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A garden is a personal thing. A wildflower garden is more unique again, representing the dreams or hopes of the gardener to create — a scene, a floral splendour, a refuge for wildlife, or just a quiet place. When someone extends the privilege to enjoy their garden one can sense, as I do with my garden, "nobody sees this garden as I do, its joys, hopes and frustrations — I wish I could get that plant to be a little more showy so that others would appreciate it as I do" Perhaps hints in this issue will help.

Cultivation Around Established Plants

Two articles by Max Hewitt, the winner of wildflower garden competitions for many years, give apparently conflicting advice. The article on *Verticordia* research urges none or minimal artificial watering, no fertiliser, no surface mulch and especially no disturbance to the ground by cultivation. The article on "Growing the Sydney Waratah" recommends cultivation of the ground to a good depth (200 mm) to within one metre of the plant. Allowing for the fact that the Waratah develops a ligno-tuber as part of its root system and most plants do not. Can the advice given for the cultivation of Waratahs be more widely applied?

"Cultivating The Soil Around Australian Plants" is an article by Dr. Byron Lamont in this issue, that should now be studied. While Byron is an experienced researcher with plant roots, he is also a serious home gardener and horticulturalist. He recommends against cultivation of the soil around plants.

Gardening Nature's Way

Has Coralie Whitby and "Eco-Gardening" further complicated the issue? I feel it could be an informed approach to bring logical thought and science to help sort out the confusion. Her approach is to "do it nature's way", but to interpret properly the continually changing and evolving pattern woven by the interdependent action of nature's creatures. Continued on page 339.

Proteaceae For Horticulture

Of special value in landscaping, the *Banksia*, *Dryandra*, *Hakea* and *Telopea* (Waratah) articles in this issue are highly commended.

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COVER PLATE: *Telopea speciosissima*

Photography by R. Page

The Waratah, the floral emblem of N.S.W. is widely known as a magnificent plant. It can be grown quite well in gardens. Read the article on page 351.

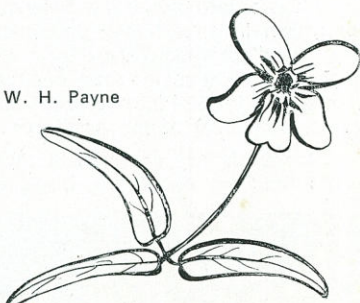
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Eco-Gardening

The Concept by Coralie Whitby, Interpretation by W. H. Payne

This is gardening with a natural balance between plants and creatures without the need for fertilisers or sprays. The native bush is generally in a state of equilibrium, of co-existence. Wild-flowers are found in a natural garden sustaining and depending upon the bird life and a host of nature's creatures.

Can we achieve this happy state of the balance of nature in the home garden? Create an eco-garden!



Coralie Whitby, a lecturer in the biological sciences, waste re-cycling, applied ecology and eco-gardening, has written a book entitled "Eco-Gardening", where she describes in a very practical way how you can emulate nature's way in your home garden. She, with her students, have created an eco-garden and have a regular colony of native hover flies, dragonflies, spiders of many kinds, predatory wasps, lacewings and ladybirds, all insect predators. Birds include welcome swallows, wood swallows in their season, shrike-thrushes and ground thrushes, several families of superb blue wrens and of southern yellow robins and eastern spinebills, weebills and thornbills, kookaburras, grey fantails and willy wagtails, all in pairs daily visiting the garden to take baths and eat insects. There are also a lyrebird, at least one spiny anteater, lizards, frogs, and an enormous goanna. There is no need to have chemical control.

Obviously she has a site near a bush area and we cannot expect to have a lyrebird as a free-roaming pet in the suburban garden, but her theory is so well based on competent study and observation, it is worth closer study. These notes are prepared from her book so the work is all hers, but the faults in interpretation and statements not directly quoted, are due to your editor.

Quoting directly from the book "Eco-Gardening — The Six Priorities":

"In eco-gardening, the aim is to copy the plan designed by nature, to achieve a synthetic equilibrium something like that of the wet sclerophyll forest. Food trees are established in a support system of carefully chosen indigenous shrubs and perennials, like the plant associations of forest trees. The part of the eco-garden used to grow vegetables, grains and soft fruits (also decorative plants for horticulture which would include the cultivation of wildflowers away from their native environment — Ed.), is designed to have a cyclic stability; as with areas of annuals in the forest, its character can be maintained only by a regularly imposed preturbation which keeps returning it from its progression towards the climax vegetation (a forest) to its intermediate stage in succession. Again, as in the forest, the dynamic pest/predator balance of the permanent eco-garden extends its protective influence over the small annual area where many of the six priorities are creatively applied."

This statement in the book summarises the principles of eco-gardening developed by the author, where by using the natural forest as a model (Sherbrooke Forest at Ferry Creek in Victoria is given as an example), she postulates six priorities for stability (harmonious co-existence of plant and creature) of a plant community. This is discussed on page 338.

Wildflowers And Birds

An eco-garden seeks a balance between creatures and plants. When plants are grown in an artificial environment, an imbalance often occurs and there is a "pest" problem. Are they really pests? Get a copy of the Society's book "Friends and Foes in Your Australian Garden", by David Hockings (available from Editor for \$24.95 post free) and you will find, from the hundreds of colour plates, that most of the creatures that you see on your plants are friends.

Use birds not chemical sprays for control. Be even more positive. Grow plants that will encourage birds, enjoy their company and forget pests.



***Dryandra formosa* with a visiting New Holland Honeyeater** (above)

Photography by George Adams

The best plants to attract birds include those in the plant family Proteaceae. These include the *Banksia*, *Hakea*, *Telopea* (Waratah) and *Dryandra*, all featured in this issue. *Dryandra formosa* has been successfully grown in a wide range of conditions, shrubs to 2 meters covered with dozens of golden flowers 6-8 cm across. You will be pleased with this spectacle adorned by visiting birds.

***Callistemon viminalis* playing host to a Musk Lorikeet** (opposite)

Photography by George Adams

Bottlebrushes are very easily grown for a spectacular showing. The best forms were described in No. 89 issue. Those photographs by George Adams are reproduced from his books "Birdscaping Your Garden" and "Foliage Birds", \$12.35 and \$35.00 respectively, from your bookseller.

* The concept of providing a book review, what is more a book intended for the home exotic garden, as the lead article to our wildflower magazine will arouse comment. Read it and following articles and you will see this reason. Coralla Whitby has been editor of "Good Earth" magazine, a lecturer in biology at Monash Teachers College and has presented her own courses on Applied Ecology for the Council Of Adult Education. Her book would be available at your bookseller.—Editor.



ECO-GARDENING

The six priorities for plant community stability and vigour are:

1. Maximum Plant Mass (actually, maximum leaf area)

Forests need a leaf area 8-10 times the ground area to provide energy for the enormous mass of living plant and animal tissue necessary for stability.

2. Maximum Diversity (within the limits allowed by other priorities and constraints). Numerous species of different heights are needed to create different micro-environments that favour different creatures and plants. A method of increasing diversity in the eco-garden is to place such a garden within an area of bush or surround it with selected bush species.

3. Compatibility of Plants in the Association

The forest situation has provided maximum compatibility over the years creating a natural equilibrium. This cannot be achieved in an eco-garden but it can be approached by mixed planting of the local plants bringing with them their associated insects and birds.

4. A Litter Layer

The advantages in reducing soil water loss and providing nutrients by decomposition are obvious. This process is accelerated by the creatures supported by damp litter. For productivity, litter should be placed around all plants as the rate at which carbohydrate is made in the leaves of a plant increases when the oxygen content of the surrounding air decreases. The use of rock-dusts is quoted as litter bacteria can solubilize rock dusts.

5. A Framework of Permanent Plant Species

Century after century, the dominant trees of a forest filter the light with their leaves, trap the moisture rising from the forest floor, temper the wind, keep the forest cool in summer, stabilise the soil with their roots, etc.

6. Mixing of Plant Species

Diversity and mixing act together to control oscillations in populations and to bring about complementary use of soil nutrients.

These priorities could well be the key to the successful cultivation of Australian wildflowers in horticulture and will be examined in more detail in future issues of Australian Plants. For those wishing to understand the factors affecting plant growth, particularly in a plant community, you are referred to the next section of the book:

THE CYCLES OF LIFE

The aim of eco-gardening is to achieve something approaching a natural equilibrium between the plants and creatures living together. Their associations are complex but their dependence on each other is real. The earth's natural cycles replenish the water, food, oxygen and other materials needed by the bodies of all living organisms. This interdependence of life is graphically illustrated by examining in turn the *water cycle*, the *carbon cycle*, the *nitrogen cycle*, the *phosphorus cycle* together with compatibility or sympathetic relationships between species, especially below ground with *Rhizobium* and legumes, *proteoid roots* and *Mycorrhizas* and the *Rhizosphere*.

AN ECO-GARDEN WITH TREES

Instructions are given for the creation of an eco-garden to support food trees under the following headings: 1 Defining a site, 2 Clearing the site, 3 Terracing, 4 Providing immediate site needs such as water, soil, fertilizer, compost and mulch, 5 Green manure crops including legumes. (A chapter is devoted to these describing farm crop plants but a comparable list of natives could easily be compiled), 6 Planting the food tree (this could be an ornamental tree), 7 Attend to its immediate needs for survival and initial vigour, 8 Add native legumes by planting species of *Acacia*, *Hardenbergia*, *Bossiaea*, etc., 9 Add native shade species, 10 Recycling by composting and mulching.

This detailed exercise in the setting up of a general garden that includes food trees is interesting in that it could apply to any reasonable area large enough to support a diversity of plant life. The fruit trees are placed in a small community of plants that comprise our native *Acacia*, pea-flowered plants, and other small shrubs and ferns.

AN ANNUAL/PERENNIAL ECO-GARDEN

"Gardening of areas of annuals is . . . in ecological terms, the occupation, by a succession of diverse ephemeral plants, of land which is subject to recurrent perturbation. The annual/perennial garden is a far more artificial plant association than the synthetic climax constructed around the food tree."

The author gives telling reasons why "the annual eco-garden managed on a rotational system shows resemblances to the fire breaks maintained around forests by periodic burning. The forest verge (which incidentally supports a wide range of native shrubs of interest to horticulture — Ed.) can keep its character as an area of annuals only because regular firing or ploughing restores light to the soil and recycles the nutrients in the plant material . . . It has been found that the declining soil fertility noted by 'No-Dig' gardeners, can be fully reversed by regular digging each few years, without any other measures. The annual area of our annual/perennial garden therefore makes a four-year-digging the basis of its crop rotation".

The author goes on to give details of how to plan and create such a garden and this could easily be a wildflower garden say in front of a house, using the six priorities with the exception of the need for tree cover.

GARDEN MAINTENANCE

The book goes on to describe in some detail how to start and maintain a garden, the natural control of pests, of weeds, etc. These are all good garden practices and highlight the theory that a wildflower garden need not be an untidy, dull, seemingly neglected area, but a pleasing display of a wide range of plants flourishing under good garden conditions, at the same time — an eco-garden. ■

Gardening Nature's Way

Further Speculation By The Editor

Cultivation in a natural garden? Is this nature's way? Cultivation of wildflowers!! Let us think about this concept again.

One concept of "Eco-gardening" with annuals is that these are pioneer species, plants that follow a catastrophic change in natural "bush" conditions. Following a fire or major disturbance where the natural leaf cover has been removed, "pioneer" species, often "weeds" and grasses, but with many small short-lived plants, spring up. Over a period of time changes occur in the composition or dominance of the plant community returning eventually to a forest or climax stage. To frustrate this natural change from one community, say a garden of vegetables, to taller growing plants and eventually to shrubs and trees, the catastrophe occurs every four years on a digging cycle following a rotation of plants or crops.

To be fair to Coralie, she is talking about annuals, "weeds" that have been developed by man to fill his stomach, whereas I am thinking of the small wildflowers that catch our fancy. Many are annuals or perennials usually, too much trouble for us to bother with, but most will be small shrubs. The type of shrubs that "spring up in a bush after a bush fire" or that occupy in a heathland community with minimal leaf cover. In my experience many have a rewarding period that rarely exceeds four years. Usually the shrubs we prefer are in an intermediate stage between the annuals and the forest and a similar concept could be applied.

Readers are invited to comment on this controversy. Meanwhile do not cultivate all over your wildflower garden? Continued on page 380.



Dryandra bipinnatifida

Photography by Erica Crane

This is one of nine (9) species of *Dryandra* that are either dwarf or ground hugging. Their unusual leaf shape and colour lends variety and mystery to the small garden. Often the flower head stalk gets covered with soil or litter giving the impression of a flower growing on the ground without leaves for support. See page 365 for *Banksia* that sit on the ground.

The Australian Tiger Quoll, *Dasycercus cristicauda* (opposite)

Largest of the four species of Australian Quoll, this nocturnal marsupial lives in forested areas of Eastern Australia down to Tasmania. It is plentiful only in Tasmania where another species the Eastern Quoll is now only found. The Little Northern Quoll occurs across Northern Australia to New Guinea and the Western Quoll is found in the southwestern pocket of Western Australia. The Tiger Quoll is a little larger than a very large tom cat but smaller than the Tasmanian Devil, in a close relative. Its disposition, however, is very different to the Devil in that it is a gentle friendly animal being more easily domesticated than a cat. It is a protected animal. When enraged it produces a blood curdling scream more spine chilling than the most enraged cat. It nests in hollow logs and pockets in trees and feeds on the flesh of any living species of birds, insects, lizards, snakes and small animals, even cats. One of nature's animal wonders living in balance with other plant and creature life except for man with his obsession to "civilise" natural habitats.

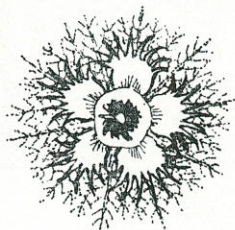
The colour plate is reprinted with permission from The Royal Zoological Society of N.S.W. from their book *Carnivorous Marsupials*.

Carnivorous Marsupials

A book in two volumes available from the Royal Zoological Society of N.S.W., P.O. Box 20, Mosman, N.S.W. 2088, at a total cost of \$48.00 including postage and packing. The books contain 61 significant original research and review papers covering the major aspects of the biology of carnivorous (including insectivorous) marsupials found in Australia. As such it is presented for the scientist and the student and not for general superficial revelation. However the presentation is certainly very easy to follow so if any reader really wants to know a little of the biology of these little known fascinating creatures and is tired of the usual short paragraph that says nothing, these books are ideal. With 800 pages, beautifully produced (only two colour plates) these books are excellent value. Interested in Australia's living creatures? Contact the Royal Zoological Society.



