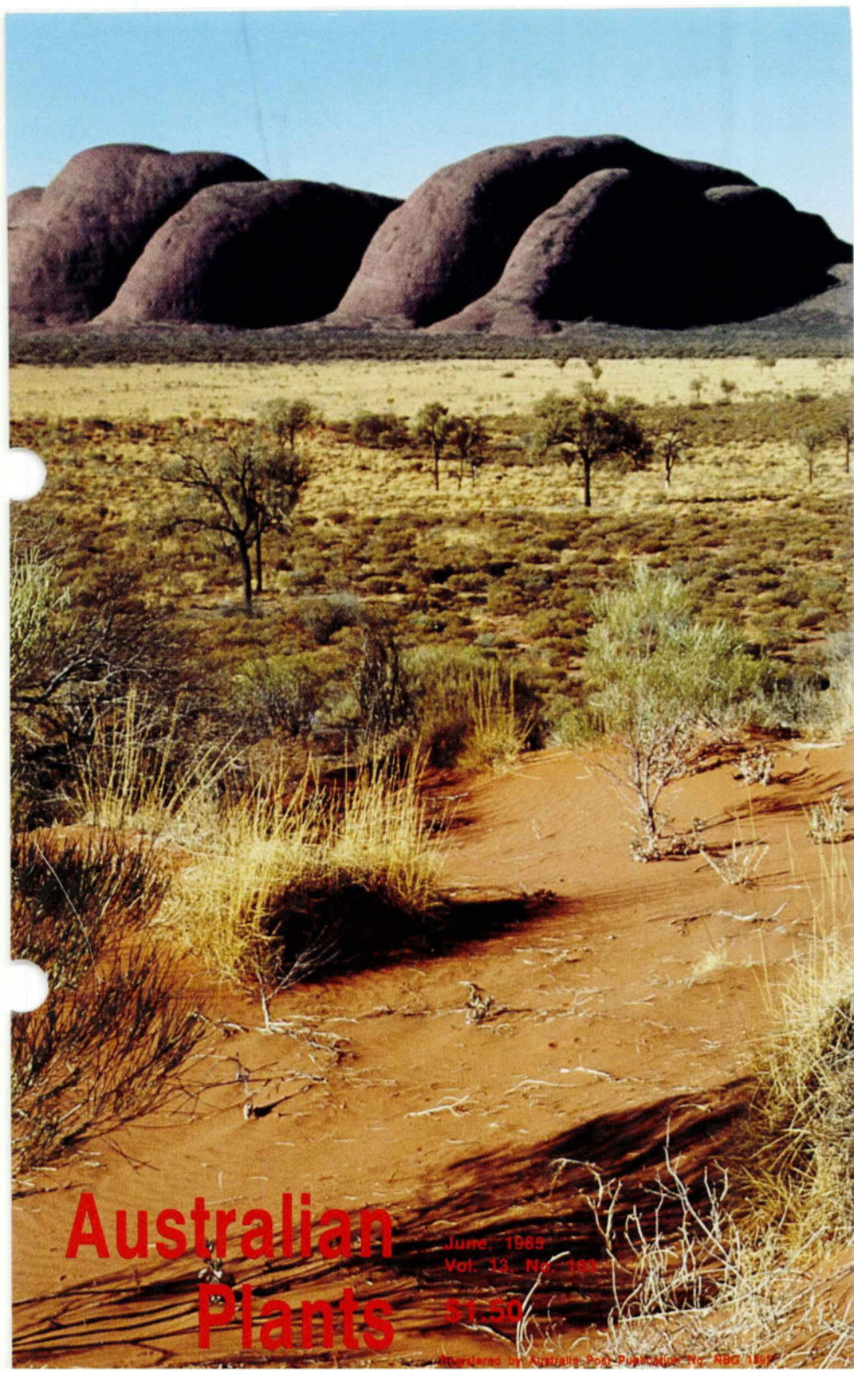




Australian Plants

June, 1965
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Wildflowers of Central Australia

The fascination of our rugged interior extends to its natural flora. It is unique, colourful and appealing. Our last issue devoted to the flora of the Alice Springs area, No. 58 is available only in bound Volume 7 of Australian Plants. Available from the Editor for \$21.00 plus \$3.00 postage this volume is a valuable and in many ways self-contained reference to our Australian Flora; order a copy.

This issue introduces the flora of the "rock" but concentrates mainly on the uses of the plants of the centre, a fascinating study — their use as "bushtucker" and in landscaping of homes in the centre.

The Society — Alice Springs Branch

This issue is principally the work of The Alice Springs Branch of SGAP, formed in 1972. This group has continued to study the Central Australian flora and its use to beautify and provide comfort for their dwellings. They meet on the first Wednesday of each month, excluding January, at 8.00 p.m. at the Gillen Primary School on Milner Road, Alice Springs.

The Society For Growing Australian Plants

What is this Society and how has it grown so strong with over 15,000 members throughout Australia? It provides a forum for people in all levels of activity, to enjoy an interest in the unique Australian flora. Why not join? Many activities can be engaged in to mail or by groups meeting locally, just like the Alice Springs Group above.

Central Australian Plants

Pages 108 and 109 are reproduced from "Central Australian Plants", a new book we shall publish later in the year. The Central Australian flora is so large, so fascinating, and so interesting we need a well-produced, colourful but inexpensive book to adequately present it.

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COVER PLATE

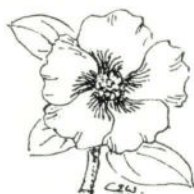
The OLGAS of Central Australia reprinted by permission from "Arid Australia" Photographer H. G. Cogger

To illustrate this issue on the Central Australian flora we attempted to produce a colour plate for the cover featuring a wildflower growing with Ayers Rock in the background. The plate turned out to be a disaster. It is produced on the rear cover. *Grevillea eriostachya*, as shown, does grow on the tourist viewing platform for the rock. Previously used techniques and the new laser beam production system did not mix. We tried!

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Wildflowers at Uluru National Park

by Geoff Coles, B.Sc. (hons)
Ranger, Uluru National Park.

General Introduction

For many visitors one's interpretation of Central Australia is Ayers Rock. Both Ayers Rock and the Olgas are formations dominating the landscape of the Uluru National Park. Ayers Rock rises 48 metres above the surrounding plain, having a circumference of 8.8 km. Thirty-six kilometres to the west lies the Mt. Olga group of domes, totaling about 35 in number and encompassing 36 square kilometres. This spectacular formation dominates the skyline of which Mt. Olga, the highest, stands at 546 metres above the surrounding plain. The many gorges and foothills create favourable conditions for a variety of unique arid plants. The remainder of the 126,132 hectares of National Park consists of sand dunes and sand plains.

Ayers Rock and the Olgas were first sighted by Ernest Giles in 1872. Unable to cross the large salt lake, Lake Amadeus, he was forced to retreat. It was William Cristie Gosse who was the first European to reach them. He climbed Ayers Rock on July 19, 1873.

Ayers Rock and the Olgas are a series of sedimentary rock, the material of which was eroded from a large volcanic mountain range and deposited on the sea bed about 550 million years ago. Between 500 and 60 million years ago this now compacted material was folded and uplifted above the sea. Subsequently, the uplift began to erode away leaving today Ayers Rock, the Olgas and a few minor outcrops projecting above the sandhills and sandplains. Hence, the sandplains are residual deposits that have resulted from the weathering of the uplift.

The climate is typically arid: because of Australia's large and comparatively featureless landscape the resulting onshore winds that eventually penetrate the inland arrive with little moisture content. Furthermore, the high pressure systems that dominate the weather pattern create warm, clear days with chiefly south-east trade winds. As a result, rainfall is extremely variable, an average of 200-250 mm per annum. It may occur at any time of the year, or not at all. Thunder storms are more likely in summer.

The Plant Community

Many visitors to the Park expect to find barren red dunes and plains devoid of much plant life from which Ayers Rock and the Olgas protrude inhospitably. To an extent this is true of a "normal" dry period, but all life evolves around the erratic rains. Lucky visitors may be entertained to a "green" landscape and wildflowers in profusion.

Whether the seasons have been good or not, one will be pleasantly surprised by the tall bloodwood trees growing around the base of the monoliths. Even stately river red gums can be found living in the creekbeds of the Olgas. In the sandy gorges dense, impenetrable thickets of figs occur. On the exposed rocky surfaces of the monoliths there are grasses, shrubs and even the occasional stunted and gnarled trees wherever purchase can be had.

Dense groves of mulga shrub abound in the Park. After good seasons the sandhills are covered in a wealth of small and large shrubs. But it is the clumps of prickly spinifex that dominate the sandhills. Between the dunes are massive, ancient casuarinas, the desert oaks specially adapted for survival in the desert.



(*Acacia victoriae* growing at Ayers Rock ▲

▼ *Acacia victoriae* in flower





Eremophila willsii (above)

Photography by Ann Urban

Named after the pioneer explorer — Wills — this is one of the plants generally known as Emu Bushes, that can be found in the Ayers Rock area. The use of these plants in horticulture for that hardy hot spot in a home garden, has been successful. Refer to page 112.

Acacia victoriae (opposite)

Photography by Ann Urban

This wattle is familiar to Australians from all parts of the continent. There are many species to be found in the Ayers Rock area. See pages 102 and 118 for a report on how the residents of Alice Springs use them for their gardens.

Adaptations to the Environment

In fact the diversity of plants occurring are so well adapted that introduced species cannot compete in the undisturbed environment. The native plants through evolutionary adaptations are able to efficiently extract and utilize nutrients from the poor, sandy soils. Casuarinas and legumes (acacias and cassias) are prominent because of their special ability to convert soil nitrogen into a form available for plant use. Many plants conserve nutrients by withdrawing them from leaves prior to shedding. Generally plants have evolved several adaptations to cope with the extremes of fire and infrequent rainfall interspersed by long dry periods. They fall into three categories:

1. *Opportunistic*: Annuals germinate, flower and set seed rapidly following heavy rains. Herb fields may be seen after good winter rains following fire. Germination will not occur until enough rain has fallen to leach inhibiting hormones from the seed. This helps ensure some plants will set seed before dehydrating. Examples include the billy button daisy (*Calocephalus platycephalus*), blue bells (*Wahlenbergia* sp.) and parakeelya (*Calendrinia* sp.).
2. *Resprouters*: During long dry periods growth slows. Leaves and branches may be shed to reduce water loss and water requirements. After drought or fire, vegetation recovery is rapid. Previously dormant buds emerge from beneath the thick bark (e.g. *Eucalyptus*), lignotubers (e.g. *mailees*) and rhizomes (e.g. *grevilleas* and the woollybutt grass).
3. *Endurers*: These include the most prominent successful plants such as common mulga (*Acacia aneura*), spinifex (*Triodia* sp.), bloodwood (*Eucalyptus terminalis*) and desert oak (*Allocasuarina decasneana*). They become dormant during dry periods, only dying back in the worst of a drought. To survive they have special modifications to the leaves, stems and roots which cut down on water loss and reduce mechanical damage to sensitive tissues.

What Flowers when?

During the very hot and dry summer months very little is to be found in flower. Summer storms are possible. If rain occurs this encourages the growth of the grasses and for a few weeks the parched yellow-brown landscape looks green.

Spinifex dominates the sanddune country. Three species occur in the Park (*Triodia* sp.) and one false spinifex (*Plectrachne* sp.). The clumps of spinifex begin as small hummocks. New growth builds on the previous year's growth. Eventually, the middle dies off and, hence, it is easy to tell how "old" an area is by the size of the spinifex rings. Spinifex is also a sandbinder and very important for stabilizing the dunes. Leaves are coated with a resin or wax and rolled in a groove on the underside of the plant. Spinifex has a growth pause in the hotter weather.

Other grasses common in the area include native millet (*Panicum decompositum*), woollybutt (*Eragrostis eriopoda*), wire grass (*Aristida browniana*) and kerosene grass (*Aristida contorta*).

Trees also show a summer growth increase. It is unusual to find trees in a desert. At Uluru National Park the desert oak (*Allocasuarina decasneana*) is found in the swales and sandplains. The "pencil pine" appearance of the juvenile concentrates its growth on establishing a large taproot to penetrate moisture deep down. Mature trees may be up to 1000 years old. Their tough bark is fire resistant.

Mulga (*Acacia aneura*) is the most common plant of the inland. Dense groves occur in the run off areas of the Rock and Olga. In August the drab grey-green foliage is masked by the display of yellow flowering spikes. Mulga has an extensive shallow root system to capture surface moisture. The angle of the leaves encourages drainage to the tree base, whilst the leaves are actually flattened stems, thus reducing water loss.

Tall bloodwood trees (*Eucalyptus terminalis*) are found where the water flows off the monoliths. The urn-shaped fruit is quite distinctive. The rich creamy flowers are usually seen in April/May.

Wills desert Fuschia (*Eremophila willsii*) with its purple tubular flowers can also be seen at this time on the sand dunes. See the photograph on page 97.

By May the mild sunny days and cold nights bring on the thryptomene (*Thryptomene maisonneurii*), which covers the dunes with tiny pink flowers. Mid-winter sees Cunninghams rattlepod (*Crotalaria cunninghamii*) with its unusual green parrot-like flowers, flowering on the crests of dunes.

August can be a colourful month as the many species of acacias and cassias bloom. The red sands are filled with shrubs and trees of glorious golden yellow. Many desert fuschias (*Eremophila* sp.) are flowering too, they flower pink, red, mauve, purple and white.

For just a few weeks of the year the deep gorges of the Olgas play host to the large, creamy, tubular flowers of the wonga vine (*Pandorea doratoxylon*).

If the seasons have been kind and winter rains have fallen, there may be a profusion of daisies carpeting the landscape. The yellow billy button daisy (*Calocephalus platycephalus*) and the Australian bluebell (*Wahlenbergia* sp.) may often enchant the visitor to Ayers Rock, particularly at the waterhole called Maggie Springs.

