and Graziers Gazette'! What do TSRs have to do with native plants? Well, if you were to pull up on a regional road or highway in NSW and hop out of the car for a close look at a TSR, you might see why they are important for native plants. In comparison to the adjoining agricultural land, you are much more likely to see a greater diversity of native plants on the TSR.

Species diversity and abundance are good indicators of the state of native plants in the wild. TSRs usually have a higher species diversity than the adjoining farming land. Some species will be present on both land types but in very low abundance on the grazing land. This pattern

Subscriptions to *Australian Plants*

Australian Plants may be received by membership or subscription.

Membership: Contact the Secretary of the following Societies: Canberra, New South Wales, South Australia, Tasmania, Western Australia and Victoria.

Annual subscription: \$30 including postage to your address.
Three-year subscription: \$90. Overseas subscription \$45.00.

Contact: Subscription Officer PO Box 3066 Bowenfels NSW 2790;
Email: merleaps@bigpond.com.

Binders: To fit the holes drilled. \$6.50. Packaging and postage in Australia is \$9.00 for 1–2 binders. For 3+ issues P&P advised on order.

Past Issues: Limited supplies of recently published past issues are available at \$5.00 plus \$2.00 postage in Australia for 1–3 issues. For 3+ issues P&P advised on order.

Contact the Australian Plants Society NSW Ltd
PO Box 263, Cremorne Junction, NSW 2090
Phone 0499 073 001 or Email office@austplants.com.au

Mail Order Book Services: Contact Society Secretaries for information on services available.

Note to subscribers

Please refer to the envelope in which you receive your journal. This will show the date of expiry of your subscription and your subscriber number – a 5-digit number shown above your name.

Use the form on the following page to renew your subscription if it is due. Include your subscriber number, especially if you are paying by credit card as this number is used instead of your name for security reasons when processing your payment.

Do not use this form if you are a member of the Canberra, NSW, Victoria, South Australia, Tasmania or WA societies (as listed on page 3 of this insert) and you receive the *Australian Plants* journal as part of your membership

Payment by Direct Deposit.

ANZ Bank

Account Name – Australian Plants Society NSW Ltd

BSB: 012 352 Account No: 302 301 693

It is essential that the depositor can be identified.

WE REQUIRE THAT YOU RECORD YOUR SUBSCRIBER NUMBER AND YOUR SURNAME ON THE DEPOSIT SLIP.

New subscribers should record their surname and/or subscriber number and send a completed form noting the date of deposit.

Note: Online payment is now available on the Australian Plants Society NSW website www.austplants.com.au. Existing subscribers please contact Subscription Officer for login information.



Australian Plants journal subscription

NEW ☐ RENEWAL ☐ GIFT ☐

Rate WITHIN AUSTRALIA is \$30.00; OVERSEAS rate is AU\$45.00.

Your subscription will cover four issues commencing with the next issue or from the end of your current subscription.

Please refer to notes on previous page before completing this form.

Name

Address

State Postcode

Telephone () Fax ()

Email Subscriber number

Payment methods: For direct deposit or online see Insert P1 Or

I enclose Cheque ☐ Money order ☐ for AU\$

Cheques should be made out to the Australian Plants Society (NSW).

Overseas cheques, unless in Australian dollars and drawn on an Australian bank account, will NOT be accepted due to the high bank fees.

OR

Please charge my: Mastercard ☐ Visa ☐ Amount:

PLEASE PRINT ALL DETAILS VERY CLEARLY

Card Number:

Card Holder's Name:

Expiry Date: Amount:

CVV/CSC: (The last three digits printed on the signature panel on your card)

Card Holder's Signature:

The completed form should be either:

Posted to: Australian Plants
PO Box 3066 BOWENFELS, NSW, 2790

OR Emailed to: merleaps@bigpond.com

Australian Native Plants Society (Australia) and member society contacts

Australian Native Plants Society (Australia) Inc. (ANPSA)

President: Riitta Boevink E-mail: executive@anpsa.org.au
Secretary: Mary Slattery E-mail: anpsa2018@gmail.com
Email: executive@anpsa.org.au
Website: http://anpsa.org.au

Australian Plants Society NSW Ltd

President: John Aitken
Secretary: Heather Miles
PO Box 263, Cremorne Junction, NSW 2090 Tel. 0499 073 001.
Email: office@austplants.com.au
Website: www.austplants.com.au

The Australian Native Plants Society, Canberra Region Inc.

President: Lucinda Royston
Email: president@nativeplants-canberra.asn.au
Secretary: Garth Chamberlain
Email: secretary@nativeplants-canberra.asn.au
Website: nativeplants-canberra.asn.au

Native Plants Queensland

President: Bob Bannon
Secretary: Paul Taylor: PO Box 586 Fortitude Valley QLD 4006
Email: secretary@npq.org.au Website: www.npq.org.au

Australian Plants Society, S.A. Region Inc.