The Australian Tiger Quoll, *Dasyurus cristicauda*



Dryandra

Dryandra as Garden Plants

by Tony Cavanagh,
Ocean Grove, Victoria

In December 1801, the famous Scottish botanist Robert Brown visited the south coast of Western Australia with Matthew Flinders in the Investigator. During their stay in King George Sound, Brown collected many plants including 12 species of a then un-named genus. He was eventually, in 1810, to call them *Dryandra* after Jonas Dryander, a Swedish botanist, student and friend of the great Linnaeus and also Brown's librarian and keeper of his herbarium. Another member of the expedition was the gardener Peter Good who collected seeds and live plants which were sent back to the great Botanic Gardens at Kew. The first *Dryandras* were introduced into cultivation in the Kew glasshouses in 1803 and by 1900, some 26 species had been grown in England and Europe including a number which are still uncommon in cultivation in Australia today. More than half these species were grown to flowering and some were long-lived, reference being made in Curtis' Botanical magazine to a flowering specimen of *D. formosa* which stood 14 feet high in its pot! Today, several *Dryandras*, including very old specimens of *D. formosa*, are still grown outdoors in the relatively mild climate of the Scilly Isles off the south coast of Cornwall.

There are approximately 57 recognised species of *Dryandra* with at least another 20-25 which are un-named. Brief details of some of the characteristics of all species are given in Table 1. Despite their long history in cultivation, *Dryandras* are still very uncommon garden plants in Australia and are usually regarded as being 'difficult' to 'very difficult' to grow successfully. Yet I know of plants of *D. formosa* more than 30 years old which have blown over and still flower every year; many other species will live 15-20 years in the right conditions. They are certainly hardier than Western Banksias and will tolerate heavier soils more successfully providing they have good drainage. So why aren't they seen more in gardens?

There are probably two main reasons, one related to the other —

1. Chronic shortage of seed and hence plants are rarely available in nurseries;
2. Lack of information about *Dryandras* and lack of knowledge of their cultivation requirements.

General Description

Dryandras belong to the Proteaceae family and range in size from prostrate shrubs to small trees. They are most closely related to the *Banksia* family from which they differ in the form of the inflorescence (flower-head), in the presence of an involucre (ring of persistent bracts around the flower heads) and in the shape and distribution of the seed capsules. The typical *Banksia* "flower" (Fig. 1) is actually a spike containing up to 2000 or more individual flowers spirally arranged around its circumference. Only a small percentage of these flowers are fertilised and the resulting seeds and capsules are firmly attached to the spike and set at right angles to its axis. The capsules are usually dull brown, sometimes 'warty' and are generally a conspicuous feature of old spikes.

On the other hand, the *Dryandra* inflorescence is squat, often hemispherical in shape (capitate) and was likened by Alf Grey to a 'shaving brush'.

The individual flowers are set in a woody receptacle which is flat or slightly convex. The heads are frequently surrounded by long floral leaves and usually also have attractive, dark coloured involucre bracts (Fig. 2). In some species such as *D. proteoides*, *D. ferruginea* and *D. tenuifolia*, the prominent involucre bracts produce a flower head reminiscent of the South African *Proteas*. R. D. Royce gave a detailed botanical description of a typical *Dryandra* (*D. speciosa*) in Volume 1 of 'Australian Plants' and this is reproduced with this article.

Very few flowers are fertilised in some *Dryandra* species (producing as little as one capsule per head). The capsules are usually thin, smooth, glossy, brown to black, roughly triangular in shape and frequently buried in the mass of old floral parts. Their long axis is usually parallel to that of the inflorescence.

The plants themselves range from prostrate and dwarf shrubs (about 9) to tall shrubs and trees above 2.5 m (about 13). The majority are medium shrubs from 0.5 to 2 m in height, often densely bushy with extremely variable foliage. Leaves are rarely entire being frequently prickly toothed or pinnatifid or pinnate, sometimes coarsely segmented. The undersides in many species show prominent veins and/or white to brown tomentum; new growth is frequently an attractive brown and densely hairy. A feature of *Dryandras* in the wild is their extremely variable nature so that leaf shape and size give only a rough guide to identification. Nevertheless leaf prints (Fig. 5) can be useful in separating species and this method was extensively employed in the key to *Dryandra* in Blackall and Grieves "How to Know Western Australian Wildflowers". I will use leaf prints in descriptions of individual *Dryandra* in subsequent articles in this series.

Natural Habitat

Even though fossil *Dryandras* have been found in Europe and in the Yallourn Coal measures of Eastern Australia, today they are totally confined to Western Australia, to the west of a line drawn from the Murchison River in the north to Cape Arid (160 km east of Esperance) in the south. The natural home of many species is laterite though a number can be found in the deep sands of the south coast and the heath lands north of Perth. Some frequent lightly forested country and will tolerate light shade in cultivation though the majority prefer full sun, especially in southern Australia. *D. tenuifolia* and perhaps several others sometimes grow in damp localities in Western Australia but still prefer a well-drained position in the garden. One of the most fascinating aspects of *Dryandras* in their home territory is their ability to tolerate (and thrive in) inhospitable environments. They are frequently seen on road-side verges, on very dry, almost barren hill sides and are a pioneering species in colonising worked-out gravel pits and even town rubbish dumps! While some species such as *D. sessilis* and *D. nivea* have a wide distribution, others have extremely restricted habitats, often less than 100 km in extent. Two *Dryandra* are officially gazetted as rare plants in Western Australia, *D. comosa* and *D. pulchella* and both are confined to the Wongan Hills.

Horticultural Features

Probably the most outstanding characteristics of *Dryandra* as garden plants are their almost infinite variety of foliage and the inherent beauty of many of their flowers. Thus species like *D. baxteri*, *D. mucronulata*, *D. longifolia* and *D. foliosissima* have very long, narrow leaves (up to 40 cms) while the opposite extreme is shown by those with short, prickly leaves, e.g., *D. armata*, *D. cirsioides*, *D. cuneata*, *D. falcata*, *D. praemorsa*, etc. Some like *D. seneciifolia* and *D. nobilis* have an incredible density of flower heads and foliage along the stem, with flower heads growing at almost every leaf axil. Some such as *D. pteridifolia*, *D. nivea* and *D. drummondii* have fern-like foliage as in Fig. 3.



Fig. 1. *Banksia spinulosa* (above)

Photography by A. Cavanagh

A spectacular eastern *Banksia* of low stature that is perfect to attract birds. *Banksia* flowerheads are a spike of up to 2000 individual flowers spirally arranged about the central axis.

Fig. 2. *Dryandra quercifolia* (top right)

Photography by B. Crafter

The *Dryandra* flower head differs from that of *Banksia* in that the individual flowers are arranged like a 'shaving brush' often with dark covered cupping bracts (modified leaves).

Fig. 3. *Dryandra drummondii* (bottom right)

The foliage of *Dryandra* is very variable. This species looks like a gathering of leaves sitting on the ground, the flower being hidden inside the clump, not flamboyantly displayed as in a similar species on page 340.



Fig. 2. *Dryandra quercifolia* ▲

Fig. 3. *Dryandra drummondii* ▼



Many prostrate species have underground stems so that both leaves and flower-heads appear to be sitting on the ground as with *D. bipinnatifida* on page 340.

Flower colour is shades of yellow through red, orange and even brown are found — several have strongly contrasting colours such as the chocolate and white of *D. erythrocephala* and the pink and cream of *D. carlinoides*. In some *Dryandra*, a most attractive feature is the bracts at the base of the inflorescence. Conspicuous and colourful, they add interest to the whole plant, as in *D. quercifolia* (deep brown bracts against yellow) (Fig. 2) and *D. proteoides* (deep brown against golden bronze). In *D. polycephala* and *D. formosa*, the strong colours of the flowers themselves (lemon yellow and bronze-golden respectively) and their long flowering period make these species particularly ornamental plants in the garden and attractive to birds as on page 336.

The other feature I like so much about *Dryandra* is their wide variation in form and habit. The prostrate species such as *D. nivea*, *D. nana*, *D. obtusa* and *D. arctotidis* form compact clumps and are ideal for rockeries while the somewhat larger *D. pteridifolia* and *D. drummondii* grow as solid mounds of tangled leaves 1-2 m high with similar spread, the flowers being hidden in the foliage. Others are almost flat on the ground and quite spreading — *D. calophylla*, a form of *D. tenuifolia* and some forms of *D. fraseri*. There are probably as many as 30 species which form compact shrubs 1-2 m high and another 6-9 which form tall, dense shrubs to 3-4 m. Only two species reach tree proportions — *D. arborea* and some forms of *D. sessilis*.

Cultivation

In common with other Western Proteaceae, *Dryandra* require a well drained site in the garden, in near full sun conditions. Forest dwellers such as *D. carduaceae*, *D. praemorsa* and perhaps *D. polycephala* can tolerate light shading. Many naturally grow in thickets, so as a group, *Dryandra* are not particularly suited to exposed sites though there are exceptions, e.g., *D. cuneata* and *D. sessilis*. Some develop a dense and even ragged appearance with age and while this may add interest to the garden, judicious pruning may be necessary on species such as *D. nobilis*, *D. armata* and *D. fraseri* which can retain dead leaves. My experience in southern Victoria is that many are quite drought tolerant and survive in clay-loam soils in slightly raised beds (12-20 cm above normal ground level). In another article I will describe 12 *Dryandra* which I have selected as being hardy and reliable in the Mediterranean-type climate (winter rainfall) of southern Australia. Regrettably, *Dryandra* have been largely impossible to grow in the humid coastal areas of New South Wales and Queensland, apparently perishing from root rot in the wet summer. They are more successful in the drier areas.

Established plants do not require fertilising though small applications of Blood and Bone or slow release fertilisers such as low phosphorous Osmocote are helpful at planting time. Coming from naturally low-nutrient soils, *Dryandra* grow well without additional nourishment, the only problem noted being yellowing of leaves in excessively alkaline soils; foliar sprays of iron chelates at fortnightly intervals help to correct this.

Careful deep watering over the first summer is also vital for success, plants so treated developing a good root system which enables them to withstand later dry weather. It is also of benefit to use a thick mulch, and an attractive and cheaper alternative to conventional materials such as pine bark and crushed rock is a 'live mulch' in the form of prostrate species at the base of taller shrubs. These help to conserve moisture and provide a more uniform soil temperature. Several of the prostrate *Grevillea* are ideal e.g., *G. synaphaea*, *G. nudiflora* and *G. thelmanniana* (green leaved form) and *Dryandra* such as the prostrate *D. tenuifolia*, *D. calophylla* and perhaps some forms of *D. fraseri* would also be suitable.

TABLE 1 — CHARACTERISTICS OF CURRENTLY DESCRIBED *DRYANDRA*

NAME	SIZE HxW(m)	FLOWER HEADS		CULT*	COMMENTS
		COLOUR	SIZE ø CM		
<i>arborea</i> C. A. Gard.	4.6 x 3.5	Yellow	4.5	D	Good for inland
<i>arctotidis</i> R.Br.	0.3-0.5 x 1m	Yellow-Green	2.3	H	Lovely foliage plant
<i>armata</i> R.Br.	1-1.5 x 1.5	Yellow	2.4	?H	Prickly, variable
<i>ashbyi</i> B. L. Burtt.	0.5-2 x 2	Yellow	2.4	H	Attractive dark bracts blue/green foliage
<i>baxteri</i> R.Br.	1-2 x 1-2	Brownish	3-4	H	Ornamental foliage
<i>bipinnatifida</i> R.Br.	Prost. x 1.5	Yellow	4-6	—	Large flower heads
<i>calophylla</i> R.Br.	Prost. x 2.5	White/brown	2-3	H	Flowers on underground stems
<i>carduaceae</i> Lindl.	2-4 x 1.5-3	Yellow	3-4	?S	Similar to <i>D. armata</i>
<i>carlinoides</i> Meisner	1.5 x 2m	Pink/cream	3	S	Nice for cut flowers
<i>clrsioides</i> Meisner	1.5 x 1.5	Yellow	3.5	?S	Similar to <i>D. armata</i>
<i>comosa</i> Meisner	1-2 x 2-3	Yellow	3-4	—	Rare; large dense bush
<i>concinna</i> R.Br.	1-2.5 x 1.3	Yellow/green	2-3	—	Endemic to Stirlings
<i>conferta</i> Benth.	1-2 x 1-2	Yellow	2.5-3.5	H	Column-like shrub
<i>cuneata</i> R.Br.	1-2 x 2	Green-yellow	3-4	H	Suitable as cut flower
<i>cynaroides</i> C. A. Gard.	1 x 1.5	Orange yellow	3-4	—	Dense hairy bracts
<i>drummondii</i> Meisner	0.5-1.5 x 1.5	Reddish brown	4-5	H	Unusual dense mound
<i>erythrocephala</i> C. A. Gard.	1-2 x 1.5	Choc/cream	2-4	H	Flowers very unusual
<i>falcata</i> R.Br.	1-3 x 2	Bright yellow	4.5	?H	Showy but prickly
<i>ferruginea</i> Kippist.	0.4-2 x 1.5	Yellow/brown	2-3	?H	Rarely cultivated
ex Meisner.		bracts			flowers, hidden
<i>foliolata</i> R.Br.	1-2 x 1-2.5	Cream/dull red	2-3	?H	Rarely cultivated
<i>foliosissima</i> C. A. Gard.	1.5-2.5 x 2	Pale yellow	3-4	H	Decorative leaves
<i>formosa</i> R.Br.	2-5 x 2-4	Orange	4-8	S/H	Outstanding cut flower
<i>fraseri</i> R.Br.	0.5 x 1-2	Orange-yellow	3-5	H	Buds have pink tonings
<i>hewardiana</i> Meisner	2-4 x 2-4	Bright yellow	3-4	H	Numerous flowers, formerly <i>D. patens</i>
<i>horrida</i> Meisner	0.5-1.5 x 1.5	Yellow/orange	3-4	—	Rare in cultivation
<i>kippistiana</i> Meisner	1-1.5 x 1.5	Pink-yellow	3-5	S	Very attractive
<i>longifolia</i> R.Br.	2 x 2-3	Yellow	3-4	—	Grown England 1805
<i>mucronulata</i> R.Br.	1-2 x 2-3	Golden amber	3	H	Soft, attractive plant
<i>nana</i> Meisner	0.4 x 0.5-1.5	Yellow	2-3	—	Rare; very long styles
<i>nivea</i> (Labill) R.Br.	0.4 x 0.5-1m	Br. yell/pink	3-4	H	Ideal rockery plant
<i>nobilis</i> Lindl.	2-4 x 3-4	Orange	5-7	S/H	Fls along branches
<i>obtusata</i> R.Br.	0.3 x 1-2	Red bracts/ yellow	3-5	?H	Bright green foliage/ ideal rockery plant
<i>plumosa</i> R.Br.	1.5 x 2-3	Yellow brown	2-4	D/S	Dense drooping habit
<i>polyccephala</i> R.Br.	2-3 x 1-2	Lemon yellow	3-4	D/S	Outstanding cut flower
<i>praemorsa</i> Meisner	2-3 x 1.5	Yellow	3-6	H	Very hardy
	2-4 x 1.5-3	Pink/yellow	5-10	H	Most attractive form
<i>preissei</i> Meisner	0.3 x 1.5	Orange yellow	3	—	Attractive foliage
<i>pteridifolia</i> R.Br.	0.5-1.5 x 1-2	Whitish brown	4-6	H	Outstanding plant
<i>proteoides</i> Lindl.	1-2 x 1-2	Yellow/brown	7-10	S/H	Very large <i>Protea</i> -like flowers on old wood
<i>pulchella</i> Meisner	1-2 x 1-2	Green yellow	2-3	—	Very rare
<i>purdieana</i> Diels	?1-2 x 1	Yellow	1.5-2.5	—	Little known about this
<i>purdieana</i> Meisner	2-3 x 2	Yell./br. bracts	5-8	S	Outstanding cut flower
<i>sclerophylla</i> Meisner	1 x 1.5	Yellow	2-3	—	Rare in cultivation
<i>seneciifolia</i> Meisner	1-2 x 1.5	Purplish- red/yellow	2	H	Foliage and flowers crowded on stem
<i>serra</i> R.Br.	2-4 x 2-3	Pale yellow	2-3	S	Requires pruning
<i>serratuloides</i> Meisner	0.5-1 x 1-1.5	Yellow	3-4	—	Rarely cultivated
<i>sessilis</i> (Knight) Domin	2-6 x 2-4	Green yellow	3-4	H	Sheds seed when ripe
<i>shuttleworthiana</i> Meisner	1 x 0.5-1	Purple-violet orange bracts	4-6	—	Flowers like <i>D. speciosa</i>
<i>speciosa</i> Meisner	0.5-1 x 1.5	Red/pale orange with grey bracts	5-7	S	Pendant flowers, entire leaves most unusual
<i>squarrosa</i> R.Br.	1.5-2.2 x 0.8-1.2	Yellow	3-3.5	—	Little known in cultivation
<i>stuposa</i> Lindl.	1.5-2.5 x 2	Orange/yellow	3-5	?S	Most attractive flowers
<i>subpinnatifida</i> C. A. Gard.	1-2 x 1-2	Pale yellow	2	—	Nearly entire leaves
<i>subulata</i> C. A. Gard	0.3 x 0.5-1	Pinkish brown	2-3	—	Tufting plant, entire leaves
<i>tenuifolia</i> R.Br.	0.1-2 x 1-5	Brownish yellow	4-5	H	Prostrate and upright forms
<i>tortifolia</i> Kippist	0.3-0.5 x 0.5	Yellow	3-4	H	Erect deeply divided leaves
ex Meisner					
<i>tridentata</i> Meisner	0.3-0.5 x 1m	Yellow	4-5	D	Flower heads at soil level
<i>vestita</i> Kippist ex Meisner	0.5-1 x 2m	Yellow	2.5-3.5	S	Slow in cultivation

