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Growing Wildflowers for the Beginner

A Beginner's Issue?

What does a beginner want? The last three issues have presented spectacularly flowered wildflowers that everyone can grow successfully. This range will be extended in coming issues. How to grow them, the basics? This is the subject of this issue. Even here the newly interested can feel overwhelmed with information.

There is really no mystery and anyone can, quite successfully, grow a magnificent range of wildflowers. The basic recipe is to provide a deep, well drained soil with fresh moisture deep down. The feature most obvious about the series of articles on successful wildflower gardens in recent issues, is the depth of well drained soil over a clay base or a natural water table. A friend has pointed out that I may be leading you to "disasterville" emphasising the excellent value of a slope at some depth of well drained soil, down which passes fresh, sweet water. This is the prime condition for the dreaded Phytophthera fungal disease. (Surely we will find a scientist smart enough to produce an additive to the high side that will inhibit this disease. Is this too logical?). Sorry beginner, again there is a strange word and a warning of a problem. For a new garden stocked with nursery-grown plants, you will not get this problem of disease especially with the plants recommended.

There is an emphasis here on gardens with sandy or light soils because, contrary to general gossip, these are the most difficult ones to get pleasing growth and flowering. "Sand In My Shoes", a deep sand garden was created on top of a flat gluggy clay, suburban block. The Gane Garden is the same sort of situation. Both gardens produce spectacular crops.

The use of scientific plant names is the reason many people new to *Australian Plants* are discouraged before persevering a little longer and realising that we go to a lot of trouble to keep it simple. There is nothing we can do to lessen the impact. Common names only lead to confusion. The scientific name is in two parts, the first known as the genera name, is the same for a group of similar plants. The second name is unique for each individual species and need not be remembered or even pronounced correctly. —Editor.

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COVER PLATE — The garden is described opposite, "A Wildflower Garden".

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Wildflower Garden

Brightened by Using Native Annuals

by Merv. Hodge

Colour photograph used on cover

Shrubs and trees take years to reach a mature size. For some time there is open space between these permanent features, spaces ideal to grow a range of short-lived plants for quick results. Alternatively, garden beds dedicated to short-lived plants can be a spectacular focal point in a landscape. When planning your garden, seek advice from experienced growers on the most suitable species of hybrids for your district and a reliable source of supply.

Adequate soil preparation has been the subject of articles in *Australian Plants.* Briefly, the preparation of the garden will depend on the condition of the soil. Heavy soils should be turned over and possibly sand and organic material added. The addition of fertilisers is beneficial, but keep in mind the effect that it might have on permanent plants nearby. A light layer of mulch is also beneficial, but if too heavily mulched it could discourage self-sown seedlings from occurring next season.

In most cases, it is better to sow seed in 2 inch tubes and raise seedlings, harden them off, then plant them out. The self-sown seedlings which still persisted year after year in my garden are *Helichrysum bracteatum, Helipterum roseum, Actinotus helianthi, Helipterum anthemoides,* and a *Podolepis.*

The plants in the photograph (on the cover) are just a small selection of those suitable to this area on the southern edge of Brisbane, Qld., and most of them are suited to southern gardens. The white flowers near the waratah are *Helipterum anthemoides.* The pink and mauve in the foreground are *Brachyscome iberidifolia.* The white flowers in the background are *Actinotus helianthi.* The yellow flowers near the tree on the right are *Helipterum albicans* ssp. *albicans.*

The yellow flowers next to the pavers are *Helichrysum bracteatum* and the red flowers immediately to the right are *Lechenaultia hirsuta.* Others not easily seen are *Sowerbaea juncea,* a reed-like plant, *Hibbertia obtusifolia,* and *Epacris longiflora. Lomandra longifolia* is the grass-like clump near the top of the steps, and the prostrate plant growing around it is *Grevillea* 'Royal Mantle'. The small shrub growing in front of the steps is *Grevillea dryandri.* There are hybrid Kangaroo Paws in the foreground. There is a wide variety of size and colour of Kangaroo Paws available for this type of planting.

Our temperatures are often a few degrees hotter than Brisbane in summer and drop to as low as −2°C in winter, albeit that doesn't happen frequently and the temperature rises quickly once the sun rises. The winter midday temperatures generally rise to about 20°C. Frosts are sometimes a problem and we only need one to damage or kill plants, particularly when some produce soft growth because of the warm days. This necessitates planting frost-tender plants close to the top of the slope near the boulders.

My Garden – 8 of David Andrews △ see page 146

Verticordia monadelpha flourishing in a garden in Adelaide ▽ Photography by Brian Crafter

see Growing W.A. Wildflowers page 147





Peter Torning's Gardens, Sydney △ Photography by W. H. Payne

A new front garden, loam over clay. On the left side is *Crowea saligna* in front of *Grevillea* 'Robin Gordon', in front of *Melaleuca bracteata* 'Golden Gem' beside *Melaleuca fulgens*. On the right side is *Hypocalymma angustifolium, Grevillea* 'Canberra Gem' and *Astroloma pumifusum* in front of *Eremophila urea* with *Melaleuca lateritia* in the rear.

The Kangaroo Paw garden of Dick Dietch — see page 174 ▽



Sand in my Shoes

or How I Constructed my Sandbed My Garden – 8 by David Andrews, Sydney

After a recent trip to Western Australia and being impressed by the flora of the sandplains, I decided there and then to try and grow, in a fabricated sandbed, some of the plants that I had seen. The location was marked out. An *Acacia baileyana* and the good woman's *Wistaria* had to go. No trouble over the wattle, but the *Wistaria* was another "kettle of fish". Suffice to say skulduggery (and a sharp axe) won the day. A four metre by four metre patch of lawn grass was ZEROED the first week in November 1987. The finished garden is shown in the photograph on page 144.

Railway sleepers were purchased and were laid on edge two high. Angle iron had to be used as supports as wooden stakes wouldn't penetrate the rockhard clay ground. Next step, what type of sand? After looking at every conceivable type of sand I settled on salt free paving sand. This is the type of sand that builders use as a base for laying paving slabs, a relatively coarse sand with about 5% of river gravel in varying sizes up to about 6 mm. It appeared to have an undefinable amount of fine clay particles which gave it a little bit of body. It was inexpensive! Approximately eight tons were delivered and barrowed into the retaining sleeper enclosure, one ton being needed to top it up after settling.

Now to get down to planting it out. Two *Lechenaultia* were the first to be planted (late November '87). I joined the *Verticordia* Study Group and a donation of a dozen species were planted. Other plantings were *Beaufortia*, three species of *Hibbertia, Grevillea dielsiana, Hemiandra pungens, Brachyscome, Boronia serrulata,* Kangaroo Paw, *Banksia blechnifolia, Calytrix, Frankenia, Brachysema, Wahlenbergia, Halgania, Acacia ambyglona,* five species of *Eremophila*, Sturts Pea and *Blandfordia.* With the exception of *Eremophila maculata* var. *brevifolia* the *Eremophila* made very slow progress. If you have had little success in growing Sturts Pea try this type of sand garden. Sow the seed, first treated with boiled water, in July or early August.

Losses have been due mainly through lack of water in very dry spells as the surface of the sand gets very hot and surface rooted plants are the first to go. There is no vegetative mulch used as I believe it tends to cause collar rot, especially in the *Verticordia.* The surface produces a reasonably sterile quartz gravel by virtue of the scouring action of water. All of the plants came through a very dry October, 1988. The only drawback of sandbed is that plants have to be staked until the roots have anchored the plant securely. As no compost or organic mulch was used I initially applied a liquid fertiliser (THRIVE) at half strength. Plants were watered only in the warmer months until they were established. Twice a year a slow release fertiliser is liberally applied to the surface. As sand has little or no nutrient one variation on the construction of a sandbed could involve the inclusion of pelletised chook manure incorporated in every barrow load of sand. Reasonably sized pieces of sandstone can be used around plants to anchor and provide insulation from weather extremes. ■

Growing W.A. Wildflowers*

With Emphasis on *Verticordia*

H. M. Hewett, A.S.G.A.P.
Verticordia Study Group Leader

'Sand in My Shoes' by David Andrews (opposite) is an important contribution to the practice of growing our wildflowers. This experimental bed has proved very useful in testing plant reaction to certain growing conditions and treatments with a number of *Verticordia* species. Some of these cultural factors warrant special comment.

(a) Specimens were planted very young rather than held in pots.

(b) Plantings were made in late spring.

(c) To assist establishment, bell jars, in the form of 2 litre wine bottles with bottoms removed, were used. See the photograph on page 148.

(d) Soil was light and relatively free of humus and was built up to a height of 40 cm over heavy base material.

(e) No surface mulching was applied.

(f) A warm location was selected with full sun exposure.

(g) Artificial feeding was applied selectively.

It has been noted that the use of root bound specimens not only retards establishment but frequently contributes to shortened effective ground life, even when root development has extended well beyond the profile at planting. Another hazard affecting longevity would seem to be the development at the nursery stage, before potting on of a very heavily congested root system. In the latter case examination on plant demise has revealed a mass of closely compacted roots near the plant crown. It is suggested that close proximity to each other of these roots has resulted in a form of strangulation as they have swollen with growth, resulting in reduced capacity to transfer nutrients to the foliage. Under both of the above conditions losses have been noted at the post flowering stage, which is a stress period with many plant species. It has been felt that, in using relatively juvenile specimens, the probabilities of achieving a better spread and balanced root system would be enhanced. A further advantage in such early planting would seem to be that specimens can be more easily maintained in continuous active growth, rather than register a secondary interruption, which so frequently occurs with the use of more mature specimens.

Experience to date with many species of *Verticordia* would seem to suggest that the best time to plant out is when continued growth could reasonably be expected. Sydney conditions, except for a few species which are strictly winter growers, point to the period mid-spring to mid-summer as best meeting this criterion. Autumn and winter plantings have frequently tended to stagnate during the colder months unless helped along by a wet winter, a rather rare phenomenon here. Hand watering does not seem to help. I believe that atmospheric moisture is the critical factor and that artificial watering only makes things worse by subjecting the inactive plants to additional hazards from the wet cold soil. Atmospheric moisture during our warmer months seems to be to the liking of the young *Verticordia*. By comparison with Western Australia, Sydney summers are relatively mild.

continued on page 158

*Let us get one thing clear, *Verticordia* are not easy to grow. This article was inserted in a "beginner's issue" as it highlights certain garden practices that are essential for the cultivation of many difficult wildflowers. It could be confidently stated that if these practices were followed you would be able to successfullly cultivate, not only the horticultural gems from Western Australia, but all the delightful heathland plants of eastern Australia —Editor.



Helichrysum in The Gane Garden

Editor

Our No. 124 issue featured the golden everlasting, *Helichrysum bracteatum* and its horticultural selections. If Kodak had been giving reasonable deliveries to areas north of Melbourne some photographs of The Gane Garden would have appeared in it, not because of the slides themselves but because of the gardening experience illustrated.

Noel Gane specialises in *Eremophila,* The Emu Bush of central Australia. To add colour and decorate the borders of the garden he grows Golden Everlastings. The photograph opposite shows a blend of Everlastings and *Eremophila.* The larger more majestic *Helichrysum* 'Dargan Hill Monarch' and the smaller *Helichrysum* 'Ganes Selection' grow along the rock edges of the garden. With this blend he has colour in his garden for most of the year.