The desert showpiece, the honey grevillea (*Grevillea eriostachya*) flowers profusely in spring. Honey can be seen glistening on the yellow and green flowers. See the cover photograph, page 93. Also among the spinifex sandhills flowers the desert grevillea (*Grevillea juncea*) and the rattlepod grevillea (*Grevillea stenobotrya*), both with sweet nectar on their orange and cream flowers. Sandhill corkwood (*Hakea eyreana*) with cream flowers is seen now too. See the photograph on page 100.

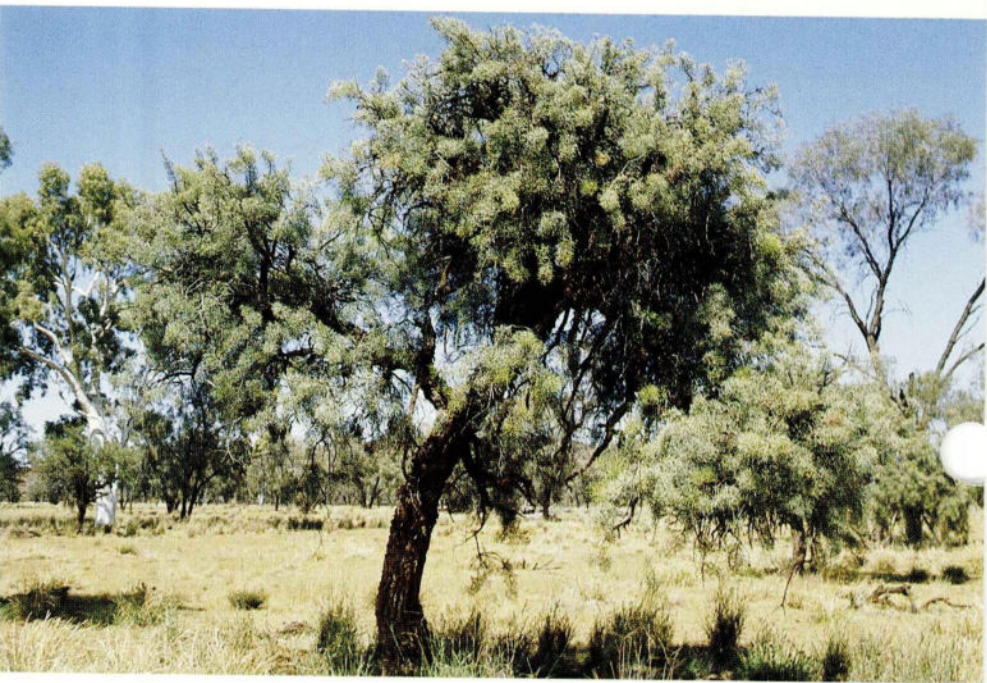
Also amongst the sandhills and sandplains one may see the parakeelya (*Calandrinia* sp.). This crimson-pink flowered plant has thick fleshy leaves which store water, while fluid pressure keeps the leaves rigid and functional. The peas (*Swainsona* sp.) are represented with six species. The mass of purple is indeed a colourful sight.

Desert Myrtle (*Calytrix longiflora*) is a shrub whose bright pink star-like flower covers the entire bush. Dicrostylis (*Dicrostylis* sp.) has small woolly, yellow flowers. Newcastleia (*Newcastleia elliptica*) lilac flowers are small woolly heads. Ten species of the bush tomato (*Solanum* sp.) occurs in the park. About half of these are edible. The small shrub has purple flowers with bright yellow anthers.

Spring in the Olgas may yield a few more plants in colourful bloom. Mulla Mulla or Lambs tails (*Ptilotus* sp.) grow profusely in the rocky areas of the Olgas, the flowering hairy spikes may be lilac or green. In the gorges a small herb, the rock isotome (*Isotoma petraea*) may be seen, the flowers are a lilac-blue. Do not touch your eyes if you handle this plant as this is thought to cause temporary blindness. The delicate purple striped, white flower of the mintbush (*Prostanthera striatiflora*) are fragrant as is the leaves when crushed. The floral emblem of the Northern Territory The Sturt's desert rose, (*Gossypium sturtianum*) is commonly seen flowering in the Olgas; the mauve pink flowers have a dark red blotch at the base. In the foothills Black Gidyea (*Acacia pruinocarpa*) may also flower, it is easily distinguished by its broad green leaves and large yellow flowering heads.

The edible flower/fruits of the Native fig (*Ficus platypoda*) may be found at any time of the year in the gorges of the Olgas and around the base of the Rock. Mistletoe flowers at different times (*Amyema* sp.); the brilliant red or green contrasting greatly with their often drab surroundings: (*Acacia aneura*).

In an arid environment such as that which includes Uluru (Ayers Rock and Mount Olga National Park) it is often impossible to predict with certainty what will flower and when. Rain is unpredictable and often absent. Many years may go by with some plants never flowering. Conversely, many plants flower for prolonged periods following good rains and visitors walking through the sandy plains and dunes will be amazed at the variety of wildflowers that can be found in this harsh but fascinating environment that is the semi-arid desert of Central Australia. ■





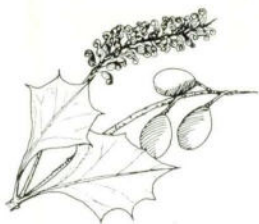
***Palm Valley* (above)**

A unique area of Central Australia that features plants found only in the "oasis". See page 112 for plants of this area.

***Hakea eyreana* (opposite)**

Photography by Ann Urban

A prominent plant of the area is the *Hakea* trees often called corkwood. Beautiful shaggy trees of the centre. The residents of Alice grow them in their gardens — "grotesquely contorted limbs, deeply fissured, masses of greeny-yellow flowers producing quantities of nectar that attracts many birds" — see page 103. Commonly called Forkleaf Corkwood, it is a very similar tree to Longleaf Corkwood, *Hakea suberea*, also a plant of the centre. *Hakea suberea* has very similar flowers, although usually more golden yellow, the plants being easily separated by their leaves, one long, the other forked.



Central Australian Plants

Cultivated in Alice Springs

by Tom Henshall

Central Australian ecosystems can be divided into three groups: salt lakes; sand plains and hummocks; and rocky hills.

Plants from the Salt Lakes Areas

Few plants from the saline areas are commonly grown, although, because many areas are experiencing salt build up, principally due to the highly mineralized bore water and rising water tables, some attention will have to be given to plants which will survive these conditions.

Atriplex nummularia — Old-man saltbush is a dense shrub to two metres with silvery grey foliage. Should the plant become leggy it responds well to hard pruning.

Hakea leucoptera — Needlewood in central Australia is usually an upright shrub, two or three metres tall. The grey needle-like leaves are sharp and the flowers cream. Needlewood is useful as a form-colour contrast.

Melaleuca glomerata — known in the Centre as tea tree. This paperbark is a straggly shrub to three metres with silvery leaves and cream flowers. Under cultivation, it can become dense and shapely. Either way it is an attractive contrast plant.

Plants from the Sand Plains

The sand plains cover about one half of the Centre and are the home of many of its most spectacular annuals, shrubs and trees. Generally speaking, the more nutrient deficient the soil, the more interesting the plant life. Some of the best, including *Thryptomene maisonneuvei*, *Bonamia rosea*, *Leptosema chambersii*, *Micromyrtus flaviflora* and many *Grevillea* are still in the too hard basket, but the following can be seen in many Alice Springs gardens.

Acacia estrophiolata — Ironwood is the graceful tree to 15 metres with pendulous branchlets and phyllodes which dominates the sand plains around Alice Springs. It is freely available and easily grown so it is surprising that it has not been more commonly cultivated.

Acacia murrayana — Colony Wattle is a spare straggly tree to three metres, normally growing in groups. The attractive white trunks make interesting contrasts against plain buildings.

Allocasuarina decaisneana — Desert oak is an upright tree to 15 metres with a spreading canopy. The dark bark is deeply furrowed. Though rather large for suburban gardens, it is superb for parks and street planting. See photograph on page 104.

Atalaya hemiglaucous — Whitewood is a pleasant upright tree to 8 metres with masses of creamy white flowers and papery fruit in spring/early summer. Good for dappled shade.

Eucalyptus gamophylla — is a multi-trunked spreading tree to 4 metres. The blue-grey opposite leaves are particularly handsome.

Eucalyptus pachyphylla — is a smaller mallee to three metres with large yellow flowers. The red-capped buds are noteworthy. This may well be the best of the local eucalypts for town gardens.

Gossypium sturtianum — Sturt's Desert Rose is the floral emblem of the NT. The large pinky-mauve hibiscus-like flowers are showy. See page 109 for more details.

Hakea eyreana — Corkwood is an upright tree to 5 metres, with grotesquely contorted limbs. The deeply fissured bark adds interest and masses of greeny-yellow flowers produce quantities of nectar attracting many birds. See photograph on page 100.

Myoporum acuminatum — Desert Boobialla produces dense foliage to three metres high and is one of the best windbreaks in the Centre. Very hardy, it will tolerate saline conditions, drought and frost.

Petalostylis cassioides — is a short-lived shrub growing less than two metres tall, but worth while because of the masses of golden flowers in spring. Fortunately the seeds germinate readily so there is a good chance, once established, of natural regeneration. It responds to hard pruning.

Xanthorrhoea thorntonii — is the only eremaeen species of this most Australian genus. The trunk grows to 3 metres and the inflorescence is frequently more than two metres long. It does not appear to transplant readily, and, as growth is somewhat slow, many garden specimens several years old are trunkless and consist of a few leaves less than 20 cm long. However, it is ideal for those founding a dynasty and prepared to wait many years for results.

Plants from the Rocky Hills

The ranges and outcrops are home to many interesting and attractive species which seem to need their roots among rock. This can be achieved by digging a large hole 50 cm deep, piling it full of medium and small rocks until they are 50 cm or so above ground level and filling the voids with humus, manure and compost. Cover lightly with sand, preferably so that it doesn't resemble plum pudding, and it's ready for planting.

Acacia hilliiana and *Acacia spondylophylla* are both known as flying saucer wattles. Rarely as tall as one metre, they are perfectly flat on top with a spread of perhaps two metres. *A. spondylophylla* is the more frost tolerant of the two and the crushed leaves have a strong curry odour.

Cheilanthes lasiophylla and *Cheilanthes tenuifolia* are resurrection ferns, common, but unremarkable when (as is normally the case) the fronds are shrivelled and tightly curled. Should rain fall, within an hour the moisture is taken up and the fronds open — it is as though the drought has never been.

Dipteracanthus corynothecus is a small shrub, about 50 cm tall with large mauve flowers. It strikes very easily from soft cuttings.

Eucalyptus papuana is the ghost gum, well photographed against the red rocks by all visitors to the Centre.

Grevillea wickhamii. The grevilleas have perhaps the most spectacular inflorescences of any genus in the Northern Territory. Most germinate easily but prove difficult to establish. *Grevillea wickhamii*, locally known as holly grevillea, is easier than others. The grey-green holly-like leaves and the masses of brick red flowers make it a worth while addition to any garden.

Livistona mariae, the Palm Valley palm deserves more attention than it gets. When abundant water is supplied it grows rapidly; by reducing the supply, growth can be slowed. Well worth while. See photograph on page 101.

Macrozamia macdonnellii is a cycad with fronds extending over two metres in length; it is generally grown as a pot plant. The macrospores are poisonous. See No. 101 issue of Australian Plants for a colour photograph.

Most of these shrubs and trees can be seen at the Olive Pink Flora Reserve or the arboretum at the Arid Zone Research Institute. ■





Eremophila christopheri (above)

Photography by Ann Urban

A straggly woody shrub to 2 m growing naturally at the base of rocky hillsides and along creeks in Central Australia, this can be an attractive bushy shrub in the garden with flowers over a long period. See page 112.

Allocasuarina decaiseana (opposite, upper)

The desert oak of Central Australia. The large tap root goes deep below the desert to "endure", to survive until the next rains. Mature trees may be up to 1000 years old.

Stemodia viscosa (opposite, lower)

A prized plant described on page 119. From the desert to the home.



Establishing An

Arid Zone Native Garden

by Meg Simmons

That gardening in Alice Springs can present many problems, soon became apparent to my husband and me when we set about transforming our large suburban block into an area of bushland.

Inspired by the magnificent Central Australian landscape, we were very keen to start planting the garden of our government-allocated house. The house was situated on a low-lying salt pan area and although it had been occupied for over 20 years, the "garden" was a wasteland of sparse couch grass, straggly clumps of bamboo, a few athel pine trees, river red gums and oleanders.

With great enthusiasm, but little gardening experience or local knowledge, we started planting. We knew we wanted a native garden, but the lack of availability (in 1974) of local species or other appropriate natives, led to many losses and setbacks, as we planted species which were totally unsuited to Central Australian conditions. However, eventually, with the aid of SGAP, the Department of Primary Production's agronomy adviser, the Conservation Commission nursery and much reading, we came to understand our soil and climatic problems and evolved a system which allowed for the rapid establishment of a low maintenance garden. The climatic problems related to the low rainfall, the long hot summers and frosty winters, while the soil related problems involved the low organic content of the soil, the high pH and the high salt content. The high pH and high salt content are due to watering with the local artesian water. Virgin Central Australian soil has a pH of 7 but this rapidly rises to 9, 10 or 11 once watering begins. The soil sets rock hard and many nutrients are unavailable to the plants at the elevated pH. A further enormous problem was the couch grass which proliferated once watering began, causing the boring and back-breaking chore of cleaning around plants to prevent them being choked.

The solution we finally came up with was to:

1. Eradicate couch grass (my husband's Enemy No. 1!).
2. Improve soil.
3. Provide adequate water, without elevating pH and salt content.
4. Select suitable species.

The key to the first three parts of this solution came from Bill Mollison's book "Permaculture 2", which describes a sheet mulching technique, which smothers weeds, adds nutrients to the soil and minimises watering needs by limiting evaporation. I will describe the system in some detail.