CULT — Codes: H = Hardy; D = Difficult; S = Special Conditions Required;

— = insufficient information available



Fig. 4. *Dryandra tenuifolia*

Photography by D. McKenzie

An illustration in Curtis' Bot. Magazine of 1836, article 3513. "Flowered at Kew, March-May, 1835, though originally introduced in 1803. It was considered a most desirable greenhouse shrub because of its remarkable habit and the density of its extremely attenuated foliage . . . its freedom of growth, and the readiness with which well ripened cuttings took root."



Fig. 5. Leaf prints of *Dryandra* species.

The objective is to show the leaf variability in species of *Dryandra* as a guide to identification of species. This is a trial plate to see if the idea is successful and generally acceptable.

The prints show five uncommon *Dryandra* species to the scale shown.

A=*D. comosa*

D=*D. falcata*

B=*D. nana*

E=*D. vestita*

C=*D. serratuloides*

The prints are from the back of the leaves as they reveal more details, the size of the centre rib (compare A with E), the presence of extensive veins (see D1) and the presence of 'reticulation' or patterns on the leaf (see B1, D1, E2).

The prints show some of the variation of leaf that can occur within the genus, from the short, prickly leaves of *D. falcata* to the long, thin leaves of *D. comosa*. In others like *D. drummondii* shown in Fig. 3, the coarsely fern-like leaves can be more than 40 cm long.

Propagation

The easiest and simplest method of propagation is by seed which should be sown in a sandy, well-drained mix. I find the best times in Southern Victoria are from mid August to about November and in March and April. In warmer areas, autumn sowing is best, in colder areas, sow in spring. Until recently, seed was in short supply though as many as 20 species are now available from the larger seed merchants. It is easy to collect your own though many prostrate species in particular suffer severe insect attack in certain years; the borers and grubs completely destroy the seeds inside their capsules. Heads or individual capsules can be heated in a moderate oven (150-200°C) for about 20 minutes, causing the capsules to split and allowing the seeds (usually small and black though sometimes papery) to be extracted with tweezers. Another simple method is to cut about three quarters of the way around the capsules with nail clippers, prise the remaining material apart and remove the seeds.

Germination takes 3-8 weeks and occasionally longer and it is advisable to pot-up while the seedlings are quite small — even at the cotyledon stage. I have found that losses from fungal infections such as damping-off are minimised by doing all growing in the open. The potting mixture should be friable and well-drained, one suitable mix being coarse sand, peat moss and soil in the proportions 3:1:1. Synthetic mixes such as composted, coarsely-ground pinebark and crushed scoria (or crushed rock) in the proportions 5:3 are also satisfactory and promote development of a good root system. With synthetic mixes, it is necessary to use a small quantity of slow release fertiliser such as low phosphorous Osmocote.

Growing from cuttings has proved much more difficult and only a few species can be readily grown by this method, including *D. fraseri*, *D. tenuifolia* and *D. formosa*. This practice was widely used in England early last century and gardening books of the period recommended firm new growth taken in August-September (i.e., autumn). Cuttings were usually rooted by the following spring. I have found the period March to June is best but success is frequently less than 20% and the roots developed, even after 6-9 months, are often weak and plants die after potting on. Rooting hormone powders may help to improve the success rate but evidence for their effectiveness on the more difficult species is not available. More work is required on techniques such as tissue culture and grafting before satisfactory vegetative means of propagation become established. Limited experiments with seedling grafting shows that *Banksia serrata* is a suitable rootstock for some species while *D. praemorsa* can be used in phytophthora-free areas. Such grafted plants appear to grow more slowly than ungrafted equivalents and this is another aspect requiring investigation.

This presentation on *Dryandra* will be continued.

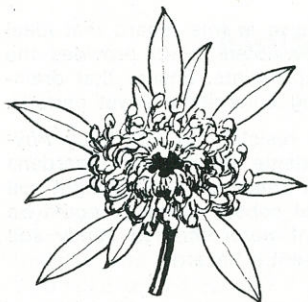
Pre-Germination Of *Banksia* Seed

A. McGarry, Oakey, Qld

I have tried the egg carton method but found that folded blotting paper was easier. The seed germinates readily and then is sown in my special brew, a mixture of Perlite, Vermiculite, peat and humus and placed in a cold frame and then into the bush house. During sunny weather, the *Banksia* seedlings go out into the full sun during the morning and they thrive on it.

I use 'Fongarid' on *Banksia*, *Dryandra*, *Eucalyptus*, *Grevillea*, etc., to combat damping-off, root rot and so forth.

Editor's Note: The egg carton method has been described in a previous issue. Readers were invited to try the simple method that does not require special facilities and report results. My experiments are continuing with spectacular results that will be reported shortly but reports from others are needed.



Waratah

Growing the Sydney Waratah — by Max Hewett, Sydney

Experience indicates there are certain guide lines to the production of healthy specimens of Waratah, *Telopea speciosissima*, under a wide range of soil types. The following factors are to be considered, the first four being of major significance.

(1) Freedom From Root Competition

The late Frank Stone, founder of Waratah Park, Bilpin, maintained that anybody could grow Waratahs providing they maintained the soil adjacent to the plant in a state of fine tilth. I have personally tested his statement on many occasions in my garden and confirm its accuracy.

After plants have been established two years or so and have formed a lignotuber I have cultivated to shovel depth (approx. 200 mm) from the plant stem to 1m radius. This has been done approximately twice per year and the plants have never failed to respond with new vigour and new growth at or near ground level. Plants not so treated have declined in vigour to bare stems carrying few leaves and few, if any, flowers. Some plants which had been overgrown with foliage from adjacent shrubbery and had been dormant for ten years or more have responded with new growth when freed from leaf competition and given the above soil treatment.

(2) Depth of Soil to Impenetrable Layer

Waratahs are most successfully grown where the main root stem can penetrate freely to a metre or more (*refer also item 4*). Although I have observed specimens growing and flowering in a bed made up of about 150 mm depth on a shelf rock, almost daily watering was required.

(3) Soil Type

Although specimens occur widely in the Hawkesbury Sandstone country of the Sydney area, the standard of foliage and flower development, except after fires followed by heavy seasonal rains, does not approach the quality of stands in the rich basaltic loams at Bilpin and other Blue Mountains areas, the deep brown loams with laterite association found near Terrey Hills, or the brown loams on shale in some locations along the Putty Road north of the Colo River. In the deep, rich, brown, volcanic loams of the Dandenongs near Melbourne, the Sydney Waratah is grown extensively and to perfection for the cut flower trade. In the poorer soils near Melbourne, however, few satisfactory growings have been achieved. I had several reports of specimens flourishing in the volcanic loams of North Island, New Zealand, producing up to 100 flowers per plant.

From the above it would seem to be obvious that soils of the heavier texture offer the most likely condition for vigorous growth. In fact, gardeners in rich soil areas such as Wahroonga have little difficulty in establishing healthy plants, whereas those in sandy areas are frequently disappointed with their performance. This must be related to factors (4) and (6) (*see later*) and suggests that plants grown in lighter soils should have their nutrient and moisture supply augmented for best results.

(4) Availability of Soil Moisture and Drainage

One-time Native Plant nurseryman, Jack Twyford of Thornleigh, who grew Waratahs very well in heavy clayey loam, made the following comment to me: "Waratahs do best when roots are kept cool and foliage is in full sun". My

own experience would seem to confirm this. I believe in this regard that ideal conditions prevail where an impenetrable layer as noted in (2) provides the moisture trap, but a word of caution would be appropriate. Ensure that drainage of subsoil is adequate to prevent waterlogging in prolonged wet periods.

Although the species seems to be relatively resistant to attack by *Phytophthora cinnamomi* I have observed several plants in members' gardens which gave the appearance of such fungal attack. These were all in light soil areas over sandstone, and one might presume that subsoil drainage could be locally deficient. Perhaps the faster penetration of water through sandy soil and consequent raising of water table could represent a hazard.

(5) Aspect and Exposure

Despite comments in (4) above, I have grown and otherwise observed many plants growing reasonably in broken sun, so I feel this factor is only of minor significance. One member reported cases of leaf scorch, which perhaps could be attributed to his rich subsoil with ample subsoil moisture producing lush early growth with vulnerability to hot early seasonal conditions.

(6) Fertilising

Although I personally do not use fertilisers on my Waratahs, my earlier observations of members' gardens indicated favourable response to light applications. As noted in (3), the major necessity arises in gardens in the light soil range. The time for application is when new growth first appears in August.

(7) Mulching

I find a heavy mulch of leaf litter advantageous providing the lignotuber is kept free and open. The mulch is dug in when cultivating (*refer (1)*).

(8) Pruning

Established plants benefit greatly from pruning. As a general rule early cutting of the flower stems to at least half the pre-flowering growth increases the number of flowering stems for the following year. Where mature plants have aged to a number of long bare canes, it is advantageous to cut them away completely to the lignotuber immediately after flowering. Some members may be apprehensive of removal of all canes simultaneously. While I have not experienced ill effects from this treatment I appreciate their concern and suggest, as a first up, the operation could be spread over two seasons.

(9) Watering

The subject of soil moisture is reasonably covered above. If, however, hand watering is applied, I would suggest the object should be to restore subsoil moisture when dry seasons would affect growth in the growing period, and would best be achieved with infrequent heavy soakings by the trickle method. On the other hand, no adverse effect could be expected from occasional general garden waterings. Waratahs go into dormancy in Sydney in late autumn and commence new growth generally in early August (*refer (6)*). Watering should not be applied during this period, unless only of a light nature.

(10) Insect Attack

On certain plants in my garden insect attack to the flower buds occurs regularly each year. This I believe is from what is known as the Waratah beetle, and has the effect of reducing the number of developed flowers on affected plants by up to 50%. All my efforts to date to overcome this problem have been in vain, the buds having been damaged before the attack was noticed. Perhaps some members could tell me what I should do about it. ■

Editor's Note: This article could well provide the recipe for the cultivation of all Proteaceae. Will readers please comment.

Melaleuca nesophila

Its cultivation at Palm Beach, N.S.W. — by Janice M. Haynes

While numerous references have been made to *Melaleuca nesophila* in "Australian Plants" over the years, readers might like to share my rewarding experience of growing this species on a northern coastal slope at Palm Beach, New South Wales. An excellent description of the species by I. Holliday and R. Hill, based on experience in South Australia, appeared in Volume 2 of the journal: "One of the large shrubs or small tree melaleucas which occur naturally on Doubtful Island, Western Australia. A very hardy species which will grow in practically any soil or situation, but varying considerably in height according to conditions. At its best it reaches 6 m. in height with branches to ground level. The flowers which appear at the ends of the branches in late November are globular, mauve with yellow anthers, and very lovely. The plant strikes readily from cuttings". Other writers testify to its extreme hardiness, its suitability for coastal gardens and its beauty as a summer flowering shrub.

In June 1979 a clump of five healthy seedlings of *M. nesophila* (purchased from the Forestry Commission Nursery at Pennant Hills) were planted in an area 5.4 metres by 4.0 metres. Over the past seven years this steeply sloping position had been considered difficult with its poor heavy clay soil and relentless exotic weed growth; *M. lateritia*, *M. hypericifolia*, *Grevillea Robyn Gordon*, *I. haemastoma* had flourished to 1 or 2 metres then died. However at the time of planting, several *M. hypericifolia* growing below the area had flourished and provided protection from the wind while not impeding full sunlight. The soil had improved after repeated mulching of weeds.