President: Margaret Lee E-mail: president@australianplantssa.asn.au
Secretary: Ms Ali Ben Kahn, PO Box 304, Unley, SA 5061.
Tel. (08) 8388 3004 (h) Email: secretary@australianplantssa.asn.au
Email: secretary@australianplantssa.asn.au
Website: www.australianplantssa.asn.au

Australian Plants Society Tasmania Inc.

President: Margaret Killen
Secretary: Mary Slattery, PO Box 3035 Ulverstone 7315
Email: apstsec@gmail.com
Website: www.apstas.org.au

Top End Native Plants Society

President/Secretary: Sarah Hirst
E-mail: topendnativeplantsociety@hotmail.com
Website: www.topendnativeplants.org.au

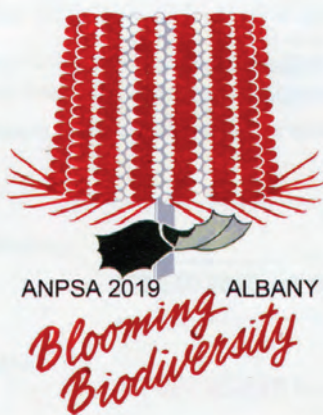
Australian Plants Society Victoria Inc.

President: Chris Long Email: apsvicpresident@gmail.com
Secretary: Helen van Riet PO Box 357 Hawthorn Vic 3122
Email: apsvicsecretary@gmail.com Website: https://apsvic.org.au/

Wildflower Society of Western Australia Inc.

President: Geoff Corrick
Secretary: Kerry Smith, PO Box 519 Floreat WA 6014.
Office: Perry House, 167 Perry Lakes Drive
Tel. / Fax: (08) 9383 7979 Email: wildflowers@ozemail.com.au
Website: www.wildflowersocietywa.org.au/

Autumn 2019 insert — Page 3



ANPSA Biennial Conference Albany, Western Australia 29 September – 4 October 2019



Every two years the Australian Native Plants Association (Australia) (ANPSA) holds a national conference, which is organised by one of its member Societies, at a different location around Australia. These conferences afford members the opportunity to meet members from other states, and learn about the native flora of different regions of Australia. The program usually comprises a series of lectures by expert speakers relating to Australian native flora interspersed with field trips to gardens and natural areas.

Other features of the Conference program are guided pre- and post-Conference tours, which allow participants to experience the diversity of the flora of the host State and are usually 5 days duration.

The *Wildflower Society of Western Australia* is hosting the 2019 Biennial Conference in Albany, W.A., from 29 September to 4 October 2019. The theme of the conference is 'Blooming Biodiversity'.

Blooming Biodiversity will feature lectures and workshops delivered by leading botanists. Keynote speaker Greg Keighery will head a panel of experts in their field. Professor Stephen Hopper will present the AJ Swaby Address. The conference also offers a range of guided tours before and after the conference, giving you the opportunity to experience the flora and scenery of Western Australia up close.

Further information about the conference can be found on the Wildflower Society of Western Australia's website at:

www.wildflowersocietywa.org.au

is due to the historical pattern of grazing that occurs on the different land uses. Historically, most graziers use a 'set stocking' grazing pattern, where livestock have access to large areas all the time. Farms might be divided up into different paddocks based on livestock types or management (fodder crops, pastures, off-shears etc) but animals usually stay in any particular paddock all the time. TSRs on the other hand are subject to a very different grazing regime. Large mobs of animals graze the TSRs for a short time, with long periods of rest between grazing events.

Sheep and cattle are usually selective grazers. When grazing the same paddock for a long time, they will keep finding their favourite plants and eating them until they are completely gone. While they prefer to graze grasses and forbs, they will also eat seedlings of trees and shrubs, including eucalypts. Over many years this pattern of grazing can completely change the composition of the vegetation community where it occurs. For example, in the sheep-wheat belt of the tablelands and western slopes of NSW, most grasslands or grassy woodlands had a ground layer dominated by Kangaroo Grass (*Themeda triandra*) and other perennial tussock grasses, such as Native Sorghum (*Sorghum leiocladum*), Snow Grass (*Poa sieberiana*) and Barbed-wire Grass (*Cymbopogon refractus*) on the Northern Tablelands. Continuous grazing with little or no rest between grazing events has eliminated these perennial tussock grasses from pastures, leaving behind only less palatable grasses such as Spear Grasses (*Austrostipa* spp.) and Wire Grasses (*Aristida* spp.). Similarly, native pastures lose orchids, lilies, daisies and other forbs leaving behind just a few hardy or unpalatable plants.

