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Editorial

Joanne Caldwell

If the last issue did not convince you to set off for the ASGAP Conference in Newcastle, NSW then hopefully this issue will. We have a mixture of practical advice from NSW gardener's and more background on places that the conference tours may take you.

Peter Olde's garden at Oakville and the Lambert Peninsula in Ku-ring-gai Chase National Park will be visited on the Sydney by Nature and Design post-conference tour, and native plant communities of the NSW North Coast gives some background to Mid-North Coast pre-conference tour. Ross Doig writes of a Plant ID book that visitors to coastal NSW will find invaluable.

Peter Vaughan, whose garden featured in the last issue writes about growing orchids as does Jeff Howes, whose garden featured in Jeff Howes garden appeared in *Australian Plants*, Vol. 21, No. 173 December, 2002. Jeff also provides some valuable advice on pruning.

This is capped off with some articles for you to ponder about – the wonders of micropropagation, a farm that is regenerating land and business with local vegetation, a review of a children's book about native plants and a look at the ancient history of our alpine vegetation with a view to the future in the context of global warming.

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Front cover: ***Acacia terminalis*** fruit

Back cover: ***Calytrix tetragona*** flowers

Photos: D. Irving from *Plants of the Coastal Area of the Royal National Park* on CD (p. 311)

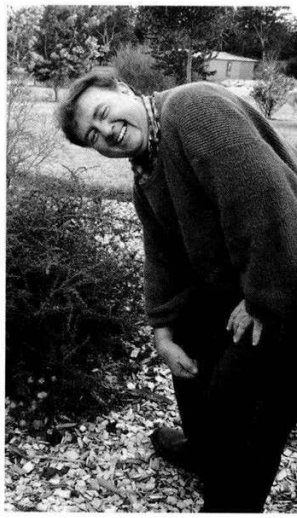
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Our Garden 50: Silky Oaks

Oakdale, New South Wales — Peter Olde



In July 2002, my wife Margaret and I purchased an 11 ha. hobby farm at Oakdale, New South Wales, ca. 70 km south-west of Sydney, between Camden and Picton. The area lies at an elevation of 480 m above sea level and enjoys a climate cooler but less humid than coastal and western Sydney. The rich deep pockets of volcanic soil that overlie sandstone once supported extensive stands of *Casuarina* prior to clearing. The farm had existing buildings, 3 dams and a parkland style landscape of mainly exotic shrubs and trees set among vast lawn areas, and several horse paddocks where racehorses were agisted. The whole area enjoys a full-sun situation. We decided to plant part of the farm as a native garden, retaining existing vistas but employing attractive plants that would give our native flora an opportunity to show off. We did not rip out the exotics, some of which were very beautiful and growing well but tried to complement them with native plantings. This necessitated a more formal approach. Vistas were defined and gardens planned so that they were not blocked.

The garden was then laid out initially using a combination of narrow serpentine and broad curved shapes. The soil was deep ripped and rotary hoed. Emergent weeds were sprayed out. Mounding was randomly created to give vertical texture by digging out the edges to a shovel depth all round, this providing soil and drainage in the garden and clearly defining the edge.at the same time. Care was taken not to plant too closely but, like all enthusiasts, we put too many plants into some areas and they outgrew their space and had to be removed. Structure in the garden relied mainly on grevilleas, both hybrid and species, selected for their beauty, long-flowering and hardiness. We already have under cultivation one of the largest collections of *Grevillea* in Australia.

We have a strong commitment to grafted plants and large numbers were purchased and planted. While these are initially more expensive, they are great value for money overall. They have performed extremely well and we have had few losses, and then mainly from wind or cockatoos who love to just bite the young plants off. The soils and climate also support waratahs and these are also planted in good numbers. We have a large number of cultivars in the waratah garden. Colour combinations, white and red, yellow and pink were all considered in the design but in the end we decided that all colours go well together. A large number of leschenaultias, hibbertias and dampieras have added great colour, dotted here and there through the garden. The leschenaultias grow well for a time and we do not mind replacing them if they die because they are so showy. We expect a life of around two to three years for leschenaultias. Grafted verticordias and eremophilas are also extensively planted as are members of the Proteaceae and Myrtaceae, including those fantastic *Corymbia* hybrids, Summer Red and Summer Beauty.





Silky Oaks,
Showing gardens planned so the vistas were not blocked and use of narrow serpentine and broad curved shapes.
Opposite top:
Vista with *Grevillea* 'Lady O' and *G.* 'Peaches & Cream' to right.
Opposite centre:
Jeff Howes with Peter and Marga Olde admiring 3 plants red of *G. rhyolitica* ssp. *rhyolitica* *G.* 'Flamingo' & *G.* 'Sylvia' on righ
Photos:B. Roac
Opposite bottom:
New rockery being prepared around dam
Photo: M. Wagne

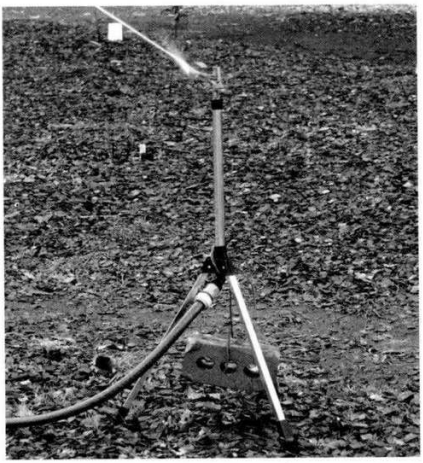


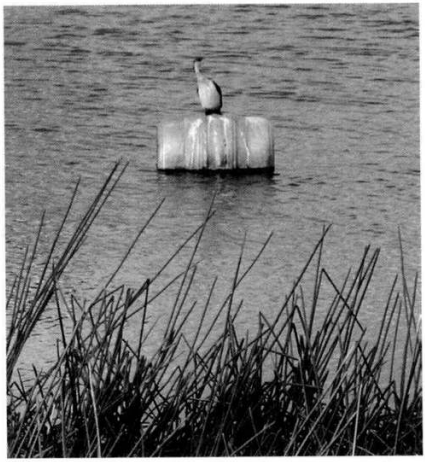


In one section close to the house we have planted in the lawn a selection of individual standard grevilleas which complement the existing exotics quite well. Standards are not everyone's cup of tea but they work well here. They need careful placement in the garden too where we have situated some. In another area near the house we have constructed a large display garden, into which only very showy and well-performed small or prostrate native plants are planted. The idea for this came from some of the spectacular native gardens to be seen in Victoria, where I think some of our best native gardens are to be found. The front boundary of the property has been dedicated to rainforest plants and an extensive collection of this plant type has been planted and is performing well. Australian rainforest plants are under-utilised in horticulture and we have an excellent situation for them. They are also excellent as fire-retardants. We greatly enjoy the wonderful flowers, foliage flushes and habit of so many plants of which we had little previous knowledge and limited opportunity to appreciate. At the rear of the property we have planted a grove of tropical *Grevillea* hybrids, which combine well and flower continuously.

We do not water the lawn areas and only give the garden occasional watering in extremely long periods of dry weather when the soil really starts to dry out. The soil is a friable black loam, very nutritious and easily wettable, remaining moist under a thick layer of pine-chip, available locally quite cheaply. The garden is pruned and the plants shaped in summer. I cannot over-emphasise the importance of shaping the plants. It makes such a difference to keep them compact and tidy. Poorly performed plants are removed at this time. The mulch keeps most of the weeds at bay too but regular spot spraying makes certain of it and we have little tolerance for same.

A garden is a constantly changing and developing process. We are constructing a shaded fernery into which ferns and other delicate plants can be placed. New gardens and a propagation hot-house are also planned. As the gardens evolve and expand we hope to be able to claim that it is a standard bearer for our native plants.





Above left: An interesting way to secure a sprinkler.
Above right: A visitor to the Olde's dam.

Photos: M. Wagner

Lambert Peninsula

Ku-ring-gai Chase NP

Sue Fredrickson
APS North Shore District Group

One of our favourite places for spectacular, rugged beauty of steep-sided river valleys and incredible variety of native plants, is Lambert Peninsula, Ku-ring-gai Chase National Park (KCNP). KCNP, the second oldest national park in NSW, conserves 15,000 hectares of sandstone bushland just 24 km north of Sydney CBD. The name Ku-ring-gai comes from the Guringai, an Aboriginal language group of those who originally lived here.

Lambert Peninsula allows you to experience the best of Hawkesbury Sandstone territory, with its fascinating geology, rich Aboriginal relics and great diversity of vegetation and animal, including bird, species.

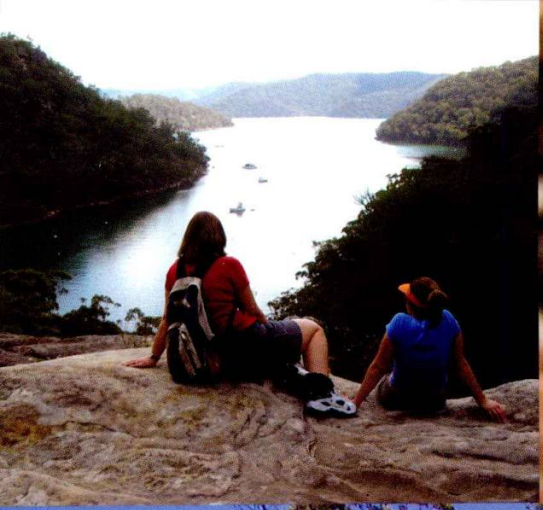
Geology and Landforms

The impressive landforms include the dissected sandstone Hornsby plateau, with interesting rocky outcrops and cut by deep, steep sided and beautiful waterways of the Hawkesbury river and it's tributaries.

The plateau is part of the Sydney basin, which consists of a geological basin filled with near horizontal sandstones and shales of Permian to Triassic age that overlie older basement rocks of the Lachlan Fold Belt. Sediments were deposited by extremely large braided rivers whose headwaters lay hundreds or even thousands of kilometres away and flowed in from the south and the northwest to deposit the Hawkesbury Sandstone, just one of the rock layers of the Sydney basin composed of mainly quartz sediment. Around the middle of the Triassic Period, the basin was uplifted to become dry land, and erosion by the waterways cut deep valleys. A sea level rise 6–12,000 years ago, during the Quaternary period, flooded these valleys to create the 'drowned river valleys' that we see today.

An interesting geological feature, visible from the West Head lookout, is Barrenjoey Headland, with its lighthouse, left as an island by the Quaternary sea level rise. It is now a classic example of a land tied island or tombolo, where the beach wave action has shifted big quantities of sand in a northerly direction along the beach to subsequently join the island to the mainland.

A few thinner shale layers that occasionally alternate with the sandstone and break down to more fertile soil, give rise to differences in vegetation associations, as does the volcanic rock intrusion of a dolerite dyke near West Head and observable from the Koolewong track. The large plug-like intrusion has broken down to form red clay soils that support a very different attractive glade of tall trees.