The seedlings, when bought, had been cut back hard and each had two or three strong upright branches from a centre stem. Bush sand was mixed in at planting; seedlings were kept moist by trickle watering and free of weeds. The winters of 1979 and 1980 were dry and sunny and regular watering was continued until the plants were a year old, when a citrus fertiliser was used for the first time, and after that twice a year².

Growth was vigorous and the seedlings took on their characteristic graceful and strongly branching form. Tip pruning was carried out continually. By December, 1980, the shrubs were dense to the ground, spreading and arching in every direction, growing into each other and exceeding the original area by 1.2 metres with their branches of beautiful light green oval foliage.

Late in November 1981, the shrubs, now 3.2 metres high, began to flower and have continued to flower to the time of writing (March, 1982). At first a few of the purple-mauve globular flowers appeared at the end of the branches, fading to white. Flowers (up to 30 mm. in diameter) multiplied noticeably by January and since then have been profuse. A remarkable feature (to me) has been that many flowers have been produced as a second flowering above the first flowers. I do not know if this double flowering is usual but it has curbed my desire to pick these fascinating flowers and added another dimension to the continual delight and interest which *M. nesophila* provides in our garden.

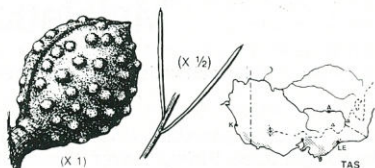
Yellow wattle birds, white-cheeked honeyeaters and little wattlebirds frequent the shrubs.

Footnotes:

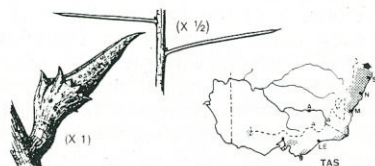
1. I. Holliday and R. Hill "Growing *Melaleuca*" Australian Plants, Vol. 2, P. 279.
2. When using this fertiliser on citrus trees elsewhere on the site, a nearby *M. nesophila* grew remarkably and flowered profusely. Since then other native plants in the garden have responded to it.

Hakea nodosa**Yellow Hakea**

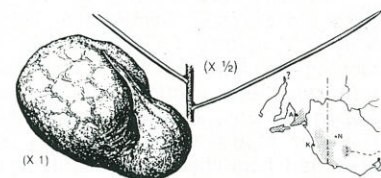
Green bushy shrub, 1–2 m. Locally common in heaths on *poorly-drained sandy soils* in southern lowlands, in low open-forests (e.g. with Silver-leaved Stringybark). LEAVES needle-like but rather soft and not prickly, green, slightly flattened, 2–4 cm long, fairly erect and crowded. FLOWERS (Apr–July) yellow, very small (about 5 mm), in clusters of 4–6 in axils. FRUIT 2–3 cm long, warty, not strongly beaked.

**Hakea teretifolia****Dagger Hakea**

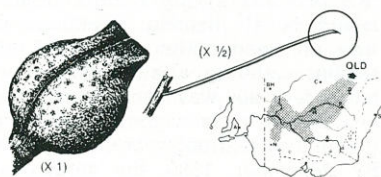
Spreading, needle-leaved shrub, 1–2(+) m. Fairly common in heaths on damp sands, especially in near-coastal areas, often with Yellow Hakea in Vic. LEAVES terete, stiff, sharp-pointed, 2–5 cm long, green (new growth white-hairy). FLOWERS (Nov–Feb) whitish, very hairy, profuse in short axillary clusters. FRUIT narrow and 2–3 cm long, distinctive with slender beak and woody crest at widest part.

**Hakea rostrata****Beaked Hakea**

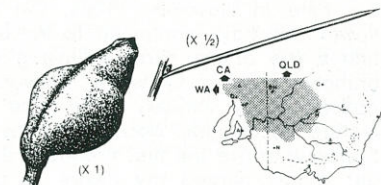
Shrub, 1–2 m, with long needle-like leaves curving upwards. Common on sandy soils, Grampians to Mt Lofty Ras, in heaths under low open-forests and mallee scrubs of 'Deserts'. LEAVES terete and fairly slender, 5–15 cm, green, glabrous, sharp-pointed. FLOWERS (Sept–Nov) white, about 1 cm long, clustered in axils. FRUIT large (3–4 cm long), becoming somewhat rough and wrinkled, distinctively S-shaped with beak curled back.

**Hakea tephrosperma****Hooked Needlewood**

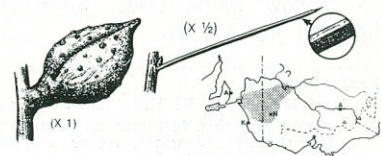
Small, sometimes crooked tree, 3–12 m, with rather sparse, greyish, needle-like foliage. Scattered but locally common inland, mostly in pine-belah-wilga woodlands, on sandy or loamy plains and ridges (NSW, Vic). LEAVES grey-green, 3–8 cm long, terete with curved tips. FLOWERS (Aug–Oct) white, minutely hairy. FRUIT 2–3 cm long, smooth, wedge-pointed, seed-wing dark. *H. vittata*, only a small shrub, restricted to SA, is otherwise superficially similar.

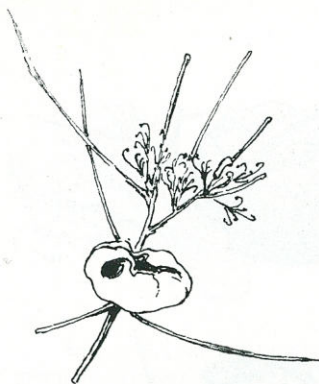
**Hakea leucoptera****Silver Needlewood**

Bushy shrub (or small tree), 2–4 m, with long greyish needle-like leaves. Scattered on various inland sandy-textured soils of dry ridges and plains, in woodlands (cypress-pine, belah, mulga) and taller mallee scrub. LEAVES rigid, terete with sharp straight-pointed tips, 4–8 cm long, hoary. FLOWERS (Sept–Jan) white, not hairy, numerous in short racemes. FRUIT pointed, 2–3 cm long, seed-wing yellow-white.

**Hakea muellerana****Desert Hakea**

Needle-leaved compact shrub, 1–4 m. Locally frequent in low mallee scrubs and heaths on sands, mostly south of Murray R and in the 'Deserts'. LEAVES very sharp and rigid, terete or angular in section, ± yellow-green, widely spreading, 2–7 cm long. FLOWERS (Oct–Dec) white, numerous in clusters in axils. FRUIT 1.5–2.5 cm long and fairly broad, shortly beaked, smooth or with scattered warts.





Hakea

The *Hakea* of South-Eastern Australia by Leon Costermans, reprinted by permission from the book "Native Trees and Shrubs of South-Eastern Australia."

Hakea belong to the family *Proteaceae* which includes the waratah, *Telopea*, the banksias, *Banksia*, the geebung, *Persoonia*, the spider and tooth-brush flowers, *Grevillea*, etc. . . The book presents all the wildflowers that will be readily observed in various natural areas in south-eastern Australia, just as it is depicted here for *Hakea*. With a page size of 25 x 19 cm, it will be appreciated that the photographic representation of two typical pages has involved a reduction in size. The clarity in the book is excellent. The 300 colour plates include separate very clear photographs of *Hakea sericea*, *H. nodosa*, *H. teretifolia*, *H. rostrata* and *H. tephrosperma*.

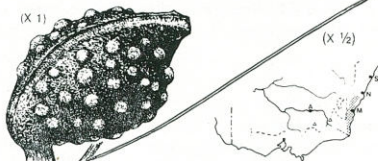
Family *PROTEACEAE*

Genera *Hakea* (contd.), *Telopea*, *Orites*, *Lomatia* (p. 383)

Hakea macraeana

Macrae's *Hakea*

Erect and flexible green shrub, 1-4 m. often like a small pine-tree. In NSW only coast to margin of S Tablelands scattered in open-forests on various sites, especially on shallow rocky soils in valleys. LEAVES fine needle-like and sharp-pointed but flexible, green, 7-13 cm long. FLOWERS (Sept-Oct) white, in clusters. FRUIT with warts, 3-4 cm x 2-2.5 cm, short points on valves, seed-wings black.



Native Tree And Shrubs Of South-Eastern Australia*

by Leon Costermans

This valuable book has been reviewed in a previous issue of Australian Plants. I have since had occasion to refer to this book on a number of occasions and find it of considerable value. There are many books on Australia's wildflowers, so many that readers will be confused. Now and again one stands out above the rest and this book by Leon Costermans certainly does that.

If you occasionally wonder through the bush and wonder at the names of the many plants on display, then this is the book for you. You will note from reproduced pages from the book (reduced in size to suit our page size so the print and sketches are quite clear) that you do not need to be an expert, just study the pictures. As well as sections in the book collecting all species in the one plant family together, other sections present a similar sketch of each species in a natural geographic area. Hence *Hakea macraeana* above is shown again on page 80, section C together with understory shrubs of the near-coastal N.S.W. and East Gypsland area together with similar sketches of *Hakea dactyloides*, *Acacia subtilinervis*, *Muehlenbeckia discolor*, *Daviesia wyattiana*, *Westringia eremicola*, *Westringia glabra*, *Boronia ledifolia* and *Phyllanthus gunnii*. Originally intended for boy scouts and bushwalkers, the book is your do-it-yourself guide to the Australian bushland areas of Victoria and N.S.W.

The book is available by mail from The Editor, Australian Plants, 860 Henry Lawson Drive, Picnic Point 2213, for \$36.00 including postage.

Propagation Of *Hakea*

Notes by Rosemary McLaren

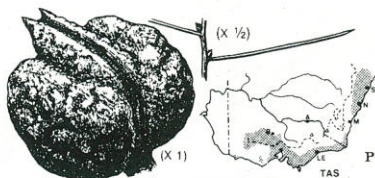
The recent articles by the Editor on propagation of seed in egg cartons has given me renewed interest in seed propagation. We do not have egg boxes here so I place the seed between "Kleenex" tissues kept damp on a saucer. I did have trouble with them drying out but I now pop the lot into a plastic bag and place on a window sill. *Hakea* seeds germinate very well this way and I can keep one eye on them. Some take 5 days and others 5 weeks and those that take longer seem to be harder.

The following have been successful: *Hakea bucculenta*, *H. dactyloides*, *H. elliptica*, *H. glabella*, *H. laurina*, *H. microphylla*, *H. minyma*, *H. multilineata*, *H. nodosa*, *H. orthorrhynch*, *H. petiolaris*, *H. platysperma*, *H. pycnoneura*, *H. sericea*, *H. salicifolia*, *H. suaveolens*, *H. tephrosperma* and *H. trifurcata*.

Hakea sericea

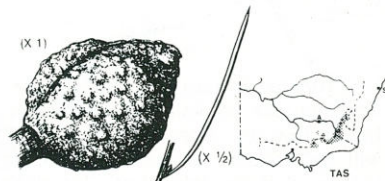
Bushy Needlewood

Stiffly erect, slender or bushy shrub, 2-5 m, with *straight, spreading, needle-like leaves*. Common in Vic-NSW, mostly in hill country, as component of heaths and scrubby understoreys in open-forests. LEAVES rigid, terete and needle-sharp, green, 2-6 cm. FLOWERS (May-Sept) white or pink scented, to 6 per cluster in axils. FRUIT persisting for years, becoming rough and knobbly, 2.5-4 cm long, almost as broad, with double-pointed beak.

**Hakea lissosperma**

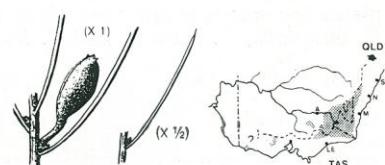
Mountain Needlewood

Shrub or $\pm$ conical small tree, 2-5 m, with rather dense and ascending *needle-leaves and branches*. Isolated occurrences in subalpine Snow Gum woodlands on rocky sites. LEAVES grey-green, terete, fairly thick and stiff, 5-10 cm long, with sharp straight points. FLOWERS (Oct-Dec) white, short but numerous in axillary clusters. FRUIT thick, woody, to 3 cm long $\times$ 2 cm broad, smooth or warted. Formerly included under *H. sericea*.

**Hakea microcarpa**

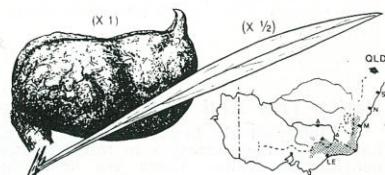
Small-fruit Hakea

Erect, greyish, needle-leaved shrub, 1-2 m. Mostly above 800 m in E highlands, common *near streams and bogs* in rocky situations, especially tablelands and high plains; some lowland occurrences (e.g., NSW near-coast rivers). LEAVES dull grey-green, fairly erect, terete (sometimes $\pm$ flat), sharp-pointed, 3-6 cm long. FLOWERS (Nov-Dec) small, white, clustered in axils. FRUIT *small* (10-15 mm long), with tiny projection near tip of each valve.

**Hakea eriantha**

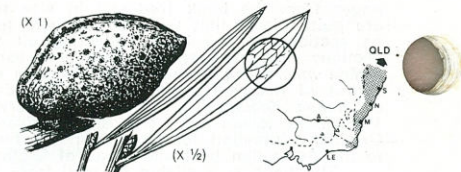
Tree Hakea

Small tree, 3-8 m, with *fairly large crown of flat, flexible, lustrous green leaves*. Mostly below 1100 m in taller forests on cool sheltered sites, Walhalla area (Vic) to Budawang Ra (NSW). LEAVES alternate, slightly darker and glossier one side, 8-14 cm $\times$ 6-17 mm, single central vein. FLOWERS (Sept-Oct) white-pink, very silky-hairy, few per cluster in leaf-axils. FRUIT almost smooth, to 3 cm long $\times$ 2 cm broad, with short hooked beak.

**Hakea dactyloides**

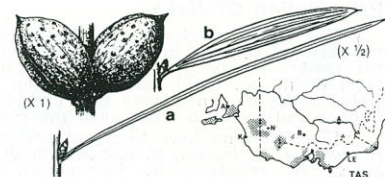
Finger Hakea

Firm-leaved shrub, 1-3(+) m. Frequent in E NSW (rare in Vic), in open forests and heaths, mostly on poorer soils from sandstone and granite, coast to montane levels. LEAVES flat, fairly stiff, green with 3 *bold translucent veins* (rarely more) and *net veins between*, 5-10 cm $\times$ 7-20 mm, silky brown-hairy young. FLOWERS (spr-sum) white, numerous in axils. FRUIT to 3 cm $\times$ 2.5 cm, fairly smooth, not beaked at maturity.