Over many decades of set stocking, tree and shrub regeneration is curtailed by grazing of seedlings. This is even more so if most of the mature trees and shrubs have been cleared, leaving few sources of seed for regeneration. Many TSRs have been cleared at some stage in their history to increase pasture growth or make it easier for stock to move, however, most have had plenty of opportunities for regeneration. As a result, TSRs often stand out as the only areas with trees in some landscapes.

As a botanist and ecologist, I often use TSRs as a reference site for plants and communities that would have been much more widespread in the landscape. TSRs hold clues to species that might have been much more widespread throughout the landscape. A good example is Yam Daisy (*Microseris lanceolata*). The tubers of this perennial daisy were once a staple food source for Aboriginal people in eastern Australia. As



Picture 2: Comparison between a TSR (r) and a permanently grazed private farm (l)

sheep were introduced, they quickly sought out and ate this nutritious plant, even eating the growing point below the surface, effectively killing the plant. Nowadays, while this is not a threatened species, it is unusual to find it growing outside TSRs and the reserve system.



Picture 3: *Microseris lanceolata* (Yam Daisy).

Apart from conservation values, TSRs are very important resources for apiarists and seed collectors. Both these industries rely on ready access to a diversity of healthy plants. National Parks are off limits but TSRs are easily accessible and located throughout the state. Specific apiary sites are marked on TSRs and licensed through LLS. Many seed collectors rely on TSRs for seed of all sorts of tree, shrub, grass and forb species.

The contrast between TSRs and surrounding agricultural land is often most stark in our woodlands on the Tablelands and western Slopes and Plains. In these areas, grazing pressure and farming put greater pressure on natural vegetation.

Grassy woodlands, in particular, are vulnerable to serious degradation as a result of continuous grazing. In these landscapes there are fewer National Parks and other conservation reserves when compared to the forested eastern parts of the state. TSRs, therefore, have a very significant role to play in conserving these vegetation communities. Most of the best remaining examples of grassy woodlands can be found on TSRs. These include Critically Endangered Ecological Communities

such as Box Gum Grassy Woodland, New England Peppermint Woodlands and Natural Grasslands on Basalt and Fine-textured Alluvial Plains.

The TSR network, because of the pattern of grazing, has mostly remained like long, linear samples of native vegetation communities that once existed throughout the landscape. Unfortunately, in the last ten years, first RLPB, and now LLS, has pushed the management of TSRs more towards the regime operating on private agricultural land mainly due



Picture 4: Brigalow community on a TSR near Croppa Creek, NSW.





to decreasing budgets. Leases have gone from short (a few months at most) to five years. Lease conditions have very few protections for the plant communities that have survived under the graze and rest regime. The main conditions are to maintain greater than 70% ground cover and to control noxious weeds. There are no specifications for rest, for maintenance of sward height or for avoiding grazing when plants are flowering or seeding.

The change to five-year leases is having a devastating effect on the conservation value of TSRs. Leases have been applied to many areas of high conservation value, including the critically endangered ecological communities mentioned earlier. Recent surveys conducted by myself and Phil Spark (North West Ecological Services) in the North West Local Land Services area, found that 85% of TSRs supported Threatened Ecological Communities. A state-wide survey of conservation values of TSRs by LLS using contractors (including myself) found a similar pattern in almost all LLS regions. Using a rapid assessment method developed by Ian Davidson, I found 79% of 280 sites in the North Coast and 67% of 90 sites in the Hunter regions were of high conservation value.

As a result of these surveys and feedback on a state management framework, LLS has assigned one of four management categories to each TSR. Most fall into either category 2 or 3 which allow grazing, however, a significant proportion fall into category 2 which allows 5-year leases. Given the very high conservation values of TSRs, one would think that the State Government, as owners and managers, would place particular emphasis on maintaining and improving them, however it seems that grazing will still be the highest priority, even in areas of high conservation value. The current management also restricts opportunities for graziers to use the TSR network in times of drought – most of the TSRs had been grazed to the ground well before the current drought hit.

Once you get west of the Great Dividing Range, conservation reserves on fertile land are extremely rare, usually confined to the rough hill country that is no good for farming or grazing. In these landscapes, the TSR network provides the only examples of many vegetation communities in fair to good condition. It would be a shame to see these public lands degraded by the change in grazing management currently being enforced.

Editor's note: Stock routes still exist in other states, especially Queensland and Western Australia. It would be inappropriate to comment on the management of them without specific local information.

Native Orchids of the Blue Mountains

Sabine Hanisch and Ben Jasiak

Sabine Hanisch and Ben Jasiak have recently (November 2017) published the book "Native Orchids of the Blue Mountains", documenting over 125 species, showcasing some beautiful and intriguing native orchids from the Blue Mountains region.