The intent was, however, not to show pretty pictures but to show how a wildflower garden can look. How can *Eremophila* from the dry centre of Australia grow so well in amongst, almost, garden exotics? How many people in temperate areas grow *Eremophila* at all and who grows such compact everlastings loaded with flowers? Our No. 120 issue describes The Gane Garden established on a low clay area recovered from almost swamp. Get this issue and read it if you want a successful wildflower garden. His secret is built up beds filled with compost. In his case, he is lucky, living not far from a horse trotting track where he gets large amounts of stable horse manure.

At the time of writing this report he has torn out areas of his garden, covered the garden with fresh horse manure to 25 cm deep and dug it in. Fresh plants were planted in the middle of summer (not recommended). The garden will again be a floral wonderland. What is his method?

Noel propagates a lot of plants himself but each year tries out many new species purchased from wherever he can get them. They are grown on in large 20 cm pots in rich compost. The article on page 150 describes how he prepares this compost and grows plants on in containers. To plant in the freshly prepared garden with fresh horse manure as above, he digs a hole larger than the pot. He sprinkles compost in the bottom of the hole and on the sides and then adds a liberal dose of native plant fertiliser. The product he uses is bagged by Patons* and is largely blood and bone with nutritional elements added. Naturally it is low in available phosphorus and is much cheaper than a slow release fertiliser (are we being ripped off?). He adds more compost, puts the plant in the hole and fills in the space around it with more compost. This is done just prior to Christmas.

He does not attempt to grow Proteaceae this way but the plants he does grow, including dry loving Poverty Bush, *Eremophila,* love it and flower prolifically. ■

*Paton Native Plant Food produced by W. Paton Fertilizers Pty Ltd, Beresford Road, Strathfield, New South Wales. Their mixture with a meat and bone base may be purchased in New South Wales only, the economic quantity being in 25 kg bags. They claim their slow release mixture contains: Nitrogen 8.25% as meat and bone 1–4%, as Ammonia 5–6% and as Urea 1–2%, Phosphorus 1.3% as citrate soluble 1.2% and as citrate insoluble 0–1%; Potassium 5.2% as sulphate.

Our Everlastings in World Horticulture

At the International Congress held in Florence, Italy, in 1990 four Australian native species were introduced as new cut flower crops, the everlastings *Helichrysum bracteatum* and *Helipterum roseum,* as well as *Doryanthes excelsa* and *Blandfordia grandiflora,* the everlastings as quantitative long day plants, i.e., they flower when the day length increases. Cut flowers and potted flowering plants can therefore be produced throughout the year using day length controls. The flowering pot plant market continues to grow and new product lines are being sought.

Planting Techniques and the Compost Heap/Bin

by Noel Gane

Throughout my interest of thirty years in the cultivation of wildflowers, I have always regarded the compost bin as most important. Neighbours and friends always know where to dispose of their fruit and vegetable scraps. There are some lawn clippings but not a significant quantity, Buffalo grass, about a catcherful to a compost bin. My compost goes into what was previously a brick incinerator a little smaller than a yard cube or two thirds of a cubic metre. The greens are supplemented with about 25% of horse manure and a litre of dolomite to this total capacity. Dead flowers and leaf material are used but no stalks or twigs. A full bin would use a bucketful of soil mixed progressively with the other material, the soil being taken from various parts of the garden.

After about two months when the bin is full, being turned over periodically, it is transferred to a similar, slightly larger brick bin for a further two months when it is ready to use. The final preparation is to dry it in the sun and transfer it into a third bin through a sieve.

This compost has been used for potting on *Melaleuca, Prostanthera, Correa, Helichrysum* (Everlasting Daisy), *Acacia,* etc., but mainly *Eremophila.* I have grown *Eremophila bignoniiflora* from a small tube to two metres in under two years.

Gardening with Compost and Manure

My block is flat and low with a clay soil, not a good place for natives, you might think. I started off with raised beds heavily mulched with *Casuarina* needles and compost. The plants recommended for heavy, possibly wet conditions were *Melaleuca* but over the years I found that I could grow a whole range of wildflowers in the raised beds.

My garden is described in *Australian Plants* Vol. 15:124 and here you will note my transition to the Emu Bush, *Eremophila*, mainly from the arid areas of Australia, growing in large quantities of horse stable manure. I have always grown plants in large containers using 100% compost produced as described above. I was a little concerned about planting out young plants in almost pure horse manure so I adopted my container methods as a planting technique.

The way you settle a plant into the garden may well decide the fate of your plant for years to come. As I propagate most of my own plants there is not much of a problem. They are grown on to a reasonable size in 15–20 cm pots in my own compost. It is the plants that you buy that you have to be especially wary of. Modern nursery practice seems to be to grow the plants on in a very porous medium, practically a "nothing" medium; its only purpose appears to be to hold the plant upright. This medium is then dosed with a slow release fertiliser that promotes vigorous growth.

When you get the plant it is growing in a very porous light fibrous material with the roots crowded to the side and bottom of the pot. The fertiliser may have been used up or leached out and the plant is partially pot-bound. I always pot on such plants into a larger pot of my compost. The trick is to encourage the roots to spread outward and not inward. First soak the pot containing the plant into a bucket of water. Leave it there for some time. Believe it or not it is often difficult to wet this fibrous ball the nurseryman calls potting mix.

Holding the plant upside down as shown below, tap off the pot. Tease the roots out so that they spread outwards disposing of as much of the original potting mix as possible without complete removal. Just how tight the root ball is varies. I have noted that some experienced horticulturists seem to tear the roots apart to get them spread properly. All too often I have noted that recently purchased plants have died after planting and when they are dug up the roots appear to be confined to the original tight ball, the shape of the pot in which it was originally purchased. An attempt had been made to tease out the roots from the bottom of the ball but the plant had not grown into the surrounding garden soil. Probably the plant had been watered spasmodically and the ball retained most of the moisture, possibly with a residue of fertiliser, so the plant continued to grow like a pot plant until it outgrew its "pot".

By growing on in a larger pot containing compost the plant seeks the nourishment around it and grows outward. For those who do not have the facilities or the opportunity to prepare good compost, it could be best to place the plant directly into the garden. Potted plants need continual care, an appreciation of exposure and shade and regular watering. It may well be that you can provide the required care best by careful planting, temporary shade, staking and watering. There are available, commercially, special growing bags that provide protection, shade with sun and some water. I have not used these so someone else should write to the Editor about their application.

Planting Technique

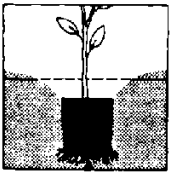
For direct planting of newly purchased plants use the same procedure as for potting on as described above. Soaking in a bucket of water and teasing out the roots is essential. A hole is dug about twice the size of the plant root bowl; the bottom and sides are sprinkled liberally with Patons Native Plant Food. The hole is then reduced in size with 100% compost and again sprinkled with the plant food. The plant is positioned so that the base of the stem will be slightly above finished garden level and then back filled with more compost. The plant is well watered in and seems to thrive.



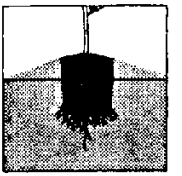
Cutting-grown plants have a fibrous root system.



Gently tease after soaking if roots are tightly matted.



Shrub planted too low, which may cause stem rot.



Shrub planted too high which may expose roots to hot dry sum as soil washes away.

Plants grown from seed often have a thick primary or "tap" root together with many, slightly thinner, secondary roots. These may only need to be gently uncoiled and spread a little so that the roots can move away from the pot soil into the prepared ground. In a very old plant, the tap root may become so tightly coiled that careful root pruning is necessary. ■

Management of tended areas

Weed Control in Garden Areas

by Harry Kleinschmidt*
Queensland Dept. Primary Ind.

Mulching is probably the best answer to the control of weeds. The mulch can consist of any fairly inert material such as organic matter, pine bark or gravel. The layer should be sufficiently deep to stop weed seedlings from reaching the surface. This can usually be achieved with a 5 to 10 cm layer.

The use of lawn clippings to mulch garden beds has a lot to recommend it. It adds to the organic matter content of the soil, which makes soil more friable, and although at first it may cause a temporary shortage of nitrogen it also adds to the nutrient status of the soil and lessens the compacting effect of rain or hosing. The surface temperature of the soil is lowered.

Black plastic sheeting is sometimes used under the layer of mulch, particularly when gravel is used. It excludes light from the soil surface and light is essential for the growth of weed seedlings once the seeds have germinated. Its disadvantages are that it impedes the entry of water and, if exposed to the elements, it becomes brittle after a few years and disintegrates. Weed control matting, or mulch mat, has a similar effect, but does not impede water or air penetration into the soil. Several layers of newspaper can be used between pine bark or gravel mulch and the soil to retard mixing.

Pre-emergence weedkillers can be used to form a layer of treated soil at the soil surface. This layer kills any emerging weed seedlings. The cultivated plants in the area have their roots in a soil layer below the weedkiller impregnated layer and are unaffected by it. Sometimes, the cultivated plants are also tolerant of the weedkiller. The area must be free of established weeds before treatment, since these chemicals act only on newly germinated seeds. Once the weedkiller has been placed in position, disturbance of the soil surface should be avoided, since this breaks the continuity of the layer of weedkiller; weed seeds can then germinate and grow in these disturbed areas. It is possible, however, to take out the surface 5 to 10 cm of chemical impregnated soil and then replace it after the necessary planting or other operation has been done. Some chemicals which have been used for this type of treatment are simazine, which is frequently used overseas, diuron and chlorthal. Another method of weed control which has been used overseas is the incorporation of a pre-emergence chemical with the mulch.

Many people are afraid to use weedkillers in their gardens. This fear probably stems from the confusion between weedkillers, or herbicides as they are often called, with insecticides, disease-controlling chemicals and all the other chemicals used to control pests under the all embracing term "pesticides". Most weedkillers in use now are non-toxic to humans and other animals. Unless they are used incorrectly there is no build-up in the soil. With most of them, any residues are broken down by soil microorganisms to harmless compounds in a relatively short time. They can, of course, be harmful to wanted garden plants, when used carelessly. ■

*Suburban Weeds (2nd Edition) is published and marketed by the Queensland Department of Primary Industries, G.P.O. Box 46, Brisbane 4001, at a cost of $20 which includes postage and handling. The above article is taken from a chapter in this book of the same heading and gives a guide to the value of it as a reference to weed control. The rest of this section describes and illustrates the weeds that confront us in cultivated areas. Another section gives a guide to the weeds and their control in untended areas. The final chapters describe the chemicals available for weed control and recommended registered herbicides. Other states probably have a similar publication but this one is very well presented and should meet all your weed control needs.