**Hakea ulicina**

Furze Hakea

Rigid shrub, 1-3 m, branches and long narrow leaves interwoven. Frequent in southern heaths and scrubby understoreys on sands or some rocky slopes, near-coast to hills. LEAVES glabrous green, *flattened*, fairly stiff, sharp-pointed, typically narrow (a), 4-20 cm $\times$ 2-4 mm, 1 or 3 prominent veins; leaves of var *latifolia* (in west) broader (to 15 mm), 1-7 veins (b). FLOWERS (Aug-Nov) whitish, *small clusters*. FRUIT smooth, 1-2 cm, shortly beaked, often *tightly clustered*.





Grow What Wet

by The Australian Plant Study Group

This is the intriguing name of a new book produced by a group of Society members known as the Australian Plant Study Group and follows the widely acclaimed book *Grow What Where*. Prepared in such a competent and practical way, the effort and painstaking detail has produced a book that all should be proud to own. Hopefully it will inspire readers to give thought to featuring water in a section of their garden. With the detailed advice and clear step-by-step instructions illustrated by sketches, any one could be sure of success. The book may be obtained from The Editor, Australian Plants, for \$16.95, post free.

The coverage may be gauged from the titles of sections of the book.

1. Water in the garden, a landscape feature integrated in a garden design.
2. Landscaping, siting and planning. Techniques used by the professional.
3. Designing your pond. Instruction for simple, unique pond designs.
4. Basic pond construction with step-by-step instructions and sketches.
5. Preparing and planting ponds. A wide range of plants recommended.
6. Bogs and bog gardens. An unusual feature for a garden.
7. Sullage areas turned into an attractive garden feature.
8. Maintenance and problems resolved to retain this attractive feature.
9. Background and accent plants that attractively present a water feature.
10. Creek beds and streams built as a feature in a natural garden.
11. Courtyard ponds presented generally in a formal but restful setting.
12. Formal ponds as a feature in a well-cared garden landscape.
13. Swimming pools and the landscape design around them.
14. Container ponds, a fascinating interest for small areas or as features.
15. Terrariums, the setting up and planting of a garden in a glass container.
16. Moving water, the techniques necessary to keep water moving.
17. Ferns, their use in moist situations in gardens or water features.
18. Rainforest gardens, a bold attempt to capture the rainforest in miniature.
19. Alpine pools and plants, may be located in the cooler, shadier corners.
20. Farm dams, so necessary for production, why not make them attractive?
21. Birds and water. A major dividend is the birdlife attracted to water.
22. Pond life, the creatures to encourage and others to control.
23. Fish, the selection and care of fish for your pond.
24. Plant dictionary. An excellent reference and description to the many hundreds of plants selected to feature in the water displays. ■

Wildflowers For Any Garden Situation

The work of the Australian Plant Study Group, is an example to all. It shows what a small group of people can achieve if they try. We need similar studies for the cultivation of plants in all situations. The next issue will carry results of a study in dry area gardening and the following issue on cold area gardening. We need a study for coastal planting at different latitudes, and studies in the cultivation of plants under different garden conditions. The Townsville Group of the Society produced an excellent book some years ago, the Atherton Tablelands Group and Pine Rivers Group also of Queensland have produced booklets. The New England Group in N.S.W. have just completed a book on cultivation of natives in their area. We have the resources to produce books on the wildflowers of your area, why not start on it now? EDITOR.

Terrariums

By the Australian Plant Study Group
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Growing miniature plants under glass can be one of the most fascinating kinds of indoor gardening. Unlike dish gardens or potted plants, terrariums require very little care. Once they are set up, they recycle their own moisture. The gardener can design a wet woodland, a rainforest, or a bog garden.

Terrarium containers

There are many containers that are suitable, including wide-mouthed bottles or bowls, aquariums of plastic or glass, dishes with domes, recycled plastic soft drink containers, hanging bowls, fern cases, and lead-light glass containers. It should be noted that any container chosen for a bog garden should be able to be fully covered at all times to retain moisture.

Principles of terrarium gardening

Moisture evaporates from the leaves and soil to condense on the inside walls of the terrarium. The water collects into droplets, and runs back down the walls to the soil, so enabling the cycle to commence again. However, water can condense under flat glass or plastic covers and so obscure the view from above. Curved lids will allow some run-off.

Growth medium

The growth medium for a bog terrarium should be slightly acid. It should consist of: 3 parts peat moss, 2 parts potting soil, 1 part sand.

Sterilise the growth medium to kill any disease or bacteria before placing it in the container. Sterilisation can be by: pouring boiling water through the medium or heating it in an oven at 60°C (140°F) for 30 minutes.

Once the growth medium has been sterilised, place it in a plastic bag and add water until the mix feels uniformly moist.

Fine gravel and charcoal are needed in the bottom of the terrarium. The gravel provides the basic drainage and the charcoal is placed on top of the gravel where it absorbs excess moisture and prevents the soil falling through into the gravel. It also reduces any smell caused by bacterial decay.

Sterilise both gravel and charcoal with boiling water.

Planning and planting method

A garden should be pleasing to the eye in texture, colour and arrangement. So *take your time* in the initial planning stage. It is worthwhile looking at natural gardens, whether wet woodland, tropical rainforest or a bog garden, for inspiration.

Clean the container carefully with soap and water and rinse thoroughly. Place the gravel at the bottom of the terrarium. Cover the gravel bed with charcoal chips and then add the growth medium. No more than one-quarter of the space in the terrarium container should be occupied by the drainage material and growth medium.

The landscaping of the terrarium can now commence. Rocks should be used sparingly and carefully, but they can be very effective.

Planting arrangement is a matter of taste, but here are a few hints:

Avoid overplanting. The key to a good terrarium garden is a proper balance of plants, air, light, humidity, moisture and soil.

taller plants to the rear, or to one side as accents (i.e. *Patersonia fragilis*)
shorter plants in front of taller ones (i.e. *Cephalotus follicularis*)

large-leaved plants to the rear (i.e. *Rhododendron lochae*)

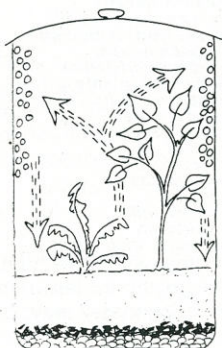
small-leaved plants to the front (i.e. *Pratia pedunculata*)

leaf variation should be from large to medium to small, in order to add depth to the garden

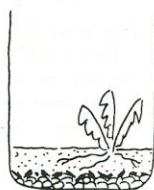
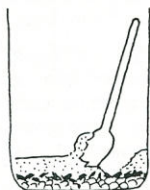
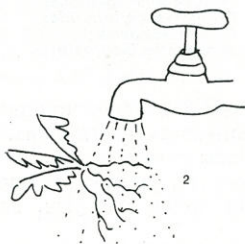
blend foliage colours harmoniously. Avoid plants of all the same colour as well as abrupt changes of foliage colour

avoid rampant plants that will quickly outgrow and smother the other plants. *Crassula helmsii* would cover smaller growing plants.

Choose plants that are young, strong and healthy. Plan their position with the terrarium. Dig the first hole, taking care not to disturb the charcoal layer or to splatter soil on the container walls. It is easier to start with the largest plants. Planting one at a time and avoid covering the small ones.



1. A terrarium. The domed lid minimises top condensation, allows visibility. Three quarters of depth is for growing space, the remainder for the growth medium, charcoal chips and fine gravel. The container can be of any shape.
2. Tap plant gently out of pot and crumble soil from roots — wash to remove soil particles and any pests.
3. Make hole carefully without disturbing charcoal layer.
4. Spread roots, firm soil around plant.



Ease the first plant gently from its pot, and crumble away the soil from its roots. Wash the plant to remove any pests or fungal spores. Place it in the prepared hole, spread the roots and firm the soil back around the plant. Dribble just a little water onto the root area to settle it in. Then continue with remaining plants.

Care and maintenance

The terrarium garden can go unattended for some time. However, to guard against fungal disease, you should remove dead blossoms and leaves. As most terrarium gardens can be moved about within the house, direct sunlight can be avoided. This is important, as too much heat can build up in the container and burn plants.

Enclosed containers may not need watering for many months. When may be splattered on the glass. Water should be gently poured down the result can be a mess. Plants may be dislodged from their position and mud watering is required, do not just 'dump' water into your terrarium or the sides of the terrarium so that it just trickles into the soil.

Plants suitable for terrarium gardens

The size of the container will dictate the size of plants to be grown. True miniatures like *Nertera depressa* and *Pentachondra pumila*, that is, those plants that never exceed 30 cm in height, are best because they grow slowly, and even at maturity most do not outgrow the average terrarium.

Although not much is known about the growing of Australian native plants in terrariums, the plants listed have been grown successfully.

Abrotanella forsterioides
Actinostrobilus pyramidalis
Bellendenkampa montana
Blandfordia grandiflora
pumila
Carex gaudichaudiana
inversa
Chorizandra enodis
Coprosma moorei
Cotula coronopifolia
Crassula helmsii
Diselma archeri
Ewartia catipes
nubigena
Goodenia humilis
Gunnera cordifolia
Herpolirion novae-zelandiae
Isotoma fluvialis
Libertia paniculata
pulchella
Luzula campestris

Mazus pumilio
Mimulus repens
Neopaxia australasica
Nertera depressa
Parahebe perfoliata
Patersonia fragilis
Pentachondra pumila
Pimelea pygmaea
Pratia pedunculata
Pultenaea pedunculata
Ranunculus rivularis
Rhododendron lochae
Scaevola hookeri
Scleranthus biflorus
Sowerbaea juncea
Stellaria pungens
Veronica gracilis
notabilis
plebeia
Viola betonicifolia
hederacea

Wahlenbergia gloriosa
 Ferns
Asplenium flabellifolium
Blechnum penna-marina
Grammitis billardieri
Lindsaea linearis
Marsilea drummondii
 Mosses and clubmosses
Lycopodium ssp.
Sphagnum cristatum
 Carnivorous plants
Cephalotus follicularis
Drosera arcturi
auriculata
binata
hamiltonii
macrantha
peltata
planchonii
whittakeri
Utricularia dichotoma

Many other plants may also be suitable, and experimenting with new ones can be fun. Some of the following plants are tall, but growth in terrarium conditions would be slow. Some pruning for shape and openness may be necessary.

Agapetes meiniana
Callistemon sieberi
Cyathodes dealbata
glauca
parvifolia
straminea

Epacris exserta
lanuginosa
serpyllifolia
Eucryphia lucida
milliganii
Gaultheria depressa
Hibbertia dentata

Kunzea ericifolia
Microcachrys tetragona
Orites revoluta
Podocarpus lawrencei
Prionoxystus cerinthoides
Richea scoparia
Sprengelia incarnata

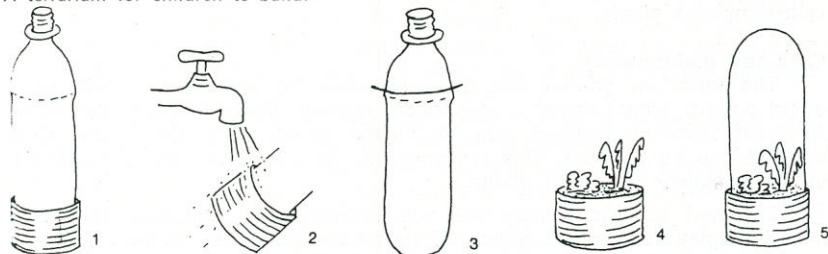
Terrariums for children

Most children find it fun to have their own terrarium bog gardens. Recycled plastic soft drink containers make ideal dome-shaped terrariums.

To prepare a terrarium from a soft drink container:

1. Remove the black plastic base from the container by pouring a small amount of hot water between it and the base to soften the glue, and then prise them apart.
2. Cut the plastic with a sharp knife approximately 12 cm from the top and invert to form the domed cover.
3. Insert the drainage and growth medium as described earlier into the base, and plant.

A terrarium for children to build.



1. Plastic soft drink container; 2. Hold black base under hot water to soften glue then prise apart; 3. Cut clear plastic container about 12 cm from top; 4. Plant into black base as for other terrarium plantings; 5. Invert clear domed section over base.



A Wildflower Garden

by Peter Bailey, Wheelers Hill, Victoria

When I built our house seven years ago, my interest in gardening was zero. It was not long though before I became hooked on our Australian flora and have proved it is not necessary to be an "old hand" or have "green fingers" to be successful at taming them. Provided you are prepared to follow the advice given in many good publications, such as Australian Plants, and ignore "proven principles" not recommended.

My initial garden was made from terracing the front area, taking advantage of the one metre fall across our block.

A Sand Bed

Following success with the built up beds (over clay), I decided to build a three high sleeper retaining wall at the rear and create a sand bed ranging from 5 to 75 cm. deep. The sand came from a Cranbourne sand pit and is similar to that at the Cranbourne Annexe of the Botanic Gardens.

My successes in the sand bed include *Banksia coccinea* (18.5.80). Success at establishing a plant at last. My method was to make the sand very acid by watering Acitone* in at regular intervals over 12 months and then allowing the rain to leach the top layer of sand to neutral. The plant is 40 cm. high, dense and 2 cm. dia. at ground level with rough bark.

Banksia menziesii (20.7.79), my pride and joy, about 1.5 m, flowering beautifully and at least 9 cm. dia. at ground level.

Banksia praemorsa (21.10.79), dense to 80 cm. and growing strongly.

Calytrix aurea (16.12.79) has flowered for the last two years.

Hakea victoriae (16.12.79) dense shrub to 1.8 m. and yellowing nicely.

Halgania cyanea (25.4.80), almost always flowering and suckering.

Verticordia mitchelliana (16.12.79), flowering beautifully over a long period.

Planting and Getting Plants Established

My thoughts on watering the more difficult species are that once partially established they should be artificially watered only when showing signs of stress. While many plants seemed happy after planting, others died or did not prosper. I became convinced many of the losses were due to the potting mix becoming a hard, dried out ball, much the same as if the plant was badly pot bound and the ball had not been broken.

To overcome this problem I selected small plants and with a very gentle hose carefully washed the potting mix from the plant. The benefits of this drastic approach appear to be two fold; one, the problem of the potting mix not being compatible with the sand is solved and two, all things being equal, the risk of disease is lessened. Naturally I have had failures with this method due to foot damage, too large a plant, or harsh weather the following days.

* Acitone: Nitrogen as ammonium nitrate 5.25%, sulphur as sulphates 16%, sulphur as elemental sulphur 25%, aluminium sulphate 2%, iron sulphate 5%.

Plant Hormone 20

The active constituents are Naphthylacetic Acid 0.22 G/L and Indol-3YL-Butyric Acid 0.22 G/L and is not to be confused with another product known as Formula 20 which includes Vitamin B1, B2, B6, Niacin, Indole Acetic Acid 0.005 G/L and Naphthalene Acetic Acid 0.005 G/L.