Ben and Sabine live in the Blue Mountains, N.S.W, and have a great enthusiasm and passion for the native flora and fauna.

The enchanting Blue Mountains are a 90 minute drive from Sydney, covering over 11,000 km² of intriguing landscape that is home to some of the most beautiful flora and fauna. With spectacular views over a maze of dense valleys and sandstone escarpments with fascinating rock formations and iconic lookouts boasting breathtaking views that seem to go forever.

This is also the home of many native orchid species, with terrestrial, epiphytes, and lithophytes varieties occurring throughout the region, in a wide variety of habitats, from heath to rainforests and everywhere in-between.

This article discusses the reasons for producing the book "Native Orchids of the Blue Mountains" and includes information and photographs of some of the interesting species included. Following on from that book, the authors are now currently working on a 2nd edition, incorporating the Blue Mountains and surrounding areas of the Greater Blue Mountains World Heritage Area.



Rimacola elliptica, Green Beaks Orchid



This 2nd edition is to include photographs, and information on identification of over 150 species of native orchid species. Some were previously not located within the study area, and others included are newly recognised or re-instated taxons, or previously excluded or combined with other similar species.

The authors understand there are varied opinions regarding current orchid taxonomy, with so many changes occurring some people are willing to follow new research and others prefer to follow older recognised names.

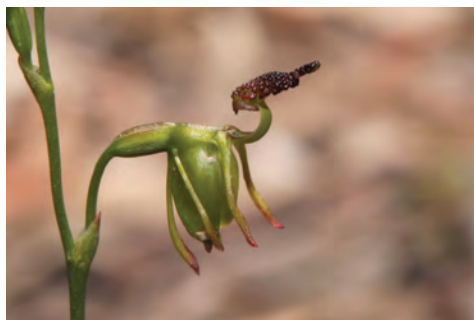
With this in mind, Ben and Sabine have decided to follow David L Jones' taxonomy and therefore have introduced some newly recognised and reinstated orchids, including the synonyms from previous nomenclature.

The newly published articles regarding these updated and newly described taxons can be sourced from various recent issues of *The Australian Orchid Review*.

In NSW, the botanic gardens provide a useful, but not definitive resource for native plant identification. This is PlantNet, an online database



Clockwise from above: *Sarcochilus australis*, Butterfly Orchid; *Caleana minor* (Syn. *Paracaleana minor*), Small Duck Orchid; *Caleana major*, Large Duck Orchid



Cryptostylis hunteriana, Leafless Tongue Orchid



Diuris punctata var. *punctata*, Purple Donkey Orchid

of plant descriptions with additional links to AVH (Australian Virtual Herbarium). This can be beneficial to identifying an unknown plant, but unfortunately is not upto date, so can also cause unwanted confusion.

Inspiration has come from botanists and plant enthusiasts who have previously, some from well over 60 years ago with records dating much further back, recorded what they found and described during their exploration and documentation of the Blue Mountains.

The objective of the *Native Orchids of the Blue Mountains* book is to be a record of the country, providing an up to date list of what currently exists within the study area along with a resource for the identification of orchids that may be located and photographed.

It is also to raise awareness of their existence, and the appreciation of the beautiful, intriguing, and sometimes elusive plants that can quite easily be overlooked or not even noticed in the bushland area around civilisation and beyond.

As the Blue Mountains have been developed over the many years there has been significant loss and damage of suitable and significant orchid habitats amongst varying plant communities.

With changing environmental factors there is the possibility of further losses and possible extinctions. Hopefully this will promote more emphasis on the preservation of all orchid species and habitats which they occur.





Our hope is that the readers will also have the same enjoyment we have received from locating and photographing some of these beautiful, delicate, yet sometimes inconspicuous flowers.

Also, it is intended to raise awareness and recognition of the existence of these intriguing plants, hoping that future generations will be able to enjoy the amazing floral features of these plants.

How hard could it be to locate these plants? As easy as it might seem, it can be quite difficult to locate some of these rare, endangered, or vulnerable orchids in situ or in new locations that were not previously known.

The habitat might be suitable, but there seems to be an absence of plants. There could be a variety of reasons as to why this occurs.

Seasonal fluctuations in weather can affect the flowering times. Rain might arrive too early or late in a season, or there might not be enough to encourage flowering.

Extended bouts of extreme heat, cold, and wind can also inhibit the flowering of different orchids.