Wildflowers Grown in Difficult Conditions

The Birth of Dulegal Arboretum

B. Graham, Tamworth Group

The Tamworth area of New South Wales has a fairly hot, dry climate with heavy frosts in winter. When we first became interested in growing Australian plants, we were told that *Eucalyptus* and *Acacia* would thrive in the area, but it was just impossible to grow the smaller natives. Of course this was like a red rag to a bull, so we started looking around for plants to try. When we eventually found a few natives in local nurseries they usually weren't the species shown on the label. One notable mistake was buying a *Eucalyptus ficifolia* to grow in front of our house, to find a few years later that it had become a magnificent *Eucalyptus sideroxylon.* We were forced along the irrevocable path of growing our own. An incurable disease.

Then when our gardens were full, or dare I say overfull, the Dulegal Arboretum was born. In 1982 in the middle of a severe drought we started. First of all we had to clear an area of shoulder high dead thistles before we could dig holes with a backhoe for the advanced trees we had been nurturing. These holes were filled with water, which took some doing in the dry, dusty soil. Many people came to help on our first planting day on World Environment Day, starting the Year of the Tree. Dirt was put back in the holes to the right depth for the plants and our babies were carefully planted and well watered. We were a bit short of hay for mulching so only a quarter of a bale around each plant. Sawdust was spread on the outer half of the hay then continuing outwards so that each tree was mulched for about a metre in diameter.

A tyre was placed on top of the mulch to deter the hundreds of rabbits. Actually we had already poisoned many of these before planting, throwing the dead rabbits into the holes before planting. There were still many in the surrounding area to take their place. Unfortunately we were four tyres short and these four plants were quickly stripped of leaves and bark, but were the only ones harmed. We do not know why the rabbits were reluctant to cross the tyres. As it was so terribly dry we watered the plants every six weeks. When I started watering I made up my mind that if the water ran off the top of the ground I wouldn't continue, but it went down, down.

Eighteen months later the drought broke in midsummer, followed almost immediately by a massive growth of variegated thistles which speedily grew to about 2 metres high, but where were our plants? A search and rescue was organized with people beating their way through the invaders to drive in a white-topped stake beside each tree before the slasher came through. Unfortunately the slasher found some *Casuarina glauca* before we did, but they have since grown up again, some with multiple trunks.

Tube stock planting was tried a few times taking great care with watering, weeding and mulching, with 100% failure. So we stuck to larger plants grown on in large plastic bags until the forestry put out their Growtubes. Instant success, which is enabling us to grow a great variety of shrubs as well as planting tube stock trees. We have some very large shrub beds now, again dug with the backhoe. After a good soaking the entire beds are well mulched and when the little plants are put in they each have their Growtube. The *Correa* have had these removed and are doing well, but we will be careful when removing the Growtubes as rabbits are still quite a worry.

Planting Procedure

As it is not possible to give our trees very much care after planting, we have worked out a scheme of planting which has been very successful. Most of the plantings are in autumn or early winter, as the moisture stays around for longer. Frost tender plants are planted in spring, but these often need quite a bit of extra watering if the summer is dry.

A very large hole is dug with a backhoe and filled with water the day before planting. The sold is loosened around the hole as this allows the water to saturate the soil around and under the hole, letting the new roots extend deeply into the soil, where the moisture stays longer than at the surface. In dry times when the plants have to be watered the water goes through the softer disturbed soil to encourage the roots downwards. After planting the youngsters are watered again to wet the dry soil and settle it around the plant. The mulch is to keep the moisture in the soil as well as to discourage weed growth which is detrimental to the young plants.

Put soil back into hole leaving room for plant, so that top of soil in pot is level with ground surface (lower side if on hillside). Please do not have plant above this level. Try to remove any grass roots as these may grow choking new roots. Cut bag carefully down the side and nearly all around the bottom, or tap pot to remove plant. Try not to disturb roots and place plant in hole. Fill around plant, but please do not trample with feet. The subsequent watering will firm soil sufficiently. Make a half circle of soil on the lower side to catch water.

Water plant until water runs off. If plant is a large one place one bale of hay around plant, leaving a space around the trunk. Hay needs to be at least 10 cm deep and cover a diameter of 1 m. Place a tyre on *top* of hay and drive a stake *outside* tyre. This stake is to make it easier to see plant when slashing etc., *not* to support it. If a small plant, put two small stakes in, slightly leaning outwards at top, put Growtube over plant and stakes and drive third stake to keep Growtube away from plant. Pull down so bottom is on ground and mulch.

Alkaline soils are another problem which can be solved by growing plants in pots of acid soil, making raised beds of sandy soil or constantly adding iron chelates. Pots dry out very quickly in our climate, so I allow the roots to penetrate into the soil under the pots. This has not had any bad effect, so obviously it is the surface roots which cannot tolerate the alkalinity.

Of course it makes more sense to grow species which suit our climate and soil type, but we are rather perverse creatures. Some of the best suited shrubs for hot, dry alkaline soils are *Calothamnus* and *Eremophila. Calothamnus* are a Western Australian genus, most species being very decorative and adaptable to most soil types and climates. They range from large shrubs to almost prostrate ones. The shrub itself is very attractive, most species having dark to lighter green, crowded, narrow or terete leaves. The flowers are very showy, bright through to deep reds with some yellow forms. These flowers are generally on old wood, so it does not pay to fertilise the plants or the foliage will hide the flowers. The flowers are formed by four of five flattened bundles of united stamens, making a vaguely bottlebrush form often on one side of the stem according to species. They generally bloom for many months.

Calothamnus, meaning "beautiful brush", are a marvellous shrub to grow, for as well as being adaptable to many conditions they seldom are troubled by pests or disease. We have one *Calothamnus* which has been covered with an attractive scale insect for about three years without any visible effect. I suppose this makes a change of diet for the birds which love the very rich nectar produced by these delightful plants. Once they are established they can stand a great amount of heat and dryness without drooping at all. They respond well to pruning as some species can become leggy. Tip pruning is best as if they have to be pruned too hard it can take a couple of years before flowering becomes re-established. *Calothamnus* are very easy to propagate by seed or cutting. I am now leader of the *Calothamnus* Study Group and we propose to grow all the species in the Arboretum, a project we enjoy sharing with others.

Eremophila also flower for ages and are such a wonderfully varied group of plants. We also plan to maintain as wide a collection of species as possible in the Arboretum and would welcome plants from those keen to support us.

The small dainty *Correa* also have surprised us with their tolerance, even ones which we have collected from much wetter areas. As the *Correa* Study Group is also based at Tamworth we propose to maintain a large collection.

Grevillea are another standby, but we have to watch out for frost tender or alkaline intolerant species. Actually we have found that some species which we thought we had lost because of alkaline soil were successful when grown on rocky hillsides, so drainage may be the main problem. All of these plants are so spectacular during their prolonged flowering that we are making a feature of them at the Arboretum.

Dulegal Arboretum has certainly proved that the people who said that there weren't many native species which would grow in our area were very wrong. We have well over 1000 trees and shrubs growing well, being 79 different genera with 359 species, 30 of which are on the rare and endangered list. We have 40 species of *Acacia*, 22 *Callistemon*, 17 species and varieties of *Correa*, 79 *Eucalyptus*, 37 *Grevillea* and 21 *Melaleuca*. ■

Flower Arrangement — Cut Flowers

There is a wide interest in flower arrangement. There is a wider interest in decorating our homes with cut flowers. I propose an issue of *Australian Plants* on this activity but first I need your help. I need photographs of flower arrangements and vases of cut flowers.

A competition? The best photographs of pleasing displays will be published so, to this extent, it could be a challenging competition. However, I want participation from all who are interested. Every entry will be studied by an expert and comments supplied, in confidence, by mail.

A correspondence flower arrangement course? In the informal sense this is what we are offering so that anyone, regardless of how remote you are, can participate.

Photographs? This will be a problem for many. Good colour slides produce the best reproductions in *Australian Plants*. However, the amateur may find it easier to produce colour prints. Give it a try. Be careful of the backgrounds. A coloured sheet or spread about one metre behind may serve. Set the arrangement on a stand or table with the maximum daylight, out of the sun, preferably with the sun or light source over your shoulder. Try a number of shots for each arrangement.

The Wildflowers? What to use in the arrangement can be a problem. Our issue on the subject will recommend what to grow for cut flowers but, meantime, you will have to make do with what you can obtain. Please participate. —Editor.

Our Garden — 9

by N. and S. Kemble

We have a bush garden at Tumbi Umbi on the Central Coast of New South Wales, and like Bill Payne*, our greatest problem is in establishing flowering shrubs. The very thing which attracted us to the (¼ acre+) land in the first place, are the large trees, predominantly *Eucalyptus pilularis* (Blackbutt). In spite of our generous rainfall (almost too much at times) we still have to water a lot and put up with excess water bills. Of course, part of this is in our choice of plants and a small rainforest area with lots of ferns.

Our experiences with *Grevillea* have been very mixed; local species such as *Grevillea sericea* and *Grevillea speciosa* have done well (some people have problems with the latter) but the common hybrids such as *Grevillea* 'Robin Gordon' and *Grevillea* 'Ned Kelly' simply will not do well, much to our chagrin. Incidentally, the Eastern Rosellas love the *Grevillea speciosa,* as, of course, do the honeyeaters; as I write, three of the former are doing the rounds of the back garden. *Grevillea sericea* seedlings pop up everywhere but are difficult to pot up, I find. We have also grown *Grevillea* 'Shirley Howie', *G. linearifolia,* and *Grevillea buxifolia.*

In spite of all the problems, we have had some success in creating a bush garden without lawns, with the following plants: *Acacia boormanii, A. baileyana* (purple leafed form), *A. amblygona, A. conferta, Banksia serrata, B. integrifolia, B. oblongifolia, B. spinulosa* var. *collina, B. ericifolia, B. robur, Hakea bakerana, H. sericea, H. nodosa, H. laurina.* Our bottlebrushes include: *Callistemon* 'Captain Cook', *Callistemon* 'Hannah Ray', *Callistemon* 'Dawson River', *C. citrinus, C. salignus, C. comboynensis, Melaleuca hypericifolia, M. bracteata* (gold), *M. nesophila, M. decussata, M. armillaris, M. thymifolia, M. fulgens* (salmon) and *M. lateritia.* Our smaller plants include: *Correa reflexa, C. baeuerlinii, C. mannii, Epacris longiflora* and *E. microphylla.*

No luck with *Chorizema* so far but Bill's report prompts us to try again in another part of the garden. Our best performing pea flower is *Hovea elliptica,* which also self-seeds and is easy to pot up or move.

Although our two *Eucalyptus citriodora* are doing well, they are prone to borer attack. Other small flowering *Eucalyptus* have not done well, especially the Western Australian species; our best performer is *Eucalyptus curtisii* (Plunkett Mallee) which has masses of white flowers in spring — the one we cut back to ground level has "malleed" beautifully, as would be expected; highly recommended for any garden.

In the mini rainforest section, our favourite is the pink-flowered form of Blueberry Ash, *Elaeocarpus reticulatus,* which the Nicholsons of Terania Creek fame describe as "incredibly tough". We now have a white form.