Lambert Peninsula
Top Left: America Bay - a drowned river valley.
Left: *Angophora costata* trees perched precariously above a sandstone cliff in Broken Bay
Photos: P. Fredrickson

Top Right: *Dampiera stricta*
Above: *Dampiera purpurea*
Bottom left: *Dillwynia floribunda*
Below: *Pimelea linifolia*
Photos: B. Hardin





Vegetation and Animals

Vegetation differences not only reflect the geology, differences in drainage and aspect, with hotter west and north facing slopes contrasting with areas that are more protected from the strong summer sun by their east or south facing orientation and also gully locations providing shady microclimates.

Heath and low open woodland, are the most common vegetation types on the Lambert Peninsula. The Proteaceae family is very well represented here. Tough leaved banksias and hakeas dominate, while a brilliant array of colour is provided by flowering of pink boronias and yellow peas. There are numerous other flowering shrubs and groundcovers including three of the local grevilleas, brown flowering *G. buxifolia*, pink *G. sericea* and red *G. speciosa*, the small but richly coloured purple blue flowers of *Dampiera stricta* and the Purple Flag Iris *Patersonia* sp. The Native Rose, *Boronia serrulata*, which is restricted to the Sydney area, with its intense bright pink flowers is one of the later spring flowering boronias that should be around and are a true highlight. All these plants have adapted well to the harsh conditions of dryness, exposure, thin, rocky, low fertility soils and a regular cycle of devastating bushfire, from which they bounce back and re-grow to produce some of their best flower displays. The area was burnt in the big January 1994 fires and then again in 2004. The dominant trees, when they do occur, are Scribbly Gum (*Eucalyptus haemastoma*) and Red Bloodwood (*Corymbia gummifera*). They do not grow to great heights and are sparsely scattered, but occasionally form groves. These tree groves are typically the habitat of the Waratah (*Telopea speciosissima*), the floral emblem of NSW. Though the peak flowering time for waratahs in the Sydney area has passed by October, there may still be the occasional straggler. The Woody Pear, (*Xylomelum pyriforme*) often grows in similar situations to the Waratah, and at the time conference tour displays beautiful copper coloured new growth.

Less harsh plant growing conditions occur where there is more fertile shale soil, a more sheltered and shady aspect or more moisture from a nearby creek. Here, typically, trees are thicker and taller and include Turpentine (*Syncarpia glomulifera*), Grey Gums (*E. punctata*) and the Sydney Redgum (*Angophora costata*) that so characterises the Sydney bush with its smooth, salmon coloured gnarled and twisted branches making it irresistible as a target for photography and hugging! Understorey here includes Sally Wattle (*Acacia floribunda*) and smaller herbs and shrubs like Soft Boronia (*Boronia mollis*), a tallish yellow pea *Pultenaea flexilis* and Hop Goodenia (*Goodenia ovata*), Native Violets (*Viola hederacea*), and various ferns. In moist areas near creeks, Cabbage Tree Palms (*Livistona australis*), Coachwood (*Ceratopetalum apetalum*), *Pittosporum undulatum*, *Backhousia myrtifolia*, Lilly Pilly (*Acmena smithii*) and Water Gum, (*Tristania* sp.) can be found.



Left: Cabbage Tree Palms
Livistona australis
Photo: P. Fredrickson

The volcanic dolerite dyke outcropping along the Koolewong Track provides different conditions again for plant growth and it is here that tall forests with Grey Ironbark (*Eucalyptus paniculata*), Forest Oak (*Allocasuarina torulosa*) and the Rough barked Apple (*Angophora floribunda*) are added to the tree species found. The shrub layer thins under the shade of the taller trees, but does include the shrub Scentless Rosewood (*Synoum glandulosum*) and such interesting gems as the bright yellow flowered scrambling vine *Hibbertia dentata* and the Ironbark orchid (*Dendrobium aemulum*) are found. Close to West Head are examples of the Large-fruited Red Mahogany (*Eucalyptus scias* ssp. *scias*), which is found occasionally in the Sydney area near the sea.

In the areas close to the estuary, maritime influence is reflected by the occurrence of salt-laden, wind-tolerant tree species such as *Banksia integrifolia* and the Bangalay Gum (*Eucalyptus botryoides*). It is quite common to see a magnificent White-breasted Sea Eagle gliding over Broken Bay and adjacent land. It also not uncommon to see the resident Lace Monitors at the West Head Lookout which are, no doubt, partly attracted to the area by the picnic leftovers of the visitors and who knows, maybe the magnificent view too!

Aboriginal Engravings

The Guringai Aboriginal people have left many clues of their presence and activities here in their former home area, before the arrival of the white people which was to alter their lives so drastically. As would be expected, living so close to the sea, much of the Aboriginals' food was obtained from it. This is evident from the shell middens and also from the numerous rock engravings in the park that depict fish and whales, as well as kangaroos, mythical beings, people and their tools. There are more than 180 engraving sites with an average of 10 figures per site, which makes them one of the greatest concentrations of rock art in the world.

One of the best, most varied and very accessible group of rock carvings occurs just off the road along The Basin Track

We can thank leading local citizen Eccleston du Faur for his driving efforts leading to the creation of this magnificent park area of Kur-ring-gai Chase in 1894, which more recently, in 1967, had its management transferred to the National Parks and Wildlife Service. Consequently, this popular park's natural beauty and rich cultural heritage are protected and can be enjoyed by over two million people who visit annually now as well as by future generations.

Native Plant Communities of the NSW North Coast

Barry Kemp

Adapted from *Wildflowers of the North Coast of NSW*, Barry Kemp. Published by Reed New Holland 2004.

The North Coast region of NSW lies between Newcastle and the Queensland border and has a coastline of about 500 km with some of Australia's most attractive quartz sand beaches, frequently punctuated by rocky headlands and tidal inlets. It is not obvious to the casual observer that the extensive, often swampy plains behind the beaches are silted up valleys, the result of periodic changes in sea level in the distant past. There are also moderately elevated sandstone plateaus, isolated granitic outcrops and folded coastal hills of sedimentary or metamorphic rock which are the first ripples of the Great Dividing Range, as well as old dunes left by more recent changes in sea level, and more dramatically, the remains of massive volcanic eruptions. In places, spurs from the Divide reach almost to the coast.

Whilst the weather is generally mild, heavy frosts can occur in the valleys, and the coast can be battered by strong, salt-laden winds. Torrential summer rain is frequently promoted by moisture-laden winds forced upward by the coastal ranges and main divide. This geological and climatic diversity, combined with a meeting of plants from both tropical and temperate zones, has resulted in a flora with a large number of species and many ecosystems.

Coastal Dunes, Headlands and Estuaries

Present north coast rivers, when in flood, carry mostly mud to the sea, but quartz sand, much of it the result of eons of erosion in granite areas further south, is carried northward by coastal currents and south-easterly swells. Wind and wave action combine to heap some of this sand in rows parallel to the shore as **dunes**. Blasted by salt-laden winds, dessicated by a lack of overhead shade and having to put roots into a growing medium of loose, shifting sand with little humus, few plants can survive there for long. Some have succulent leaves for water storage, others quickly produce long roots to reach fresh water deep within the dunes or adopt a trailing habit with roots from each node where they touch the sand. On many stretches of the NSW coast, the sand dunes have been mined for valuable minerals like rutile and zircon by means of floating dredges, causing massive disturbance which has often resulted in almost total replacement of the native vegetation with weeds. Spinifex (a hardy grass), Banksias, Sheoaks, Coast Golden Wattle (*Acacia longifolia* subsp. *sophorae*) and some tough plants like Tuckeroo (*Cupaniopsis anacardioides*)and Coast Boobyalla (*Myoporum boninense*) are originals that help to hold the dunes together.

In some respects, conditions on the exposed, rocky **headlands** are even more harsh than on the dunes, but there is the advantage of a stable base on which a thin soil layer can develop, and moisture may seep from cracks in the rock. There is usually grass cover, the main native one being Kangaroo Grass (*Themeda australis*), and plants of many families nestle amongst the grass for mutual protection. In spring the grass is quite dry and will burn fiercely, resulting in a rejuvenation of the flora within weeks, some species being rarely seen until the site is burnt. The cooler, southern side usually has a different assemblage of plants to the northern side and may harbour patches of littoral rainforest. Some plants on headlands flower for most of the year, even though their forest or heathland counterparts have a very restricted flowering period. In a few places like Evans Head and Crowdy Bay, headland plants grade into heathland. Since headlands form a convenient viewpoint, they have almost invariably attracted carparks and heavy foot traffic which damages and suppresses the natural flora, and they have not escaped the introduction of weeds.

Whilst estuaries provide shelter from waves and wind, twice daily the ebb and flow of the tide brings salt water which greatly affects plant life. Seagrass (*Posidonia australls*) may grow in the shallow water, an important shelter and food item in the ecological chain. Mangroves (*Avicennia marina*, the most common) grow on the mud flats inundated at each tide. Sedges and salt tolerant grasses grow behind the mangroves, often followed by Swamp Sheoak (*Casuarina glauca*), a Casuarina which is not deterred by soil soaked in brackish water. Some plants have close relatives found in salt affected areas of the inland. Others with different degrees of salt tolerance grow in various parts of the estuaries depending on the local topography.

Swamp Forest, Freshwater Wetlands and River Banks

Some swampy areas are too wet for tree growth and may be dominated by sedges, but broad areas of seasonal floodplain, now mainly cleared, were once populated by melaleucas, callistemons, casuarinas, Swamp Turpentine (*Lophostemon suaveolens*) and a few Eucalyptus species as well as many sedges and other fresh-water loving plants. The North Coast Regional Botanic Garden at Coffs Harbour has good examples of swamp forest as well as some other types. Riverbanks are populated by plants like River Oaks (*Casuarina cunninghamiana*) and Callistemons which need plenty of fresh water but which are capable of withstanding the force of occasional floods. Although briefly destructive, floods bring fresh soil and humus to the plains as well as carrying seed. Unfortunately this seed now often includes invasive weeds.

In some areas the riverbank community consists of what is sometimes called gallery rainforest, consisting of mainly subtropical rainforest species, not extending far beyond the riverbanks.

Continued on page 330

Micropropagation of selected ornamental hybrids

of *Eucalyptus erythronema x E. stricklandii*

P. Glocke, K. Delaporte, G. Collins, and M. Sedgley

Introduction

The genus *Eucalyptus* contains many species suitable for the floriculture and amenity horticulture industries in Australia. A development program has been underway at the University of Adelaide, with the aim of producing new and novel hybrid eucalypt varieties for these industries through controlled pollination between selected ornamental species. As each new hybrid plant reaches reproductive maturity, it is assessed for desirable characters and the very best plants selected for further development, including response to production systems and vegetative propagation. Plans that perform well in cultivation and can be propagated vegetatively will be registered with Plant Breeders Rights and made available through commercial nurseries.