Clockwise from below: *Pterostylis falcata*, Sickie Greenhood; *Corunastylis* aff. *sagittifera*, Horned Midge Orchid; *Thelymitra venosa*, Veined Sun Orchid



Calochilus campestris, Copper Bearded Orchid



Diuris sulphurea, Tiger Orchid

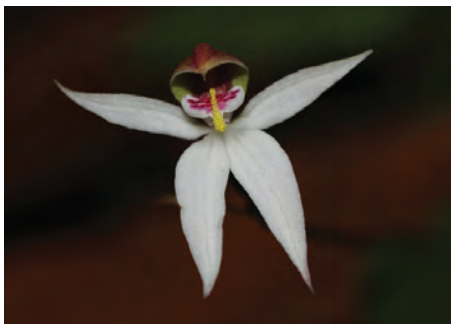


Caladenia dimorpha (Syn. *Stegostyla dimorpha*), Spicy Caps



Left: *Caladenia caerulea* (Syn. *Cyanicula caerulea*), Blue Fingers

Below: *Adenochilus nortonii*, White Gnome Orchid



Some species are also more responsive to bushfires than others, with the seasonal timing and the intensity of the fire also affecting how quickly or slowly an orchid's response can be.

Optimally the fire would be outside of the flowering period of the plant, thus not harming growing buds. But with some areas containing multiple different orchid species that flower over the four seasons, fire can be an unfortunate event for some, whilst a benefit to others.

The orchids could be in a dormant period, and not flowering this year. Some species have a flowering intensity that can build up over years to a mass flowering over an area, and then the following year could reduce to scarce amounts.

But also, on the other hand, you can be in the right location, with weather conditions perfect, timing of the season is right, and could quite easily find yourself surrounded by hundreds of flowering plants, which can be a spectacular sight. Sometimes found with other species also flowering at same time.

We hope everyone can enjoy these plants, and with suitable and informed application of conservation methods to protect their remaining habitats is the only way to allow future generations to survive.

Leave only footprints, and take only photographs.

Sabine Hanisch and Ben Jasiak:
bluemountainsnativeorchids@gmail.com



Adelopetalum exiguum



Corunastylis simulans



Corunastylis mucronata





The AusZen portable garden – Combining Biophilia and Satoyama for an Urban Therapeutic Application

Olga Blacha (MA Landscape Architecture) – Sustainable Natives

Olga works as a Landscape Architect. She has owned Sustainable Natives, a wholesale plant nursery and landscape design business in Somersby NSW for the past 10 years where she has learnt to grow natives from seed and cuttings collected from around the area and understand how to work with the plants.

Introduction

In 2015, the AusZen garden concept was produced after completing a MA in Landscape Architecture at Canberra University, based on examining the heritage values of the Japanese Garden at Cowra, NSW, produced by Ken Nakajima in 1975. In 2018, the first AusZen garden was produced at the Melbourne International Flower and Garden Show (March 27–31).

The AusZen Garden

A balance of human values that respects nature's intrinsic values is an implicit foundation in the formation of the AusZen Garden.^{1,2,3} Ecological restoration^{4,5} should be initiated from factors impacting on economic, cultural,^{6,7} aesthetic^{8,9} and spiritual values,¹⁰ whilst authentically continuing the Japanese style garden.^{11,12} Applying a cultural tradition Satoyama embodies; a human–ecological system is based on rectifying historical decline with future management.¹³ Such values simultaneously manage and repair ecosystems for their underlying value, rather than for the benefit of humans alone. In practising ecological restoration, identifying a path for both ethical and satisfying relationships between humans and the rest of nature is an ongoing development of the AusZen Garden concept developed in 2015. Selection of visual components was based on the Satoyama system, using local materials explored for production of the portable and easy to install garden that is scalable to produce a



visual reference that has been determined to produce a calming and tranquil effect on respondents in multiple settings.

The Japanese Style Garden type preferences among residents along with visitors to the Melbourne International Flower and Garden Show 2018, as part of the Boutique garden competition, were consistent with those found by Seiko Goto,¹⁴ predominantly with a Japanese 'Zen' design aesthetic.

The design competition allowed me to produce the first 'AusZen' garden in Australia.

The purpose of this garden style is based on an authentic representation of the Japanese Stroll Garden, using *senzai bori* (*using wild plants*) as the methodology to translate the garden style into Australia following a heritage framework that originated from UNESCO.

Japanese Gardens are generally considered 'too hard to maintain' due to the continued labour devoted to the garden in pruning, weeding and replacing plants.

When I first visited Japan in 2011 I realised that Japanese gardens could work very well in Australia, as we have most of the Japanese plant species which have their Australian equivalents. The only plant





that caused issues is *Nandina domestica*. In this instance – I have used *Lomatia silaifolia* [Wild Parsley] to see how well this works.