Sheet mulching

It is best to work on relatively small areas at a time, starting from a weed-free line, such as a path or a wall, to avoid invasion from the rear. Do not bother to dig, level or weed the area. Just cut any tall weeds and leave them on the ground and then sprinkle the area with gypsum — about 1 kg to the square metre. This will help counteract salinity and also to reduce the alkalinity slightly. It would probably also be good to add sulphur at this time as this had a greater effect in the reduction of alkalinity.

Sprinkle on some poultry manure or blood and bone. To encourage earthworms to come to surface, lay lawn clippings or vegetable scraps on top.

Completely cover the area with overlapping sheet mulch material. This should be relatively impervious material, as its function is to suppress weeds. You can use cardboard, underfelt, woollen carpet, seagrass matting, mattresses, rotted wood palings, hardboard, soft board, gypsum board, newspaper (3 or 4 sheets thick) or anything similar you can get your hands on. Cover the area completely, leaving no holes for weeds to poke through. It is best to use large sheets of material, for example: furniture cartons or big pieces of underfelt. If you use smaller pieces, you may need two layers.

If you have trees or shrubs already growing in the area, tear newspaper half across and pull it around the stem, then place another layer in the same way, but at right angles to the first.

Water this layer well.

Now add 75 mm (3") of relatively rich organic material such as horsestable straw, poultry manure and sawdust, leaf mould or compost, or a mixture of these.

Next add 150 mm (6") of dry, weed-seed-free material, such as straw, athel pine needles, raked leaves, bark or sawdust, or any combination of these.

Water well.

Planting Out

Starting with a small tree or shrub, pull back a small area of the top layers of mulch, then slit a hole in the carpet or felt with a knife, to allow the roots to grow down. Put a couple of shovels full of good soil into the hole and plant the shrub in that, finally pulling the mulch back over level with the bottom of the stem.

Watering

A drip irrigation system is a satisfactory method of watering. The mulch limits evaporation and hence water requirement. The mulch also minimises the concentration of salt in the soil water zone.

Within 12 months of planting areas of our garden in this manner, growth far outstripped that of trees and shrubs which had been planted 6 years before, and existing trees in the mulched area showed rapidly accelerated growth, seemingly unaffected by the alteration in the ground level around their trunks.

Species we have found to do well in our difficult conditions are: *Acacia murrayana*, *A. glaucoptera*, *A. acinacea*, *A. aneura*, *A. saligna*, *A. ligulata*. *Eucalyptus papuana*, *E. microrthea*, *E. gillii*, *E. woodwardii*, *E. salmonophloia*, *E. torquata*, *E. spathulata*, *E. kruseana*, *E. transcontinentalis*, *E. gamophylla*. *Hakea leucoptera*. *Cassia nemophila*, *C. desolata*, *C. artemisioides*, *Allocasuarina verticillata*, *Callistemon Harkness*, *Callistemon 'Captain Cook'*, *C. viminalis*. *Eremophila calorhabdos*, *E. laanii*, *E. youngii*, *E. polyclada*, *E. maculata 'Aurea'*, *E. denticulata*, *E. macdonnellii* (but prone to die off after one or two years.) *Dodonea viscosa*, *Melaleuca elliptica*, *M. bracteata* and *Brachychiton populneus*. *Grevillea* tends to do poorly in our particular soil, yellowing badly, but thrives elsewhere in Alice Springs.

The biggest thrill for me has been the gradual appearance of self sown grasses and annuals as well as species of *Cassia* and *Gossypium*. Patches of *Parakeelya* which we have brought in from the bush are well established in pockets of red sand. The first *Wahlenbergia* are popping up, but the *Brachyscome* and *Helipterum* maddeningly still prefer the stony footpath.

Our plantings are not particularly well planned in terms of flowering times and flower colours. I have tried to keep one corner specifically for local species and am gradually culling out the 'foreigners'. Maybe the answer would be to move house and start again, but I think we'll be happy to sit back and watch the birds and flowers for a few years yet, till the hours of mulch collecting and spreading are a dimmer memory. ■

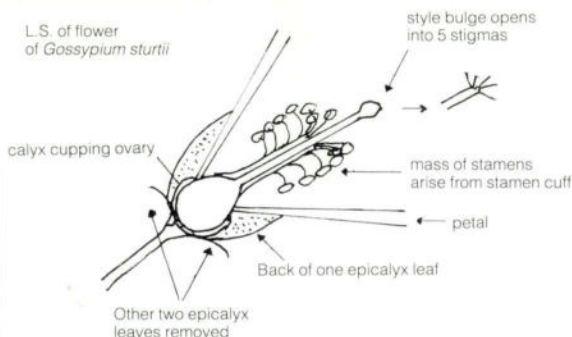


Gossypium sturtianum ▲

▼ *Gossypium sturtianum* (left) and *Radjera farragei*



L.S. of flower
of *Gossypium sturtii*



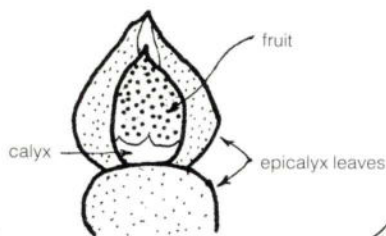
Sturt's Desert Rose

Gossypium sturtianum

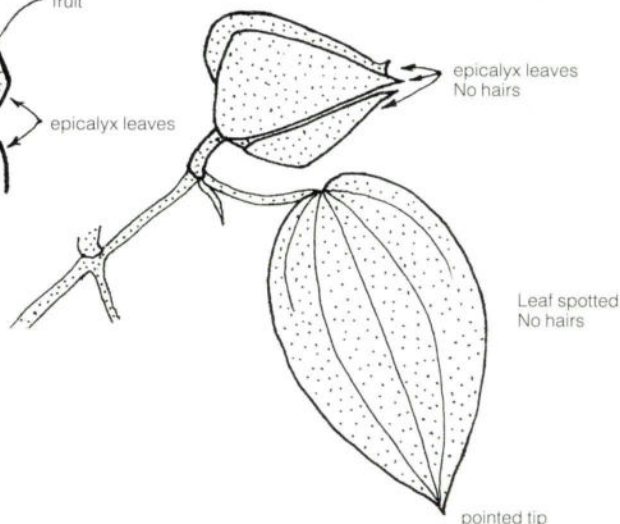
by Anne Urban

This delicate hibiscus-like flower is usually lilac, occasionally pink or white. As it is the Floral Emblem of the Northern Territory it is planted in many public gardens, and frequently seen in flower. *Gossypiums* belong to the MALVACEAE family, which also includes *Hibiscus*. The *Hibiscus* flower shape is that of a flaring trumpet formed by five overlapping petals, with a central style emerging from the ovary at the flower base, and ending in one or more stigmas; the style is surrounded by a cuff of fused stamens which emerge to crowd round it with a mass of pollen-bearing anthers. There is almost always a darker basal 'throat-spot', either purple or red. *Gossypium sturtianum*, with its lilac petals, has a blood-red striated throat spot. It's style is undivided, ending in a gentle bulge, which opens into five tiny finger-like stigmas when the flower matures. *Gossypium* can usually be easily distinguished by the marked black spotting found on many parts of the plant, especially obvious on the calyx, epicalyx, fruit and some stems. These spots are glands. *G. sturtianum* is also distinguished by being the only species of this family (in Central Australia), which is smooth, being entirely without hairs, and also by the remarkable enclosure of the fruit, bud and calyx

Fruit exposed



Fruit calyx and epicalyx
(3 foliage leaves, and leaf
of *Gossypium sturtianum*)



within three large triangular epicalyx leaves. This triangular cup also supports the flower. The bush grows quite high — 1.5-2 m — and being perennial will last many years in the garden. It can be found frequently in the bush, even in dune country, but seems to prefer rocky places.

There are two other *Gossypium* species in the region — *G. australe* and *G. bickii*. Both are hairy, *G. australe* being soft and silky. *Gossypium australe* usually grows about 1.5 m, a lilac flower with dark purple centre, a spotted calyx with long teeth and three narrow epicalyx leaves hanging down from the stem. *Gossypium bickii* is usually smaller — .5-1 m — pink flower with red throat-spot, and spotted calyx lobes long and narrow, with similar epicalyx hanging loosely. The seeds of all *Gossypium* are hairy, and it is interesting that 'commercial cotton' is a *Gossypium*.

***Radyera farragei* — River Hibiscus**

by Anne Urban

This flower is often mistaken for Sturt's Desert Rose, but the plant really is very different. *Radyera farragei* is both showy and elegant, the flower, and leaf, being the largest of the *Hibiscus* group in Central Australia. The strongly lilac flowers are very trumpet-shaped and flaring, and the dark purple 'throat-spot', can be seen to have paired lilac nectaries, often with tiny insects sucking at the nectar. The style is undivided and ends in one stigma, which is a 5-lobed knob. From the stamen cuff come a bunch of pollen-bearing stamens to surround the style. The flower is cupped by a densely furry calyx and epicalyx. The 5-lobed calyx is toothed, and the epicalyx, which is half its length, has lobes which look like 'frills'. After fertilization, when the fruit grows, it looks like a tiny furry egg, with a frill around its middle! This is distinctive for this plant.

The bush grows in areas of water run-off — near rivers, roads and rocky outcrops. It grows to 2 m, and after seeding, dies down (rather untidily), to re-shoot after the next rain. Being perennial it lasts many years, and is an excellent garden plant. The leaves, like all else about the plant, are large and showy, green above and white underneath, bristly to touch. All over the plant the hairs are dense, and the star-shaped hairs, both gold and white, can be seen by the naked eye, as tiny knots.

Central Australian Plants

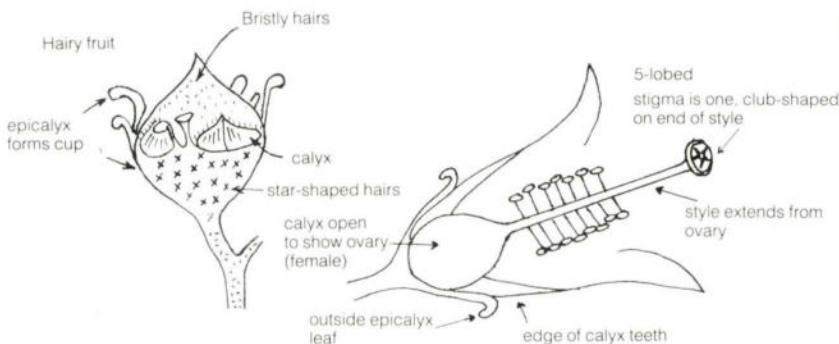
A Preview

Pages 108-110 are reproduced from early drafts of a book in preparation, "Central Australian Plants" by Ann Urban. Its availability will be announced in an issue shortly. These pages are from that section of the book describing the hibiscus-like plants of the centre. Extracts from the introduction to this section are:

Hibiscus-like Flower of Central Australia

by Ann Urban

These plants belong to the plant family Malvaceae which, in Central Australia, is represented by *Gossypium* with three species (as described on page 109), *Radyera farragei* (see page 110), *Alyogyne pinoniana*, *Hibiscus* with 7 species, *Lavatera plebeia*, *Mal-*



vastrum americanum (introduced), *Malva parviflora* (introduced), *Abutilon* with 5 species, and *Sida* with 9 species.

For many centuries the Malvaceae or Mallow family, have been important to man. A European member, 'Marshmallow', has been and still is, used medicinally for coughs, chest problems and diarrhoea, and herbally, in ointments, jellies, shampoos, etc. In Australia and Asia, indigenous people and settlers alike, made jelly from Malvaceae by boiling the roots, or steeping the leaves in hot water. Paddy's Lucerne (*Sida rhombifolia* and *S. rohlena*) were especially good, and preferred for diarrhoea.

Hibiscus is a good food item, as the buds and flowers of nearly all species can be eaten. Rosella, a Hibiscus naturalised in tropical Australia, is widely used as a fruit. All Malvaceae have very strong underbark, which has provided fibre for the Aborigines, for fishing lines, nets, dilly bags, etc. In C.A., *Abutilon otocarpum*, and *lavatera plebeia* were the species of choice. There have also been efforts to grow Paddy's Lucerne as crops, to make paper, and to replace copra, but these failed, as the wild plant would not be tamed.

The book continues with sketches, colour photographs and descriptions — Editor.

Palm Valley of Central Australia

by Anne Urban

Palm Valley is best known because of its stand of palms *Livistona mariae*, one of the Cabbage Palm group, is considered a relict species, this pocket of *Livistona mariae*, is a left over from the time, millions of years ago, when Central Australia had a tropical hot wet climate, and the palm, with other similar vegetation, covered wide areas. When first stepping into Palm Valley, after leaving sandy scrub and sand dunes behind, one had, for a moment, an uncanny feeling of time long past, and even a fleeting illusion that it might be dinosaur country!

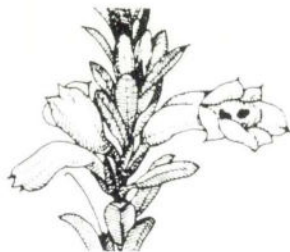
Livistona mariae is a long-stemmed palm with the typical Cabbage Palm canopy. The tallest palms of up to 25 m height are considered (by measurement of comparative growth rates) to be 200-300 years old. Trees are mature by about the time the long trunk is well clear of the underbrush. Flowers, and later, fruits, can be seen hanging down from the canopy. The nut-like seeds (about 2 cm) seem to germinate readily, the infant seedling being a beautiful copper-pink palms of all sizes and ages are seen in abundance. Photographic counts have suggested an increase of established young plants in the last 50 years. According to a careful study by Dr Peter Latz, in 1975, there are probably 3000 established palms in the region (60 km², centred on Palm Valley). He states that the likely reason for the survival of these stands seems associated with "the peculiar stratification of this area", water percolating down, and providing a permanent seepage area. The palm is shallow-rooted, and cannot stand the torrential flooding of the open river, but survives in protected creeks and bends.