We always use Nutricote when planting and periodically later when needed, as well as some Dynamic Lifter in the mini rainforest area, the latter without any significant effect. We also suffer from "must-have-one-of-those-itis" our losses here have been much higher than in our previous garden in Melbourne. We have been on a re-learning process and to some extent still are; but that is part of the fun of a bush garden which by its very nature is dynamic, as against the more conventional static garden of lawns and flower beds. ■

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△ A natural bush garden, the track through *Acacia, Banksia ericifolia* and *Eucalyptus pilularis.*

▽ Approaching the house the shrubs on the left are *Grevillea sericea* and *Grevillea* 'Shirley Howie' in front of *Acacia boormanii, A. conferta* and *A. baileyana.* The white flowered *Micromyrtus ciliata* opposite provides colour contrast and low stature.



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The use of bell jars is proving a very useful ingredient in the establishment of small plants in summer. The screw tops are perforated and are removed when significant growth has occurred. This removal is done a few weeks before the jars are taken away, to provide transition of conditions. Final removal is done at the start of a cooler weather cycle. On hot days it has been noted that air temperature inside the jars is well below that outside, due, no doubt, to convection, which draws replacement air through the soil. This also tends to maintain a reasonable humidity level around the specimen.

Soil Type and Surface Conditions

David's use of rather sterile sand with inclusion of a little clay and fine quartz particles has provided an opportunity to compare growth performances of his *Verticordia* with similar species elsewhere in soils of differing texture, nutrient and drainage characteristics. Under his conditions those which tend to develop deeper root systems have tended to show out a little better than the lateral rooters.

I believe the surface condition of David's bed does much to overcome any problems of collar rot which might otherwise be expected to develop when suspect species from dry summer areas are exposed to Sydney's summer humidity. The weathering to a finely gravelled quartz surface would, as David says, be relatively sterile. I believe quartz has the ability, by refraction, to break up light into five distinct wave lengths and that one of these has the potential to inhibit pathogen action. The absence of vegetative mulch would certainly also contribute towards this end. The white surface would reflect rather than absorb heat and thereby tend to prevent excessive temperature build up in the upper stratum. Furthermore, this added reflected light must surely assist the action of photosynthesis in the plants. It should be noted in this regard that in the main, *Verticordia* are plants of the low heath where high levels of light are the norm.

David's bed is located to provide full sunlight and he has noted that during heat wave conditions in late spring, when his garden was unattended, no *Verticordia* species reacted unfavourably, although some other plant species were put under stress. My own experiences also reflect this situation and reinforce my belief that *Verticordia* in the main, are best suited by a selection of a warm to hot microclimatic garden position.

Plant Feeding

David's feeding programme appears to have been successful by augmenting the rather low nutrient value of the soil with slow release and liquid fertilisers, the latter applied during the expected growing period of the particular species. If his good early results are maintained in the long term his procedures may well become a blueprint for the successful growing in Sydney, of not only many *Verticordia* species, but also many other notoriously difficult small plants.

In the balance of David's garden, generally, many other plant species are doing particularly well in elevated beds using his natural brown heavy clayish loam. Among these are many species of *Eremophila* which seem particularly suited by the soil type. ■

Our Garden — 10

by Pam and David Shiells, Shepparton, Victoria

Our garden and nursery would be about six years old, situated on 1.5 acres of 7–10 cm of clay loam overlaying a clay subsoil which is poorly drained, with a dead flat aspect typical of the Goulburn Valley. To provide better drainage our entire garden is made up of raised beds using soil scraped from the house site and nursery area. When this was used up cheap soil? (rubble from building sites etc.) was used.

Beds were first shaped, any weeds removed then sprayed with a pre-emergent prior to mulching to a depth of between 5 and 10 cm of unscreened concrete sand. Virtually no weeds whatsoever came through the mulch for the first 1–2 years, now seed blown in is germinating but it is not a problem.

Under these conditions plants grew very quickly (too quickly as explained later). Plants that have grown well include *Acacia aculeatissima* 'Prostrate' (an excellent dense ground cover form), *A. congesta, A. guenettii, A. binata* and *A. chrysocephala.* The *Grevillea* include *Grevillea nana, G. thyrosoides, G. dryandroides, G. tenuiloba* — all low growing — *G. involucrata* with its lovely foliage, and many forms of *G. alpina, G. lavandulacea* and *G. rosmarinifolia.*

Two plants which come to mind because of their long flowering period and potential in the nursery trade are *Keraudrenia integrifolia* and *Lysiosepalum involucratum* both members of the Sterculiaceae family. Both appear quite at home in our climate.

Possibly our success story would be our Kangaroo Paws *(Anigozanthos).* Living 5 km from Shepparton we have a septic sewerage system, and because of our soil type and poor drainage we were compelled to put in a "Transpiration Bed" instead of the normal septic lines. A transpiration bed consists of an area (in our case 20 m × 8 m) of agricultural pipes which take the run off from the septic tanks, these pipes are covered by coarse 3–4 cm stone, then finer stone, then coarse concrete sand. We further topped the bed with fine garden sand and then mulched it with 2–3 cm of unscreened concrete sand. Then we planted our Kangaroo Paws. We chose Kangaroo Paws as:

1. They have a shallow vigorous root system which tends to die off in the summertime and become active in the winter, our wet season.
2. They provide a large range of flowers from early spring through to late autumn with some having a few flowers throughout the year.
3. No watering is required making this the best way of growing some of the more difficult species.

The big advantage of using coarse sand mulch is the amount of regeneration and suckering that it promotes. Some plants that have regenerated include: *Grevillea alpina, G. paniculata, G. aquifolium* 'Carpenters Rocks', *G. beadleana, Adenanthos sericea, Astartea* "Winter Pink", *Pileanthus peduncularis, Calytrix aurea, Micromyrtus rosea, Baeckea virgata* — compact, *Anigozanthos species, Clianthus formosus* (Sturt's Desert Pea) and of course the daises, *Melaleuca styphelioides* and *Baeckea virgata* from adjoining properties. Plants that have suckered well are most species of *Dampiera, Lechenaultia formosa* (various forms), *Scaevola* (numerous species), *Eremophila longifolia* (various forms), and *Helichrysum* forms. ■



***Calothamnus hirsutus*, the bush and flower** Photography by Kay Bartlett





Calothamnus chrysantherus △ Photography by P. J. Hawkeswood

Known as One-sided Bottlebrush, *Calothamnus* species are closely allied to the Bottlebrush, *Callistemon* and *Melaleuca*. They are easily grown shrubs in a wide range of conditions, so tolerant that practically anyone in subtropic to temperate areas can grow them. They will flower more profusely, given some water over winter, surviving long dry periods. This particular species grows to 1.2 m high.

Calothamnus hirsutus (opposite) is typical of a large number of *Calothamnus*, growing to a large dense shrub to two metres where shelter is needed, surviving severe pruning to create a hedge or to maintain a smaller bush of less than two metres high. A wide range of species is described in our previous issue. *Calothamnus* species were featured in our last issue.

Potting Mixes for Australian Natives

by Kevin Handreck, CSIRO Division of Soils, Adelaide

Just about every person who grows Australian native plants has his or her own recipe for a potting mix for them. Sometimes the recipe is a closely guarded secret, but more usually, where SGAP people meet, there is discussion about the contents of the mixes used. Some growers have different mixes for different types of native plants.

One reason why growers often make their own mixes is that many have experienced poor growth of plants in commercial mixes. There is a general feeling that commercial mixes cannot be trusted. Good results obtained in one season may not be repeated in the next season, presumably because of a change in formulation of the commercial mix.

These sort of considerations were in part responsible for the setting up nearly four years ago of a committee of Standards Australia to formulate standards for potting mixes sold in the retail trade throughout Australia. The efforts of that committee finally led to the publication last December of AS 3743-1989, the Australian Standard for Potting Mixes.

The Australian Standard for Potting Mixes

Grades of Mix

The Standard recognises two grades of mix — Regular and Premium. Most of the properties of these two grades are the same. Thus all mixes must conform to minimum and maximum levels of physical properties such as air-filled porosity and water holding capacity and chemical properties such as pH, salinity and available levels of plant nutrients.

The main difference between them is that a Premium mix must be able to sustain plant growth for at least one month without the addition of fertiliser. This is achieved in part by requiring that it has good levels of all nutrient elements, but most importantly, it must have a built-in supply of nitrogen that is sufficient to satisfy a plant growing in it as well as the microbes that are decomposing the organic matter which is a component of all potting mixes.

Nitrogen

A major problem with commercial potting mixes is that the wood wastes — pine bark and composted sawdust — that often make up a high proportion of their volume continue to be decomposed after potting or tubing up. The microbes responsible for this decomposition consume considerable amounts of soluble nitrogen (a process called nitrogen drawdown) and so rob plants growing in the mix. Often commercial mixes have had a high nitrogen drawdown rate, necessitating the use of quite large amounts of nitrogenous fertiliser. Of even greater concern has been the fact that different batches of mix, even from the one manufacturer, have different rates of nitrogen drawdown, making it difficult to know how much fertiliser to use.

In the Standard, nitrogen drawdown is specified by the Nitrogen Drawdown Index. The Nitrogen Drawdown Index of peat is close to 1. That of a well composted pine bark with added nitrogen will often be in the range of 0.8 to 1, while that of composted sawdust will often be in the range of 0 to 0.3. The closer the Index is to 1, the smaller the amount of fertiliser nitrogen needed to get good plant growth.

The Standard requires a Premium mix to have a Nitrogen Drawdown Index of at least 0.7, and to contain a good level of soluble nitrogen. The Index for a Regular mix is set at no less then 0.2 and there is no requirement for soluble nitrogen to be present. Therefore, with a Regular mix, it will be necessary to use fertiliser from potting, and bags are required to say so. It will be possible to delay fertiliser use with a Premium mix for about one month and still get adequate growth of plants. Setting the Index at no less than 0.2 for Regular mixes will eliminate really raw high-sawdust mixes from the bags that contain mixes stated to conform with the Standard. Use of such mixes should present fewer problems than have been experienced with mixes in the past.

Special Mixes

The main part of the Standard relates to general purpose mixes (of both Regular and Premium grade) that make up the bulk of the retail trade. It does, however, also define the properties of specialist mixes for seedlings, *Cymbidium* orchids, plants that prefer an acid growing medium and plants that do not like even moderate levels of phosphorus. These latter two types of mix can be marketed in both Regular and Premium grades but Seedling and Orchid mixes do not have a Premium grading. It is the low phosphorus mixes that are of most interest to SGAP members, because young plants of quite a few species are harmed by the levels of phosphorus that are contained in general-purpose mixes.

General Comments

Let me be diverted for a while to make some general comments before I focus on this business of phosphorus. It is possible to grow the vast majority of plants in the world in the one potting mix, so long as this mix has physical and chemical properties in about the middle of the acceptable ranges for these properties. Its air-filled porosity (percentage of its volume that is air space immediately after drainage has ceased following watering) would be around 15%, it would have a water-holding capacity of about 50%, a pH in the range 5 to 6 and adequate levels of all plant nutrients.

Certainly, some plants, particularly those crop plants such as tomatoes that have been bred to respond to very high levels of nutrition, will do better in a mix that is specially designed for them, but by and large the one mix can give adequate growth of most plants. The main exceptions to this are those plants that have an especially high requirement for a particularly nutrient element (e.g., boron by asparagus), have a need for plenty of (humid) air around their roots (e.g., tropical epiphytic orchids), or that find the "normal" level of a nutrient to be toxic. Many proteaceous plants and some acacias fit into this last category in relation to phosphorus.