To maintain genetic integrity selected hybrids must be propagated by vegetative means, such as grafting, cuttings, or the tissue culture methods of micropropagation and organogenesis. Micropropagation and organogenesis in ornamental horticulture can provide a rapid form of vegetative multiplication of selected hybrids. Micropropagation involves the multiplication of shoots from existing meristems, such as axillary shoot proliferation, followed by root development, and hardening off of plantlets to the natural environment. Organogenesis is the formation of adventitious shoots and roots from cells such as callus, which can then be treated as for micropropagation. The success of these two methods can be influenced by the mother plants age and growth environment, as well as tissue culture conditions including light, temperature, nutrient medium, and the type and concentration of plant growth regulators (hormones). Research into tissue culture propagation of eucalypts has focussed mainly on forestry species, with further investigation required to adapt these methods for ornamental varieties. The objective of the research was to identify a suitable method of introducing ornamental hybrid eucalypts of *Eucalyptus erythronema x E. stricklandii* into culture for clonal propagation via the tissue culture methods of micropropagation and organogenesis.

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Experimental method and results

Plant material

Stock plants used for experimental material included the following field and glasshouse grown plants.

Eucalyptus cv. 'Urrbrae Gem' (EUG) planted in the Waite Arboretum, University of Adelaide (tree 1867), is a natural hybrid of *E. erythronema* var *erythronema x E. stricklandii*. Grafted scions of the above mother tree on *E.* cv. 'Urrbrae Gem' seedling rootstock growing in the glasshouse.

Selected artificial hybrids produced by crossing *E. erythronema* var *erythronema x E. stricklandii*, the same parental species as *E.* cv. 'Urrbrae Gem', field plants growing in the Laidlaw Plantation at the Waite Campus, University of Adelaide, *EeEs*01 (Figure 1A), *EeEs*02, *EeEs*03, *EeEs*04, *EeEs*05, *EeEs*06, *EeEs*07, *EeEs*08, and hybrids *EeEs*A and *EeEs*B in pots in the glasshouse.

Initiation into culture

Stems and leaves (explants) were sprayed with 0.5 g^{-1} Benlate® (DuPont) and 20 ml^{-1} Pyrethrum (Ausgro Technologies Pty Ltd,) prior to harvest. Following harvest explants were dipped in 2 ml^{-1} Sporkill (Hygrotech), washed for 1-2 hr in RO water, gently agitated in 1% sodium hypochlorite with Tween 20 at 2 $dropsl^{-1}$ (field explants for 15 min and glasshouse for 10 min), rinsed 3 times in sterile water, and placed at 15°C for 72 hr. Stems and leaf explants were trimmed before placement onto medium and observed for contamination and browning levels.

Initiation of field grown hybrids *EeEs*01-08 and EUG into culture were poor, compared to explants from hybrids *EeEs*A and *EeEs*B grown in the glasshouse. There were greater contamination rates and higher levels of explant browning and death from field grown hybrids compared to glasshouse hybrids. Of the field explants EeEs01 showed the lowest contamination percentages with minimal explant browning while EUG nodal explants rapidly browned and died. Nodal explants *EeEs*A, *EeEs*B and the grafted *E.* cv. 'Urrbrae Gem' from the glasshouse were successfully initiated into culture and readily produced shoots.

Organogenesis

Following initiation of leaf explants of field hybrids EUG and *EeEs*01-08 into culture, explants were subcultured to Murashige and Skoog (MS) medium supplemented with 5 µM 6-benzylamino purine (BAP) and 10 µM α-naphthalene acetic acid (NAA) 1 for callus production. Callus growth was initiated on leaf explants of all hybrids except *EeEs*03, however, no buds or shoots developed. Callus was harvested and placed on ½MS medium, with a range of cytokinins and auxins and observed for bud and shoot development (Figure 1B). Buds were observed on genotypes *EeEs*01 and EUG at 10 weeks on ½MS medium supplemented with 5 µM BAP/5 µM NAA and hybrid *EeEs*01 on 1 µM BAP (Figure 1C). Only buds on hybrid *EeEs*01 leaf callus developed shoots. These shoots were subsequently harvested and multiplied but shoot multiplication could not be maintained.

Micropropagation

Following initiation surviving nodal explants of field hybrids EUG, *EeEs*01-08 were transferred to Quoirin and Lepoivre (QL) medium supplemented with 2.2 µM BAP and 1.0 µM NAA and observed for bud and shoot development. Explants were difficult to sustain in culture and very slow to produce axillary shoots. Four nodes of *EeEs*01 produced an axillary shoot at 8 weeks (Figure 1D), which were harvested and multiplied, but multiplication rates greatly diminished after 6 months and shoots could not be rooted. Shoot development was also observed from *EeEs*08 and *EeEs*02 but these deteriorated and could not be maintained.

In vitro shoots produced from nodal explants of *E.* cv. 'Urrbrae Gem' grafted plant were harvested at 3-4 week intervals with subculture on woody plant medium (WPM), 1 µM BAP, 0.05 µM NAA, 0.5 µM gibberellic acid (GA_3), with every fourth subculture containing 1.5 g^{-1} activated charcoal. Initial axillary shoot growth was good (Figure 2) but after several subcultures shoots began to deteriorate. At 12 months shoot tips blackened and wilted and could not be maintained.

Nodes of *EeEs*A and *EeEs*B were successfully initiated and multiplied in culture. Axillary *in vitro* shoots with 2-3 nodes were harvested and placed on WPM, 0.5 µM GA_3, and treated with a range of cytokinins to improve shoot multiplication. Shoot numbers were greatest for both *EeEs*A and *EeEs*B on BAP, with good growth also seen on zeatin and 2iP (dimethylallyl amino purine) and poor growth on kinetin. Leaf callus was a problem for both genotypes and was less with BAP compared to the other cytokinins.

Root initiation

Root initiation for hybrids *EeEs*A and *EeEs*B was unsuccessful on shoots multiplied with BAP while short stubby roots were produced after kinetin was used in the multiplication medium. Elongated roots are required for hardening off, as shoots with short, stubby roots fail to grow new leaves or roots following transfer to the external environment. After investigating different treatments elongated root growth occurred with the following process: shoot multiplication on 2 µM zeatin (Figure 3A); rooting medium consisting of ½ WPM, 20 µM IBA, for 1 week in the dark; subculture to ½ WPM, 1.5 gl^{-1} activated charcoal, and returned to 16 hr light at 75 µmoles m^{-2} sec^{-1} (Figure 3B).

Discussion

The initiation of explants into culture was more successful from glasshouse grown plants compared to field plants and more successful from field leaf explants than field nodal explants. Organogenesis through callus from mature *Eucalyptus* explants has proven difficult, as many species produce callus but fail to develop buds or shoots. These results are consistent with previous reports on forestry *Eucalyptus* species. Of the 9 field hybrids selected only *EeEs*01 showed potential through shoot organogenesis from leaf callus. For *EeEs*01 to be clonally propagated commercially the method requires a minimum 50% success rate. The comparison of field and potted plants in this study has shown that grafting and management under controlled conditions will improve initiation into culture and micropropagation. Successful micropropagation was limited to hybrids *EeEs*A and *EeEs*B from the

glasshouse. The varied response of selected hybrids was related to their growing conditions and mother plant age. Woody plants grown in the field are difficult to decontaminate and a woody plants ability to be clonally propagated diminishes with age. With selection criteria for ornamental hybrids applied after first flowering, their explants are more difficult to establish into culture and multiply compared to juvenile plants. Grafting of the now 70 yr old *E.* cv. 'Urrbrae Gem', initially improved micropropagation compared to explants straight from the mother plant. Successive grafting of scions from a mature plant is reported to improve plant vigour and this can relate to improved success in tissue culture. Therefore, grafting and glasshouse management of EeEs01, a field-grown artificial hybrid, should improve micropropagation success.

As other ornamental eucalypts are crossed and the hybrid plants assessed for commercial potential a suitable method of vegetative propagation for each individual needs to be identified. Initial work on the ornamental hybrids of *E. erythronema x E. stricklandii* provides a starting point for vegetative propagation of such individuals. Future work should aim to reduce explant losses on initiation into culture, and improve axillary shoot growth and shoot organogenesis, by aiming to improve stock plant vigour by management of hybrid plants under controlled glasshouse conditions. Work is currently proceeding on grafting techniques for *E. erythronema x E. stricklandii* and other eucalypt hybrids within the breeding programme. This is the first report of successful micropropagation for an ornamental hybrid eucalypt.

Acknowledgments

This research was supported by the Rural Industries Research and Development Corporation, the Australian Flora Foundation, and an Australian Postgraduate Award, the Noel and Vivian Lothian Scholarship, and Aileen and Bert Kollosche Scholarship awarded to Pauline Glocke. Special thanks to Dr. Kate Delaporte for the use of the hybrid trees in the Laidlaw Plantation.

Figures Opposite

Figure 1 **A)** Flowers of *E. erythronema* var *erythronema x E. stricklandii* hybrid *EeEs*01, courtesy Dr. Kate Delaporte
B) Nodular callus (Ca) on leaf (L) explant of hybrid *EeEs*01 on ½ MS medium with 5 µM BAP and 10 µM NAA at 4 week. Bar = 1 mm
C) Buds (Bu) from leaf callus of hybrid EeEs01 subcultured with ½ MS medium with 1 µM BAP after 10 week. Bar = 1 mm
D) Axillary shoot (Sh) 2 week following subculture from nodal explant to QL medium with 2 µM zeatin, with callus (C) on the underside of the leaves. Bar = 2 mm

Figure 2 *In vitro* shoots, harvested from E. cv. 'Urrbrae Gem' grafted plant growing under controlled conditions in the glasshouse, on WPM, 1.0 µM BAP, 0.05 µM NAA and 0.5 µM GA3, after 3 months in culture. Shoots did not sustain in culture and died after 14 months. Bar = 1 cm

Figure 3 **A)** Multiplication of *EeEs*B shoots on WPM, 2 µM zeatin, 20 g/L sucrose, gelled with 4 g/L Phytagel® prior to placement on root initiation medium. Bar = 1 cm
B) Root growth observed on shoots of *EeEs*A. After being multiplied with zeatin shoots were successfully rooted (R) on ½WPM containing 20 µM IBA, 10 g/L sucrose followed by ½WPM containing 10 g/L sucrose, 4g/L activated charcoal gelled with 4 g/L Phytagel®. Bar = 1





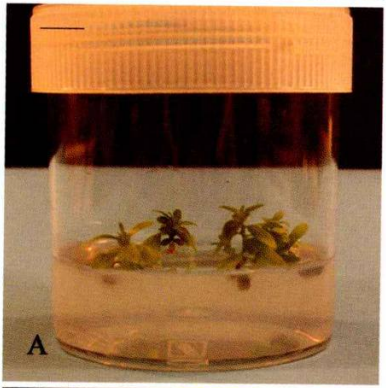


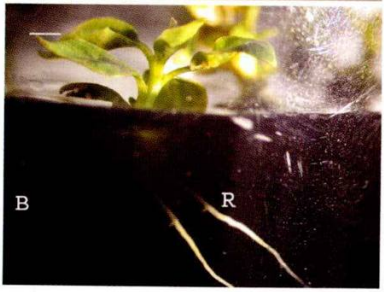


Above and Above Right: Figure 1 (A-D)

Descriptions on opposite page







Above: Figure 2 (A-D)
Right: Figure 3 (A and B)

Descriptions on opposite page

Pruning Australian Native Plants

A Fact Sheet _____ Jeff Howes

1. What is this fact sheet about?

This fact sheet aims to give some basic guidelines and general background to pruning Australian native plants and hopefully enable you to prune with confidence and success.