The benefits of this garden style are incredible as it fulfils biophilic principles of natural beauty which works within the Australian environment. Biodiversity amongst other ethical issues surrounding plant choice and habitat is not obvious upon viewing; one is seduced by the careful aesthetic placement, and sounds. Australian plants in the first instance initially represent an alternative; in the future, when this style becomes a mainstream Australian garden, and is imbued and embellished from working in and through the Australian culture it will transform the environment. It is a stewardship garden style. A legacy that in futures to come will represent Australia, as it has Japan.

Landscape Design Concepts for the Melbourne International Flower and Garden Show 2018

The Garden bed: the basic shape is a stepped path to a minor Zen garden. The distinguishing features are the circular deck for the bench seat and the wooden surround for the native Crepe Myrtle *Lagerstroemia archeriana* and was changed to a standard Grevillea and in front a Wollemi Pine in 200 I pot I borrowed from Merle Thompson which was used at the front stepped area to the deck to hide the back of the garden.



The design of this garden follows my competition design for using Miegakure or 'Hide and Reveal' where certain shapes or plants block another from being revealed. The idea is that when you walk around the site you are constantly surprised by what is being revealed.

The bed was raised by approximately 80 cm to provide a set of steps to negotiate what originally was intended to be a dry waterfall and dry pond, which was for the show produced from a shaped wire with fibreglass structure with crushed rock overlay which had been shaped in a new Australian way, to produce a gentle and flowing sound of water to the lower corner pond with 'Deer Scarer' water feature surrounded with sundews, *Lepironia articulata* 'Twizzler™' and *Philydrum lanuginosum*.

Some of the plants used in this 5m x 5m garden include;

<i>Wollemia nobilis</i>	<i>Hakea laurina</i>
<i>Casuarina</i> 'Carpet Star'	<i>Callerya megasperma</i> 'Native Wistaria'
<i>Thelionema grande</i> & <i>T. caespitosum</i>	<i>Baeckea virgata</i>
<i>Goodenia macmillanii</i>	Brachysomes
<i>Westringia</i> 'Flat n Fruity'	<i>Banksia ericifolia</i> inc. 'Red Rover'
<i>Zieria</i> 'Carpet Star'	<i>Crowea saligna</i>
<i>Dietes robinsoniana</i> ,	<i>Callicarpa pedunculata</i> 'Velvet Leaf'
<i>Podocarpus elatus</i>	<i>Persoonia chamaepitys</i> , the prostrate-
Dianellas, Anigozanthos	or mountain geebung
Ozbreed 'Twizzler'	<i>Acacia</i> 'Honeybun' and <i>A.</i> 'Limelight'
<i>Scleranthus biflorus</i> in Zen dry garden	<i>Homoranthus flavescens</i> ; <i>H. papillatus</i> ,
Grevillea varieties including 'Cooroora	<i>H. prolixus</i> , <i>H. decumbens</i>
Cascade' and 'Golden Lyre'	<i>Eremophila</i> 'Kalbarri carpet'



With aesthetic attraction not being a superficial concern but an environmental imperative, ['Beauty could save the planet'¹⁵] and linking human with ecological health will be further examined by reviewing current research to isolate what factors, materials, innovations [such as Citygreen Stratacells an engineered interconnecting cell 50 cm high, used to build a structure above-ground] would best articulate a flexible solution in an urban space environment.

I would like to thank the team who assisted in making this garden happen;





Jonathan Steeds and David Meldrum who helped in the original construction that was built at home that was then dismantled and reassembled in Melbourne. Construction included a deck, a custom bench and surround, and a staircase. Special stones including boulders to selected rocks and pebbles were used. The raked 'beach' area was an off-white quartz. The fence was constructed from *Doryanthes excelsa* spent flower stems.