It is also probably because of this protection, and regular water-supply, that Palm Valley has a remarkably rich flora. Among other plants, *Macrozamia macdonellii* survives here, as well as in Macdonell Range gorges. During this 1975 survey, Peter Latz recorded 333 different plant species, in Palm Valley. Of these 10% were rare plants, and others are those with which most of us are familiar — trees, climbers, bushes, small plants, rushes, water weeds and sedges. When visiting the area, one's greatest regret is usually the lack of time to explore. ■

A Field Companion to Australian Fungi

by Bruce Fuhrer

The fruiting body of fungi may be regarded as the equivalent to flowers by higher order plants. This book presents in large colour plates, the fruiting body of 135 species of Australian species expected to occur in most states. Bruce Fuhrer is a professional photographer and his exceptional degree of skill is shown in the quality of the photography so well reproduced. A life long fascination for these unique plants shows clearly in the text and presentation of this field guide. Nicely proportioned for a practical field guide this 162-page book is available from The Editor



Eremophila in Alice Springs

by Connie Spencer

We couldn't have a dry area issue of Australian Plants without mentioning the genus *Eremophila* — meaning 'desert-loving'.

Living in Alice Springs where there is still a great deal of work to be done in civilising our local flora and where the majority of native plants in commercial nurseries are brought in from the south, the challenge is in propagating our local species. This applies to many genera and not just *Eremophila*.

Many *Eremophila* species are now available at nurseries and have proved to be good garden shrubs even in climates foreign to them. Some species which are almost extinct in their natural areas are propagated easily and are valuable garden shrubs; for example, *Eremophila denticulata*.

However, most of our familiar eremophilas growing on hillsides and sandhills near Alice are not available in any of the nurseries in town, nor have I seen them listed in catalogues of nurseries we deal with in South Australia.

I have come across some magnificent grey-leaved forms of *Eremophila latrobei*. *E. freelingi* abounds on the hills around the town but there are no garden specimens that I know of in town. *E. duttonii* is another common shrub not far from Alice.

Eremophila macdonnellii (prostrate) was propagated from material collected in the King's Canyon area in October 1982 and cuttings struck readily as do other forms of *E. macdonnellii*. Plants were planted out April 1983. One which was watered more frequently grew rapidly and spread well. However, there were few flowers and recently it turned yellow and died (November 1983). Another was watered very little and irregularly at that and although has only grown half as much as the well watered one, it is a dark green healthy looking plant and has flowered freely. This is an excellent prostrate plant for Central Australian gardens provided it is not as short lived as the other forms of *E. macdonnellii*.

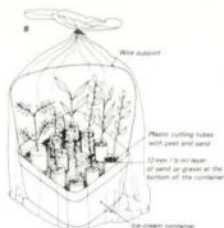
Eremophila christopheri is one of my favourites. This medium shrub to 2 m with its bright green leaves and pale to dark blue tubular flowers grows at the base of rocky hillsides and along creeks in Central Australia. It responds to pruning which makes for an attractive bushy shrub in the garden. In its natural state, it can become very woody and straggly. It flowers over a long period of time and is a worthwhile addition to any garden. See the photograph on page 105.

Eremophila willsii is my latest conquest; that is, as far as successfully propagating it. I haven't got it in the ground yet. This small shrub to about 1 m with purple flowers occurring only one to a stem is found in deep red sandy areas often on sandhills. A small area of the red sandhills to the South of the town was burnt early 1983 after which we had record rain-falls. This combination has led to a host of young *E. willsii* coming up.

Eremophila gilesii is a small shrub growing from .3-1 m. It is very useful in gardens because of its size. It has slender grey-green leaves and blue to mauve flowers. In good conditions it will have some blooms year round. Although it has been described as easy to grow, it is not readily available to gardeners in Alice. ■

Eremophila — Emu Bushes — Plants of Dry Areas

There have been numerous references in past issues of Australian Plants, to species of *Eremophila*. "*Eremophila — Their cultivation and Care*", by Ian Bond, page 11 of our No. 93, Vol. 12, issue is an excellent reference. It is supported by many colour plates with other articles describing many *Eremophila* species of special floral interest. Past issues of Australian Plants are available as noted on page 139. See "Growing Eremophila" on page 114 — Editor.



Propagation of Wildflowers

by Connie Spencer

My experience with propagation is limited and my set-up primitive.

My containers for striking cuttings in, are the large plastic soft drink bottles converted into 'mini glasshouses' or should I say 'plastic houses'! To do this the black plastic bottle base is removed. This is attached to the bottle by few blobs of glue. By leaving the bottle in the sun for a few minutes or by running hot water over the base, the glue softens and the base is easily twisted off. I remove labels and clean the bottle. Methylated spirits is good for cleaning off glue. Next I cut the bottle into two about 15 cm up from the bottom. In the bottom section several slits are cut near the base to allow for drainage. Also holes are cut in the black base if not already there. The bottom section is filled with my propagating medium and placed back in the black base.

Cuttings are prepared and placed in the medium. The top section, with the cap removed, is placed over the bottom. Often it is necessary to cut slits in the top section in order to make it fit either over or into the bottom.

The cuttings are in a moist atmosphere protected from drying winds and there is a convenient hole in the top to water through. Condensation which appears on the top of the bottle tells whether the medium is wet enough and root development is easily checked by carefully removing the black base and having a look every now and then.

I keep these 'mini glasshouses' in my shadehouse.

I also use individual tubes in ice-cream containers with plastic bags supported by a wire frame over the top.

The medium I use is either coarse river sand or a mixture (3-1) of river sand and peat moss. So far, I haven't found any difference in the length of time cuttings take to strike or in the root development by using either one or the other medium. I have found the medium with the peat moss tends to create too much humidity when the top is on the bottle. However, once the top is taken off (usually as soon as some root development is noticed or even before in some cases) the plain sand mixture dries very quickly and on hot windy days, has to be monitored regularly.

I also use the hormone powder, Seradix No. 1 on all native plant cuttings.

I have used the same technique for all eremophilas. *Eremophila maculata*, *E. denticulata*, *E. polyclada*, *E. glabra*, *E. serpens*, *E. biserrata*, *E. calorhabdos* to name a few have all struck well while *Eremophila macdonnellii* (prostrate), *E. gilesii*, *E. christopheri*, and *E. willsii* have been moderately successful.

My main problem with the four *Eremophila* described opposite was with the roots breaking away from the stem so easily when separating the cuttings from the community pot. I have more success with individual tubes but do not have the space required.

Another big problem with some of the more difficult ones which I have tried, i.e. *E. latrobei*, *E. duttonii*, *E. freelingii*, is the material is often woody. Soft young plants are hard to come by in the bush. Another problem is not enough air flow in my propagation set-up.

Although this hobby of propagating our flora can be a frustrating business, the few successes spur me on. Hopefully by getting these plants into the garden where life is not so harsh, they will be attractive to the general public, and not considered to be a straggly bit of scrub, and one day perhaps our nurseries will be full of local plants which are well suited to our climate. ■

Plants of the Desert Cultivation in Sydney!

by W. H. Payne

Seeing these beautiful desert wildflowers one may reasonably wonder how well they will grow in more temperate climates. Experience has indicated that they do indeed grow well. The principal factors are a deep well-drained soil and an open sunny position.

The Desert Rose, *Gossypium sturtianum*, or any other species of desert hibiscus will succeed and flower rewardingly in good garden conditions. Seed is readily available commercially. Sow it in moist sand in a pot and keep moist.

The Sturt Desert Pea, *Clianthus formosus*, is a different story. It is difficult but it can be grown most successfully and the results are spectacular. It has been grown as a glass-house plant in England since 1834. Readers are referred to the many articles in past issues, by growers who have been successful in germinating the seed and cultivating this magnificent plant to perfection. An article in our No. 89 issue of Vol. 11, page 195, describes methods used, by seeds or by grafting and is illustrated by a flourishing, flowering plant in a hanging basket.

The pea flowered plants, including the Sturt Desert Pea, have seed with a very tough coating. Saw a hole in the outer coating with a nail file, soak in initially, very hot, almost boiling water for a week then watch it germinate in a wet tissue or a saucer in a sunny position on a window sill. Plant the seed in a small pot of very wet sand, preferable a pot that will decay in a short time such as a peat, or "jiffy" pot, or cardboard disposable cup with most of the bottom removed. Plant the pot of sand in the final garden position; very well drained, with the lip of the pot well above ground level. Now water around the small pot of sand every day without watering the sand in the pot. The trick is to get the sand moist from copious watering around and hence below, such that the moisture comes up from beneath. The root will go for the moisture out of the bottom of the pot. If you can get the seedling away, it will grow well. Get it too wet at ground level and it dies. This means that it must be in an open sunny position and for Sturt Desert Pea — covered when it rains!!

The desert annuals, everlastings, etc., may be grown. Treat as any other annual. Sow in trays or pots of sand in autumn. Keep in a sunny position and water from below by standing the pot or tray in water. When planted in the garden, you will need to be lucky with the weather. The more successful you are in copying nature's natural conditions for these plants the better the results. The seed lies dormant on the ground over very hot periods. Come a soaking rain, the seed germinates in the wet and quickly sends a root down as the water recedes deeper and deeper into the ground, the top surface of the soil becoming hot and dry. The plants flourish, flower prolifically and then die casting great quantities of seed ready for the next rain, possibly years to come.

This is the only time I recommend to gardeners to "copy the natural conditions" when growing wildflowers. Generally it is the worst thing you can do. Why? Read on.

Growing *Eremophila*

There have been spectacular results in Sydney.

A friend, Noel Gane, is a very keen and successful grower of wildflowers on a small flat suburban block of clay. As one of his great successes is in growing the *Eremophila* of the desert, you have a paradox. We shall devote a special issue on Noel's method of success with colour photographs of his garden, one day, but it is topical to report on his spectacular results with *Eremophila*. It could be a vital key to future success in the cultivation of wildflowers.

His method is to build up beds of good garden soil sitting on top of the clay. All organic matter goes into the compost bin and the output is well composted and finely grained. In fact all his gardening procedures would be acknowledged as "professional" by "an old English

gardener". Whole beds are renewed every few years, the plants never being allowed to get leggy or sparse, or out they come. It is well known that I consider that the key to the successful cultivation of wildflowers, is the good healthy garden conditions so successful with exotic annuals.

His *Eremophila* bed? He has been very successful for years growing *Eremophila* in large pots, the plants flourishing in well composted, well drained soil. The new *Eremophila* bed has out-performed his pot culture. The bed used to be a vegetable garden, a very successful vegetable garden with healthy well grown produce. Who wants vegetables when you can grow *Eremophila*!

Immediately before planting the young *Eremophila* plants he added horse, rather, stable manure by the tonne. There was nearly as much manure as soil mixed to sit on top of the natural clay, the whole retained by a wall 20 cm high all around the garden.

The manure was straight from the stable so was free of weed but with undigested oat seed in it. You do not get only manure from racing horse stables. The manure is mixed with wood shavings at least in equal parts. The fresh wood shavings have been spread over the horse stall for a week receiving all that drops including urine as well as manure. The result is a slightly composted mixture that appears succulent to plants, especially wildflowers. *Eremophila* love it.

With the manure/soil mixture lightly covered with soil, the first two weeks yields dozens of oat seedlings. These are easily pulled out. What are the conditions being enjoyed by the desert loving *Eremophila*? Are they in fact growing in the clay soil under the 20 cm deep manure/soil mulch? Do they prefer the area where the mulch and clay meet, an area where water must be available at most times; Or are they living in the manure/soil mulch solely, sucking the water up from the water table on top of the clay? We are yet to find out, but the *Eremophila* love it.

Are the best growing conditions for our wildflowers, good healthy garden conditions just as they are for most other plants? One suspects that they are. We can provide the good garden conditions as it concerns friable, well composted, well drained, moist soil but are we being frustrated by the inability to maintain "healthy growing conditions". What is happening down there? Is the balance of nature, the continual war between creatures living below the soil getting out of balance at times and how can we maintain a stable "cold war" between them? Where are the scientists capable of carrying out the necessary research? One study is reported on page 118. ■

Conservation At Ayers Rock

by Heather McPhee

500 kilometres west of Alice Springs is Ayers Rock and the multi-million dollar new Yulara Tourist Resort to supply accommodation for the thousands of visitors who travel there each year. The Yulara village has been built 14 kilometres from the Rock and great care has been taken to preserve the natural flora. The village has been so well designed that as you approach it from the road it is barely visible, hidden by sandhills and natural foliage.

The ecology of the site is that of an arid environment and is very fragile. The summers are hot and dry with dry temperatures ranging from 35° to 43°. Winter has warm days in the 20° range and the nights very cold, below -5°. Average rainfall is about 260 mm but varies greatly each year. In this climate a highly specialised and sensitive flora has developed.

The area around Yulara and Ayers Rock contains many native species and in September and October when most are in flower, a walk around this area is every bit as rewarding as climbing the famous Rock itself. *Casuarina decasneana* (Desert Oak) is one of the species you notice most but there are species of *Eremophila*, *Cassia*, *Helipterum*, *Parakeelya* with *Grevillea juncifolia*, *Brunonia australis* and *Acacia estrophiolata*.

Continued on page 126.



Feathers in Foliage

(A consumer's view) by John Erlich

Having failed over three years to "attract" no more than six species of native birds to our garden, (Australian native predominantly), I cheated. We moved house.

We moved to a house 20 years old, with a garden well established over eight to nine years. It was also virtually adjacent to an Historical Reserve/National Park. It worked — the number of species rose above 50. But why were there greater than 50 species, where before there were six, with a move of about 3 km? Having succeeded, with a Lateral Arabesque (of Peter's Principle) there was the opportunity to 'sit back' (if ever one does that in a native garden) and try and see why. Perhaps having for three years imposed my ideas, I could learn from the consumer.

It seems at first reflection little has changed from my learning, and it was interesting to see the effect of not making changes.