2. Australian native plants

Australian plants are wonderful to have in the garden but they are not maintenance free. 'Plant and forget' is an all too often promoted horticultural myth about the growing of our Australian plants. It is true, that most Australian plants require less attention than many exotic plants, however they do benefit greatly from some fertilising, pruning and watering. Pruning promotes healthy growth and vigour, extends the life of short-lived plants and promotes a greater display of flowers.

3. Types of pruning

Tip pruning to promote lateral growth and therefore bushier plants

- Regular tip pruning of the soft new growth is preferred to infrequent hard pruning and should be commenced when plants are very young, preferably at seedling or rooted cutting stage.
- Tip pruning is best undertaken after flowering and during the growing season for quicker results. Pruning too late in the season carries the risk of reducing next seasons flowers, as I have done on a few occasions.
- Tip pruning results in an increase in flowers as it promotes more flowering wood.
- Always carry secateurs when you're out and about in the garden as this allows you to easily practice tip pruning.

General pruning

- When pruning to control unwanted growth, it is best to only make clean cuts that slope away from buds. Cut close to and parallel to existing branches and leaf nodes, but not flush with them.
- With large branches, first cut the bark below, then make the top cut – this prevents tearing of the bark as the branch falls away.
- Use the plants natural habit as a guide. If it is slow-growing, compact and well-shaped, then only light pruning is needed tc tidy it up as necessary. If it is fast-growing, then more frequent pinching-out or pruning should be carried out.
- Prune the whole shrub at one time, that way even growth will occur all over the plant.
- It is best not to prune in winter as the resultant new growth can easily be damaged by cold wind and low temperatures.

- When cutting into old wood be aware that you may lose next years flowers on plants that flower on old wood such as many leptospermums, melaleucas and hakeas.

Pruning screen/hedge plants

Successful screen/hedge plants need to be given regular light pruning all over to promote and maintain dense growth. If you are using the lillypillies such as: *Acmena* sp., *Syzygium luehmannii* various forms and *Syzygium australe* various forms, this pruning will also keep them bushy to the ground.

Pruning to repair damage

- When branches are broken or attacked by insects/borers the branch should be pruned back to clean undamaged wood and close to a limb or leaf node. If left in an undamaged state, branches are prone to infection and dying back.
- After pruning large branches, advice in the past was to seal large cuts with a suitable bituminous sealing compound. These days it is generally not recommended that this needs to be done. I have not used a sealing product for many years and have had no problems.

Pruning to improve flowering

- Removal of old flowers should be undertaken after the flower is finished. This way the plant does not put its energy into producing seed. It also has the same effect as tip pruning as it promotes new lateral growth and hence more flowers next season.
- Callistemons, and fine-leaved melaleucas certainly benefit from having the top two thirds of their flowers removed and is a 'must do' pruning action.

Pruning to minimise new growth

- Pruning flush with the trunk should result in no new leaf growth – handy if you are pruning lower branches off a shrub to make it more tree like.

4. How to prune when more drastic results are required

- Trying to keep large plants to a manageable size by pruning is hard work and is best done continually through-out the year and not once a year as is often done. Be aware that hard pruning into old wood may even kill some plants.
- If you have any old woody shrubs that are more of an eyesore than an asset in the garden, arm yourself with secateurs and a pruning saw and get stuck into it. The easiest way to rejuvenate callistemons, (especially the *C. viminalis* hybrids), fine-leaved melaleucas and leptospermums is to lop them off at ground level. If undertaken in spring they will quickly put out new shoots and grow into bushy shrubs with attractive healthy foliage. Water well to maximise new growth. See Plate 1. for an outstanding result of hard pruning of a banksia.





Above: (Plate 1) This four metre high *Banksia ericifolia* has been pruned close to the ground. Only after a few weeks there are already plenty of new shoots which will create a very bushy plant. I would have cut the older top branch off as well, as there are no new shoots from it.

Below: (Plate 3) Do not forget to take the stake out as the plant grows. In this example the tree has grown around the stake and cannot be removed by hand.

Above: (Plate 2) The main branch of this mature *Grevillea* 'Moonlight' has been pruned hard which has resulted in a mass of new shoots. Ideally when pruned, the cut should have been made at a greater angle so that water runs off, to minimise rot and fungal entry.

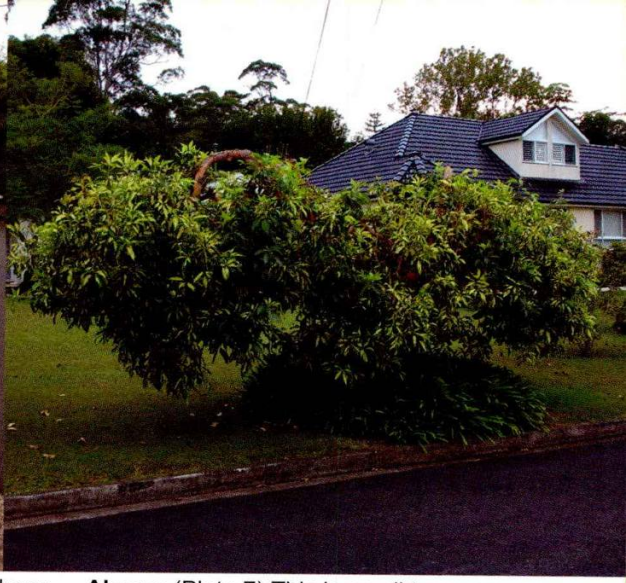
Below: (Plate 4) Plants pruned like this are for show only, as often the flower buds are pruned off.
The plants will need to pruned often in the growing season to keep them 'neat and tidy'.

Photos J Howes









ove: (Plate 5) This *Callistemon* has been pt pruned, for neatness but allowed to wer by not pruning new growth in spring. ter flowering, the plant will need to be uned again to maintain its compact habit. te the use of volcanic pebbles as a ound cover.

low: (Plate 6) This example shows uning of all side shoots to try and create a icker growing tree that has a clear trunk re suited to public places. Any regrowth l need to be continually removed for the t few years.

Above: (Plate 7) This is an all too common occurrence of a very large tree planted under power lines. Very hard pruning is required which completely spoils the shape of the tree.

Below: (Plate 8) See paragraph 4 for explanation.

Photos J Howes





- Drastic pruning of older more senile grevilleas is not always successful; however I have seen successful results of severe pruning undertaken on *Grevillea venusta*, *Grevillea* 'Orange Marmalade' and the taller Queensland hybrid grevilleas such as *Grevillea* 'Moonlight' and 'Honey Gem'. See Plate 2 for a great result of pruning.
- If the plant has got to the stage where you have nothing to lose – prune hard and see what happens.
- When pruning large heavy branches, make the first cut about 150 mm further out than where you need to make the final cut. When the heavy branch has been removed, make a second cut to clean up, this minimises tearing of the bark. Note that untidy cuts or torn bark can create entry points of fungal diseases etc.
- Plate 7 shows the result of pruning of trees that are far too big for their situation especially the one shown, as it is under the power lines to the house. In this position it would have been better to use one with a lower growth height in the first place.
- The foreground plant in Plate 8 has been pruned parallel to the ground, completely spoiling the shape. A much better way, is to prune branches at three levels - some near ground level, a few in the middle and the remainder higher up. When the plant commences to grow it will fill out all over and not just at the top. This results in a much better visual look. As well, the Grevillea in the rear of Plate 8 needs hard pruning as it is in the senile stage and will slowly decline. Hard pruning will either revitalise it or kill it. If it dies, then there is space for a new plant. Your garden has not space for a poor performing or senile plant unless you have sentimental attachments to them.
- Plants that develop a lignotuber usually respond very well to cutting off all growth just above the lignotuber. I have successfully done this with *Ceratopetalum gummiferum* (NSW Christmas Bush) and *Lambertia Formosa* (Mountain Devil).

5. Maintenance of pruning tools

Use sharp tools and disinfect them by cleaning with methylated spirits. Blunt tools leave ragged edges on the branch and are an invitation to disease to enter your plants.

6. Finally

A good days pruning is more satisfying than a day at your local gym and its free.

New CD:

Plants of the Coastal Area of the Royal National Park _____ Doug Rickard

The Sutherland Group of the Australian Plants Society has produced a CD that includes botanical details plus pictures and other information on over 300 of the flowering plants and ferns that grow in the Coastal Area of the Royal National Park.

The Realisation of a Dream

It started as one man's dream. Doug Irving was that man and his dream was to create a fully interactive CD with pictures and botanical details of all the plants in the Royal National Park. He insisted that the CD was to be easy to use and that you did not need to have any botanical knowledge to use it. Armed with a camera, a notebook, a copy of Robinson and a GPS unit so he could record where he found the plants, he set off on the first of his many trips into the Park. He soon realised that to record all the plants in the whole Park would take forever so he decided to concentrate on the plants that grew in the scenic Coastal Area of the Park. He assembled a team of helpers from the Sutherland Group – Aileen Phipps, Gwen Caddy, and Connie McPherson for their knowledge of native plants and Margaret Bradhurst for her specialist knowledge on native orchids and her photographic expertise – and this small group set out to find, record and photograph the plants.

Unfortunately Doug did not live to see the project completed, but other members of the Group took up the challenge. Doug Rickard, who had been involved with this project for some time, took over the role of co-coordinator and Ruchir Sodhani took on daunting task of developing the software. Two others that must be mentioned are Ken Smith who reviewed all the pictures and produced all the drawings used to illustrate the Glossary and Belinda Pellow who checked all the botanical texts and produced the maps of the Park. Thanks must also be given to the committed members of the Sutherland Group who spent hours both proving that the software was bug free and diligently went through the text looking for errors and omissions. After thousands of hours either trekking through the Park or sitting in front of a computer the project is now complete and Doug Irving's dream has at last become a reality.

So what is on the CD?

The CD has information on over 300 of the flowering plants and ferns that can be found in the Coastal Area of the Royal National Park. It does not claim to cover every species of plant that grows in the area (there are over 700 of them); but rather it concentrates on the plants that you are most likely to come across along the Coast Walk Track and the other tracks east of Sir Bertram Stevens Drive, the road running from North to South through the Park. There is a list those plants that are not featured on the CD but are known to grow in the area. These are mainly plants that are rare, hard to find or grow in areas that are not easily accessible from the walking tracks - also excluded are some that are just plain boring! In addition the CD includes a wealth of other information on the Royal National Park plus a comprehensive glossary of botanical terms, a plant identification guide and maps.

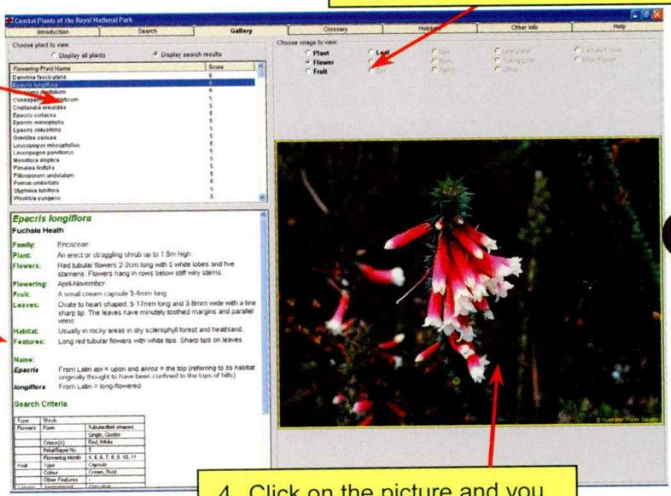
Plants of the Coastal Area of the Royal National Park
The Information about the Plants

The Gallery Screen includes comprehensive information plus pictures of the plant, its flowers, leaves, fruit etc.