I understand that Plant Hormone 20 has evolved from the study of the use of growth promoting substances in U.S.A. where it has been shown that hormones do make up a vital part of the healthy growth of plant life. Plant Hormone 20 is designed to promote growth by increasing the number of feeder roots which is reflected in increased top growth. It assists in overcoming the shock of transplanting and ensures that plants, shrubs get a quick start.

I have used P.H. 20 at the recommended rate of 4 drops to 3 litres of water applied around the base of the plant each two weeks, except the sand beds which only received one application at time of planting. The results have been little short of spectacular and include a one metre *Xanthorrhoea* which did not take to being transplanted and looked dreadful and is now growing well. Other plants to have a new lease on life are *Actinodium cunninghamii* and *Melaleuca scabra*. There is a general improvement in the condition of the garden and I would recommend anyone who is not happy with their plants to cut out all fertilizers and try P.H. 20. Use Ferrous Sulphate and Ammonium Sulphate as necessary and all others with extreme care. ■

Editor's Note: Will readers please advise on their experiences with the use of fertilizers and growth regulators. We will deal with this item in an issue shortly. Meanwhile try Plant Hormone 20.

MY SAND GARDEN

by Paul Baxter, Happy Valley, S.A.

You have asked for reports from readers who have experience with a sand garden. Mine is in the very western extreme of the Adelaide foothills and is on what was previously a vineyard. Soil testing has revealed generally slightly acid loams to clay with very little evidence of limestone.

In the front yard (southerly aspect), I had a large load of what is locally known in the trade as Mallee Sand, dumped. It is a light grey acidic sand with occasional lumps of soft yellow clay and odd plant roots in it. This sand was spread over a portion of the yard with its depth varying from 45 cm down to 10 cm, the existing loamy topsoil having been left virtually undisturbed.

Planting took place mainly between February and April of 1977. Results to date have exceeded even my wild hopes. In some cases the plants took a while to get started but all look healthy and vigorous. The plants have had no fertilizer apart from a little blood and bone in the original holes. I have covered the whole area with a pine bark layer to a depth of 8 cm.

Editor's Note: I have lost contact with Paul Baxter. Will he forward an up-to-date report please. Meanwhile what are the experiences of other readers with sand gardens?

The Bendigo Primitive Seed Germination Method

by R. J. Tucker

Articles by the editor encouraged me to attempt the somewhat difficult but certainly rewarding process of growing natives from seed. I use milk cartons with the opening stapled up tight again, the carton placed on its side, a panel cut out on the upper side and leakage holes incised in the bottom side with a "Stanley" knife. These are filled with creek bed sand, a sprinkling of seed and a further cover of sand. They are placed under the broken shade of a eucalypt and watered twice daily.

When the seedlings grow their second set of leaves they are pricked out and planted. A high mortality rate? So what's new? I am successful with more than enough plants for my garden and for acquaintances. It has encouraged me to grow more and encouraged planting more widely.

Starting a Wildflower Garden in Victoria

by P. S. Mills*

* There are many good reference books and much advice in previous issues. However, it is nice to present an article from an obviously practical gardener recommending plants that should assure success. Based on common sense practical advice the beginner can supplement the plants recommended with plants of his choice and be sure of some early successes. The basic design is never easy. Perhaps you could consult your wildflower nurseryman to advise and supply. However it is usually governed to a large extent by aspect, existing buildings, pathways, clothes lines, compost bin, etc. With experience you may decide on a complete change in a few years anyway so do not be deterred by indecision. A garden is a personal thing and a good gardener is "ruthless". —Editor.

You want to convert an existing garden to mainly wildflowers? The bug has not hit you to the extent of tearing out the lawns, but watch out in the future. Do not tear out the existing shrubbery but develop a long-range plan. You can achieve quite a pleasing effect with a mixture of exotics and natives gracing lawn areas, the balance being progressively reduced to a level of your choice. In any case leave the existing undergrowth and leaf cover intact initially. If weeds or grass runners are a problem it would be best to kill them with chemicals, leaving the dead weeds as a mulch, but do not disturb.

Prepare a design to suit the house showing paths and other fixtures. You may be able to introduce rocks or logs as a feature. If the soil is heavy it would be best to incorporate sandy loam mixed into the first 15 cm. of topsoil in some areas. Decayed leaf matter or compost can be added as well. The trees and shrubs mentioned will grow in heavy or sandy soils, except for some *Grevilleas* where good drainage is essential. It may be necessary to build up some areas about 20 cm if water logging is suspected.

Start with the boundary first. If very exposed to wind closely plant *Casuarinas* with some *Melaleucas* such as *M. armillaris*. A few gems are also suitable such as *Eucalyptus nicholii*. *Acacias* should be planted on the protected side. Suitable boundary trees could include *Casuarinas* such as *Casuarina stricta* and a few small gums. *Eucalyptus crenulata*, with its small glaucous foliage and white flowers, is a good tree for a wet spot and grows to four metres. A small group of three *Eucalyptus caesia* is recommended. It could include *E. caesia* and 'Silver Princess' if you can get one for its beautiful red flowers and attractive trunk. They must be anchored with large rocks as wind can cause damage. They will flower in the second season from July to October. The third choice is *Eucalyptus leucoxylon* var. *rosea*, the dwarf variety; this has pink flowers and grows about three metres high. A few *Acacias* can be planted in between, recommended species being *A. prominens*, the golden rain wattle, spring flowering and four metres high, *A. baileyana purpurea* as it has lovely purple new growth, also to four metres and *A. pravissima* 'Oven's Wattle' as it has yellow balls in spring, pendulous tips and also to four metres high. *A. cardiophylla* with feathery foliage, 10 m x 10 m, prefers a sunny position, protection and good drainage. *A. mitchellii* is a small shrub, 3 x 6 m preferring semi-shade and good drainage, producing golden balls in spring and summer.

Shrubs for planting in front of the trees on the boundary should include *Callistemons* such as *Callistemon* 'Captain Cook'. They look attractive in front of the *Casuarinas* with their bright red bottlebrush flowers and are quite hardy. You must have a few *Grevilleas*, such as *Grevillea tridentifera* with its bright green triple foliage and profuse white lacy scented flowers. The bees love this one and it is a good refuge for the small birds. It grows to a height of 1-2 metres and is very bushy. The ever popular *Grevillea* 'Robyn Gordon' is a must. It flowers nearly all the year and grows into an attractive dome shape about one metre in height and about as wide. Another attractive Gre-

villea is *Grevillea* 'Poorinda Firebird' with its very bright red claw flowers in spring. The *Banksias* are a novelty. Two easy ones are *Banksia ericifolia* with large orange or deep amber coloured candle type flowers and *B. spinulosa* with honey coloured flowers and "hooked black pins".

Having created a boundary of foliage with occasional colour, the garden areas may now be planted. Similar plants may be used. *Callistemon* and *Melaleuca* with their many species of all sizes will survive well in wet or dry spots as long as they receive plenty of sunlight. *Grevillea* and *Banksia* must have a sunny open position, well drained and soil of a sandy nature and there are many beautiful *Grevillea* to choose from.

Boronia heterophylla and *B. megastigma* are valuable plants for their delightful perfume. Plant on the east side of the block in a protected position that is moist at all times but never wet. Sandy soil mixed with a little peat moss suits them well. Plant *Thryptomene saxicola* 'Payne's Hybrid', with them for colour contrast.

For a cool, moist spot *Bauera Sessiflora* is excellent as it has very showy magenta coloured flowers for most of the year and grows only one metre high. *Leptospermum* (Tea Tree) species like moisture and will tolerate shaded conditions. *Prostanthera ovalifolia* is a nice shrub with purple flowers in spring, also preferring semi-shade and a moist position. There are many species of *Prostanthera* (mint bushes) that are hardy and provide that cloud of mauve that sets off the garden.

To complete the garden, prostrate plants such as *Grevillea juniperina* (yellow or red flowers) and *Grevillea* 'Royal Mantle' with its dark red toothbrush flowers and red tipped foliage are a good choice as a ground cover or for a rockery. *Scaevola aemula* is nice with its blue fan flowers in summer. *Hardenbergia violacea* is a purple pea flowering creeper that can be planted at the base of a tree. It will twine everywhere, as well as on the ground and is excellent for a rockery as well as it does not get rampant.

For a shady and wet area, the Australian native ferns fit in well; tree fern *Dicksonia antarctica*, *Asplenium nidus* (bird's nest fern), *Adiantum* (maiden hair), that will grow nicely under the fronds of the tree fern, and the commonly grown fish bone fern, although this one can spread rapidly. If a large area is to be filled in it is ideal. When planting ferns, incorporate some peat moss or leaf mould into the surface area. Feed in August with a seaweed extract, a little blood and bone or Osmocote in small quantities. River pebbles can be put on surface as a mulch and a few small bush rocks give a natural appearance.

When planting it is best to mix one teaspoon of blood and bone in the bottom of the hole dug for planting, with a little of the soil, after you have already watered the hole. Plant the shrubs and trees only to the level in the pot and water in well. Mulch after planting to about ten centimetres thick but not up against the trunk or main stem. I found that *Casuarina* needles are ideal but pine needles and pine bark are good also. The mulch will keep the roots cool in hot weather as well as inhibiting weeds. Summer watering is best done early in the morning because there is less chance of root rot setting in. Most natives must have good drainage so low areas of the garden may have to be built up with sandy loam. No cultivation is the rule for natives and feed lightly, preferably in the spring with Osmocote or pure blood and bone. Tip pruning when young makes the shrubs bushy and produces lots of flowers. Lightly prune after flowering also. *Acacias* last many years if this is done. If yellowing occurs use magnesium sulphate, 1 teaspoon to a shrub and water in). Also beneficial to *Eucalyptus* species is one teaspoon of sulphate of ammonia mixed in the soil at the base of the hole at planting time. There are many more lovely varieties of natives obtainable, why don't you try some? ■



Banksia

Banksia That Sit On The Ground

A series to introduce new name changes for the advice of readers*.

It is normal practice to invite the botanist concerned, to present some notes written in general terms, advising of name changes of new species he has published recently. In this case Alex George is fully engaged in his own time in the production of a book on *Banksia*, a book we are all eagerly awaiting. These notes may serve in the interim and are prepared by the Editor from the review by Alex George as published in *Nuytsia*, Volume 3, No. 3, 1981, any errors being the responsibility of the Editor not the original author. Readers experiences in cultivation are invited.



Banksia blechnifolia

Photography by A. J. Cough

The characteristic reddish-pink flower becoming cream towards the base, turn pale brown then grey when dying. The leaves stand 25-45 cm tall with 8-22 lobes on each side.

Banksia are usually shrubs or trees but there are six species that hug the ground. They send their branches out horizontally, not upward, sometimes on the surface of the ground or often just below the surface. In the wild the soil or sand usually covers the horizontal branches and when the leaves, and eventually the flower heads, are thrust skywards, one gets the startling impression that they are separat eplants — behold a large *Banksia* flower head growing on the ground seemingly without foliage.

Prostrate *Banksia* are an ideal plant for the garden, particularly as a border or rockery plant. References to their cultivation mention the ease in growing them in a light or sandy topsoil with good drainage.

Key to Species of Prostrate *Banksia*

- 1a. Leaves dentate (leaves like cutting edge of a saw) 2
- b. Leaves pinnatipartite (deeply divided almost pinnate) 4
- 2a. Leaves white-tomentose, (hairs) below; perianth cream, often pink-tinged 44. *B. petiolaris* F. Muell.
- b. Leaves glabrous (hairless) below except in lacunae; perianth ferruginous (rusty red) 39. *B. goodii* R.Br.
- 3a. Leaves 4-8 cm wide, dentation often irregular; involucre bracts 2-4 cm long very hirsute (coarse stiff hairs) 40B. *B. gardneri* var. *brevidentata* A. S. George
- b. Leaves 2-3 cm wide, dentation regular; involucre bracts 1-3 cm long, shortly hirsute 42. *B. repens* Labill.
- 4a. Stems underground; leaf lobes $\pm$ cuneate, irregularly dentate 5
- b. Stems on surface, rarely underground; leaf lobes entire 43. *B. blechnifolia* F. Muell.
- 5a. Leaves bluish-green; perianth 28-30 mm long, red-pink; claws loosely pubescent with short, curled hairs 6
- b. Leaves deep or pale green; perianths 22-30 mm long, ferruginous or cream and pink; claws hirsute with spreading hairs 41. *B. chamaephyton* A. S. George
- 6a. Leaves divided almost to midrib; lobes 3-8 cm long; Mogumber-Eneabba thorpe 7
- b. Leaves divided 1/2-2/3 way to midrib; lobes 1-3 cm long; Albany-Ravens 7
- 7a. Perianth ferruginous; Albany-Stirling Range 40A. *B. gardneri* A. S. George var. *gardneri*
8. Perianth pale brown; Borden-Ravensthorpe 40C. *B. gardneri* var. *hiemalis* A. S. George

Other Prostrate *Banksia*?

Banksia scabrella is a shrub without lignotuber to 2 m tall and 3 m wide, much-branched, the lowest branches resting on the ground, often producing flower heads with yellow and purple flowers, sometimes giving the impression of a flower growing on the ground. A ground cover, not prostrate.

Banksia micrantha is a shrub up to 60 cm tall and 1.2 m diam. with a lignotuber, that has developed a stage further, laterals often first growing underground for up to 60 cm before emerging to continue as apparently separate bushes. The underground stems can produce "leaves" apparently growing out of the ground. This species is closely related to *B. sphaerocarpa* but with more pungent leaves.

Banksia blechnifolia F. Muell.

A shrub without a lignotuber, the stems up to 70 cm long are prostrate on the ground, often becoming covered. The species is readily recognised by its blue-green foliage and reddish flowers being the only prostrate *Banksia* with these colours. It could be confused with *B. petiolaris* which sometimes develops a pink tinge to its otherwise cream flowers, but which has shorter deeply divided leaves that are hairy white below. The leaves of *B. blechnifolia* are erect, 25-45 cm long, including the petiole (stalk) 5-18 cm long, saw-toothed along the edges with 8-22 lobes on each side, the end pointed and sharp. Both sides are densely hairy, slightly rough to the touch but becoming hairless with age, blue-green except for fine white wool in cavities of the lower surface.

The flowers are a characteristic reddish-pink becoming cream towards the base, turning pale brown then grey when dying, in terminal heads. It occurs in south-west Western Australia in white sand among low heath.

Although first named in 1864, it has been regarded as a form of *B. repens* until the recent review. Hence references to cultivation have referred to this very beautiful little plant under *B. repens* and also incorrectly referred to as *B. rubicunda*. On first glance it could be confused with *B. chamaephyton* as the foliage is quite similar in the field.