Endnotes

- 1 Brown, G., Raymond, C. M., & Corcoran, J. (2015). Mapping and measuring place attachment. *Applied Geography*, 57, 42–53.
- 2 Takeuchi, K., Ichikawa, K., & Elmqvist, T. (2016). Satoyama landscape as social-ecological system: historical changes and future perspective. *Current Opinion in Environmental Sustainability*, 19, 30–39.
- 3 Thompson, I. H. (1998). Environmental ethics and the development of landscape architectural theory. *Landscape Research*, 23(2), 175–194.
- 4 Flannery, T. F. (2002). *The future eaters: an ecological history of the Australasian lands and people*.
- 5 Griffiths, T., & Robin, L. (1997). *Ecology and empire : environmental history of settler societies*.
- 6 Gehring, K., & Kohsaka, R. (2007). 'Landscape' in the Japanese language: Conceptual differences and implications for landscape research. *Landscape Research*, 32(2), 273–283.
- 7 Tachibana, S., & Watkins, C. (2010). Botanical Transculturation: Japanese and British Knowledge and Understanding of *Aucuba japonica* and *Larix leptolepis* 1700–1920. *Environment & History* 16(1), 43–71.
- 8 Bourassa, S. C. (1990). A paradigm for landscape aesthetics. *Environment & behavior*, 22(6), 787–812.
- 9 Slawson, D. A., & Zōen. (1987). *Secret teachings in the art of Japanese gardens : design principles, aesthetic values* (1st ed.)
- 10 Keane, M. P. (2012). *Japanese garden design*.
- 11 Cole, D. (2013). At the coalface: Garden history, heritage conservation, and interpretation. *Australian Garden History*, 25(1), 7–9.
- 12 Ramsay, J., & Australian Heritage Commission. (1991). *How to record the national estate values of gardens*.
- 13 Indrawan, M., Yabe, M., Nomura, H., & Harrison, R. (2014). Deconstructing satoyama – The socio-ecological landscape in Japan. *Ecological Engineering*, 64, 77–84.
- 14 Goto, S. (2012). Visual Preference for Garden Design: Appreciation of the Japanese Garden. *Journal of Therapeutic Horticulture*, 22(1), 24–37.
- 15 Browning, B. (2016). Biophilia, Buildings, and Your Brain. *People & Strategy*, 39(2), 8–11.

More details for the references can be obtained from the editor or from the author at Email: olga@sustainablenatives.com.au

A personal addendum from the editor

As I said in the editorial, the Wollemi pine, *Wollemia nobilis*, which Olga used in her garden at the Melbourne show was mine.

For many years I had a personal research interest to understand the conifers of Australia and to map where they occur. You can imagine my amazement when in 1994 I heard that a new conifer species had been discovered in the Blue Mountains. And I lived in the Blue Mountains, albeit a long way from where the Wollemi was discovered. I went to the first information session and a seminar to learn all I could.

Naturally, when the opportunity arose in 2005 through the Friends of the Botanic Gardens to obtain plants for yourself, I registered for two in the first release and proudly kept their identify papers.

Often with rare species cultivation is not encouraged, especially if obtaining propagation material could be detrimental to the surviving specimens. With *Wollemia nobilis* there has been a major propagation program, a form of ex situ conservation. While in a canyon, the location of which is secret, a number of new plants have been introduced.

I called my plants “my boys” even though they clearly had both male and female cones. They out-grew their pots several times and became too big to keep. Olga saw my “advert” offering them to good homes and asked to use one in her display garden. So “big boy” went to Melbourne. Both now have new homes in suburban gardens where I hope they continue to thrive. If they don't, it won't be for lack of love.





In a Different Light – Australian Native Flower Photographs in Ultraviolet Light

David Oldfield

David has been a 'camera nut' ever since he was bitten by the photo bug at school in the UK in the 1950s. He studied chemistry at Birmingham University then moved to a new job in Australia in 1967 and has been here ever since. His wife Sue is the one in the family with green fingers which provided the impetus to explore close-up photography of Australian native flowers.

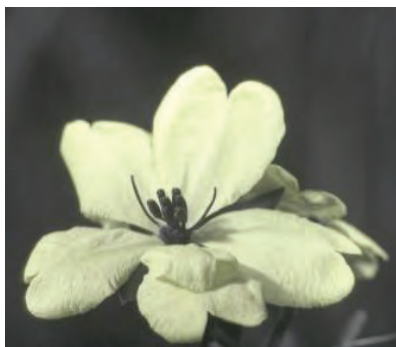
Many flowers have dark patterns visible under Ultraviolet (UV) light, but not visible to the naked eye. On the basis of much overseas work on honeybee vision, the eyes of pollinating insects are known to be sensitive to UV and it is widely believed that the UV patterns assist insects, such as bees or wasps, to find the nectar or pollen on the flower.

There is a wonderful website www.ultravioletphotography.com which explains how to take UV flower photographs which answered all my questions when I started in this field in 2013. I was welcomed into the UV fraternity with open arms and I discovered, to my great surprise, that nobody else in the world seemed to be taking digital photographs of Australian native flowers in UV light! You will now find many of my images of Australian natives on that site.

The first time you see the comparison of the visible and UV shots, in this case for *Hibbertia exutiaces* taken in the Grampians in Victoria, it hits you in the eye.



Hibbertia exutiaces Visible light



Hibbertia exutiaces UV

This is typical of UV images where the stamens and styles are black and petals may be pale yellow in UV.

Diuris chryseopsis Golden Moths Orchid, shows a distinct UV pattern.