The consumer's guide to the garden (low maintenance) seemed to show the use was related to the 'activities of daily living'. There was the morning song, flirting, drinking, washing, searching and feeding, working, preening, nesting, and scrutiny and security. By far the greatest use was made of the numerous (untidy?) dead branches and twigs, and 80 to 90% of perching, passing through, scrutiny, and security checks were done from dead wood, often apparently precariously thin. Cats and dogs were watched, abused and teased, other species were watched and chased, flirtations commenced, and at times branches were used just to perch and sing. (Male brown honey-eaters would spend five minutes relaxing before 20 minutes of varied canary-like song of immense variety in call and pitch).

Honey-eaters, — white plumed, spiny cheeked, singing, brown, and rarely grey headed — were the major consumers, complemented by mistletoe birds, black faced cuckoo shrike, grey shrike thrush, white-rumped miner, Port Lincoln parrot, kingfishers sacred and red-rumped, rainbow bee-eaters, butcher birds, and rarely masked wood-swallow. Also the occasional sitella, rufous whistler and wandering cuckoo were transient visitors.

Other consumer usage areas were ground, general foliage, and feeding.

Ground use was mostly limited to searching for food — seeds and insects. Grey shrike thrushes (and grey crowned babblers at times) would systematically search and scrutinise the mulch, bark, and odds and ends accumulated around the yard. I have tried to encourage native grasses with the anticipation of providing an obvious seed source and natural bird attraction — and have yet to succeed (well, mostly). Zebra finches, diamond doves, crested pigeons, and on one occasion quail, transiently visit and search, then move on to larger supermarkets in the nearby national park.

The general foliage is used for 'chasings', flirting and feeding. Young (white plumed honey-eater, black faced cuckoo shrike and rainbow bee-eater) are usually fed in the foliage. Leaves are checked and cleaned of insects, as is the bark, and this may be a meticulous process; nectar is used continuously (in our yard nearly exclusively from the bottle-brushes and eucalypts).

At night the foliage is used for rest and security by the kingfishers and, lovely to hear, the mopoke muttering through the night his characteristic call. Willy wagtails, pallid cuckoos, and rufous songlarks can not uncommonly be heard also calling through the moonlit nights; but only occasionally from in our garden! A nankeen heron seemed to feel it appropriate to perch at night in our largest cedar tree.

Mistletoe, and mistletoe birds, are only just returning to the yard after two years, after intensive fruit fly spraying of the town. (Many birds are only just returning). Grapes, apricots, and figs certainly seem a consumer favourite for the mistletoe birds, honey-eaters, and the three bower birds that come and go. Figs (not native) seem high on the bower birds' shopping list, and the fruit is readily shared with those birds that come (there's usually enough for us humans as well, though we would prefer they take the whole fruit rather than testing each one just as it is almost ripe).

Nests are not usually sought out by us to avoid disturbance, but found in passing, and are usually in trees not used for general "activities of daily living", — the citrus trees, olive tree, and climbers. Ripe fruit on pepper trees are eaten avidly by the mistletoe birds, and in the male the seed passed during enthusiastic song. Galahs seen happy to be social, and vocal, high in the river red gum, and feed on the seeds of the iron wood trees, as usual before they are ripe.

Some five species of birds of prey have passed through the yard, and we have made no special effort to attract them. (Sparrow hawk, whistling kite, brown goshawk). Their presence is always well advertised by the noisy complaints of the honey-eaters. All very natural.

What do we do that is not natural? Each day fill up the three water containers hanging from the long lateral branches, using wire and plastic ice-cream containers. The use and success increased dramatically when small dead wood perching sticks were incorporated into the hanging string and wires. The water is popular for drinking — and splashing; the spiny cheeked honey-eaters may deplete the water in a few hours. There is often a polite queue of birds in the surrounding trees, and frequent consumers are honey-eaters (white plumed, singing, spiny-cheeked), mistletoe bird, Port Lincoln parrots, and the western bower bird.

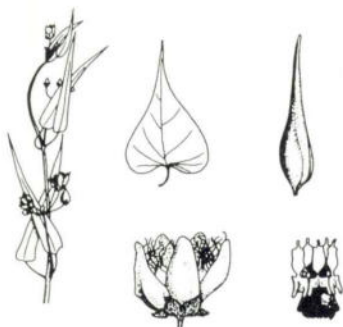
The temptation to provide food and calories has been resisted, so as not to create a dependence, though the temptation persists and returns at unexpected moments.

Consumer antagonism was, and is, successfully engendered by cats, fruit fly spraying and baiting, pruning dead branches, clearing mulch, destroying spider webs (used for nesting and feeding), and possibly by deliberately providing food.

One delightful benefit of having native birds in the garden has been the inadvertent learning of bird calls and song. The variety, purity of note, the mimics (mistletoe birds in particular are enthusiastic mimics, though the mimicry becomes almost a caricature with their limited range and far from perfect pitch), and the mistakes all impinge on the unconscious and surface with a smile. A reminder of a life of Feathers in Foliage. ■

Wildflowers and Birds

Our wild birds need plant life. There are those that live off the flowers and fruit and those who live off the creature life that feed off plant life. We need our bird life to survive, to maintain a reasonable balance of nature. In particular many of us just love birds in our garden. Growing wildflowers is an excellent way to attract birds to your garden.

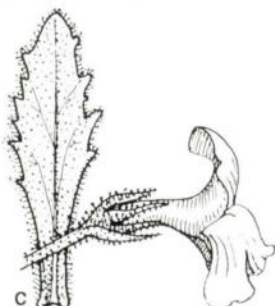


Planting For Security

by Tom Henshall

In medieval times it was the custom to protect property by building castles surrounded by moats. This is not always practical today when so often one tenth of a hectare needs to be made secure from intruding dogs, cats and people. In the last year dogs have eaten all my chooks, cats prowl through the bottle brushes frightening the honeyeaters and there has been a spate of petty burglary in the neighbourhood.

Evolution, anticipating my problems, has come up with the answer: prickly plants. Placed strategically outside windows, not only do they discourage predators, but also provide easily observed havens for nesting birds. An additional bonus is that many of the most thorny are the most attractive. Here is a selection.



Acacia strongylophylla. This round-leaf wattle is a straggly upright shrub about two metres tall with spiny stipules and phyllodes. The globular inflorescence is large and colorful. Commonly found in damp rocky gullies, it forms an impenetrable barrier.

Acacia victoriae (Bramble Wattle). Also known as Elegant Wattle, this grows thick as a shrub or as a small tree to 8 m tall. See the colour photograph on page 96.

Acacia estrophiolata (Ironwood) is a graceful tree to 15 m with pendulous branches. See page 102.

Acacia tetragonophylla. Dead Finish is a dense spreading shrub, generally about two metres tall with needle-like phyllodes. The inflorescence is globular but not particularly noteworthy. It is found along dry creeklines, and as the common name suggests, it is one of the last survivors in a drought. The species is sketched above.

Capparis spinosa var. *nummularia*. Native Passion Fruit has deceptively hard and sharp recurved thorns. This is likely to come as a surprise because the leaves are a fresh green, and the white flower is one of the most beautiful in the Centre. The fruit was eaten by Aborigines. See page 128 for a colour photograph and further notes.

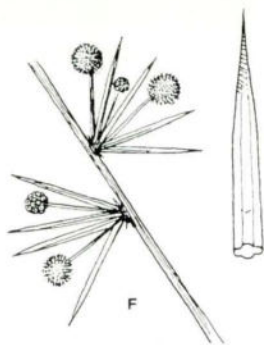
Grevillea wickhamii. Holly Grevillea is an upright shrub. See page 103.

Hakea eyreana. Corkwood is at its best when young. The pungent lobes of the leaves are five to ten centimetres long and a sure deterrent.

Lycium australe. Australian box-thorn is an upright dense prickly shrub about two metres tall with nothing to recommend it but its defense possibilities.

The genus *Solanum* has many representatives in central Australia with large colourful flowers and needle sharp spines on the stems, leaves and fruit.

Last but not least is the grass *Triodia*, generally known as spinifex, which resembles a large porcupine. Anybody who has walked through this has experienced something they are unlikely to forget quickly. ■



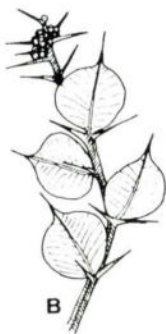
Wild Pear *Cynanchum floribundum*

By John Blakeman

This blowing seed found a protected corner behind a large bougainvillea stem and was quite large before someone noticed that a plant from the bush was colonising suburbia.

It climbed, it had small starry flowers with a sweet scent so it was probably a wild jasmine, that was the reasoning of the householder. The expert said it had to be the family Asclepiadaceae *Cynanchum floribundum*, called the wild pear because of the seed pod which when unripe is edible and astringent but becomes hard and woody before splitting to release a mass of hairy seeds which blow it the wind to find some other corners where it can colonise a new area.

Apparently it is not only the Northern Territory which is host to this lovely little native, it grows in all mainland states with the exception of Victoria. It has been planted in my own garden now and will be tried as a pot plant when new seedlings make their appearance. ■



Stemodia

by John Blakeman

Central Australia can be hot in summer and a visit to one of the gullies, clefts in the hills, brings a feeling of relief, shade, yes, but the main component is a freshness of air, a clean pungent scent which invades the senses. We rested and my city friend said, "What plant produces that tangy scent?" I had to admit I didn't know but soon found a mass of fine green growth alongside the track with tiny purple blue flowers.

The handful of pungent green came home with me and naturally went into the propagating box. The cuttings rooted readily and were potted up. Since then pots of *Stemodia viscosa* have been a show piece of my cool greenhouse — hanging half a metre from the pots, lightly covering plants on the shelf beneath — the small purple flowers showing well against the other foliage in the house. Except for attacks of Mealy Bug and Cottony Cushion Scale, it seems to be trouble free and accepts the limiting root expanse of 127 mm — 152 mm pots quite happily. See the photograph on page 104.

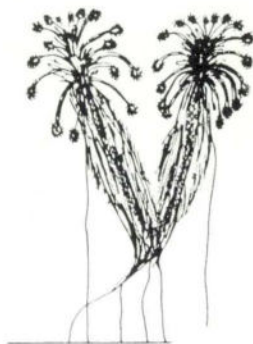
The description of the plant given in Flora of Central Australia is:

Stemodia viscosa Roxb. Densely glandular hairy strongly aromatic robust perennial to c. 80 cm high. Branches decumbent to erect. Leaves opposite rarely in whorls of 3, obovate to elliptic usually narrowly so, ± auriculate, serrate, acute, at plant base 3-6 cm long, shorter higher up and on younger branches. Flowers in racemes or panicles, solitary in axils of small to large leafy bracts; pedicels 0.5-2 cm long. Sepals 3-5 mm long. Corolla 5-9 mm long along upper side, lower lip yellow at base, ± porrect or ± downturned, lobes hardly overlapping. -S pedicellaris F. Muell. WA: wr. NT: cn, cs. SA.nw. (WA, NT, SA, Q; India). Sandy to stony soil of creek and river beds in hills or surrounding plains.

Size of upper leaves varies considerably, but large and small leaved branches can be found on single plants. The CA plants form one race of a widespread complex varying in incidence of yellow blotching and shape of the corolla and the number of leaves at each node. ■

Rooting Patterns Of Sandplain Plants The Kwongan*

An extract of paper by
J. Dodd, E. M. Heddle, J. S. Pate and K. W. Dixon
as published in
"Kwongan — Plant Life of the Sandplain".



*Kwongan, an indigenous term for the Western Australian sandplain and its vegetation — sandy country with open scrubby vegetation. This is the area of the study reported here, an intermediate area between arid "desert" and scrubland of more temperate climate. A recently published book of vital concern to those interested in dry area flora, it will be available from The Editor when publishers can send me copies with the price. As space was available in this issue on dry area flora, it seemed appropriate to publish this extract here.

In an area of infrequent rain, the evolution of various rooting systems is related to plant survival. An understanding of these could be a vital factor in the cultivation and eventual conservation of dry area flora.

1. Plants with Fleshy Root Tubers

The reserve substances of root tubers vary widely between species, but the majority contain in excess of 75% of their fresh weight as water. Some carry significant reserves of starch, others store reserve carbohydrate as wall thickenings or oligosaccharides. Levels of stored minerals are usually not abnormally high; protein amounts to usually less than 6% by weight in root tuber dry matter, although additionally reserves of free amides and amino acids may represent an amount of nitrogen equal to or exceeding that present in protein. Studies suggest that water reserves of root tubers play a significant role in the resumption of shoot growth in autumn, and that reserves of certain nutrient elements (e.g. K, Mg, N, P, Mn) are transferred with high efficiency between tubers and vegetative organs at the start of the growing season and back into the new season's tubers the following summer.

2. Water-storing Woody Plants

Unlike the fleshy root tubers of herbaceous species in which water is stored in highly vacuolate parenchyma of the root cortex, water-storing woody roots carry their reserve of water in specialised, large-diameter xylem vessels. The water can be easily displaced from such roots by blowing air through a 10-20 cm segment of root held in the mouth. This type of root is typically restricted to major horizontal components of the root system; vertical roots of the same plant will show normally-sized, smaller vessels from which water cannot be expelled by blowing. Aside from mallee eucalypts — many of which hold 'free' water in their horizontally-oriented roots — water-storing woody roots have been encountered amongst the sandplain flora only in the genera *Scaevola* (one species) and *Grevillea* (seven species). The significance of the water reserve to the water economy of the plant is not known. However, it is unlikely to be quantitatively important in providing water to the transpiring shoot, since, for example, the total reserve of the larger-diameter vessels of large shrubs of *Grevillea* spp. was estimated to be of the order of only 100-200 ml, compared with a transpirational loss per day from equivalent plants estimated to be in excess of 100 ml per plant per day during summer. It is more likely that the water reserve of the horizontal roots is of significance in maintaining turgidity of these roots, especially in view of their location in dry upper layers of the soil — as is often the case with species of *Grevillea*. Field observations have indicated that the large vessels remain full of water until at least mid summer, though by the following autumn much of the reserve may have been depleted.