***Banksia chamaephyton* A. S. George**

This prostrate shrub, with a lignotuber usually to 1m across the prostrate branches, is a newly named species and together with *B. gardneri* was previously known as a form of *B. prostrata* (which name is now no longer to be used). It differs from *B. gardneri* in having usually thicker stems, larger leaves, with longer lobes, cream and brown flowers and larger seed follicles and seed. The leaves are erect, 20-50 cm long, 4-16 cm wide, deeply divided to the midrib almost to the extent of being pinnate (pinnatipartite), with 10-30 thin (narrower than the gaps between them) lobes each side 2-8 cm long. The leaves are at first tomentose (covered with matted hair) but becoming glabrous (hairless) and tough.

The flower head appears to sit on the ground, in reality being at the end of the usually covered stems, surrounded by a number of leaves, standing erect around it. The flowers are cream with a dark brown limb, the new buds at the top being pink, becoming brown after flowering, then grey. As it was previously known as *B. prostrata* all records for cultivation are under this name.

***Banksia gardneri* A. S. George**

A prostrate shrub with a lignotuber, this species was previously known as *B. prostrata*. It is characterised by its usual surface, densely hairy stem 4-10 mm diam., characteristic leaves 10-40 cm long and smaller pink and brown flowers. Because of the transition of leaf form from one to another it is difficult to describe other than from mature leaves. The new growth is soft, furry and rusty red becoming green and hard with a yellow midrib.

The species has three varieties distinguished by leaf dentation or lobing, flower colour and flowering period.

B. gardneri var. *gardneri* has deep green, deeply divided (pinnatipartite) leaves and rusty red, but sometimes brown flowers opening in spring.

B. gardneri var. *brevidentata* has deep green sawtooth edged (dentate) leaves with rusty red flowers opening in late autumn and winter.

B. gardneri var. *hiemalis* has pale green, deeply lobed leaves and flowers opening in winter, that are pink on top with a brown limb.

Banksia gardneri has affinities with *B. chamaephyton* as above, its closest relative being *B. goodii* which differs in the large, undulate, irregularly (but not so deeply) lobed leaves and large flower heads.

***Banksia goodii* R. Br.**

A shrub with a lignotuber with spreading densely hairy branches usually underground, 7-12 mm thick; although this prostrate *Banksia* is unusual in that the branches may unaccountably stand erect to 20 cm high. The young growth is red-brown, softly hairy but mature leaves are green with a prominent yellow midrib, erect, 20-45 cm long, 3-8 cm wide, tapering to a very long, thin stalk which is curved and attached to the underside of the branches. They are clumped together, surrounding the flower cones when in flower. Leaf margins are shortly and irregularly toothed to 10 mm, rarely 15 mm long. Flower cones are up to 20 cm long, cylindrical with large woolly bracts at the base and closely surrounded by a circle of leaves. The flower buds are bronze coloured and furry developing yellow styles curving upwards.

B. petiolaris has the closest resemblance to *B. goodii* but it can be readily distinguished by its yellow flower cones and by having its narrower leaves borne along the branches. *B. gardneri* differs in having more regularly lobed leaves and smaller flower cones.

Banksia goodii is a rare and endangered species and should not be sought after in the wild. If you can get seed or a plant, cultivate it, propagate from it and share it with others preserving one of Australia's floral treasures.



Banksia chamaephyton (above)

Photography by B. Crafter

Previously known as a form of *Banksia prostrata*, this decorative plant is much appreciated in a rockery or border situation. The flowerhead comprises a large number of individual flowers arranged spirally around the vertical axis, each being cream with a dark brown limb, the new buds at the top being pink.

Banksia petiolaris (top right)

Photography by A. J. Cough

More vigorous than the other sit-on-the-ground *Banksia*, the species is ideal for garden cultivation.

Banksia repens (bottom right)

Photography by B. Crafter

The flower head is often up to 20 cm from the leaves that are a deep rusty red when new.



Banksia petiolaris ▲

Banksia repens ▼



***Banksia petiolaris* F. Muell.**

An often vigorous shrub without a lignotuber with prostrate 6-12 mm diam. densely haired (rusty red) stems on the surface or lightly covered by soil or sand. The erect leaves borne along the branches are 20-40 cm long, 1.8-4 cm wide with numerous short triangular sawtoothed (shortly dentate), slightly recurved margins. The new growth is a deep red, young leaves being velvety above with rusty red hairs, becoming mainly hairless on top but with dense short white hairs below. The pink and pale yellow flowerheads are 6-7 cm diam. The flowers are pink or reddish with a cream limb becoming brown then green.

***Banksia repens* Labill**

A shrub with a lignotuber with thick densely haired (rusty red) horizontal stems 1-4 cm below ground level. Leaves are erect, scattered along the stem in clusters, 25-40 cm long, pinnatipartite, with 5-10 large lobes either side and several smaller lobes towards the base and apex. The large lobes are tending to triangular in shape and are themselves lobed with 1-6 triangular lobes. New leaves are a deep rusty red. The flower head is often up to 20 cm from the leaves often appearing isolated on the soil without subtending leaves at the base, and are 6-7 cm wide. The flowers are cream and pink, sometimes pale brown. ■

Banksia Growing in Tasmania

Notes by Jeanette Closs

Over the past six years I have collected a variety of *Banksia* seed. I have sown some of the seed during this period but with limited success. I had reasonable results with germination, but I lost a lot at the potting up stage, probably due to damping off.

A local nurseryman, Mr. Stan Clark, told me of the success he has had using composted *Eucalyptus* bark for growing *Banksias*. He has had almost no losses from damping off. Stan gave me a bag of this compost to experiment with. I tried growing some seed in this and some in pure coarse sand, obtained from Clarks of Huonville. This sand is recommended for propagating by a number of nurserymen.

The roots of the seedlings grown in the *Eucalyptus* bark compost went straight to the bottom of the pan and formed a flat layer on the floor of the container. The roots of the seedlings grown in the Clarks sand formed a thick bunch of fine roots below the surface. When they developed their first set of true leaves, I potted them into black sandy loam from Males. This sandy loam comes from South Arm and I believe that it is drawn from as far down as 15 feet below the surface.

For some months after these were potted I lost only two or three plants out of 100 or so. Since then about 6 have died, but I believe it to be caused by the situation where they are kept, which is too damp and cold. They receive a lot of shade during the winter (probably 80%), only because I haven't anywhere else, at present, that would be suitable and provide adequate warmth.

I have a number of *Banksias* "growing" in my garden, but only *B. spinulosa* and *B. media* are doing well. They are planted close to a brick wall facing west in a deep sand bed over a French drain. I also have a very nice *B. marginata*, but this "old faithful" will grow anywhere. ■



Verticordia

A Research Project — by Max Hewett,
Mount Kuring-gai, N.S.W.

It is proposed to evolve and test procedures best calculated to prove successful for the establishment, under garden conditions, of species of *Verticordia*. Early results have been encouraging enough to suggest that the adoption of certain procedures may be expected to yield far more satisfactory results than have previously been achieved in Sydney.

I shall be pleased to receive advice from anyone in Australia who can contribute to these observations and especially anyone who would be prepared to work with me to verify the best practices for other regions.

A. To grow from juvenile specimens being either from cutting or seed, so that root restricting influences of staging containers are avoided.

Juvenile plants will be protected on planting and until reasonably established, with bell jars or inverted 2 litre clear glass flagons with bottoms removed.

Experience to date with many species of the genus, suggests that a stronger than usual interdependence exists between root development and tip foliage growth, since, when growing tips of juvenile plants have been removed for provision of cuttings or other purposes, the plants have frequently died quickly.

It has also been noted that cuttings of some species tended to make extensive root development before significant foliage growth commenced. These factors prompted the suggestion that container staged plants were in an out of balance condition which tended to mitigate against later establishment.

The planting of such specimens has resulted in many losses following early bursts of growth, or in the few cases which did survive, plants having a prematurely mature growth form with comparatively little development of low foliage.

On the other hand, struck cuttings planted directly to their final positions have grown quickly and with few losses, into robust well-developed specimens, far surpassing their ex-container parents, and having abundant lower foliage development. No juvenile specimens have shown adverse reaction to build up of temperature below the jars during hot summer periods.

Most species used to date have produced maximum growth during late spring and summer.

B. To encourage plants, as far as possible, to grow by natural influences, without the use of fertilisers or surface mulches, and with minimal artificial watering during the warmer half of the year.

Summer watering is to be applied individually to juvenile plants by allowing a hose to drip very slowly, or by provision of a container with a nail hole in the bottom. Such watering is only to be applied when absolutely necessary to ensure survival, and not in sufficient quantity to influence any adjacent mature specimens. It is to be applied at night and preferably when cooler weather cycles prevail.

Winter watering of the entire garden section by general sprinkler, or by prolonged use of the hose drip method will be used under dry seasonal conditions when necessary to restore soil moisture, or in early spring, to provide a boost to pre-flowering growth.

Examination of the root systems of some ex-container plants which died as noted above indicated that no root development had occurred beyond the profile of the container, despite the fact that foliage height had doubled. It is suggested that either the presence of fertiliser in the potting mix is indicated, or, alternatively, a reluctance of the specimen to resume balanced root development is reflected, when planted out in a partially mature and unbalanced condition. This phenomenon has been encountered with several members of the family RUTACEAE and successfully overcome by using procedure "A".

The omission of surface mulches is proposed so that:—

1. Plants will be encouraged to develop deeper root systems, and so be less sensitive to dry weather cycles.
2. Full value of the sun may be utilised to promote a sterile condition of the soil surface.
3. In periods of heavy rainfall excessive water will run away rather than be directed into the soil.

It is intended that no artificial watering of mature plants be applied during the warmer half of the year. While this procedure has been used very successfully to date in Sydney, it is appreciated that conditions in some dry-summer zones of Australia may ultimately demand modification to the principle, unless growing area is such that some movement of moisture is available, either by evaporation or capillary action from subsoils. If then some watering is absolutely necessary to ensure survival, it should be sparingly applied in cooler weather cycles, but not in quantity sufficient to stimulate growth reaction.

C. To allow plants to go into dormancy after flowering, without removal of flower heads and without pruning, until new seasonal growth commences.

It is intended that no cutting material be taken from planted specimens until they have reached an advanced stage of development. It is contemplated that stock plants in large containers will be retained for this purpose.

Earlier attempts at growing some species have indicated adverse reaction frequently resulting in loss of the plant when pruned immediately after flowering. On the other hand, plants which have been left to their own resources have shown some summer die-back of tip growth, but have responded with vigorous new growth from below the die-back during the following growing season. It is suggested that the latter phenomenon is in keeping with the natural growing pattern of these dry-summer species and that removal of defoliated stems during summer deprives them of their store of reserve to resist the rigours of the dry season. It has also been noted that spent flowers of many species are retained for long periods on the plants, and it is suggested that this phenomenon also is a significant characteristic of their dormancy pattern.

OTHER PRACTICES TO BE OBSERVED AS CLOSELY AS POSSIBLE

D. Planting Bed

The bed should be elevated at least 25 cm above surrounding garden areas in the form of a rockery or earth mound, or in sloping terrain be a retained section of similar depth.

E. Aspect

Plants should receive maximum sunlight possible, but at least for 50% of the day. Morning exposure is considered preferable to afternoon. Experience to date suggests that most species prefer a hot situation such as the northern edge of a rockery or foliage bank. A distinct tendency to make growth towards the sun has also been noted.



Verticordia ovalifolia

Photography by Elizabeth Berndt

This particularly lovely form of *V. ovalifolia* grows on white sand over laterite gravel. This bush reaches 30-40 cm high by up to 30-cm wide. The flowers are small, 4 mm in diameter, but are held in dense heads on the bush.

F. Soil Type

Soil is to be of light to medium texture, or gravelly, and with sufficient content of clay particles to weather to a surface crust. Siting over soil is considered preferable to shelf rock or concrete slab so that maximum advantage may be taken of sub-soil moisture.

G. Root Competition

The *Verticordia* section should be free of root competition from trees or large shrub species.

H. Surface Cultivation

Soil surface is to remain completely undisturbed except for removal of weeds, which should be done by hand when young, and when new plantings are made, in which case there should be minimal disturbance.

J. Fungicides

Some species, particularly those having yellow flowers, have shown susceptibility to fungal attack on the foliage. Suitable controls will be explored, but it is tentatively suggested that the fungicide "SAPROL" may be effective. ■

Cultivating the Soil Around Australian Plants

by Dr Byron Lamont, School of Biology, W.A. Institute of Technology, Perth.

For the home gardener, I consider a major advantage of native plants is that they are vigorous and attractive under the harshest conditions. After the first year, no watering, fertilising, soil disturbance or weeding should be necessary. The only reason for cultivating the soil might be to remove troublesome weeds, although this in turn can be the stimulus for the germination of a whole lot more, and mulching may be more effective.

I refer readers to photographs of my garden in the No. 88 issue of *Australian Plants*. This garden has remained vigorous and virtually weed-free without disturbing the soil for almost seven years.

However, let us consider the natural rhythms of roots and the effect of soil disturbance on them. Left to experience nature's cycles, root growth is seasonal if the climate is seasonal. If the soil is always moist then there is always some root growth occurring. When the soil is dry the rootlets wither and die back to the larger parent roots which may be little more than a millimetre wide. These parent roots will be the source of new fine roots when the soil becomes moist again. Some recent evidence shows that roots still reaching water at depth during the dry season can shunt sap into the surface laterals and secrete water into the immediately-surrounding soil. This enables growth of new fine roots and uptake of water and nutrients even from dry soil. In addition, I have found that shrivelled and corky roots can still take up water which may be important in absorbing surface water following out-of-season showers.

To a degree this natural oscillation from moist to dry periods with the periodic loss of the fine rootlets has advantages. Organic matter is built up and the nutrient-holding and releasing properties of the soil are improved. Nitrogen is released into the soil from legume nodules, becoming available to other plants. This dividend is enhanced by the deliberate mixing of families and is worth bearing in mind for the horticultural situation.

Most of the plant's roots occur in the upper 15 cm of soil (except in dry soils). Thorough cultivation therefore will probably reduce the plant's capacity to absorb nutrients and water whatever the time of year it is done. Deliberate severing of surface roots would have the problems of letting sap run out of the plant and encouraging entry by soil-borne disease organisms. It has been suggested that thorough cultivation when the roots are dormant invigorates the root system and hence the plant. I have my doubts, but this could be sorted out by comparative experiments. It may be more sensible to remove old plants (including the stump) that dominate the garden and replace with a new stock of smaller species. I find seedlings of many species popping up all over my garden anyway, ready to replace the parents when they die. Of course, a good fire is needed in some old native gardens — but who would be game? In the absence of fire, shoot pruning may achieve the same end, especially with species that normally resprout after fire.