Diuris chryseopsis Visible light



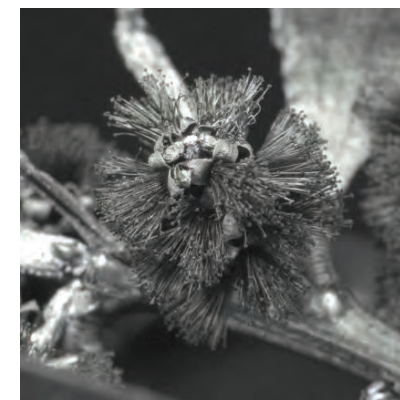
Diuris chryseopsis UV

These UV images are typical of what UV forum members in Europe and USA have reported for their flora with so called dark "bullseye" patterns on yellow petals in many of their UV images.

So, what do we find with our yellow wattles?



Acacia longifolia Visible light



Acacia longifolia UV

The stamens, which are yellow in visible light become very dark grey or black in the UV image. This corresponds to the black stamens in *Hibbertia exutiaces* above. There are four relatively inconspicuous petals and sepals in each flower which are dark grey in UV.

As a chemist, I knew that the first thing on moving into a new area of research was to do a literature survey. Now I'm retired I no longer have access to most of the 'good stuff' behind paywalls but I did find that in 1924 James Matthew Petrie at the University of Sydney had worked on the yellow pigment of *Acacia longifolia*. He showed that the water-soluble yellow pigment was a derivative of kaempferol, a widely distributed flavonol, found in foods as varied as apples and broccoli. It is effectively





a natural sun-screen which absorbs UV strongly. So the stamens are yellow in visible light and black in UV because of the yellow pigment.

It seems to me, as someone who is not a botanist, that UV-absorbing pigments may be acting to prevent UV-induced damage to the genetic material in the flowers. Pollinating insects which are able to see in UV would then be able to orient themselves to visit those areas.

A similar situation exists with Eucalyptus blossom. Regardless of the colour of the blossom which we see with our eyes in visible light, it turns out black in UV. The visible colour is probably due to different pigments from those in wattles but they absorb UV and so appear black in the UV image.



Eucalyptus torquata Visible light



Eucalyptus torquata UV

Greenhood orchids make attractive subjects. Here the transparent green flower becomes dark blue while the labellum of this Large Bearded Greenhood from Central Victoria, became dark grey in UV. It is believed that greenhoods are pollinated by fungus-gnats.



Pterostylis plumosa Visible light



Pterostylis plumosa UV

The Blunt Everlasting proved to be a spectacular flower in UV, with a change from white to blue bracts.

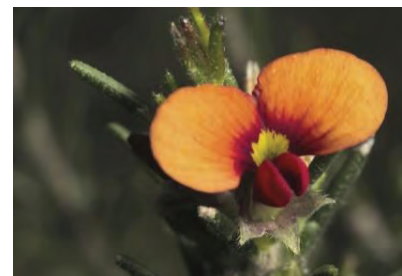


Argentipallium obtusifolium Visible



Argentipallium obtusifolium UV

Dwarf Wedge Pea was also interesting, with a typical 'bull's-eye' pattern on the petals in UV.



Gompholobium ecostatum Visible



Gompholobium ecostatum UV

A Common Billy Button was found in the Grampians with a grasshopper. As with wattles, the visible yellow was replaced with dark grey or black in UV.



Craspedia variabilis Visible



Craspedia variabilis UV

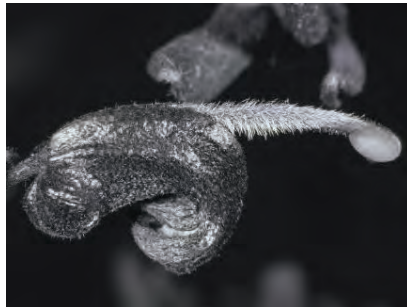




Grevillea alpina was another colourful flower from the Grampians.



Grevillea alpina Visible



Grevillea alpina UV

All the visible colours were replaced by grey or black, which is interesting as pollinating insects, such as honeybees, have three receptors in their eyes sensitive to UV, blue and green. Very little has been reported on the visual sensitivity of Australian insects so it is impossible to know how evolution of Australian native plant colours was influenced by Australian insect vision.

On the other hand, birds are attracted to red flowers and are important pollinators of Australian native plants.

Waxlip orchids were prominent as usual, with a change from purple in visible light to dark blue in UV.



Glossodia major Visible



Glossodia major UV

A few Common Buttercups were also found, the petals remained yellow in UV with the carpels and stamens becoming black and the suggestion of a “bulls-eye” pattern at the base of the petals.



Ranunculus lappaceus Visible



Ranunculus lappaceus UV

Austral Storksbill...



Pelargonium australe Visible



Pelargonium australe UV

and Magenta Storksbill show interesting changes in colour.



Pelargonium rodneyanum Visible



Pelargonium rodneyanum UV

This is just a taste of the wonderful world of UV photography.