3. Cord Roots

This term is introduced to describe tap-rooted species which at maturity possess multistellar roots apparently formed early in seedling development by the fusion of lateral roots onto the main primary root. The only species so far known to exhibit 'cord' roots amongst the kwongan flora are members of the genus *Daviesia*, *Acacia? barbinervis* and another legume *Phyllota dasyphylla*. In *Daviesia* (e.g. *D. aphylla*) the small fused lateral roots are usually four in number, running vertically down the much larger main root to give a tetragonal appearance to the whole tap root. In *Phyllota dasyphylla* the laterals adhere in a less regular fashion, often twisting around the tap root in true 'cord-like' fashion. The functional significance of cord roots is not clear, and the mode of development of their unique anatomical features during seedling stages has yet to be investigated.

4. Root Suckers

The ability to reproduce vegetatively by forming shoot buds on laterally extensive root systems is a reasonably common feature amongst sandplain plants and assumes importance in regeneration of certain species following fire. Our survey of 429 common kwongan species revealed 14 suckering species, some essentially woody plants (*Acacia*, *Muehlenbeckia*, *Rhagodia*), the remainder small herbaceous plants (*Glischrocaryon*, *Logania*, *Platysace* and several genera of Fabaceae and Goodeniaceae). In root-suckering species of *Acacia* (e.g. *A. saligna*) clones developed from a single plant may occupy areas of up to 0.2 hectare, the members remaining connected with one another and often dying communally when diseased or of old age. Long-lived interconnections between members are also to be observed in herbaceous species (e.g. *Glischrocaryon aureum*, *Platysace* spp.), and in such cases flowering of members of a clone may be highly synchronous, and often slightly out of phase with that of other neighbouring clones of differing genotype.

5. Sand-binding Roots

The diagnostic feature of this category of root is the presence of an adhering sheath of densely-packed sand particles around the body of the root. The particles are bound by persistent root hairs, secretions from which are presumed to be responsible for cementing the particles so firmly to the root surface. The mantle of sand is most noticeable on upper old parts of a root where it probably affords protection against desiccation and heat stress, especially during summer. Young absorbing roots do not possess a mantle.

Sand-binding roots in the kwongan are mostly confined to monocotyledons, being almost universal in members of the Restionaceae (e.g. *Caustis*, *Ecdeiocolea*, *Alexgeorgia*, *Lyginia*, *Restio*), common in the Cyperaceae (e.g. *Lepidosperma*, *Cyperus*, *Tetrariopsis*) and Haemodoraceae (e.g. species of *Haemodorum* and *Conostylis*), and occasional in the Liliaceae, Orchidaceae and Iridaceae.

3. Lignotubers

Although in many cases originating from lower stem or hypocotyl and therefore not strictly a root, the lignotuber is considered here because of its significance in determining the storage capacity and regenerating abilities of the underground organs of a species. For present purposes, lignotubers will be defined as woody, roughly spherical swellings of noticeably greater diameter than the roots and shoots which emanate from them. They are usually located just at soil surface or buried within 10 cm of the soil surface.

When the shoot above it is destroyed or damaged, a lignotuber develops a series of shoot buds on its upper surface, giving the plant a capacity for very rapid regeneration of a new shoot system. Depending on the species, a mature lignotuber may be of as little as 10 cm diameter or up to 1 m across and of several kilograms of weight, as in the case of the so called 'burls' of certain mallee species of *Eucalyptus*.

The survey of 429 kwongan species showed lignotubers to occur in 24 out of 74 species of Proteaceae (involving the genera *Grevillea*, *Hakea*, *Isopogon*, *Dryandra*, *Petrophile*, *Lambertia*, *Adenanthos*, *Persoonia*, *Conospermum* and *Banksia*), in 18 of 62 species of Myrtaceae (with 11 species of *Eucalyptus*, two each of *Melaleuca* and *Calothamnus* and one each of *Darwinia*, *Verticordia* and *Eremaea*), and in a single species of *Allocasuarina* (Casuarinaceae) and *Conostephium* (Epacridaceae). These 44 lignotuberous species comprised just over a quarter of the 163 woody shrubs and tree species shown in the survey to possess the capacity to regenerate after fire by means of below-ground buds. All lignotuberous species exhibit a pattern of root morphology involving a woody tap root bearing woody horizontal side branches of diameter approaching that of the tap root.

7. Schizogenous Roots

Mature plants of this type possess a shoot and root axis which has split radially and longitudinally into a series of more or less equally sized segments. Eventually, if splitting proceeds down to the deeper parts of the root, each sector of the plant may become independent. Splitting is initiated along the ray tissue of stem and root and the radial faces of each split develop periderm tissue, thus providing protection to the previously exposed xylem tissue. In some species (e.g. *Verticordia* spp.) the sectors of the shoot remain intertwined, in other cases they separate completely so that the shoot develops a multistemmed bush-like habit (e.g. *Hibbertia hypericoides*) comprising a dozen or more independent plants (i.e. leads to cloning). In certain old plants some sectors of the shoot and root systems are dead while others remain healthy, suggesting that root/shoot splitting may be an effective self-pruning mechanism. Such partial death of plants is particularly noticeable following drought or attack by termites. Root/shoot splitting species are relatively common in the sandplain flora, being especially frequent in the Myrtaceae (certain species of the genera *Calytrix*, *Darwinia*, *Verticordia*, *Micromyrtus*, *Leptospermum*, *Beaufortia*, *Baeckea*, *Astartea*, *Eremaea*, *Thryptomene*, *Hypocalymma* and *Pileanthus*), less common in the Fabaceae (species of *Daviesia*, *Gompholobium* and *Oxylobium*), Epacridaceae (species of *Andersonia* and *Astroloma*), Dilleniaceae (*Hibbertia* spp.), Loganiaceae (*Logania tortuosa*) and Myoporaceae (*Eremophila maculata*).

8. Stilt-Roots

Within many of the ecosystems of the kwongan and in several associated habitats one commonly encounters a highly unusual form of diminutive ground-dwelling chamaephyte, for which we have coined the term 'stilt plant'. The characteristic which immediately sets these plants apart is that each mature individual possesses a completely aerial shoot system, fully supported a centimetre or more above ground by a set of stiff, fibrous, adventitious prop roots. The stilt plant thus resembles — on a many times smaller scale — screw pines (Pandanaceae) and certain mangroves.

The development of the 'stilt' growth form is only one of several ways in which diminutive understorey species might have adapted to the seasonal drought and high surface soil temperatures of ecosystems of the kwongan.

Stilt-rooted plants will be presented in a future issue of Australian Plants.

9. Proteoid Roots

Root systems previously described in issues of Australian Plants.

The Olive Pink Flora Reserve

by Tom Henshall

The Olive Pink Flora Reserve is situated within the town boundary of Alice Springs near the east bank of the Todd River, within easy walking distance of the central business district, most hotels, motels and the casino.

Of the 16.35 hectares, approximately one quarter is more or less flat, with sandy loam soils. The remainder is rocky hills. The hills retain their original vegetation, in the main witchetty bush (*Acacia kempeana*) and several species of *Cassia* with some *Prostanthera striatiflora*. On the flats a few ironwoods (*Acacia estrophiolata*) together with isolated corkwoods (*Hakea* spp.) and wattles (*Acacia* spp.) are the sole survivors. Nevertheless, well established groves of mulga (*Acacia aneura*) and river red gums (*Eucalyptus camaluensis*) planted by Miss Pink are approaching maturity.

A board of trustees is responsible for the maintenance and development of the park. Planting is limited to those species found within a radius of 200 km of Alice Springs. Many of these plants are unlikely to be found in any other public garden in the world.

It is expected that the reserve will become a centre of education showing the botany, ecology and environment of the interior of Australia. Adaptations by plants for survival can be demonstrated by the woolly-cloak fern (*Cheilanthes lasiophylla*) in which the fronds become desiccated in times of drought, but quickly become turgid when rain falls. Many *Acacia* species, in order to reduce transpiration, shed their leaves and starch is manufactured in flattened leaf stalks called phyllodes. Gum trees have a thick wax coating over their leaves in order to prevent moisture loss. Some hakeas grow a thick corky bark to prevent damage to the cambium layer by fire. All of these plants are presently in the reserve.

The relic nature of many central Australian plants will be shown. Survivors of wetter ages such as the Palm Valley palm (*Livistona mariae*), the cycad (*Macrozamia macdonnellii*), the euphorb (*Ricinosarpus gloria-media*) and the heath (*Leucopogon sonderensis*) are found nowhere else in the world. Others, such as *Acacia peuce* and *Xanthorrhoea thorntonii* are limited to a few isolated localities within 500 km of Alice Springs. Identification and limited information are provided by the use of interpretive signs.

Once these rare plants become established, the reserve will become an important conservation establishment. At present *Ricinosarpus gloria-medii* is found only on about one hectare near Simpsons Gap and Trephina Gorge. *Leucopogon sonderensis* is found only on Mt. Sonder and Mt. Giles, and an undescribed fern of the genus *Nephrolepis* is limited to a few square metres near Haasts Bluff. Additional sites are urgently needed, both as an insurance against disaster and as a centre for the distribution of propagating material.

There is no botanic garden in Australia located in the drier areas, although the arid/semi arid zone covers two thirds of the continent and eventually it may be desirable for the Olive Pink Flora Reserve to become an annexe to the Northern Territory Botanic Gardens. In the United States the desert botanic gardens at Tucson and Phoenix are among the prime tourist meccas of the plains states.

A building with interpretative displays and meeting rooms for such bodies as the Central Australian Field Naturalists Club and the Society for Growing Australian Plants was completed recently. ■

White Cedar For Shade

Living with *Melia azedarach*
as a shade and comfort tree
by Nancy Hall.

I alternate between cursing and praising the white cedar tree (*Melia azedarach*) — depending on the season. Its heavy crop of berries takes a long time to clean up but its dense shade in summer is very welcome.

The original owner twenty-five years ago, planted what is known locally as the 'umbrella cedar'. This form branches from about one metre, forming an umbrella shape with a dense canopy. The other variety more often seen in the Alice is taller and more open — less of a berry crop but also less shade.

My kitchen and lounge windows face due west and they were wise enough to plant the cedar three metres out from the kitchen windows making it southwest of the lounge. Consequently, during the summer both rooms are shaded from the late afternoon sun, but in the winter, when the leaves have gone and the sun sets less to the south, the lounge gets the late afternoon sun and I can delay putting on the oil heater for several hours.

Contrary to what many tourists think, the Alice can be cold in the winter. Some years we have quite a few frosts, a few to -5°C , and while the days are usually sunny and often 20°C , there can be a sharp wind from the south and after you have been here a few years, you tend to look for the sunny protected places to sit. Its lovely to get home from work and have a warm sunny lounge in the winter.

I also shade my lounge windows in the summer with vines on an overhead large mesh trellis. By the time the sun is not welcome, the vines have grown enough to provide shade in the early afternoon and the cedar tree is leafed out again to provide the late afternoon screening.

During winter, if the frost hasn't knocked the vines, I prune them back to vertical mesh. At one time the trellis was of fine chicken wire, but this didn't allow the leaf litter to fall through, blocked the sunlight and was tricky to clean off in the late autumn.

About May-June the leaves turn yellow and for several weeks give a nice autumn display. The fallen leaves decompose quickly but the centre rib of the compound leaf may be a problem. At one time I used to separate the ribs from the leaves and run them through the mulcher, put them in the compost pile and eventually spread the compost around the garden.

However, a year ago I did some sheet mulching just out from the cedar tree and not just sweep everything there to increase the mulch layer — much easier and less time consuming.

I soon discovered that the shade was so dense that grass wouldn't grow and getting the berries out of what grass did survive was difficult. The solution was to lay a brick patio — roughly circular and about seven metres in diameter. As my soil is sandy, I just laid them in concentric circles on the soil. This allows the water to penetrate and makes it relatively easy to sweep up the berries. Many that drop are still attached in groups to the berry stem and they can be rather quickly put into garbage bags for a trip to the tip. The loose ones I sweep up and roughly sieve to reclaim any soil or composting material before emptying the sieve into garbage bags. Sometimes I just sweep it all from the patio onto the mulched area. When the berries dry they blend in and when they eventually germinate they are easy to pull out of the mulch.



I used to think that the berries fell over a long period, but the tree is so dense that the clusters get caught up in the branches and gradually filter down, so the berries are a fairly constant job.

After the patio was done, I had metal beams installed in roughly a circle around the perimeter and have hung planters from the cross pieces — those plants requiring some sun toward the northwest and those requiring more shade on the east side. This frame is also sturdy enough to take hanging chairs and the uprights support hammock hooks. I have also suspended a terracotta birdbath from the frame and honeyeaters and escaped sulphur crested cockatoos often drink from it.

There is always dense shade somewhere on the patio, and as there is a choice of locations for the hammock you can change its position. A floodlight at night makes evening entertaining pleasant and this is quite common in the Alice during the summer months.

Another bonus for having dense shade happened after the death of my cats. A family of boobook owls took up residence in the tree. One year there were two adults and four juveniles in October. The honeyeaters mob the owls, so you have some clue where to look. On cooler days they are very difficult to spot and often there is only one viewing location. They move during the day to the shadier side of the tree. On very hot days they move into the centre and fairly low down. I've often shot a fine mist up into the tree while watering the hanging plants and sometimes they take a bath, spreading their wings to get the underside wet too and then spend some time preening themselves.

If you go out about dusk you can hear the juveniles doing their muted whistle and often see them fly away for the night's hunting. They make a few noises at dawn when they return.

An examination of the pellets they regurgitate show lots of bug parts which I hope they have gathered from my garden. By the end of the summer, only the original adults are left and they stay until almost the last leaves are left.

The cedar has far reaching surface roots and they have raised part of the paving, but I think that adds to the character of the patio. The trunk has expanded since the three tiered circular planter at the base was cemented in and I need to fill in a few gaps again with some mortar.

The cedar grows well here and is listed as being salt tolerant in some books. Some people "solve" the berry problem by severely pruning the tree every other year: autumn one year which removes the berries and as the tree doesn't blossom the next year, just sends out new shoots, they do not have to prune again until the following crop. However, I feel this eventually gives a distorted tree.