1. List of probable plants appears here

2. Botanical and other information on the plant appears here

3. Select the picture of the plant you want to see here



4. Click on the picture and you will zoom to a larger image

…and if you Zoom you not only get larger pictures but you can also see a Slideshow

Select the picture you want to see (plant flower fruit leaf etc.) here

Click here to get a Slideshow



Click here to return to the Gallery screen







Top Left: *Conospermum tenuifolium* fruit

Top Right: *Gleichenia rupestris* sori

Above: *Cissus antarctica* fruit

Left: *Eucalyptus camfieldii* bark

Photos: M. Bradhurst

Below: *Xylomelum pyriforme* flowers

Photo: D. Irving

Photos from

Plants of the Coastal Area of the Royal National Park





The CD will run on any computer having Windows 98, ME, NT, 2000 or XT. Unfortunately it will not run on a Mac.

The powerful Plant Search Facility that is built into this CD

The most important feature of the CD is its powerful Plant Search facility. It enables you to identify a plant simply by ticking boxes to input what you know about it. It also enables you to search for information on a plant by entering its botanical, common or family name. Having entered what you know about the plant you will get a list of all the plants that have one or more of the features you entered with the most probable (i.e. the one with the highest score) at the top. It's a very forgiving system; enter as much information as you can - it does not matter if you make an incorrect entry; an incorrect entry just will not score.

Detailed Botanical Information plus over 1200 stunning Photographs

Having got a list of the probable plants you highlight one and click on the 'View Plants' button to be taken to the Gallery section with the pictures of the plant plus all the botanical and other information. Here you will find the plant's botanical and common name(s), a botanical description and the derivation of its name. With flowering plants (and this CD treats all plants that are not ferns as flowering plants) you have pictures of the plant, its flowers, leaves, fruit and, if applicable, its bark, buds, young leaves and male and female flowers. With ferns you have pictures of the fern, its fronds and sori. If you click on any picture it will be enlarged to almost fill your computer screen. Again you can select any one of the pictures of the plant. You can also get a Slideshow. This feature cycles through the pictures of all the plants.

There is a comprehensive Glossary

If you are not sure of the meaning of a particular botanical term you can highlight it, click on it and be taken to the page of the Glossary section relating to that term. Here you will find the meaning of the term plus a photograph or line drawing that illustrates it.

And the CD includes information about the Habitats in the Park

The botanical description of a particular plant may say, for example, that it grows in rainforest. But where in the Park will you find rainforest? And how will you recognise a rainforest when you see one? These are two of the questions most frequently asked by people visiting the Park. So the CD includes a Habitats section that describes the habitat types that you find in the Coastal Area of the Park and lists the main plants that characterise the various habitat types. There is also a detailed habitat map.

So you're off to the Park

Not everyone is familiar with the Royal National Park so this CD includes a map of the Park, details on how to get there and information on the walks you can go on through the Coastal Area. It also includes useful information on the Park regulations and on how to look after both yourself and the environment when going on a walk. There is even a potted history of the Park from before white man set foot on these shores up to the present day.

It was realised that people are unlikely to take their computer with them when they visit the Park. So the CD includes a handy plant identification guide and a data collection form that, like just about everything else on this CD, you can print out and take with you on your trip.

Not all of us are a whiz on the Computer

Although this software is very easy to use, it still includes a Help section. This explains how to use every feature of the Search, Gallery and Glossary sections of the CD plus the answers to Frequently Asked Questions about the software. If you are still in trouble you can get further help through the Sutherland Group Website.

Keeping your information up to date

The botanical names of plants may change as botanists reclassify plants and species and the NSW National Parks and Wildlife Service can change information on the Park and its regulations at any time. Details of the changes that affect the information on the CD will be posted on the Sutherland Group's Website. These updates can be downloaded and install on your computer to keep your version of the software up to date.

How much does it cost and where can you get it?

The cost is $20 plus $2 for packing and postage.

You can get the CD from the Sutherland Group by visiting their Website at www.ozemail.com.au/~ssgap and following the prompts. The Website also lists the various retail outlets and nurseries in Sydney that stock the CD - these include the Royal Botanic Gardens Shops at Sydney and Mt. Annan as well as the Royal National Park Shop at Audley.

Arcadia - Narrandera NSW

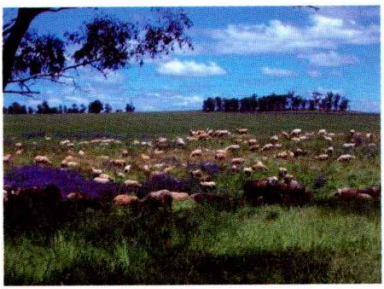
Rosie Smith

Introduction to the Central Riverina



Old Man Saltbush (*Atriplex nummularia*) plantation at Arcadia
Photo: Graham Strong

By now it should come as no surprise that much of south eastern Australia is in the grip of a severe drought. Every day we hear another gloomy story, such as irrigation water cutbacks, financial ruin faced by farmers, and economic and social downturn in rural communities. Ecosystems are equally stressed, the dry conditions aggravating existing issues caused by salinity, erosion, dieback, ecosystem fragmentation and poor land management. Most of the central Riverina region of NSW is currently an Exceptional Circumstances declared area that qualifies for some financial relief during drought conditions[1].



Sheep 'crash grazing' a revegetation corridor to trample annual weeds
Photo: R Smith

The countryside of the central Riverina is generally heavily cleared, and supports large-scale industrialised agriculture. Recognised bush 'islands' in the region include The Rock Nature Reserve, Cocoparra National Park, Galore Hill, Brobenah Hills and the Narrandera Ranges which were never cleared due to their unsuitability for cropping or grazing. There are also a few state forests such as Buckingbong in which white cypress pine is harvested, and the area still supports some good quality roadsides and Travelling Stock Reserves.

Rosie writes of her experiences on a farm near Narrandera. She is an Ecologist, originally from the UK who came to live on the farm in late 2002. Rosie is currently employed by the Murray CMA, working on Landcare and the Bush Stone-curlew.
The Strong family have been farming 'Arcadia' for four generations, and are building a healthy business based on healthy, diverse land and enterprises.



Rosie Smith amongst Chocolate Lilies (*Dichopogon strictus*) at 'Arcadia'
Photo Graham Strong





Above: A high quality local grey box remnant with intact understorey - Allan Carroll Reserve, Boree Creek.

Top Right: Inside one of the revegetation corridors at 'Arcadia'

Right: A fenced off area of remnant vegetation. Photos: Rosie Smith



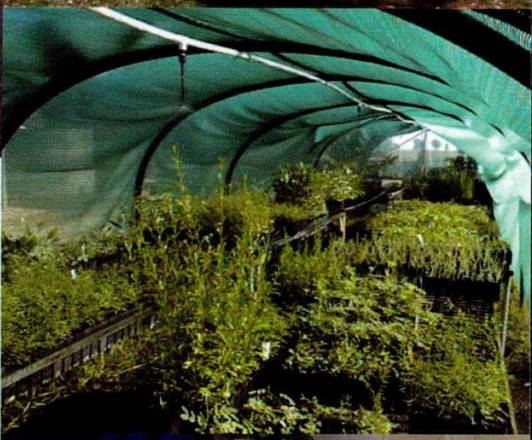


Above: Graham Strong weighing native seed to calibrate the Flexicoil Airseeder before sowing. Photo: Garth Strong

Right: The onfarm native plant nursery. Photo: Graham Strong

Below right: Wattle seed drying after being floated to remove unviable seed. Photo: Rosie Smith

Below: Direct seeding an area of scalded ground at 'Arcadia' using cropping machinery Photo: Rosie Smith







The region marks the end of the Great Dividing Range and the beginning of the interior plains, and is very interesting floristically, with ecosystems including open box (*Eucalyptus microcarpa / melliodora / albens*), Buloke (*Allocasuarina luehmannii*) and Boree (*Acacia pendula*) woodlands, Black Box (*E. largiflorens*) swamps, River Red Gum (*E. camaldulensis*) along the Murrumbidgee river, White Cypress Pine (*Callitris glaucophylla*) and Kurrajong (*Brachychiton populneus*), native grasslands, saltbush, and hilltop vegetation communities incorporating Drooping She Oak (*Allocasuarina verticillata*), Currawang (*A. doratoxylon*) and Blakeley's Red Gum (*E. blakelyi*). By virtue of being earmarked for prime agricultural land, grassy box woodlands and native grasslands have become some of the most threatened ecosystems in Australia. Inland grey box woodland in the Riverina and Cobar bioregions has been reduced to just 20,000 hectares, 3% of its original coverage[2]. Buloke woodlands of the Riverina and Murray-Darling Depression Bioregions, and White Box–Yellow Box–Blakely's Red Gum Grassy Woodland and Derived Native Grassland are listed as endangered and critically endangered respectively as Threatened Ecological Communities under the Commonwealth EPBC Act[3]. Much of the existing vegetation survives as patches and remnants on private property.

During drought times the effectiveness or otherwise of land management strategies really becomes apparent, and 'Arcadia', situated 30 km from Narrandera in the NSW Riverina is so far weathering well. Run by Garth and Jan Strong, their son Graham and his partner Rosie Smith, the 1830 Ha sheep and dryland cropping property has seen the beginnings of a remarkable turnaround in the last ten years. Adopting the term 'regenerative' agriculture instead of sustainable, the Strong family are trying as far as possible to have a two-way dialogue with the land they are custodians of, confronting long held beliefs of what good farming is, thinking in an environmentally progressive way and developing a long-term vision for the farm. This has so far been achieved by adopting biological farming and holistic management techniques and developing additional enterprises, with a view to maximising biodiversity on the property whilst achieving sound economic returns.

Regenerating land and business with local vegetation

Regenerating and utilising native vegetation has been key to all of the above. The family began collecting and propagating seed from local native plant species in 1996, and the operation quickly mushroomed as a result of the Strong's use of direct seeding to plant tree corridors. 'Pioneer' species commonly found on local roadsides such as Golden wattle (*Acacia pycnantha*), Western Black Wattle (*A. hakeoides*), Western Silver Wattle (*A. decora*), Grey Wattle (*A. brachybotrya*), Punti Bush (*Senna artemisioides*), Wedge Leaf Hopbush (*Dodonaea viscosa* subsp. *cuneata*), Deans Wattle (*A. deanei*) are planted in fallowed soil with a Flexicoil airseeder, the very same used to sow annual crops. Other common local species such as Yellow Box (*E. melliodora*), Grey Box (*E. microcarpa*), Buloke (*Allocasuarina luehmannii*), Hooked Needlewood (*Hakea tephrosperma*) and White Cypress Pine are then planted by hand afterwards, including species that are locally rare such as Mallee Bush Pea (*Eutaxia microphylla / diffusa*) and Sugarwood (*Myoporum platycarpum*).