Phosphorus Toxicity

Phosphorus toxicity wasn't once as big a problem as it has been in recent years. The main reason is that once upon a time potting mixes were based on natural soil. The clay of the soils tended to limit the amount of phosphorus available to plants growing in the mix. Problems started when potting mixes began to be based mainly on either peat and sand or wood wastes and sand. These soil-less mixes have little ability to "fix" phosphorus compared with clay, so any phosphorus that is added to the mix in components or via a fertiliser will be readily available to the plant. What were once considered "normal" additions of superphosphate to mixes (0.5 to 2 grams per litre) are very toxic to young plants of sensitive species or cultivars in soil-less mixes.

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Melaleuca squarrosa △



▽ *Melaleuca conothamnoides*



Melaleuca fulgens △ Photography by Ivan Holliday

This spectacular hardy shrub that can be maintained 1–2 metres high is available in a range of colour forms from pink to orange, salmon to red. The plant previously known as *Melaleuca steedmanii* is now reduced to a subspecies. Our last issue described this plant and many other *Melaleuca* that are all easily grown and quite hardy.

Melaleuca squarrosa (opposite top) Photography by Ivan Holliday

One of the many yellow bottlebrush species of *Melaleuca* to 1.5 m tall if not pruned.

Melaleuca conothamnoides (opposite bottom) Photography by Ivan Holliday

A rewarding hardy shrub for the garden growing to 1.5 metres tall if not pruned. Why show these photographs in this issue? The previous issue described many species of *Melaleuca* all of which can be readily grown in areas from S.E. Queensland to Tasmania. It is desirable to reinforce the point — these plants are ideal and rewarding for beginners.

Phosphorus Toxcity of Potting Mixes — *continued from page 163*

One solution to this problem is to use soil-based mixes for sensitive plants. Some growers do this with success. Most potting mix manufacturers do not use soil in their mixes because of the disease-causing organisms often present and because of the near impossibility of getting enough natural soil of consistent quality. A rich garden soil may have had so much phosphorus added via poultry manure and superphosphate that it too will give problems with sensitive plants. But of course it all depends on how much phosphorus is present, how available to plants it is and how sensitive a particular plant is to phosphorus.

The Australian Standard for mixes for plants that are sensitive to phosphorus specifies maximum levels of extractable phosphorus to be present in soil-less mixes and those containing soil. The levels specified are compromises: there may still be an occasional species or cultivar that is damaged by a phosphorus concentration at the upper end of the permitted ranges. But it is believed that the levels specified cover the vast majority of species and cultivars likely to be grown.

Phosphorus and Iron

Sensitive species seem to exhibit two responses to a level of phosphorus that is too high for them. One response is that they are not able to use iron properly. Somehow the phosphorus interferes with the use of the iron by the plant so that it shows symptoms of iron deficiency — yellowing of the young leaves. Another symptom is death of the tips of old leaves, leading eventually to premature loss of the leaves. Some species show both of these symptoms at the same time, just to confuse the person trying to diagnose the problem.

This interaction between iron and phosphorus has led to the Standard specifying a rather high level of available iron in potting mixes for phorphorus sensitive plants. But it is still necessary to keep the level of phosphorus low, as raising its level will inactivate even the highest levels of iron addition.

Analysis

The analytical procedures prescribed in the Standard make it possible to check potting mixes and to adjust their nutrient contents before sale so that they do conform with the Standard. They show the levels of all nutrients so that adjustments can be made if necessary. They show clearly whether a mix designated for phosphorus-sensitive mixes has sufficient iron and a low enough level of phosphorus.

Your Own Mix

If you want to make up your own soil-less mix, you should not add any source of phosphorus to it other than such materials as blood and bone, a Macrocote or Osmocote containing no more than 1.6% phosphorus or any of the Nutricote range of controlled release fertilisers. You should add to it at least 1 gram of iron sulfate per litre and the pH should be in the range 5 to 5.5. A few very sensitive species may need to have iron supplied in chelated form. The commonly available iron EDTA is of little use. The most useful chelate is iron EDDHA and it is sold under at least two brands — Librel FeHi and Sequestrene 138.

Ordering Mix

Most manufacturers make bulk mixes for use in nurseries producing Australian native plants, but as far as I am aware only one is planning to market a bagged mix conforming to the low-phosphorus provision of the Standard. That manufacturer is the Victorian firm Debco and their product is labelled "Green Wizard". Some mixes currently available might be suitable, but if they are not labelled as conforming to the Standard (indicating that they have been manufactured under strict control and the use of analyses), then it is not possible to know which might be used.

In SA we have one manufacturer (Nu Erth) who is making a bulk mix that is suitable for sensitive native plants. The Trees for Life (Men of the Trees) organisation used this mix with great success over the past summer growing season. It should be possible for local SGAP in each state to persuade one local manufacturer (see the Yellow Pages) to produce a bulk mix according to the Standard.

Cautions

Two words of caution are necessary. While some native plants are sensitive to even modest levels of phosphorus they still need some of it for normal growth. They just need smaller amounts than do other plants and they are very efficient in extracting what they need from sources that would be quite deficient for other plants. Also, there is an enormous range in phosphorus requirement and tolerance amongst species of the same genus, let along amonst species in different genera. Catering for the full range of plants with the one mix is a fairly tall order and one consequence is that some species will have slightly restricted growth through lack of phosphorus if they are grown in a mix that has a low enough level of phosphorus to allow growth of sensitive species. That has to be lived with or the less sensitive species can be given a small boost of phosphorus during the growing season.

An example is an attempt to grow *Eucalyptus camaldulensis* and *Banksia ericifolia* in a bark/sand mix containing no added phosphorus but all other nutrients. The *Banksia* will grow well but the *Eucalyptus* will be retarded due to insufficient phosphorus, but at least it will grow. Trying to promote maximum growth rate in the *Eucalyptus* via extra phosphorus in the mix would ensure that the *Banksia* would be quite yellow.

Conclusion

The Standard makes it possible for a manufacturer to supply a potting mix that is suitable for a wide range of native plants. I urge SGAP members to specify their bulk and other mix requirements according to the Standard. That action will encourage manufacturers to do the right thing for you. ■

Water Repellent Potting Mixes **by Trevor Batty** **see page 170**

Many more of you will have "lost" potted plants in spite of regular watering. CSIRO's Discovering Soils No 9 says "Most potting mixes are difficult to rewet once they have become dry . . . The best way of avoiding rewetting problems is to use a wetting agent". My version of their directions is as follows:-

Take a 46 litre clean garbage bin and half fill with clean water . . . about 20 litres.
Add 20 ml Agricultural wetter (not kitchen or laundry detergent) and stir well.
Dunk 1, 2 or 3 pots at a time according to size. Avoid disturbing loose mixes like pine bark by slow immersion to below the rim of the pot.
Soak for a few minutes or less if surface is wet and bubbles cease to rise.
Allow to drain thoroughly, return pots to their usual home and resume normal watering routine.

Pots too large to treat this way may be surface sprinkled with a slightly stronger solution of wetter. Scratch into the mix to confirm wetting. Beware of deception!! The root ball can be dry because channels have developed in the mix due to improper filling, over-watering or robbery by ants. If in doubt knock out carefully, inspect and take appropriate corrective action.

Wetting agents are usually effective for about three months. ■



Melaleuca nodosa △ Photography by Fairhill Nursery ▽ ***Melaleuca viridiflora*** **(pink)**
Hardy *Melaleuca* described in our last issue for beginners' gardens



Melaleuca thymifolia △
Photography by D. Hockings

▽ ***Melaleuca leucadendra***
Photography by Ivan Holliday

Sandy Soil Can Be Water Repellent

by Trevor Batty,
Mid North Coast Group, SGAP

Many soils are initially slow to wet yet after a good soaking they will hold a useful quantity of water for some time. The term "water-repellence" is used here to describe a far worse condition in soils which wet slowly and also fail to hold it because of a waterproof coating on the grains of soil. Soil scientists classify my soil as "sandy loam", loam because it has a size fraction under 2 microns. As a true clay is a hydrated alumino-silicate with ion-exchange capacity, highly water retentive and in fact able to suspend in water as a colloid, this arbitrary classification escapes me.

My soil consists of sand and silt, no clay. It was part of the Christmas Bells Plain which embraced my home before "development", behind the frontal dune between Lake Cathie and Lighthouse Beach 31 deg. South in latitude, in New South Wales.

On moving here in 1978 I noted the garden had been neglected but thought a little proper care would fix that. The sandy soil looked much the same as I had gardened in Sydney but after several years results were indifferent. In particular many small shallow-rooted plants had died in infancy and the lawn was mostly weeds and bare patches. Now we all know that water sinks straight through sand! Don't we?? If so why did I have persistent pools of water on my lawn after a shower of rain and why was my garden only wet on top and bone dry again only a few hours later?? Since manure, compost and mulch had each and all failed I realised that the basic problem lay in the soil itself.

Water Repellence, What is it? How to cure it?

On casual inspection my soil is fine grey sand. Washing reveals it is white silica sand plus very fine soot. Turf cut from the lawn shows how this soot floats to the surface and at that stage I blamed it for the whole problem of water-repellence. In truth the sand grains too have a repellent coating but the soot is a reliable indicator of the problem and my decision to apply wetting agent (wetter) proved to be 100% correct. But what kind of wetter? At what strength? What rate of application per unit area? How often? and so on.

I had no books on soil, could find no references in SGAP journals. Fellow gardeners too knew nothing about wetters except for use in foliar sprays nor did local nurserymen and suppliers. My luck changed when I came upon a 5 litre can of Lane X-77 "Non-ionic Spreader Activator for Agricultural Sprays". This included in its directions its use at 200-400 ml per 50 litres water per 100 sq m grass for "Control of Dry Patch, Hard Patch, and Fairy Rings on Golf and Bowling Greens". I was also impressed by the disclosure of the active ingredient as "370 g/litre Nonyl Phenol Ethylene Oxide Condensate" (which means no Sodium).

My only equipment was a hose-end suction sprayer and a 10 litre bucket of water into which I stirred 300 ml X-77 and applied to 100 sq m areas of both lawn and garden. The improvement was nothing short of miraculous. Water now went straight into the soil which held it for a useful period. Within a week or two my garden plants perked up and the lawn was greener and already showing sign of running over the barren patches. Although the X-77 label recommended repeat treatment at intervals of one to two weeks for a period of four to eight weeks I decided to wait and see, and find that repeat treatment is needed only at 3-6-9 months periods depending on weather, rainfall and degree of protection from mulch and shade.

Clay, the Permanent Solution?

Clay minerals have an enormous specific surface area and with it the ability to adsorb that objectionable organic matter responsible for water-repellence. A figure of 8% clay is the threshold below which soils are prone so CSIRO recommends "the simplest cure in home gardens is to increase the clay content of the sand to above 8% with a clay or clay loam". My attempts to mix the rich red clay-loam from Port Macquarie were quite unsuccessful. I fear that mixing the two needs to be a lot more thorough than I could achieve with a fork and spade. Incidentally if you have enough clay in your soil do not use a wetter. It won't work.