So while I curse the berries, I have yet to find another native tree that would provide the dense summer shade which is essential in the Alice, yet allow the sun through during the winter. ■

Conservation At Ayers Rock — Continued from page 115.

To preserve this ecology, guidelines were specified to the Builders when the new Yulara Tourist Resort commenced construction. Tree positions were plotted and recorded and there were penalties for any damage to these existing trees. A fine of \$2,000 was payable to the Construction Commission for the destruction of a Desert Oak and with this in mind the contractors were very careful and no fines were collected. Desert Oaks were retained as possible and became the criteria for the position of the roads.

In areas where earthworks were necessary, the seed topsoil was removed and retained for later plantings. Sub-soil beneath this was excavated and stockpiled to be used later in landscaping. No exotic plants or seeds will be included in the landscaping so that the natural desert flora will be maintained.

This attempt at preserving the natural vegetation in the presence of moder development has been very successful. ■

Bushtucker

Grow Your Own

by G. Griffin

Bushtucker is a term commonly used by Aborigines and Europeans alike to describe foods obtained from native plants and animals. It is particularly applied to plants as a food source.

In central Australia, before the arrival of Europeans, plants provided the bulk of the food for Aborigines. They utilised about 200 different species for a great variety of purposes. These included sources of food, material for implements, medicines, narcotics and decorations. Of this large number only a few formed the staple bulk of food supply. I have selected fifteen species as being both suitable for cultivating as garden specimens and producers of quantities of edible items.

Readers of this journal will not need to be convinced of the satisfaction to be had from growing native plants, but bushtuckers may add yet another dimension. Most bushtuckers do however have such a different taste to our normal foods that many of us have to 'acquire' an appetite for them. The bushtuckers have substantial food value as the accompanying table shows.

NUTRITIONAL VALUE OF SOME CENTRAL AUSTRALIAN NATIVE FOOD PLANTS

(After Peterson, N. (1978). The traditional pattern of subsistence to 1975. In 'The Nutrition of Aborigines in Relation to the Ecosystem of Central Australia'. B. S. Hetzel and H. J. Frith (Eds.) CSIRO, Melbourne.

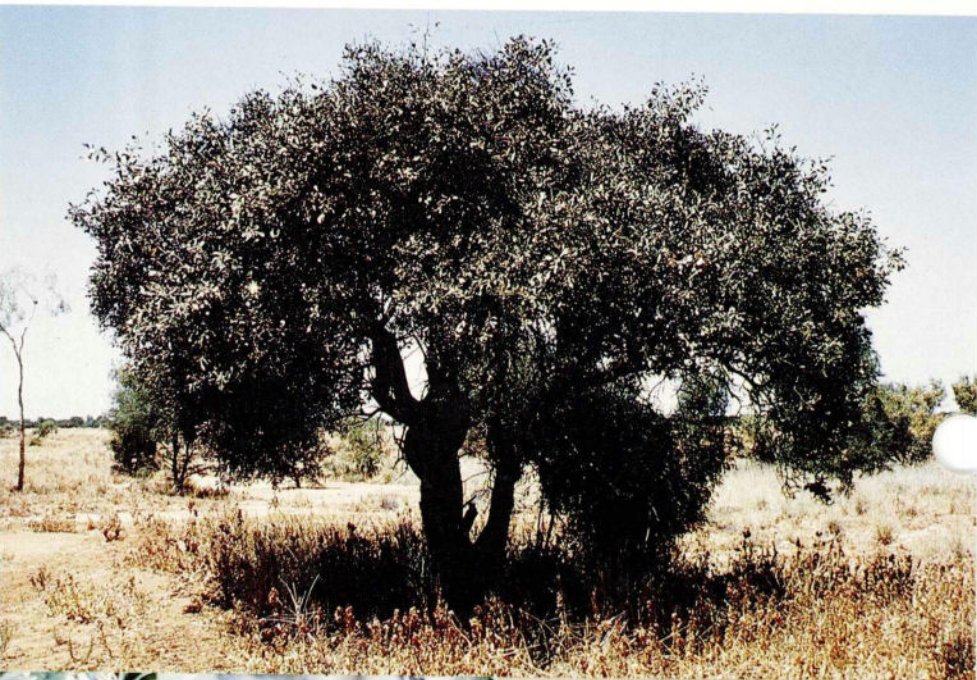
COMMON NAME	BOTANICAL NAME	PROTEIN G/100G	CARBOHYDRATE G/100G	KCALS
WATTLE	<i>Acacia</i> spp.	25	42	395
YULKA	<i>Cyperus bulbosus</i>	4	62	271
FIG	<i>Ficus platypoda</i>	6	-	-
IPOMEA	<i>Ipomea</i> sp.	2	52	228
BUSHBANANA	<i>Leichhardtia australis</i>	3	5	53
YAM	<i>Vigna lanceolata</i>	3	17	86

The question is often asked "Why didn't Aborigines cultivate and domesticate these bushtuckers and make their life a bit easier?". The answer is that they did practise a form of low-intensity agriculture by using fire to promote the growth of many edible plants. The adaptation of these plants to fire has important implications for garden cultivation. Many of the food plants grow in fire-prone habitats such as spinifex plains. They are usually most abundant in the first few years after a fire, before other plants re-establish dominance. This suggests that many bushtuckers prefer open, sunny, well drained positions, some even preferring disturbed situations. Other bushtuckers have evolved in habitats where fires seldom occur, such as rocky cliff faces, and these plants can of course be grown in quite different garden situations to the fire-tolerant species.

Cyperus bulbosus Vahl

Widely known as "Yulka" in central Australia, this sedge grows up to 40 cm high. The leaves are flat and generally semi-erect. The plant grows at almost any time after rains but most commonly during the summer months. It is found on open edges of salt-pans and creek banks. The edible part is the small tuber. It can be eaten raw or lightly roasted.

The tubers can be transplanted for growing. A period of heavy watering during warm weather should start them off. See photograph on page 128.



Santalum acuminatum

The tree — Photo P. K. Latz
Fruits — Photo G. Griffin

OPPOSITE TOP

Capparis mitchellii

Photo G. Griffin

OPPOSITE
LOWER LEFT

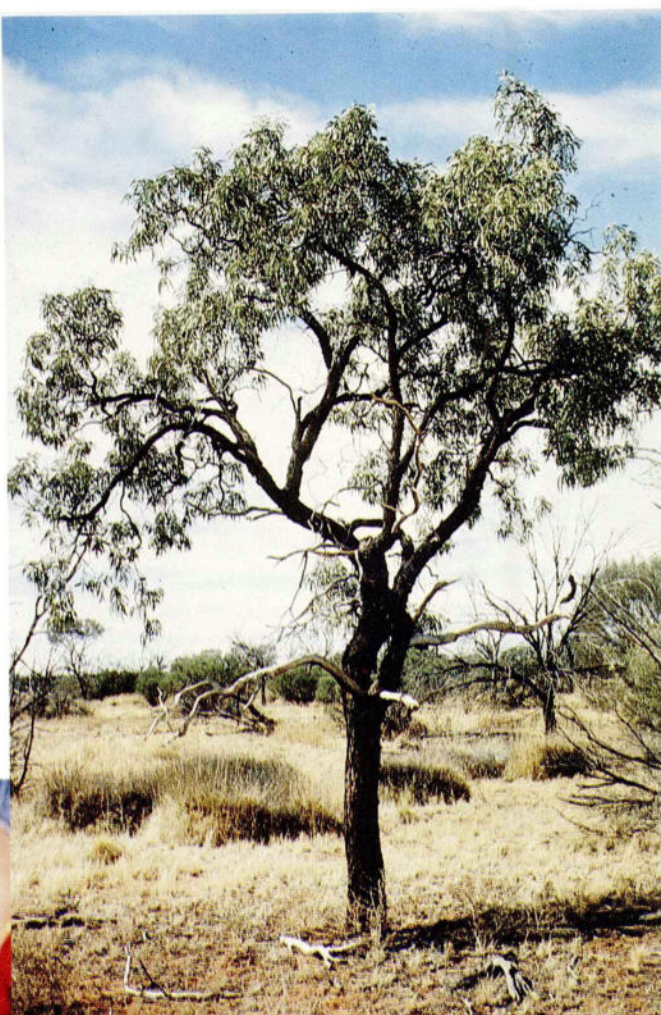
***Capparis nummularia*
var *spinosa***

Photo G. Griffin

OPPOSITE
LOWER RIGHT

Cyperus bulbosus

Photo G. Griffin



***Vigna lanceolata* Benth.**

The 'pencil yam' is a trailing perennial herb that usually grows after rains during the summer months. The tri-foliolate leaves and the yellow flowers on erect stalks characterise this species. It usually grows in sandy creek beds but is also found in spinifex plains country, particularly in the first few years after fire. The edible part is the long taproot that is usually within 50 cm of the surface. Fruit pods can become buried and appear as small 'white bulbs'. They are also edible. The root can be eaten raw or lightly roasted.

The rootstock is perennial but the foliage usually dies back during winter. The bulbs can grow for several years before harvesting. Seed produced on aerial shoots is usually abundant. It can be easily germinated by scarifying or applying hot water to crack the seed coat. Photograph on page 132 is by P. K. Latz.

***Ipomea costata* F. Muell. ex Benth.**

A low shrub or creeper with thick leaves. It grows on spinifex sand plains and is often common in the first few years after a fire. The edible part is a large tuber; up to 20 from a single plant may be obtained by digging down to a metre below the surface. Tubers can be 20 cm in diameter. The tubers should be baked in an oven.

Seeds can be scarified and germinated quite easily. Cuttings can also be struck. Root suckers are often frequent along roadsides and these can be transplanted. The plant is frost sensitive, but will resprout annually. Photograph on page 132 is by P. K. Latz.

***Acacia holosericea* A. Cunn. ex G. Don**

A shrub or small tree up to 4 metres tall. This quick growing frost sensitive species is normally found along watercourses but also in spinifex country after fires. It produces an abundant crop of edible seeds which can be ground to a flour and baked. The red arils that connect the seed to the pod can be used to make a dye.

Seeds can be germinated by scarifying or hot water treatment. The shrubs grow rapidly and may produce a seed crop within two years.

***Acacia victoriae* Benth.**

Prickly or Elegant Wattle is a common shrub along creek banks and in open woodland country in much of arid and semi-arid Australia. It forms a dense shrub up to 8 metres tall. A heavy seed crop is produced most years, generally in spring or early summer. The green seeds are edible after parching and grinding to a paste and baking. A gum that exudes from small wounds on the branches is also edible but not very tasty. It has been used as glue in the same way as 'gum arabic'.

The shrub is readily grown from seed that can be germinated by scarifying or hot water treatment. Shrubs can be pruned to form hedges.

***Ficus platypoda* (Mig.) A. Cunn. ex Miq.**

Native fig is a sprawling shrub up to 3 metres high and occasionally as large as 10 metres across. It lives on rocky outcrops, cliff faces and scree slopes where it both avoids fires and taps moisture from deep rock crevices. The edible part is of course the 'fruit' which grows to 1.2 cm in diameter and is most abundant in the early summer months. The figs can be eaten raw, dried and reconstituted later, dried and ground to a paste, or used for making jam.

I have not tried to germinate fig seeds but have found that cuttings strike readily. Because figs are uncommon and do not often get the chance to establish new members, young plants should not be uprooted from the bush to be taken home.

***Santalum acuminatum* (R. Br.) DC.**

Quandong is a shrub or small tree up to 4 metres high usually found in association with limestone and saline areas. The edible part is the flesh of the fruit which can be eaten raw, dried and stored or used in jams and preserves. The roasted kernels are also said to be edible. The kernels have a high oil content and can burn. The nuts have been used to make necklaces and marbles. See photograph on page 129.

Germination of seed is tedious but usually successful. The technique has been described in an earlier issue of Australian Plants (Vol. 9, page 316-318). Quandong is a root parasite, at least as a juvenile, and should be grown in close association with other host plants.

***Santalum lanceolatum* R. Br.**

Plumbush is a shrub or small tree less than 3 metres high. It usually grows along creek-banks and in gullies but can also be found on spinifex plains where it responds well to fire. The edible part is the black fleshy 'plum' which can be produced in abundance over the late summer period. Fruits can be dried and later reconstituted with water. The wood burns with an aromatic smoke similar to incense.

Germination of seed is rather difficult but is basically the same technique used for Quandong. The plant is a root parasite and needs to be grown in association with other plants, either grasses or trees.

***Enchylaena tomentosa* R. Br.**

Ruby saltbush is a low thick subshrub usually less than 1 metre high, often growing under the canopy of trees along creek banks or in woodland areas. The edible part is the small brightly coloured fruit which is often produced in large quantities. The fruits can also be used to produce a dye. See photograph on page 133.

Germination from seed is the easiest method of propagation. Allow fruits to dry and shrink. A light rubbing of the dried fruits between the hands followed by winnowing will separate the seeds out. Seeds germinate best in a warm but shady area.

***Capparis mitchellii* Lindl.**

Wild Orange is compact tree up to 4 metres high usually found growing in open woodland country and on calcareous soils. Flowering generally occurs over the early summer, following rains, and fruits ripen in mid to late summer. The edible part is the flesh between the seeds. Seeds and rind are not eaten. See photograph on page 128.