Many of the corridors have been strategically located next to high conservation value roadsides as an advertisement to plant trees, and as one factor in an integrated approach to ecologically sound land management. The corridors and remnants are also managed to encourage natural regeneration wherever possible, and always include understorey species and native grasses, some of which are now seldom found on local roadsides, e.g. Kangaroo Grass (*Themeda triandra*). Natural regeneration from adjacent roadsides has been encouraging, as several speargrasses (*Austrostipa* sp.), windmill grasses (*Enteropogon* sp.), Red Grass, wallaby grasses (*Austrodanthonia* sp.), Mulga Grass (*Thyridolepis mitchelliana*), Climbing Saltbush (*Einadia nutans*) and Creeping Saltbush (*Atriplex semibaccata*) are just some the species recolonising naturally in many of the corridors.

The tree corridors not only provide aesthetic benefit, but are utilised as shady grazing in high summer, provide habitat and ground litter for predatory insects and birds, and are now providing such large quantities of seed that a few species are harvested commercially for revegetation in the Murray and Murrumbidgee catchments. To date around 250,000 native trees and shrubs have been planted, which has happened concurrently with retention of stubbles, minimum till cropping, increased perennial pasture and approximately 120 Ha to date of Old Man Saltbush plantations. Old Man Saltbush (*Atriplex nummularia*) is a deep rooted, perennial, highly palatable species which has been instrumental in droughtproofing the farm and historically grew in the area. Sheep that graze on it over a period of weeks produce lean and tasty meat, so much so that in 2006 a saltbush lamb enterprise was launched, which is so far enjoying great success in restaurants and food festivals in the Riverina and Victoria.

Other related projects include the establishment in 2005 of seed production areas for local native species which are difficult to collect sustainably from roadsides due to their scarcity. Species planted so far in these areas include Gold-dust Wattle (*A. acinacea*), Mallee Wattle (*A. montana*), Deans Wattle, Narrow-leaf Hopbush (*Dodonaea viscosa* subsp. *angustissima*), Mallee Bush Pea, Fern-leaf Hopbush (*Dodonaea boroniifolia*) and Miljee (*A. oswaldii*). Eventually it is hoped that most of the seed supplied for local revegetation projects and nurseries will come from such onfarm seed production areas, therefore reducing collection pressure on local roadsides, increasing local gene pools of fragmented populations and providing a reliable seed source. Sweet Quandong trees (*Santalum acuminatum*) are also being grown for their delicious red fruit, which makes fantastic sauces, quandong tarts and muffins. Quandong trees are now extremely rare locally and only one wild stand ever produces fruit, so seeds have been sourced during outback trips. The resulting fruit is sold to gourmet restaurants and food manufacturers.

Continued on page 323





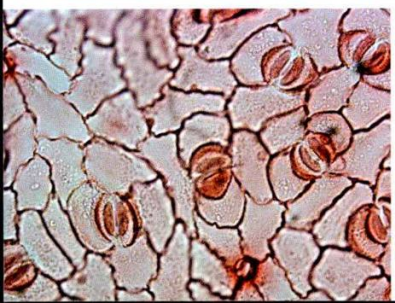
Above left (Figure 1):
Tree ferns near Mt Lewis, North Queensland Wet Tropics.

Above right (Figure 2):
Giant kauri pine in New Caledonia.

Above (Figure 3):
Leaf litter in New Caledonia rainforest, including a leaf of *Cryptocarya* (Lauraceae) at left, and abundant foliage of the podocarp conifer *Acmopyle*.







Left (Figure 4):
Leaf cuticle from Mt Hotham fossil Lauraceae. Note the 'butterfly'-shaped arrangement of thickened scales associated with the stomata, and a poral hair base (near centre of image).

Bottom left (Figure 5):
Leaf cuticle from an Australian species of *Cryptocarya*. It is virtually identical to the fossil in Figure 4.

Right (Figure 6):
Fossil shoot of *Acmopyle* leaves from Mt Hotham.

Photos: R. Carpenter



Vegetation at Mt Hotham Victoria

50 million years ago to present

Dr Ray Carpenter
Department of Environmental Biology, University of Adelaide

There is much concern that the climate of Australia's alpine regions is changing as a result of global warming, and that for instance snowfall is expected to decrease and the treeline to reach higher altitudes. Plant fossils from a site near the summit of Mt Hotham dated at approximately 50 million years old (Early Eocene) show that over a much greater time period such changes in climate and vegetation are actually trivial. The past vegetation was most unlike the snow gum (*Eucalyptus pauciflora*) woodland grading into alpine herbfields that now dominates in the region. Instead, picture the wet, bright green world of rainforest like that now found on the Atherton Tableland in the North Queensland Wet Tropics. Fossils identified include abundant lycopods and ferns (especially tree ferns of Cyatheaceae and Dicksoniaceae) (Figure 1), *Agathis* (the Kauri Pine) (Figure 2), *Gymnostoma* (Casuarinaceae), many Lauraceae (the cinnamon and avocado family) (Figures 3-5) and many Proteaceae including probably *Musgravea* (a close rainforest relative of *Banksia* and *Dryandra*). Some of the plants are now extinct from Australia, but with nearest living relatives in other wet, rainforested areas, especially New Caledonia and Papua New Guinea. Such plants include conifers of the family Podocarpaceae *(Dacrydium* and *Acmopyle*; Figures 3 and 6). One fossil spore species, *Kuylisporites waterbolkii*, has been closely allied to extant species of *Cnemidaria*, tree ferns of Cyatheaceae now confined to South and Central America.

The Early Eocene is recognised as one of the warmest periods in Earth's history, when sea surface temperatures were up to 8–10°C warmer than present, and 'tropical' organisms such as coral reefs, crocodiles, cycads and palms were found at high latitudes in both the northern and southern hemispheres. At this time the Mt Hotham region was located at about 60° S, and would consequently have experienced long periods of near darkness during 'winter', and near continuous light at the height of 'summer'. Although the geomorphic evolution of the region is very complex, geologists understand that the south-eastern Australian Highlands were formed over 100 million years ago, elevated to altitudes of the order of 800 m above sea level. This seems a reasonable estimate for the altitude at the time of deposition of the sediments in a system of rivers and lakes, but there has obviously been subsequent uplift to the present altitude of about 1700 m. The Early Eocene lowlands of south-eastern Australia would have been much warmer, even to the point of supporting diverse mangrove vegetation in western Tasmania. High ocean temperatures were probably partly due to the fact that Australia was connected to an ice-free Antarctica via Tasmania, so that only a narrow, mostly shallow seaway was opened to the west and no circum-polar current existed. The best evidence for cooler adapted vegetation at Mt Hotham is probably the extremely high abundance of fern and bryophyte spores; two in every three grains of the preserved microfossils (comprising spores and angiosperm and gymnosperm pollen) extracted from the sediments are

spores, and of these most are from tree ferns. This must reflect a dominance of tree ferns in the nearby vegetation. In tropical mountainous areas, tree ferns become increasingly abundant as you reach cooler elevations.

The northward drift of the Australian continent and further uplift of the Highlands contributed to changes in the type of rainforest that would have grown at Mt Hotham and its eventual disappearance. A profound change apparently occurred at around the time of the final separation of Australia from Antarctica at around 35 million years ago. Vegetation similar to modern Wet Tropics rainforest became dominated by *Nothofagus* species and conifers like those of modern upland Papua New Guinea. Increasing coolness and seasonal dryness eventually led to the extinction of these species from the region by around 2 million years ago. *Nothofagus cunninghamii* and *Podocarpus lawrencii* are modern representatives of these lineages, the former is now restricted to wet forests in other areas of Victoria and Tasmania, and the latter is now a characteristic element of Mt Hotham's boulderfields, as well as those in alpine Tasmania. Lightning-induced fires and then human lit ones over many millennia saw the replacement of fire-sensitive species by eucalypt dominated vegetation with an understorey of shrubs including other Myrtaceae, Epacridaceae, Rutaceae and Proteaceae. The upper altitudinal limit of trees has also undoubtedly changed over time, notably being much lower when glaciers covered the Highlands at periods during the Pleistocene over the last 100,000 or so years. Extensive tracts of open alpine herbaceous vegetation dominated by grasses (Poaceae) and daisies (Asteraceae) are probably of relatively recent origin, but it is interesting that this vegetation type was formerly very widespread as a form of steppe at low elevations whenever glaciers appeared.

Rapidly rising global temperatures will undoubtedly affect the alpine biota, but it remains to be seen how serious the changes will be. Short of the unlikely event of further mountain uplift in the near future, many species may have no further habitat available, and will become extinct.

Acknowledgments

I thank my co-authors for their contributions to our paper, and the Mt Hotham Management Authority and Victorian Dept of Sustainability and Environment for access and permits. Funding from the Australian Research Council assisted our research.

Further reading

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2. Hill RS (1994) *History of the Australian Vegetation: Cretaceous to recent.* (Cambridge University Press: Cambridge).

continued from page 319

Towards a healthy future

Although the family has borne most of the establishment costs in these ventures, in 2003 they undertook several large onfarm projects as part of the Department of Natural Resources' Environmental Services Scheme, an initiative to encourage permanent, broadscale land use change that provides services to the community by way of improving water quality, reducing salinity and erosion, protecting and enhancing biodiversity and enhancing aesthetic and social values. Other exciting recent ventures have included participation in the 2005 'Pass the Salt' online exhibition, a joint initiative between the Museum of the Riverina and the National Museum of Australia on salinity in the Wagga Wagga area, and in 2006 the family received a Primary Producers Landcare Award from the Murrumbidgee Catchment Management Authority.

Farming regeneratively is an ongoing process requiring longterm vision, but the first signs of change have attracted attention from groups as diverse as university students, academics, farmers, conservationists and the occasional arts project. The Strongs also hold the odd Field Day, and are hosts with the Willing Workers On Organic Farms scheme (WWOOFing), accommodating backpackers and agricultural students, with this educational aspect set to grow in the future with a biannual 'Hoggett Festival' and farmstay style accommodation / conference facilities in an old converted church. The Strongs have signed up with Landcare's CarbonSmart program – as the first farmers in Australia to do so they featured on the ABC news and Bush Telegraph. 2007 will see large scale direct seeding of native grasses on the property, and hopefully more rain.

Although the farm is not generally open to the public, visitors are welcome. Please email or call 02 6959 8656 beforehand, and if you want to read more, see the Arcadia Saltbush Lamb website at www.saltbush-heaven.com

Additional information can be found online at

www.nma.gov.au/exhibitions/community/pass_the_salt/salinity_and_wagga_wagga/arcadia/
www.murrumbidgee.cma.nsw.gov.au/index.php?id=552

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5. Kent, Earl, Mullins, Lunt & Webster (2002). *Native Vegetation Guide for the Riverina: notes for land managers on its management and revegetation.* Johnston Centre, Charles Sturt University.