A "wetter" does not obviate the need for good gardening practice. A "wetter" is not a pesticide, fungicide . . . nor is it a fertiliser although it may pave the way for some of those products to do their job more efficiently by making the soil and the plant roots more receptive.

Advice and Explanations

Only after solving the problem have I been able to learn anything about the cause of water-repellence from the product manufacturer and more particularly CSIRO Division of Soils and their excellent series of nine booklets viz "Discovering Soils". We are all familiar with the use of compost to retain moisture in our soil so it comes as a shock to find that certain forms of organic matter such as dead plant stalks and roots and exudates from fungi can coat the soil particles and upon drying render them waterproof.

The problem is far more common in Western Australia where in fact a product "WettaSoil" has been developed. I have used only X-77 and latterly Agral 600 which has the same active ingredient at 600 g/l (so I use less). I note that WettaSoil used at 500 ml per 100 sq m may last up to 12 months but have not tried it as I've only seen it in small bottles at higher price.

These wetting agents act by lowering the surface tension but only work as long as they are kept wet or at least damp. One cannot expect them to completely launder each grain of sand and even if it did the offensive material would merely move to a lower position in the soil profile. Wetters do not take the place of good garden practice and so mulching is still most important; in fact if the grey soil surface is left bare in summer the soil becomes so hot that small plants succumb immediately.

How much? How strong? How often should I apply a wetter? I'm still asking these questions. Recommendations per 100 m^2 range from as much as two litres over two months to as little as a half litre per year. It would seem that as long as the wetter is of non-ionic composition (and thus not a sodium salt like a household detergent) overdosing is unlikely to harm anything but the hip pocket. I have adopted a "little and often" philosophy for my East Coast rainfall pattern. It seems to me that our summer deluges must wash the wetter down and away . . . the water table is only 1.5 metres below surface and the sand continues down to the coffee rock base at 5 m depth. On the other hand spring is mainly dry and if at all windy the sand dries out in a few days. Mulching and regular watering are of vital importance and if the sand feels dry and hot it will soon revert to being water repellent calling for re-application of wetting agent.

Summary

Water repellence occurs in fine sandy soil. It is best remedied by watering with dilute non-ionic wetting agent at a rate of 100 g active ingredient per 100 sq metres. Avoid drying out and the treatment will last 6-9 months. ■



***Buckinghamia celsissima*, the plant and flower** Photography by Frank Morand



Verticordia plumosa

by Joan Hales, Glen Alvie, Victoria

About four years ago I purchased a plant of *Verticordia plumosa.* Although my reference books suggested it was one of the easier members of the genus to grow, my expectations were not high. My failures have included many plants which were supposed to be easy to grow.

Along with *Hibbertia serpyllifolia, Hibbertia microphylla, Hibbertia stellaris, Dampiera trigona, Brachycome multifida, Thomasia pygmaea* and *Stylidium graminifolium, Verticordia plumosa* was planted in a narrow bed facing west between the driveway and a galvanised iron fence. Because of the fence it is almost midday before the sun reaches it. By late afternoon it is once again in shade due to the trees growing along the roadside. The soil is a clay loam with some gravel from the driveway incorporated into it. For water the plants are reliant on rain as our tank water is required for our own use although I occasionally collect "used" water for my plants during the summer to early autumn period. From December to the end of March can be a very thirsty time and many plants have succumbed.

Under these conditions my *Verticordia plumosa* has thrived. The *Hibbertia serpyllifolia* died as did *Hibbertia stellaris.* The *Dampiera trigona* and *Hibbertia microphylla* are survivors but have refused to flower since the first year. The *Thomasia pygmaea* has looked particularly healthy this year probably due to a higher than usual summer rainfall. *Brachycome multifida* is a rampant grower but my favourite is *Verticordia plumosa* which is smothered in flowers from September to December. ■

Buckinghamia celsissima

by Trevor Batty

The seaside village of Lake Cathie boasts a magnificent specimen of *Buckinghamia celsissima* the Ivory Curl Flower of the family Proteaceae in the street adjacent to the local bowling club. Photographs opposite were taken here by Frank Morand in mid-February 1990 showing this globular shrub some 2 m high by 2.5 m spread at the base literally smothered in pale cream flower spikes up to 20 cm long x 5 cm diameter. Let us look at the history of this plant in closer detail.

Its botanic name honours the Duke of Buckingham who built Buckingham Palace. The specific epithet means very lofty and so it is in its natural habitat, the coastal ranges of Far North Queensland to which it is endemic. Lake Cathie lies 31° South but on the seaside. The climate qualifies as sub-tropical with 1,500 mm rainfall mostly in summer and autumn. The bowling club lies on grey dune sand but the garden to which we refer is filled with a hotch-potch of soil, sand, roadbase and builder's rubble, a far cry from deep well-drained loam so often specified for natives.

Our plant was put out about eight years ago and when young it suffered wind burn being only 200 m from the seafront. It is never pruned or shaped but it has been mulched with paper and wood chips to curtail weeds, and it has been fertilised with Dynamic Lifter (about 4:2:1 NPK), but tender loving care has been spasmodic to say the least. A plant of similar age in my garden grows well but flowers poorly by comparison possibly due to excess watering. Incidentally my own plant is the only one I have seen here bearing seed.

To conclude, the Ivory Curl has year-round attractive foliage, flowers prolifically and requires so little attention I feel it should be grown much more in public places particularly along the coast of New South Wales and Queensland. ■

Hybrid Kangaroo Paws[1]

The Victa Mower versus Ink Disease

My experiences in cultivation
by Dick Dietch

At a meeting of the Sutherland, NSW, group during 1988, the plant stewards gave two suggestions regarding the control of Ink Disease. Fire the clumps which would destroy infected foliage and spores on the ground; or run a Victa mower methodically over the clumps. Backyard burnings are prohibited in Rockdale Municipality, so I cut all the clumps by hand down to 25 mm above the ground and removed all foliage from the bed in February 1989. Their growth was then recorded in November 1989, as detailed below and again in 1990.

During this time the following Paws died: *A.* 'Pink Dwarf', *A. viridus, A.* 'Bush Baby', *A.* 'Bush Haze', *A.* 'Bush Emerald'. I lost six clumps out of a total of 25, the remaining 19 clumps produced a total of 298 spikes. The following is a record of performance from February 1989, the reported details being observed at November 1989 for garden bed No. 1 with a record of the plant at maturity.

Garden bed No. 1 is 6.8 m × 1.4 m; the soil is a sandy loam on a gravel under-bed; the bed runs north-south. The growing conditions are very hard as there is competition from the feeder roots of two well established citrus trees on the other side of a path 0.7 m wide. The feeder roots would certainly affect one row of the Paws. The clumps are watered by a drip irrigation line controlled by a timer; two micro-tube drip tubes feed the water to the clumps. I reckon that the clumps receive approximately eight litres per hour and in one row this moisture must be shared with the citrus feeder roots; so you can see that they are growing hard. To underline the phase, the bed has received no feeding during 1988 and little regular weeding. The bed was mulched with lawn clippings whenever available.

Anigozanthos 'Bush Glow'[2] — three clumps; a medium, vigorous, open-type clump, with sparse upright foliage, which is tinged yellow.

No. 1 — 250 mm AB, ALOF[3] 300 mm; there are 15 spikes to 800 mm and most of them are carrying double heads of flowers, branching at approximately one-third of the length of the spike from the ground. It is 10% I.D. infected. The flowers are light scarlet at the base, gradually fading to a greenish-lime. The whole flower head is covered with short, upright hairs.

No. 2 — a very vigorous, partly opened clump. 300 mm AB, ALOF 600 mm; it has 11 spikes, tallest 1,200 mm, and none of them are fully opened. It is 5% I.D. infected; on maturity it had 11 spikes 300 mm to 700 mm.

No. 3 is an extremely vigorous, densely packed clump, with upright foliage; growing in a bed 350 mm wide. 300 mm AB, ALOF 400 mm. It has 18 spikes to 800 mm; again some of them are many branched. On maturity it had 32 spikes from 350 mm to 700 mm.

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[1]Not all the Kangaroo Paws sold as ink disease free, grow that way in my garden. It there a flaw in my growing methods?

[2]Special Note — In 1988 *A.* 'Bush Glow', together with *A.* 'Bush Baby' provided a bunch of flowers for every meeting night of our group. They were growing 0.5 m from each other. *A.* 'Bush Baby' is dead but *A.* 'Bush Glow' continues to grow in the same vigorous manner.

[3]ALOF = Average length of foliage.

I.D. = Ink Disease.

AB = At base — Distance from outside to outside of clump, across the centre.

Anigozanthos 'Pink Joey', a sparse, extremely open type of clump, with strong upright foliage, leaves are tinged red along the edges. 150 mm AB, ALOF 300 mm. There are no spikes and the plant is 5% I.D. infected. On maturity it had four spikes, 860 mm to 1,000 mm; the flower colour is pale pink, and the red edge on the leaves gives the clump a nice appearance.

Anigozanthos 'Bush Ranger', a very sparse, extremely open type of clump, with very short upright foliage. 100 mm AB, ALOF 150 mm and it has one spike to 270 mm and is 5% I.D. infected. On maturity it had one spike 370 mm, the colour is mid crimson red, lightening in colour towards the top.

Anigozanthos flavidus, yellow form — two clumps; very vigorous dense clumps.

No. 1 — 450 mm at base (AB), ALOF 550 mm; there are no spikes present and the percentage of foliage infected with Ink Disease is 20% I.D. At maturity this clump had 15 spikes with a height range of 680 mm to 1,300 mm.

No. 2 — 350 mm AB, ALOF 500 mm and is 10% I.D. infected. At maturity, 19 spikes from 70 mm to 1,500 mm. The colour is a pale greenish-yellow and the flower heads are carried on several small branches in the top half of the spike.

Anigozanthos flavidus, orange form — a vigorous growing dense clump with upright foliage 350 mm AB, ALOF 500 mm, 10% I.D. infected. The colour is pale, it had 23 spikes ranging from 800 mm to 1,700 mm, and the appearance is similar to the yellow flowered form.

Anigozanthos (rufus × *flavidus)* — three clumps; a sickly yellowish looking dense clump with floppy foliage. As at September 18, 1990, all these clumps are 100% I.D. infected, and will go to the tip. No. 1 clump was discarded.

No. 2 — 300 AB, ALOF 450 mm; it is 100% I.D. infected; on maturity it had 12 spikes from 700–1,350 mm; the colour is a deep bright red.

No. 3 is a vigorous growing, upright, open type of clump. 250 mm AB, ALOF 500 mm. It is 5% I.D. infected. At maturity the clump had 23 spikes, ½ to 1 m high.

Anigozanthos 'Red Cross' — A sparse, open type clump, with moderate vigour and upright foliage. 450 mm AB, ALOF 550 mm; it has two spikes at 900 mm with four others showing, but not fully opened. It has 40% I.D. infection. On maturity it had 16 spikes from 60–900 mm, colour deep red. This variety can develop into a very large clump. 1990 update — A bitter disappointment as the stems were thin and short and the colour faded quickly. After the clean-up the clump was sparse with little vigour and reduced in size.