Plants in cultivation do not need as extensive a root system as in nature because of the better growing conditions. Generally, the poorer the growing conditions the greater the ratio of roots to shoots. In addition, pruning of the shoots usually results in corresponding die back of the roots, and both have to start growing again. I would imagine that well-watered plants with adequate nutrient supply could be cultivated around their roots with less damage to the plant than those growing under harsher conditions. If you are after continued production of leaves and flowers there are advantages in selective pruning — but I would leave the roots alone! ■

Crowea 'Festival'

A hybrid of *Crowea exalata* x *C. saligna*
Rene Cooper, Turramurra, N.S.W.

The two *Croweas* of the Sydney region, *Crowea exalata* and *C. saligna*, set viable seed only rarely; so it was that specimens of the two species had grown side by side in our garden for years without any seedlings resulting. But in 1975 a number of crowea-like seedlings arose all over the garden. Those which were not growing in impossible places were allowed to grow on, and they revealed a wide range of characteristics; some were soon discarded as uninteresting, but others were clearly worth propagating. It is a pity that croweas are notoriously slow and chancey to strike from cuttings, so we were amazed to find that these hybrids struck quickly and reliably.

Croweas growing in nature are famous for their variability; the Sydney herbarium had often been asked to identify specimens as hybrids which were only extreme forms of one or other pure species, so that the impression was that "the Herbarium says there are no hybrid croweas". But when we showed them a selection taken from our hybrid shower, they (in the person of Jim Armstrong) agreed at once that they had the wide mixture of characteristics one would expect from a hybrid. For instance, the "wing" (that prolongation of the mid-rib of the leaf which runs down the back of the stem) which gives one of the species its name (*exalata* means "no wing") occurred in some and not in others.

Selecting the Specimen

Among the wide range of specimens from which to choose, many could be rejected at once for uninteresting colour, shortness of flowering season, or other such defect. But it seemed a good thing to select a typical "crowea-like" appearance; croweas are usually difficult to propagate, so it would be an advantage if an easy-to-propagate hybrid looked "just like a crowea".

The name selected commemorates the fact that the first public sale of this hybrid was at the 1979 Festival of Wildflowers, Ku-ring-gai, Sydney.

Growing Conditions

Croweas are generally very tolerant of conditions, though they are often thought to prefer "semi-shade" conditions. We have however some specimens growing in full sun just as well as in some shade; full shade seems (as with most flowering plants) not to be good for the plant. Specimens have been trialled on the Darling Downs of Queensland and the heavy clay of the Fleurieu Peninsula of South Australia.

Failures have occurred with plants which have dried out, as can happen in light well-drained soil subjected to excessive sun.

The whole of our garden is treated once a year with a light dressing of general fertiliser; following the example of Canberra Botanic Gardens, we used to use "Greenleaf 10-9-8", but since this is no longer available we now use the nearest available substitute, Shirleys 'Poplar Special'.

Propagating

Crowea 'Festival' strikes easily from cuttings; under amateur conditions, cuttings should be taken from November until not later than February in the Sydney area. I have no experience whether this period can be extended with bottom-heat or other refinements. I have always concentrated on simple means, so that I can recommend this plant as a suitable subject for beginners who need reliable successes so as to develop their self-confidence.

Characteristics

Typically, it grows about one metre high and one metre across as a fairly dense shrub, with generally wide branching. Leaves are elliptical (sometimes oblanceolate) about 40 mm long and 8.5 mm wide. The mid-vein is distinct, not extending down the stem; leaves are dark green above and paler underneath, not markedly glossy. Flowers are deep rose-pink, up to 35 mm diameter, growing more closely together than in the natural species. ■

Micropropagation

A Project by the CSIRO Division of Forest Research

Many ornamental plants and horticultural crops (e.g. orchids, ferns and strawberries) are now routinely propagated commercially using micropropagation techniques.

Micropropagation has many advantages over alternative techniques such as the propagation of clones by cuttings. These advantages include very high multiplication rates (over 100,000 plants from 1 square metre of growing space in a year), absence of pests and diseases, and the low cost of transporting plants in vials.

The CSIRO Division of Forest Research at Yarralumla, ACT, has now developed a simple technique for *in vitro* micropropagation of some selected eucalypts. Highly salt-tolerant eucalypt clones produced in this way have been sent to a number of organisations in Australia, and to Israel, for testing.

Micropropagation has many potential applications in forestry. Besides producing clones adapted to specific sites (such as saline areas), maximum genetic gain could be obtained and hybrid vigour exploited.

Current Status Of Research

The basic techniques of micropropagation of certain species have been published in the scientific literature over a number of years. CSIRO has applied the techniques to forest species relevant to Australia. For eucalypts, small shoots are taken from the tree and surface-sterilized in dilute bleach. The shoots are then placed on a medium containing hormones to induce rapid growth. The plants can be maintained indefinitely and multiplied to produce a large number of clonal shoots by sub-division and transfer to fresh medium every three to four weeks. Roots develop on the shoots when they are transferred to another medium containing different hormones.

Eucalypt species able to be propagated by this technique are *E. camaldulensis*, *E. curtisii*, *E. ficifolia*, *E. grandis*, *E. marginata*, *E. obtusiflora* and *E. rudis*. Of the species tested to date, *E. globulus* subsp. *bicostata* and *E. regnans* had a low rooting percentage (about 35%). Further experiments are required to find the optimal hormone concentration for these two species. ■

CSIRO wishes to collaborate with a commercial organisation in producing and marketing experimental quantities of plants, reviewing the techniques and expanding their applicability to further species and genera.

Expressions of interest are now sought from organisations involved in commercial propagation who wish to enter into formal collaboration with CSIRO in the area of micropropagation. Further information may be obtained from: The Officer-in-Charge, Commercial Group, P.O. Box 277, Civic Square, A.C.T. 2608. Telephone: (062) 48-4531.

Wildflowers And Soil Nutrient

Notes by E. Rukusan, Wyong Creek, N.S.W.

I do not wish to join in the controversy of the advantages to be gained by the use of lime but my experiences are worth reporting. After reading Jim Webb's article on the role of calcium in the cultivation of Australian Plants. I have planted my natives with a desert spoon of dolomite mixed in the bottom of each hole with an equal quantity of blood and bone. All plants are very healthy making vigorous growth. If I notice a tinge of yellowness on any plant, I dust around it lightly with dolomite and the result is miraculous.

My soil pH is 5.6 which is rather acid and suitable for rhododendrons, etc. One authority on Azalea maintains that all plants need calcium and magnesium and in England it was established that rhododendrons will grow in even an alkaline soil provided it contains magnesium.

Dolomite is about 50% calcium and 30% magnesium and while I am not advocating the benefits of lime, its use with magnesium appears very beneficial. It could be the magnesium alone, an observation made by a writer in an early use of Australian Plants.

With hardy plants such as *Callistemon* (bottlebrush) a handful of XXX citrus fertilizer produced a glorious display two months later. I am now trying Osmacote.

For a number of natives naturally occurring. I mulched heavily with fresh horse manure (not near the crown of the plant). The flowers were far superior to their sisters in the bush untouched.

For those who wish to grow the Western Australian natives, I recommend the use of dolomite on acid freely draining soil such as mine.

A Problem With *Eucalyptus* Pests

Notes by L. H. Couch, Echung, S.A.

I had a problem with sooty mould. All the experts writing in books regarding this parasite advised spraying with white oil plus other chemicals. This I carried out regularly but the trouble did not improve until one day, watching Noel Lothian on television, he gave his solution to this problem. His main advice was not to spray your tree with anything, spray only the butts of the trunks to keep the ants away, they spread this scale. Leave the natural predator, a small wasp about a centimetre long to do the job.

Since following his advice the trouble has disappeared, or if a new lot starts, the little wasps are soon on the spot to clean them up.

Wildflower Nurseries in Queensland

Fairhill Nurseries — Fairhill Rd., Yandina, 4561. Tel. (071) 46-7193, P.O. Box 100. Large range of trees, shrubs, ground covers, climbers, ferns, palms and orchids for the sub-tropical and tropical east coast. Extensive display gardens 8.30 a.m. to 5 p.m. anyday. New comprehensive catalogue now available \$2.00 posted.

Lakkari Native Plant Nursery — Specialist growers of Australian Plants, retail & wholesale. Large range available. Browse through our display gardens. Many selected natives unique to Queensland as well as new cultivars and hybrids. Grevilleas, and rainforest species our speciality. Catalogue \$1.50 posted. Open 7 days. 477 Redland Bay Road, Capalaba, Queensland. Tel. (07) 206-4119.

Utingu Native Plant Nursery — (Bob and Glynis Dawson) — 37 Sorbiston St., Wellers Hill, 4121. Tel. (07) 397-5706. Open 7 days. Wholesale and retail, specialising in Australian native plants with a large variety of Grevilleas and other indoor and outdoor species.

Australian Wildflower Seed Suppliers

Nindethana Seed Service — Largest selection of native seed in Australia. Nindethana, Narrikup, W.A. 6326. Available in 50c pks. gram lots or kgs. Send 27c stamp for free catalogue. Tel. (098) 46-2205 in business hours.

H. Grant — 2 Sandra Pl., Dubbo, 2830. West N.S.W. a speciality. Two stamps for a catalogue posted.

Wildflower Nurseries in New South Wales

Bundara Native Nursery — 37 Carters Road, Dural, Sydney, 2158. Tel. 651-1962. Specialising in *Grevillea*. Open weekends. Weekdays please ring first.

Cranebrook Native Nursery — R23 Cranebrook Road, Cranebrook, N.S.W. Tel. (047) 77-4256. Four miles north of Penrith, between Tadmore and Taylor Roads. Open 10.00 a.m.-8 p.m. Closed Sundays.

Denovans Nursery — 188 Marco Ave., Panania, 2213. Tel. 77-8891.

Sydney Wildflower Nursery — (part of the Forest Native Nursery Group) — 9 Namba Road, Duffy's Forest. Tel. (02) 450-1785. We specialise in a wide range of native plants. Catalogue \$4.50 posted. Open 7 days.

Floralands — Parry's Nurseries Pty. Ltd. Kariong via Gosford, 2250. Tel. (043) 40-1142. Preservation by cultivation. Send \$1.50 for descriptive catalogue.

Kentlyn Native Plants — 96c George's River Rd., Campbelltown, 2560. Tel. (046) 25-1583. Open 7 days.

Telopea Valley Nursery — George Downes Drive, Kulnura, 2250, 1.5 km past Kyola Road. Rare and unusual natives. Phone: (043) 76-1318 (best at 9.00 a.m.). Send S.A.E. (230 x 100 mm) for list. Regret no mail orders. Closed Tuesdays.

Wirrimbirra Native Nursery — Hume Hwy, between Bargo and Tahmoor E. side 2574 (3 km N. from Freeway entry). Wide range including unusual plants. Tel. (046) 84-1112.

Wirreanda Nursery — end of Wirreanda Rd., Ingleside, 2101. Tel. (02) 450-1400. Growers of advanced and semi-advanced native trees and shrubs. Open 7 days.

Deanes Orchid Nursery — Specialist in Australian Native Orchids, 29 Hemers Rd., Dural, 2158. Tel. (weekdays) (02) 651-1798. Nursery closed Friday. Plants sent anywhere. Please send for descriptive list.

Wildflower Nurseries in Tasmania

Banksia Nurseries P/L — Waratah Hwy., Elliot 7325. Tel. (004) 36-3128. Open 7 days, 9-5. Grower of rare and common Australian native plants. Available in most sizes at certain times of the year. Advanced and tube lines a speciality. Send S.A.E. for list.

Wildflower Nurseries in Victoria

Austraflo — The nursery with the "Native Know How" — Belfast Rd., Montrose 3765. Tel. 728-1222. Mon.-Sat. 9-5.00 p.m. Sun. 10-5.00 p.m.

BOOKS FOR SALE FROM THE EDITOR

Flora Of The Sydney Region

by Beadle, Evans, Carolin & Tindale

Available, once again, from the Editor, *Australian Plants*, 860 Henry Lawson Drive, Picnic Point, 2213, for \$45.00 inc. free postage, the third revision is a must for all people interested in the N.S.W. flora. Now ten years after the second edition, this revision is the only up-to-date reference to the Sydney flora. Be warned, it is a student's reference to the flora comprising botanical descriptions to the thousands of species in the area. But, it is easy to follow with a good glossary of botanical terms and is illustrated by many colour plates. A really fine book.

Flowers And Plants Of N.S.W. And Southern Queensland

by Rotherham, Blaxell, Briggs & Carolin

This book has been in such demand that a reprint has been necessary. The presentation is a collection of 556 colour plates such that they give a pictorial presentation of the wildflowers commonly met in the defined areas, such as the coastal fringe, the heath, forests and woodlands of coast and tablelands, etc. Ideal for the beginner this book is excellent value. Available from the Editor for \$26.00 incl. postage, this book is one of a series.

Flowers & Plants of Victoria & Tasmania. As above hundreds of colour plates grouped together for geographic areas of similar vegetation. Available also at \$26.00.

Flowers & Plants of Western Australia. The latest edition features a section on the little known north-west. Available also at \$26.00.

Books On The Flora (Some including fauna) of Discrete Areas

For Australia

Flora Of Australia — Volume 1, Introduction \$15.00
Australian Plant Genera — The only botanical reference to all genera \$11.30

For N.S.W.

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"Flowers and Plants of Western Australia" \$26.00
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For Tasmania

"A Guide To Flowers and Plants Of Tasmania", Ed. M. Cameron \$25.00

About Specific Groups of Plants

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WILDFLOWERS AND GARDENS

The articles in this issue have presented opinions by competent horticulturists that appear to differ. For the cultivation of Waratah, Max Hewett recommends cultivation but for *Verticordia*, no cultivation. An inspection of his garden and what he is doing, shows there is not a contradiction in practical terms. He is growing his *Verticordia* in circumstances where root competition from other more vigorous plants is not a problem. Stimulation of root growth by pruning them or providing better growing conditions at the growing point, or just reducing root competition?



Dryandra speciosa

Photography by B. Crafter

Refer to "*Dryandra*" on page 342 for advice on these unique plants.

Do not go and dig around all your wildflowers because some crack pot editor has reached this conclusion. Join the big experiment. As the smaller short-lived plants pass their peak, remove them, cultivate the soil in that area, restore its vitality with mulch and compost and achieve a good garden tilth. We will assume you have already attended to the MUST. Good drainage is essential in any good garden for the healthy growth of any small horticultural plants, exotic or native. Then plant new, small wildflowers of your choice. Aim at a general digging of all areas every four years, except where you have larger, longer-living shrubs or trees. Do not forget Coralie's six priorities. ■