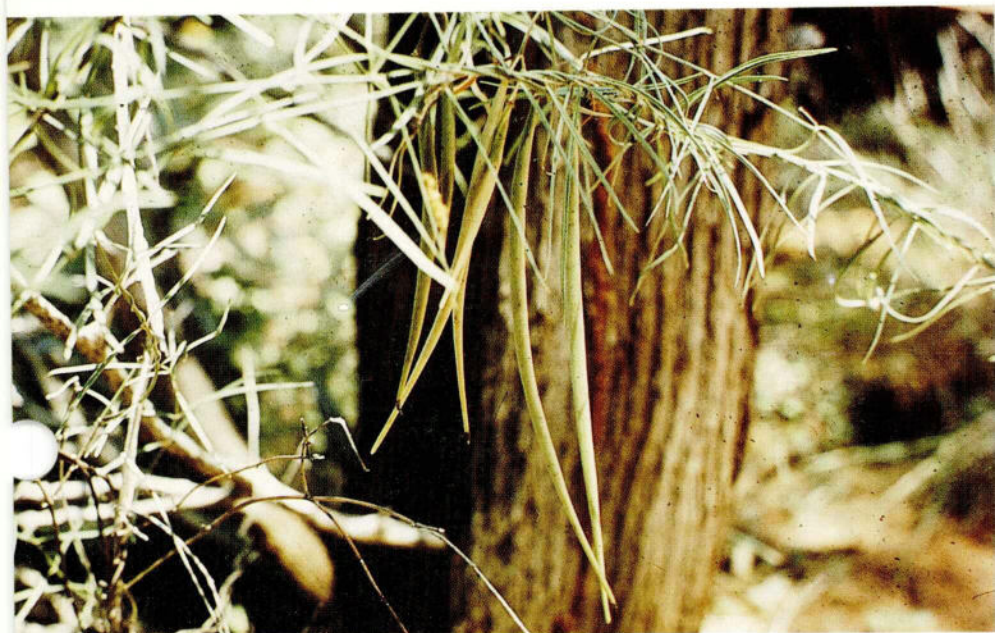
Fresh seeds can be easily germinated in trays or pots. I have found that washing and coating seeds with a fungicide prior to planting improves germination.

***Capparis spinosa* var. *nummularia* (DC) F. M. Bail.**

Wild Passionfruit grows as a low shrub up to 4 metres across and 2 metres high. A pair of recurved spines usually occurs at the base of each leaf, making the shrub difficult to penetrate. Flowering occurs in early summer and fruits ripen over the summer months. The edible part is the flesh between the seeds. Immature buds can be pickled in the same way that capers of the European form are. In central Australia the larvae of the Caper White Butterfly feed on the foliage of this plant, often completely defoliating it. It readily regrows however, in the next season. See photograph on page 128.

Fresh seeds should be extracted from the fruit and washed prior to planting. Coating seeds with a fungicide prior to planting improves germination. The plants generally prefer to grow close to the base of a large tree.





Rhyncharrhena linearis Photo P. Latz. ▲

▼ *Enchylaena tomentosa* Photo Ann Urban.

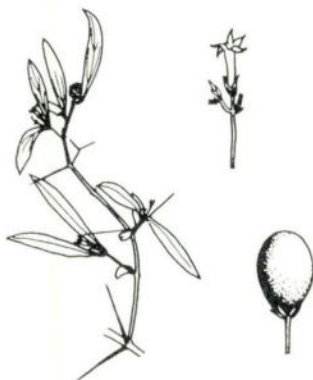


Opposite top to bottom: *Ipomea costata*; *Cucumis melo* sub sp. *agrestis*; *Vigna lanceolata*.

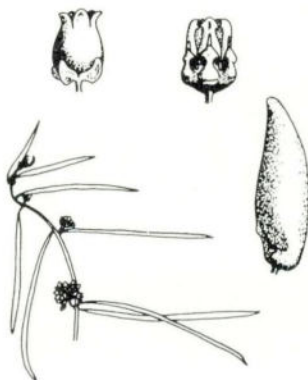
***Carissa lanceolata* R. Br.**

Conkerberry is a sprawling shrub up to 2 metres high. It occurs in open woodland and sandy country and is able to resprout after burning. The edible part is the fleshy berry (about 1 cm in diameter) produced in late summer. Fruits can be dried and subsequently reconstituted with water.

I have not tried germinating seed of this species but it would probably require some cracking treatment similar to quandong. Root suckers which are often abundant around existing plants can be transplanted.



Carissa lanceolata



Leichhardtia australis

***Leichhardtia australis* R. Br.**

Bush banana is a slender climbing vine found in all habitats and often common after a fire. Almost the whole plant is edible but the part most commonly sought after is the young green fruit. The white rind of the fruit is very palatable, particularly when the fruit is immature. The fruit is usually eaten raw but can be cooked.

Germination of seed is quite simple, particularly if it is fresh and the plumes removed. The vines are perennial but foliage may dry off after frosts or a dry spell.

***Rhycharrhena linearis* (Decne.) K.L. Wilson**

Bush bean is a slender vine that winds its way through the branches of trees. It occurs in mulga country and is often more common in the first few years after a fire. The edible part is the green whole fruit which resembles and tastes like a bean. Leaves and flowers are also edible.

Germination of fresh seed requires no special treatment. The 'plume' can be removed for easy handling. Seeds can be sown direct or germinated and transplanted. Ensure that the seedlings have something to climb on, preferably a low, much-branched tree.

***Cucumis melo* L. subsp. *agrestis* (Naudin) Greb.**

This nowadays-rare melon is an annually growing vine found on deep clay soils. It probably responds well to disturbed situations but it is very palatable to grazing animals and is nowhere common. The edible part is the flesh of the melon.

Germination from seed is simple and identical to the techniques used in starting most garden variety melons. Photograph on page 132 is by P. K. Latz.

Books on Wildflowers

The books available on wildflowers of the centre are far from adequate. For the professional and the student there is the "Flora of Central Australia" now being reprinted. There are numerous small pretty picture books very scrappy and superficial. We shall produce "Australian Plants of the Centre" by Ann Urban in 1986, a book that presents the wildflowers of the centre in beautiful colour but with sensitive interesting text.

Colour Your Garden

This magnificent book by Gwen Elliott was featured in the last issue of Australian Plants. It is now available from The Editor — Australian for \$17.95 plus \$2.05 postage. If you would like a garden of Australian wildflowers ablaze with colour, then this book is the one to get. Together with the companion volume "Australian Plants For Small Gardens and Containers" also available, the home gardener, especially for beginner.

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. any day. New comprehensive catalogue now available \$2.00 posted.

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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. 2750. Tel. (047) 77-4255. Four miles north of Penrith, between Tadmore and Taylor Roads. Open 10.00 a.m.-8 p.m. Closed Sundays.

Devonans Nursery — 188 Marco Ave., Panania, 2113. Tel. 77-8891.

Sydney Wildflower Nursery — Branches at Duffys Forest 450-1785, Heathcote 520-3335, Marsden Park 637-4585.

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.

Terania Rainforest Nursery — (Hugh and Nan Nicholson) — Specialising in rainforest trees and shrubs, wholesale and retail. Open weekends or by appointment. Mail orders accepted — minimum 1 box. Send three stamps for descriptive catalogue. Terania Creek Road, The Channon via Lismore 2480. Tel. (066) 88-6204.

Wirrimbirra Native Nursery — Hume Hwy, between Bargo and Tahmoor E. side 2574 (3 km 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.

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Les and Kay Nesbitt — 18 Cambridge St., Vale Park, S.A. 5081. Tel. (08) 261-1550. Specialists in the propagation of Australian terrestrial orchids. They are marked as flowering size bare root plants. Send for a price list enclosing 40c for postage.

Wildflower Nurseries in Tasmania

Banksia Nurseries Pty. Ltd. — 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 lines a speciality. Send S.A.E. for list.

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Austraffora — 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.

Neil Marriott's White Gums Nursery — Specialising in Grevilleas, small shrubs and rarer species. Situated 3 km along Warracknabeal Road from Western Highway, Deep Lead intersection (13 km from Stawell). Hours — Fridays, Saturdays 9.00 to 5.00 or by appointment. Phone: (053) 58-2885 (orders to Box 107, Stawell, Victoria 3380).

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Forestry in Central Australia

by Peter Sandell

The concept of plantation forestry in Central Australia sounds highly impractical. However, a recent project in Alice Springs has shown that several species will grow rapidly once water is no longer a limiting factor.

The principle of the project is that wastewater from the Alice Springs sewerage lagoons is used to flood irrigate a 25 ha plantation of trees. It is proposed to grow the trees on a short rotation of 5-6 years and to harvest them for firewood at the end of that period. Coppice regrowth from the stumps will then produce subsequent crops.

The advantages of the scheme are twofold. Firstly, it provides a method of disposing of sewerage effluent. Overflow from evaporation ponds would otherwise cause problems such as mosquito breeding. Secondly, the production of firewood for use by Alice Springs residents reduces pressure on native mulga stands which have traditionally been the main source of supply.

Naturally, there have been difficulties and there are potential hazards in a project of this type. The main difficulty is the salinity of the wastewater. The concentration of dissolved solids in the water is of the order of 900-1,200 mg/litre. The total alkalinity (CaCO_3) is approximately 500 mg/litre. Sodium is present at a concentration of approximately 220 mg/litre.

The presence of relatively high levels of sodium and carbonates is likely to cause problems by dispersing soil colloids and thus reducing soil permeability. In the long term this has the potential to reduce soil fertility, however the application of gypsum could help to maintain soil structure.

Another problem has been the vigorous competition from weeds promoted by irrigation. *Cenchrus ciliaris*, a perennial grass introduced to Alice Springs as a dust control measure, has become dominant in most areas. It has been controlled by periodic slashing until the trees attained canopy closure. Several annuals such as *Rumex vesicarius* and *Lactuca serriola* have also caused problems by over-topping seedlings. These species are exotics and in general it is the introduced weeds that have taken most advantage of irrigation. One exception is *Salsola kali* which has been vigorous, particularly on cultivated sites.

The first tree seedlings were planted in October 1980. These trees were measured in October 1983, at age 3, and averaged 8.7 metres in height. The tallest trees are approximately 12 m in height.

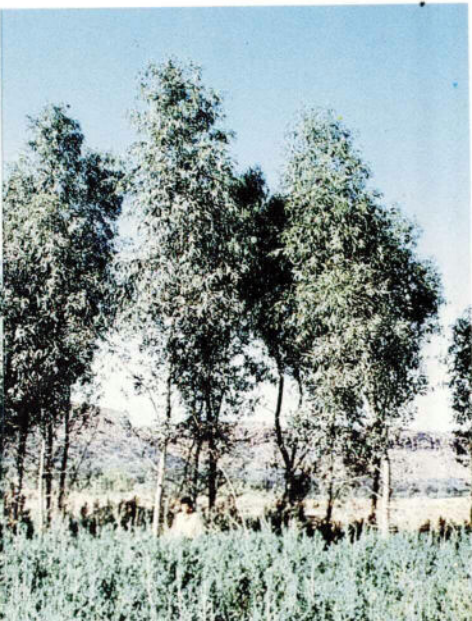
Several species have been tried as part of the project but the main species used has been *Eucalyptus camaldulensis*. The river red gum is the most widely distributed eucalypt

Top left: *Eucalyptus paniculata* and *Dalbergia sissoo* planted as part of a species trial.

Top right: *Eucalyptus camaldulensis* grown under effluent irrigation at age three years.

Lower left: *Eucalyptus camaldulensis*, Wiluna provenance, aged 2½ years.

Lower right: Two salt tolerant clones of *Eucalyptus camaldulensis* supplied by CSIRO; the Broken Hill provenance has the blue leaf and the de Grey River, the greener leaf.



on mainland Australia and it exhibits a great deal of genetic variation between populations. For this reason several different provenances of *E. camaldulensis* have been established in trials aimed at identifying those with the greatest growth potential. Although *E. camaldulensis* is little planted in Australia for wood production it is widely used overseas. About 500,000 ha have been established mainly in the Mediterranean region (Turnbull and Pryor Ed. Hillis and Brown).

Some provenances that have exhibited good growth to date are Mt Benstead Creek (N.T.), Mt Newman, and Charleville. The hybrid *E. x. "Trabutii"* has also shown excellent vigour.

Provenances that were introduced in 1983 include Katherine, Lake Albacutya, Docker River and a range of North Queensland and Kimberly (W.A.) provenances. Experience from overseas summarised by Lacaze indicated that the most successful provenance in arid and tropical regions is Lake Albacutya (Vic). Because Lake Albacutya is also a salt tolerant provenance it may prove to be very useful under effluent irrigation.

Other provenances that were found by Lacaze to be vigorous in arid regions were Katherine, Petford and Wiluna. Wiluna provenance is the one that has been planted most extensively as part of the Alice Springs project.

A total of 23 other species including two exotic species were introduced with the initial planting in 1980. The two exotics were *Dalbergia sissoo* and *Populus* sp. Five poplar clones were originally planted and of these clone 65/5 has been the most successful. Many of the clones exhibited low survival due partly to a heavy grasshopper infestation soon after planting which defoliated the cuttings. *Dalbergia sissoo* has grown well but has not recorded height or volume growth comparable to the eucalypts.

All species were planted at a spacing of 3×1.5 m with the exception of the poplars which were planted at 4×4 m spacing. The growth performance of some of the better species is comparable to that of *Eucalyptus camaldulensis*. For instance at age 3 years, *Eucalyptus tereticornis* had a standing volume equivalent to 55 cubic metres per hectare whereas the best *Eucalyptus camaldulensis* at the same age had a standing volume of approximately 80 cubic metres per hectare.

The criteria used in species selection were vigour, coppicing ability, salt tolerance and value as firewood. By these criteria *E. camaldulensis* appears to be the best species particularly if the salt tolerant clones such as Lake Albacutya and de Grey River exhibit high vigour.

The use of cloned material provides the opportunity to capitalize fully on genetic variation. The de Grey River and Broken Hill provenances planted in this project were cloned material supplied by CSIRO in Canberra.

The project has shown that dryland species such as *E. intertexta* and *Acacia aneura*, whilst they are good firewood, are not capable of efficiently utilizing irrigation water. Whilst their growth is faster than would be expected in a non-irrigated situation it doesn't approach the growth rates of those species that are adapted to wetter conditions.

Probably the major value of the project from a conservation viewpoint is that by growing an intensive fuelwood crop under irrigation the native woodland around Alice Springs can be better protected from firewood harvesting. The consumption of firewood throughout Australia is on the increase and it will become more necessary to cater for this demand in the future. ■

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