Anigozanthos 'Bush Sunset' — two clumps, vigorous and reasonably open.

No. 1 — 300 mm AB, ALOF 500 mm; it has two spikes at 550 mm, plus five others, none are fully opened. At maturity, 35 spikes from 550–1,200 mm.

No. 2 — 300 mm AB, ALOF 600 mm; it has 11 spikes, tallest 1,200 mm, none are fully opened; 5% I.D. infected. At maturity it had 30 spikes, 570–1,550 mm.

Anigozanthos 'Gold Fever' — very vigorous dense clumps — flowers golden yellow.

No. 1 — 350 mm AB, ALOF 450 mm; there are no signs of spikes; it is 80% I.D. infected. On maturity it had 22 spikes 850 mm–1,450 mm.

No. 2 is a very vigorous clump, with dense upright foliage; 300 mm AB, ALOF 550 mm; it has two spikes to 600 mm, neither of them are fully opened. It is 40% I.D. infected. On maturity it had 16 spikes ranging from 600–1,750 mm.

No. 3 is a weak looking open type of clump with upright foliage. 200 mm AB, ALOF 500 mm; there are no spikes and the clump is 90% I.D. infected. On maturity it had nine spikes from 950–1 450 mm.

In 1990 I have given each clump 1 × 500 gram tub of Blood and Bone and used three dripper tubes. On October 16, 1985, in a talk to the Sutherland Group, Angus Stewart, suggested that Ink Disease was not the only cause for the blackening of the foliage. It could also be attributable to stress and other causes; he also said that he mulched his beds of Paws with horse manure.

On January 12, 1990, I planted out another bed of Paws in the front of the house. The bed is 5.5 m × 1 m and receives full sun after 10 a.m. each day. These are the clumps that are growing in the bed.

Anigozanthos 'Bush Ranger' — A very sparse bowl shape clump, 150 mm AB, ALOF 150 mm; it has seven spikes 300 mm to 400 mm, with 21 flower heads. It is 40% I.D. infected. The amount of flowers produced is out of all proportion to the sparse foliage.

Anigozanthos 'Dwarf Pink' — A vigorous, semi-open clump, 150 mm AB, ALOF 300 mm. There are no spikes and the clump is 50% I.D. infected.

Anigozanthos 'Bush Nugget' — A very sparse open clump, 120 mm AB, ALOF 200 mm; there are five spikes 20 mm to 550 mm with two in bloom; it is I.D. free. The individual flowers are the largest I have ever seen on a Paw, 50 mm long and 8 mm diameter. All the flowers are formed into a tight group. My first thought was to call it a "club". The colour is a deep lemon with a scarlet hue.

Anigozanthos 'Bush Gold'. A vigorous, upright fairly open type of clump; 150 mm AB, ALOF 300 mm; there are six spikes 500 mm to 750 mm; the colour is pale gold and the clump is I.D. free.

Anigozanthos 'Bush Haze'. A vigorous, dense clump with semi-floppy foliage. Many leaves are affected with deep reddish bronze colour but the end of the leaves are black and shrivelled. 200 AB, ALOF 400 mm; there are no spikes and the clump is 50% I.D. infected. This is the first time that I have seen a Paw with foliage this colour.

Anigozanthos 'Bush Dawn'. An extremely vigorous, dense clump, with semi-upright, but wide floppy foliage. 250 AB, ALOF 550 mm, there are five spikes from 500 mm to 800 mm but none are in flower. It is I.D. free.

Anigozanthos flavidus — Pink form. A vigorous, growing clump, with narrow, upright foliage, 250 mm AB, ALOF 500 mm; there are four spikes from 550 mm to 950 mm, but none are in flower. It is 5% I.D. infected.

Anigozanthos 'Pink Joey' is a sparse, open, fragmented type of clump, 200 mm AB, ALOF 300 mm; some of the foliage is sickle shaped. There are no spikes present and it is 40% I.D. infected.

And so to the 1990 season. I removed all the spikes, reduced the foliage to 50% of height, took out all dead stems, leaves and decaying foliage and gave each clump a 1 × 500 gram margarine container of Blood and Bone. I fitted three micro-tube drips to each clump and mulched the bed with lawn clippings which will be added to as the season progresses. The following table gives details of their performance.

Performance Report of Garden Study by Dick Deitch over 1989–1990 Seasons.

Cultivar Name	Details taken Nov. 1989 No. of Flower Spikes	Height in mm Max	Min	Details taken Dec. 1990 No. of Flower Spikes*	Height in mm Max	Min
Anigozanthos flavidus						
Yellow No. 1	19	1,500	70			
No. 2	15	1,300	680	12+	1,110	700
Orange Form	23	1,700	800	16+	1,300	750
Pink Form				22	1,350	1,200
A. rufus × *A. flavidus*						
No. 1	22	1,450	950	Discarded		
No. 2	29	1,000	550	Discarded		
No. 3	12	1,350	700	Discarded		
'Bush Dawn'				26	1,400	1,100
'Bush Glow' No. 1	24	780	480	Discarded		
No. 2	11	700	300	Discarded		
No. 3	32	700	350	Discarded		
'Bush Gold'				12	730	480
'Bush Haze'				20	900	700
'Bush Nugget'				4	550	300
'Bush Ranger'				10	375	200
'Bush Sunset' No. 1	35	1,200	550			
No. 2	30	1,550	570	18+	1,150	750
'Dwarf Pink'				22	800	350
'Gold Fever' No. 1	22	1,450	850	Discarded		
No. 2	16	1,750	600	Discarded		
No. 3	9	1,450	950	Discarded		
'Harmony'				12+	950	800
'Pink Joey' No. 1	4	1,000	850	11+	1,100	550
No. 2				10	800	600
'Red Cross'	16	900	60			

*After the clumps were cleaned up, the No. of spikes were counted by the stumps.

Some Kangaroo Paw Hybrids

continued from page 135, No. 127 Australian Plants

***Anigozanthos* 'Miniprolific'** is the result of a manipulated cross between *(A. humilis* × *A. bicolor)* × *A. flavidus*. The name was selected due to the small stature and prolific flowering nature of the hybrid. The flowering stems are up to 0.5 m tall with scattered grey-green (144A) plumose hairs, increasing in density and becoming red and pale orange at the final division of the inflorescence. The wool on the ovary is red with scattered black and dark red hairs becoming pale orange, some with red tips which give the rest of the tube a grey-pink dusty appearance. The pedicels vary in colour from grey through pale orange to pink and are ca. 10 mm long. The perianth tube is 40 mm long, glabrous inside with a few stellate-tipped linear hairs immediately above the ovary, with four lobes 8 mm long. The two outer pairs of floral tube lobes fail to separate, so that unlike either parent, there appears to be two single inner lobes and two double outer lobes. Inside the hairs are grey to pale orange. The anthers are linear, longer than the filaments and the connective is tipped with a small gland-like appendage. The ovules are more than 12 per locule. See Australian Plants No. 126, page 52 for photograph.

***Anigozanthos* 'Mini Red'** arose as a seedling in the garden of Mr A. E. Brooks of Sandringham, Victoria in the vicinity of *A. flavidus* (red form), *A. rufus* and *A. manglesii*. It is a perennial rosetted herb growing to a height of approximately 60 cm, with strong affinities towards *A. flavidus* but with a small, compact habit and dense flower clusters. The red (45C) flowers 35–40 mm in length, are yellow-green (146C) inside.

***Anigozanthos* 'Pink Joey'** arose as a seedling presumably of *A. viridus* origin. It differs from other known forms of this species in its small stature and pale purplish pink (186A) flowers. They are yellow-green (144A) inside with yellow orange (22C) stamens. It attains a height of only 50 cm and has somewhat narrow leaves 16–33 cm long and 4–6 mm broad; the much branched panicle is 20 cm long and many flowered. Aust. Plants No. 126, page 69 for photograph.

***Anigozanthos* 'Red Cross'** is a manipulated hybrid between *A. rufus* ♀ and *A. flavidus* ♂. It is a vigorous plant with flowering scapes to 1.6 m tall. The flowering stems are multibranched, thin and tend to spread as broad as they are high. Up to 7,600 individual flowers have been recorded for a mature plant and they are a rich burgundy (59A) in colour. This colour is produced by the dense covering of plumose hairs on the flowers and much of the flowering stem, fading in colour and intensity as they reach lower down the stem. The flowers have a bright yellow-green patch of colour near the pedicel. Individual flowers are up to 30 mm long by 8 mm wide at the widest point of the corolla. The corolla tube is terminated by six perianth lobes which taper to a point. These lobes are reflexed when the flower is fully opened. Inside, the perianth segments are yellow-green as are the stamens which are more or less as long as the perianth tube. Leaf-like bracts occur frequently on the flowering stem and regularly reach 30 cm long. The foliage is also vigorous with leaves from 36 to 60 cm long by 10 to 40 mm wide. The flowers have the rich colouring of *A. rufus* but the anthers are yellow-green, as are those of all the *A. flavidus* hybrids. See the photograph on page 48, No. 126 issue.

There are two other cultivars that arise from this cross. *Anigozanthos* 'Red Cross' has a very distinct yellow patch at the base of the flower; *Anigozanthos* 'Velvet Harmony' is a much deeper colour while *Anigozanthos* 'Unity' has larger flowers, to 40 mm long.

The hybridisation work was deliberately undertaken by Dr S. D. Hopper of the Western Australian Wildlife Research Station to produce plants with the longevity, vigour, snail resistance and resistance to ink disease displayed by *A. flavidus* but with the more popular colour of *A. rufus*. It was also done to increase the percentage germination of seed, which can be low on species other than *A. flavidus*.

***Anigozanthos* 'Regal Claw'** is the result of a cross between *A. preissii* and a red form of *A. flavidus*, another early cross by Dr S. D. Hopper of the Western Australian Wildlife Research Centre. It grows to 1.5 m tall (flower stem). The leaves are 25 cm long by 5–10 mm wide and glabrous. The flowers are in terminal clusters on a double headed inflorescence. The individual flowers are 4 cm long, yellow-green with a bright red base. In bud the flowers are covered in a dense covering of red (45A) plumose hairs but as the flower grows and matures these hairs become more scattered making the flower appear more orange. It is similar in shape to *A. preissii*. It was first published as *A. preissii* × *A. flavidus* in *Australian Plants* Vol. 10. Photograph, No. 126, page 48. ■

Photographic Competition

The flowering season is upon us. I desperately need good colour slides, so why not have an informal competition. Comments on each entry will be supplied, in confidence, by mail so here is a chance to learn and improve your skills. The most suitable photographs for use in *Australian Plants* will be published. This is the best prize I can offer — it is a valuable prize for those seriously engaged in photography. I suggest these categories:

1. Flowers — relatively close-up with, preferably, more than one flower in each photograph, leaves and anything else that makes a pleasing photograph. Be careful with the use of flash as all black backgrounds are dull.
2. A flowering plant — An attractive plant in full flower, all the plant or most of it. The major problem is background and the tendency for the plant outline to get lost in various other foliage around it.
3. A wildflower garden, either in whole or part or an attractive segment of a wildflower garden.