Australian Plants

the P.L.Ant Guide _____ Book Review by David Chandler

This book is an excellent introduction to Australia's native plants for young people. It is suitable for the upper primary, lower secondary age group and helps to fill the gap in readable informative text about native plants.

It meets the challenge of providing scientific names, with an easy phonetic pronunciation key which demystifies their use and opens up a whole new experience for children.

I like the use of the P.L.Ant guide, where readers are invited to find the ant in every illustration, it adds a fun link to each section. The cross referencing also guides the reader through the book and provides additional information.

The arrangement of the book in alphabetical sections with plants from A to Z provides a simple format, but this might not appeal to older students.

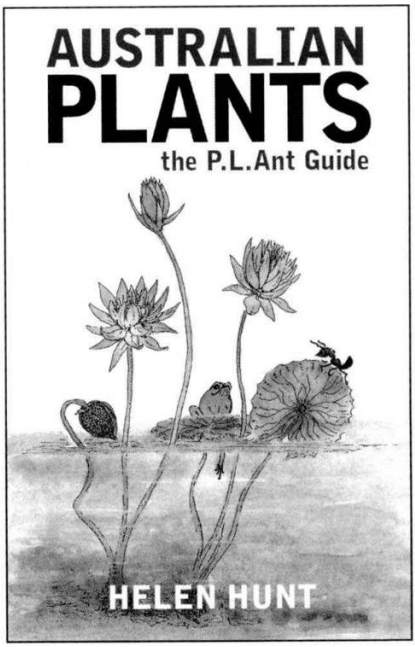
I would like to see the Wollemi pine given more emphasis, the dinosaur tree would certainly excite children's imagination. It is only briefly mentioned in the 'Just for Interest' section. It could justify a section of its own with the story of its discovery and rarity.

Helen Hunt is to be congratulated for writing a well-researched book which provides a storehouse of information on native plants for children from acacias to xanthorrhoeas and zamias. I recommend this book for children interested in the natural world as well as a school text book for environmental education.

AUSTRALIAN PLANTS

the P.L.Ant Guide

by Helen Hunt



David Chandler is a Retired School Principal and a Member of Australian Plants Society in NSW affiliated with the North Shore District Group.
He is a keen gardener and his garden is open in Australia's Open Gardens Scheme.

In Praise of Robinson

Ross Doig*

Five of us are on one of our regular botanising trips along a bush track. Every species is listed (native of course) including those in adjacent areas when we spot a side track, an escarpment edge, a creek line or a plant community change. Every so often we spot a species we can't name and out comes Robinson, that is, to give it the full title; *Field Guide to the Native Plants of Sydney (Easy Identification)* by Les Robinson and an ID search begins. Usually from the group hints as to family, genera and species are suggested for checking and in at least 90% of cases ID is confirmed. If unsuccessful, the *Flora of NSW* is consulted and as a last resort a dried and mounted specimen is submitted to the NSW Herbarium.

And just what does Robinson offer? Following are the main, but not all of the details supplied.

- A very user friendly key of families, genera and species.
- Drawings of the plants which give visual ID details.
- Written description of each species with such details as habitat, flowering time, size and chief distinguishing features.
- Division in to helpful sections such as Major and Lesser Families and groups, for instance Rainforest, Aquatic and Estuarine, Climbers, Grasses and Sedges.
- An excellent glossary and index.

I have found the paper quality to take biro or felt tip inks allowing me to add new names, field characteristics discovered, tick all species included in my slide collection and local sites verified.

Although designed for Sydney which includes part of the Blue Mountains, south to Nowra and up to near the Central Coast, the book is helpful elsewhere, particularly on the tablelands from Victoria to Queensland where it might cover up to 50% of species.

It will not fit a pocket but is ideal for a backpack and will as a paperback have a longer life if protected inside a clip-lock type plastic bag or A4 sheet protector of the thickest gauge.

To sum up: Available since 1991 and revised in (1994 and) 2003, it will undoubtedly continue to be published for a long time yet as an indispensable first ID portable and shelf top book not only for Australian Plants Society members, but also bushwalkers, naturalists and others interested in our native flora.

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* Ross Doig is a Life Member of the Australian Plants Society in NSW and he is affiliated with both the North Shore and Parramatta/Hills District Groups.
This article was not solicited as a book review, but written in genuine praise of Les Robinson's Field Guide, which is a must have book when identifying plants in Sydney and nearby environs.
Les Robinson, *Field Guide to the Native Plants Of Sydney* 3rd Ed, ISBN 0731812115 Simon & Schuster, $39.95 It is available from all good book stores.

Establishing Dendrobium Orchids

Jeff Howes

I have been gardening using native plants for nearly thirty years. And over the last six years I have opened my garden three times for the Australian Open Garden Scheme. My real aim is not to show my garden off but to show people that you can successfully grow native plants in suburbia and to promote the Australian Plants Society.

What I find interesting when I talk to the visitors is comments like - when you go to most open gardens you know nearly all the plants that are used - only the site and method of use changes - with a native garden you do not know most of the plants so they ask me many questions like : how you I grow them, which ones do I use, what can they use in their garden etc etc. I start off by saying that there are over 20,000 native plants in Australia that are growing from the coast to the desert. You need to select the ones that will grow in you micro climate and local conditions such as: how much sun you is present, what type of soil is it well drained or retains water etc.

One of most frequent question I receive is how do I manage to grow *Dendrobium kingianum* and *Dendrobium speciosum* orchids on my rocks and 'apparently' in the ground. These orchids are really very hardy and many are killed by to much kindness and water. In fact they can endure extreme desiccation and flower best in full sun to one quarter shade.

To establish them on large rocks obtain some aerial shoots that have been removed from existing orchids or cut off clumps with three or four pseudo-bulbs and hold them down with small rocks (or even tie them down with old stockings) and surround them with plenty of old leaf litter. Use an open friable litter that does not hold too much moisture and drains well. Keep the orchids moist (not wet) until new growth commences and then only water occasionally and apply more mulch as they grows.

To appear to get them growing in the ground, (which they wont), place a few 50 mm thick paving blocks on the ground and follow above method. In no time they will multiply and reward you with flowers. Liquid fertiliser can be applied monthly during spring and summer at 1/2 strength if you must as they will get enough nutrients from the decaying leaf iitter.

Jeff Howes garden appeared in *Australian Plants*, Vol. 21, No. 173 December, 2002

Orchids in the Garden

Peter Vaughan

Orchids have long fascinated many people. They have evolved into incredible forms of both plants and flowers. Being so highly evolved, many fit into narrow ecological niches, and so are difficult or impossible to grow in cultivation. Fortunately many Australian orchids are generalists, adapted to a wide range of habitats and hence can be grown in many gardens.

For many years I have grown a range of native orchids, with many successes, and as many failures. The successes are very encouraging however and provide a spectacle that is worthwhile. I would like to share my experiences in the hope that many others may also grow native orchids in their gardens. I expect others will have even more success than I have had.

Native orchids can be divided into two broad categories, the epiphytic/ lithophytic orchids, and the ground orchids. As their growing conditions are very different I will discuss them separately.

Epiphytic & lithophytic Orchids

These are the orchids that grow on trees and rocks respectively. They are not parasites and do not harm the tree in any way. Common examples are the Dendrobiums such as *Dendrobium speciosum* & *D. kingianum*.

I grow these orchids by tying them onto a suitable tree between waist and head height. This allows for regular examination for pests such as Dendrobium beetles. Lengths of cut stocking are one of the best materials to use as a tie as it will stretch as the tree grows. When tying the orchid onto the tree do not place anything between the orchid and tree. Sphagnum moss or similar can be placed thinly over the roots. The stocking should be left supporting the plant for at least 12 months and perhaps two years. There is usually no need to water the orchid more than weekly in coastal NSW. Watering is most effective if done in the evening. Although I don't fertilise my orchids, light fertilising would probably be beneficial.

Despite the fact that we can see many orchids growing naturally in strong light, they do not seem to accept these positions in the garden. Grow them in more shade than they receive in nature. I often place a plant on the southern side of a tree so the plant base is kept cooler.

My preferred tree hosts are *Casuarina* species. Callistemons are excellent, as are *Melaleuca alternifolia* and *M. nodosa*. Most rainforest trees are also suitable. Ironbarks with grey, but not black, bark are suitable. Grevilleas, except *G. robusta* which is an excellent orchid host, seem to have bark that is toxic to orchid roots. Also any tree that sheds its bark or has bark that impedes water flow such as *Melaleuca quinquenervia*, is unsuitable. Trees that develop black soot also do not seem to support epiphytic orchids.

Peter Vaughan, of APS Newcastle District Group was a previous leader of the Brachychiton & Allied Genera Study Group. His garden featured in *Australian Plants* No 187, June 2006. We asked Peter the secret of his phenomenal success with orchids. This is his reply.

Orchids that grow well in my garden are *Dendrobium speciosum* and its related species, *D. gracilicaule*, *D. aemulum*, *D. tetragonum*, all *Dockrillii* species (previously the terete and fleshy leaved Dendrobiums), *Bulbophyllum exiguum*, *B. crassulifolium*, *Sarcochilus falcatus* and *S. olivaceus.*

To create a more natural environment other epiphytes such as felt ferns *Pyrrosia rupestris* and *P. confluens*, and the Ant Plant, *Myrmecodia beccarii* can be grown near the orchids.

Pyrrosia rupestris and *P. confluens* should be tied directly onto the bark of the host tree. They require watering weekly until established, but then are surprisingly tolerant of dry conditions, my plants only receiving rain. The Ant Plant has little tolerance of cold conditions, although my plant survived the cold wet winter of 2006 in Newcastle and is now two years old.

Ground orchids

I grow a range of terrestrial orchids, mainly greenhoods. These are unusual orchids that add considerable interest to a native garden. The flowers of greenhood orchids are tubular in shape, with the labellum forming one side of the tube. An insect lands on the labellum, which then flicks back throwing the insect into the base of the flower and closing the tube so the insect has to walk past the stigma to deposit any pollen already on its back, then rub the pollinia to pick up a fresh load of pollen for the next flower. The insect can escape via a small opening at the tip of the flower and in half an hour or so the labellum opens again ready for the next insect.

Greenhoods are deciduous, having leaves during spring, winter and autumn, but are leafless and dormant, below ground tubers during summer. Keep this in mind when choosing a site so you don't dig them up accidentally.

I grow my greenhoods in shaded areas in a sandy loam soil with light mulch. Find a well shaded location in your garden where the soil is often damp. Mix 5 cm of sand into the top 2 cm of soil. Plant orchid tubers 2–3 cm deep, depending on their size. Next winter the orchid will grow new tubers at its preferred depth which appears to be related to moisture levels.

The main problem I have found is soil that is too sandy or dry. Greenhoods do not like to dry out when growing, but should be kept dry when dormant. Mulch can create problems as it harbours leaf-eating insects. Remember, most ground orchids grow best after fires and the mulch has been removed.

The easiest species to grow are *Pterostylis nutans* (there is a beautiful form with variegated leaves, and another with white flowers), *P. curta* or *P baptistii*, as well as *Acianthus* and similar species, which spread in the garden to form colonies. Tubers are difficult to obtain, the only source I know is Nesbitts Orchids (ph 08 8261 1550) which have a good mail service.