STUDY GROUPS

by Mrs J. M. Sked, Study Group Co-ordinator,
P.O. Box 41, Lawnton, Q. 4501

The study of plants under cultivation. This is a practical way of applying knowledge gained from *Australian Plants* to gain further data to assist in the conservation of the magnificent Australian flora and its development for horticulture.

Study Groups consist of a Leader, active members who participate in any studies undertaken, and passive members who receive newsletters but take no active part in the Group's activities. To join a Study Group write to the Leader (addresses below) stating whether you wish to become an active or passive member (some of the smaller Groups are only interested in taking on active members at the moment). Their annual subscription fees are listed below. Please send a stamped envelope with correspondence as Study Groups operate on slim budgets.

Study Group Leaders	Fee $
ACACIA — Mrs Marion Simmons, P.O. Box 1148, Legana, Tas. 7251	3.00
BANKSIA — Mr Trevor Blake, 22 Vista Avenue, Ringwood East, Vic. 3135	Cost of reports
BIRDS & NATIVE PLANTS — Mrs Barbara Henderson, M.S. 1063 Farrow Road, Samsonvale, Qld 4523	5.00
BLANDFORDIA — Dr Peter Watt, 10 Erina Street, Eastwood, NSW 2122	5.00
BORONIA & ALLIED GENERA — Mr John Knight, 24 Kardinia Crescent, Warranwood, Vic. 3134	5.00
BRACHYCHITON & ALLIED GENERA — Mr Peter Vaughan, 66 Ridgeway Road, New Lambton Heights, NSW 2305	3.00
CALOTHAMNUS & ALLIED GENERA — Mrs Barbara Graham, Nundle Road, Woolomin, NSW 2340	2.00
CALYTRIX — Mrs Gwynne Clarke, 26 Henry Street, Cook, ACT 2614	2.00
CORREA — Mrs Trish Mactavish, 99 Rawson Avenue, Tamworth, NSW 2340	3.00
CYCAD AND ZAMIAD AND PALM — Mr Len Butt, 25 Ortive Street, Yeronga, Qld 4104	5.00
DAISY, The AUSTRALIAN — Mrs Esma Salkin, 38 Pinewood Drive, Mt Waverley, Vic. 3149	5.00
DODONAEA — Mrs Jeanette Closs, 7 Vyella Court, Austins Ferry, Tas. 7011	4.00
DRYANDRA — Mrs Margaret Pieroni, 16 Calpin Crescent, Attadale, WA 6150	5.00
EREMOPHILA — Mr Colin Jennings, 4 Kinnaird Crescent, Highbury, SA 5089	2.00
EUCALYPTUS — Mrs Shona Sadlier, 84 Chelmsford Avenue, Epping, NSW 2121	4.00
FERN — Mr Peter Hind, 41 Miller Street, Mt Druitt, NSW 2770	4.00
FOOD PLANTS, AUSTRALIAN — Mrs Lenore Lindsay, 323 Philp Avenue, Frenchville, Qld 4701	5.00
GOODENIACEAE — Mr Dennis Margan, 58B Norman Avenue, Thornleigh, NSW 2120	5.00
GRASSES, AUSTRALIAN — Mr Dermott Kelly, 6 Willcox Avenue, Prospect, SA 5082	5.00
GREVILLEA — Mr Peter Olde, 138 Fowler Road, Illawong, NSW 2234	5.00
HAKEA — Mrs Hazel Blackney, 23 Devon Street, Eaglemont, Vic. 3084	4.00
HIBBERTIA — Mr Ross Field, 4 Tyree Avenue, Springvale, Vic. 3171	2.00
MELALEUCA & ALLIED GENERA — Mr Colin Cornford, 16 Eldorado Street, Bracken Ridge, Qld 4017	5.00
PLANTS IN CONTAINERS — Mrs Norma Darwon, P.O. Box 459, Wauchope, NSW 2441	3.00
PROSTANTHERA & WESTRINGIA — Mr Brian Timmis, Lot 4 Ballengarra Road, Gum Scrub, NSW 2441	4.00
RAINFOREST — Mr David Jenkinson, 18 Skenes Avenue, Eastwood, NSW 2122	5.00
THYSANOTUS & ALLIED GENERA — Dr Peter McGee, School of Biological Sciences, University of Sydney, NSW 2006	5.00
VERTICORDIA — Mr Maxwell Hewett, 11 Harvey Place, Cherrybrook, NSW 2120	3.00

Cultivation of Some Rare and Threatened

Rainforest Plants of South-east Queensland

— Part 1

by G. Leiper and J. Thompson

There are many Australian plants that have curiously been neglected for horticultural use. For rainforest species this neglect has derived in part at least from misconceptions about their suitability for the home garden. There appears to have been excessive generalisation about rainforest species size, and moisture and soil requirements. In fact, many rainforest species require little more attention and possibly less attention than that required for cultivation of other specialty interest groups of plants. Another reason for neglect is ignorance of the plants let alone their qualities.

In south-east Queensland there are a number of rare and threatened rainforest species that have high potential as feature plants in horticulture. Their rarity is a result of land clearing rather than a consequence of their ecology. Some of these species are proving to be readily adaptable to a variety of soil conditions in cultivation. These species respond well to heavy surface mulching, regular fertilising, and watering during prolonged dry periods. Frost tolerances have not been assessed but plants will withstand temperatures to about 0°C.

Austromyrtus inophloia **Thready-barked Myrtle**

Family: Myrtaceae *Conservation Status:* rare

Distribution: Mt Glorious to Blackall Range of south-east Queensland

A shrub to about 3 m high, often less. Plants are bushy to the ground with flushes of soft hairy pink new growth. It will grow in full sun to heavy shade. Best results so far have been on well drained loam to clay loam, but also performs well on sandy loam. This species could make a very attractive tub plant. They respond very well to pruning. The charm of the plant is not in its flowers and fruit but in its attractive new growth and shapely form. Flowers are small and cream in spring followed by a small black edible berry. *Propagation:* Fresh seed or cuttings.

Cassia marksiana (opposite) **Brush Cassia**

Family: Caesalpiniaceae *Conservation Status:* rare

Distribution: Northern New South Wales and southern Queensland

A deciduous tree up to 20 m high in the field but expected to grow to about 10 m in the garden. It is a very attractive foliage tree with a dense rounded canopy. Plants have been tested in full sun to part shade. The species is a host to the yellow migrant butterfly. The caterpillars can defoliate small plants but they recover rapidly. Plants perform well on sandy loam soil. The perfumed yellow flowers are spectacular sprays in masses in spring followed by up to 30 cm long pods. *Propagation:* Scarified seed. Tests using boiling water treatment yielded marginal response.

Fontainea venosa (photograph on page 185) **Queensland Fontainea**

Family: Euphorbiaceae *Conservation Status:* vulnerable

Distribution: Centred mainly near Beenleigh in south-east Queensland

A small bushy tree to about 5 m high. Plants are male or female. It will grow in full sun or part shade. Well drained soils are desirable. The flowers are

Cassia marksiana △ Photography by J. Thompson ▽ *Austromyrtus inophloia*



white, heavily scented of honey, clustered towards the ends of the branchlets amongst the leaves, appearing in spring. Fruits are orange drupes about 2 cm diameter. *Propagation:* Fresh seed or cuttings. Seeds germinate best by cracking the hard seed coat before sowing.

Lepiderima pulchella (photograph on page 184) **Fine Leaved Tuckeroo**

Family: Sapindaceae *Conservation Status:* rare

Distribution: North NSW and Tallebudgera Valley area of southern Queensland

A small densely foliated tree to about 6 m high growing in full sun or part shade. Mature plants have dense dark green foliage and the new growth is a delightful flush of pink. Plants grow well in cultivation on a sandy to heavy loam soil. The orange flowers, although set within the foliage, are abundant and extremely attractive, appearing in spring. The fruits are highly ornamental orange capsules about 1 cm across. This hardy species could prove to be useful as an ornamental street tree. *Propagation:* Fresh seed or cuttings. ■

Fontainea

by L. W. Jessop

*Fontainea** is a small group of plants found in the rainforests of Queensland. Large shrubs or small trees, these are not known in horticulture, being most attractive when in fruit as shown in the photograph on page 184. The fruits of *Fontainea ovaria* and *F. rostrata* are also a pinkish-red while those of *Fontainea picrosperma* are apricot coloured with a pink tinge. The male plants are most attractive when in flower.

The sketches opposite are reproduced from Austrobaileya* 2(2) 1985 and the following information is presented for your reference:

The female flower of *Fontainea venosa,* detail E, has five petals surrounding five styles in the centre, with large stigmatic surfaces awaiting pollen from the stamens of a male flower. The styles emerge from the top of a large hairless ovary. The flowers of *Fontainea australis* are also shown, the female flower with five styles emerging from a large hairy ovary in detail and the male flower, detail G, comprising numerous stamens surrounded by five petals. The glabrous or hairless ovary of *Fontainea venosa* is a distinctive feature of this species; other species of *Fontainea* found in Australia have a villous, hairy, ovary as in *Fontainea australis.*

On fertilisation, the female flower matures, losing its petals, the ovary enlarging to the orange fruit about 3 cm across as shown in detail A. The hard central core of this fruit is known as the endocarp which contains the seeds on maturity. The characteristics of the endocarp may be used to identify the four other Australian species as in details H–L.

A cross-section of the fruit of *Fontainea ovaria,* detail M, shows: (1) the mesocarp or outer fleshy part of the fruit; (2) the endocarp; (3) the testa or outer covering of the seed, and (4) the endosperm protecting the embryo (5).

*Austrobaileya is a regular publication by the Queensland Herbarium, Department of Primary Industries, Meiers Road, Indooroopilly, Qld 4068, and may be obtained by mail for $20 including postage, at this address. There is usually one issue produced per year, the above information being taken from Volume 2, Number 2 of 1985, "A revision of *Fontainea* Heckel (Euphorbiaceae — Cluytieae)" by L. W. Jessop and C. P. Guymer. While these publications are at the scientific level, many species described are illustrated by full page sketches. The sketch opposite was compiled from large sketches of each of the five species.



Fontainea venosa (A) a branchlet with fruit ×2/3; (B) a branchlet with male flowers ×2/3; (E) a female flower ×4 with hairless ovary. *Fontainea australis* (F) a female flower with villose (hairy) ovary ×4; (G) a male flower with numerous stamens ×4; Endocarps ×2/3 of (H) *F. venosa* (H1 is plan view, H2 is side view); (I) *F. picrosperma*; (J) *F. ovaria*; (K) *F. rostrata*; (L) *F. australis*; (M) a cross-section of a fruit ×2/3 of *Fontainea ovaria* showing (1) the mesocarp or outer fleshy part of the fruit; (2) the endocarp; (3) the testa or outer seed coat, and (4) the endosperm protecting the embryo (5).



Lepiderema pulchella **in fruit and flower** Photography by J. Thompson





***Fontainea venosa* in fruit and flower** Photography by J. Thompson



Please Photograph Your Garden

The flowering season is with us. We urgently need photographs of pleasing sections of wildflower gardens. I prefer colour slides but if this is not possible then good colour prints will do. Please make a special effort to assist. —Editor

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