Calanthe triplicata, the Christmas Orchid, and *Phaius tancarvilliae* are ground orchids that are not deciduous. They are easy to grow in the garden. Both will grow well in full shade and *Phaius* will tolerate some sun. Both species require a rich layer of mulch, and preferably sandy soil for their roots to run through. These orchids should be watered regularly all year.

Note: I do not have a slug or snail problem growing these orchids. Whether it is because my garden is too dry for these pests, or whether the lizards and birds control them I do not know.







Top left: *Pterostylis nutans*
Top right: *Dendrobium speciosum* var. *hillii*
Above: *Dendrobium gracillimum*
Photos S. Rostas
Left: *Sarcochilus* 'Burgundy on Ice'
Below: *Sarcochilus* 'Sartylis Toowoomba'
Photos J. Rostas





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Coastal Heath

Behind the dunes, there are tracts of mostly flat land with nutrient-poor soil consisting of either a shallow layer of white or grey sand over a layer of clay which impedes drainage, or deeper sand over a layer of impervious rock. Tree growth is inhibited and the natural vegetation must be able to survive in nutrient-poor soil, often with alternating very wet and very dry conditions.

Plants with small, hard leaves are common and a proportion of plants with nitrogen-fixing roots is usual. Heathland is often divided into wet and dry heath according to the depth of sand and degree of drainage, with some species favouring one or other sub-group. Wet heath is sometimes called 'Wallum'. Where they have survived, these are some of the best wildflower areas on the north coast, being very colourful in late winter and spring, but they may appear drab and uninteresting in other seasons. Many plant families are represented, but often the Proteaceae, Myrtaceae, Fabaceae and Epacridaceae dominate. Occasional fires are needed for best flowering and regeneration. These areas are also home to the rare ground parrot. Several large areas are protected in National Parks like Broadwater, Bundjalung, Yuraygir and Crowdy Bay, but many others have been replaced by airports, racecourses, industrial areas or housing development.

Woodland

Woodland is characterised by widely spaced trees, their crowns seldom touching, allowing most of the sunlight to reach the under-storey. On the North Coast, woodland areas are mostly on elevated sandstone, similar to the Sydney sandstone, or old dunes and other areas with poor soil and limited water retention. The flora is dominated by Eucalypts and Angophoras, with an under-storey including many heathland species, as well as a diverse collection of shrubs and herbs not found in coastal heath. Sometimes there are moist gullies supporting additional species like Callistemons and Prostantheras, as well as seasonal streams or swampy areas of limited extent which are equivalent to wet heath. Sherwood Nature Reserve, west of Woolgoolga, and Fortis Creek National Park, north of Grafton are good places to see this habitat.

Open Forest

This is the most widespread vegetation category on the north coast, and is dominated by closely spaced *Eucalyptus* and related species with a very transparent canopy, allowing a high percentage of sunlight to reach the forest floor. Adapted to fire to the extent that many of the species need fire for successful regeneration, these forests are nevertheless quite complex and variable. Some species have special adaptions to survive fire, such as a reserve of buds under dense bark. Others are killed by fire but their seeds germinate in the favourable conditions which follow. Sheltered sites with moist soil may contain fern gullies, Callicomas and shade-loving plants like Prostantheras and Palm Lilies, perhaps grading into rainforest. Drier and more exposed sites may feature an under-storey of plants like Kangaroo Grass (*Themeda australis*), Blady Grass (*Imperata cylindrica*), Bracken Fern

(*Pteridium esculentum*), Bush peas (*Pultenaea* sp.), Grass Trees (*Xanthorrhoea* sp.) and Burrawangs (*Macrozamia* and *Lepidozamia* species), with enough sunlight on the forest floor to encourage terrestrial orchids and other small herbs.

Rainforest

Whilst the total area of rainforest in Australia is small, it contains a richness and diversity of species out of proportion to its size. Recognition of this has led to protection of the larger areas of surviving rainforest on public land in NSW, as well as some small but important remnants. There have been numerous methods of classification, and the term 'closed forest' is often preferred, as high rainfall is not always the most important condition for rainforest formation. 'Closed forest' means forest with a closed canopy where no more than 30% of sunlight reaches the forest floor. However, 'rainforest' is used here because it has become so familiar.

Subtropical rainforest, usually found on very fertile soil, is very complex and may have up to three canopy layers, buttressed trees, many vines, epiphytes and palms. Taller trees often emerge from the general canopy surface. Extensive areas where it was once found on fertile, flat land, have now been cleared and it is mainly now seen on steep slopes where clearing was impractical, or in small reserves. Stotts Island Nature Reserve (on the Tweed river), The Border Ranges National Park, Nightcap National Park, Boatharbour Nature Reserve (near Lismore) and the western (volcanic) part of Dorrigo National Park are good sites to see it.

Warm temperate rainforest, usually on poorer soil, is less complex, has a small number of dominant tree species, two foliage layers, few vines and smaller, less obvious epiphytes. On the North Coast it mainly occurs on the escarpment slopes like the eastern part of Dorrigo National Park and parts of Mount Warning and Nightcap National Parks.

Littoral rainforest is associated with the seashore. In the swales behind the dunes and on the southern sides of headlands, there often develops a kind of closed forest which is a sub-group of subtropical rainforest, but adapted to the moist, salt-laden air, which provides small quantities of important elements. There are no very tall trees, but bulky fig trees of several species may be present, as well as Tuckeroo, stunted Brush Box, Syzygiums, Acronychias and many others forming a mutually protective cover. Since the littoral zone is favoured for development and recreation, these small areas of rainforest are constantly at risk and are often unrecognised by local authorities. Good places to see littoral rainforest include Iluka Nature Reserve, Bongil Bongil National Park south of Bundagen Head, Sea Acres at Port Macquarie and parts of Hat Head and Myall Lakes National Parks.

Dry rainforest, seemingly a contradiction in terms, is closed forest in areas with a long dry season, sometimes protected from fire by rock outcrops such as in the gorges of the Oxley Wild Rivers National Park. Other areas are Wilson Park (Lismore), Richmond Range National Park and Glenugie Peak Flora Reserve.









Above left:
Alectryon coriaceus
fruit & leaves.
Above right:
Phaius australis

Far left:
Leptospermum whitei
Left:
Hakea laevipes
Below left:
Melastoma malabathricur
Bottom left:
Ipomoea pes-caprae
Below Right:
Swainsona galegifolia
Photos: B. Kem









North Coast plant communities: headland (above), river banks (below left), coastal heath (below right), woodland (below right centre), open forest (bottom left) and rainforest (bottom right).

Wildflower Nurseries in Queensland

Fairhill Plants and Botanic Gardens — Huge range: rainforest plants, grafted grevilleas, rare plants, wildflowers, ferns, orchids, revegetation trees. Extensive display gardens. Open every day 8.30 a.m. to 5.00 p.m. Fairhill Native Plants, Fairhill Rd, Yandina, Qld 4561. Tel. (07) 5446 7088.

Nielsen's Native Nursery — Over 500 species including grafted grevilleas, eremophilas, eucalypts and brachychitons, also Foxtail Palms, cycads, rainforest, Bush Tucker plants. Display garden. Open 8.00 a.m. to 5.00 p.m. every day. 49-51 Beenleigh Redland Bay Rd, Loganholme, Qld 4219. Tel. (07) 3806 1414.

Wildflower Nurseries in New South Wales

Dealbata (cold climate) Aust. Plant Nursery — off Bloomfield St, Dalgety 2630. Tel. (02) 6456 5043. Specialising in alpine and dry Monaro plants — Sorry no overseas orders. Phone to arrange a visit.

Stocks Native Nursery — Lot 3, Simmonds Rd, Harden, 2587. Tel. (02) 6386 2682. Plants for frost and dry weather suited to Canberra, Wagga Wagga, Orange type conditions.

Sydney Wildflower Nurseries — South at Heathcote (02) 9548 2818; West at Marsden Park (02) 9628 4448; North at Terrey Hills (02) 9450 1555. Excellent range of native plants. Open 7 days.

Wariapendi Nursery — Church Ave, Colo Vale (10 km north of Mittagong off the freeway towards Colo Vale). Tel. (02) 4889 4327. Extensive range of natives from tubestock to advanced for Southern Highlands and Tablelands, South Coast and Sydney Basin. www.wariapendi.com.au

Wirrimbirra Native Nursery — Hume Hwy, between Bargo and Tahmoor E. side 2574 (3 km from Freeway entry). Wide range including unusual plants. Tel. (02) 4684 1112.

Wirreanda Nursery — End of Wirreanda Rd, Ingleside 2101. Tel. (02) 9450 1400. Growers of advanced and semi-advanced native trees and shrubs. Open 7 days.

Wildflower Nurseries in South Australia

Brenton Tucker Native Plants and Carawatha Garden — Placid Estates Rd, Wellington East via Tailem Bend. Tel. (08) 8572 7104. Wide range of tubestock and advanced plants. Extensive display gardens and picnic areas. Open weekends and public holidays March to November and by appointment, 10 a.m. to 4 p.m.

Nesbitts Orchids — Australian terrestrial orchid specialists. PO Box 72, Walkerville, SA, 5081 Email: lesnesbitt@iprimus.com.au. Tel: (08) 8261.1550 or 0400 9922 05.

Wildflower Nurseries in Tasmania

Plants of Tasmania Nursery — 65 Hall St, Ridgeway 7054. SAE catalogue. Tel. (03) 6239 1583. Open 7 days.

Wildflower Nurseries in Victoria

Kuranga Native Nursery — NEW BRANCH OPEN at 118 York Rd, Mt Evelyn 3796. Melway 52 K3 Tel. (03) 9760 8100. www.kuranga.com.au Charming setting, beautiful building, café and of course Australia's largest range of Australian flora. Delivery to all mainland states and free stock list on request.

Wildflower Nurseries in Western Australia

Orange Valley Nursery — 20 Patricia Rd Kalamunda 6076. Eremophila plant specialist. Phone (08) 9293 2569 Email: ovnjames@iprimus.com.au

Australian Wildflower Seed Suppliers

R. Horner — 1 Grundy St, Alice Springs, NT 0870. Seed of trees and shrubs of Central Australia. Please send a 45c stamp for a list.

Wildflower Society of Western Australia (Inc.) — PO Box 64, Nedlands 6909. A range of seeds available, labelled and packed, at $1.50 (plus postage) per packet. Send for a **current** Descriptive Seed List ($3.00 posted) to: The Seed Sales Officer, Eastern Hills Branch, PO Box 111 Glen Forrest, WA 6071. Also available a book *Hints on Growing Native Plants* ($6.00 posted).

The Grevillea Book, volumes 1, 2 and 3 by Peter Olde and Neil Marriott, is a complete reference to all species of *Grevillea*. The Australian Plants Society NSW ensured that they were published to a very high standard with at least one large colour photograph of each of the 340+ species, an easily read description of each species and details of its occurrence and cultivation. They are available from the Australian Plants Society NSW, PO Box 744, Blacktown NSW 2148, at $44 per volume plus postage and handling of $9.50 for 1 volume and $15.50 for 2 or 3 volumes within NSW.

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