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Editorial

John Aitken, NSW Region Council

This edition of Australian Plants has been written and compiled by members of the South East District Group of NSW. Like many areas in Australia, plants and plant communities of the far south coast of NSW are being threatened by clearing for residential development. The articles by Jackie Miles and John Knight demonstrate the diversity and uniqueness of the plant communities of the Far South Coast NSW and highlight the need to be always vigilant about the potential impact of development on our native flora. Other articles are of a practical interest and include uses of Australian plants by Aboriginal people and early settlers, as well as landscaping with Australian plants in a variety of garden designs. The article by Sue Sullivan is a timely reminder about how we, as individuals, have the responsibility to identify the types of native plants that grow on our properties and the obligation to protect any identified and endangered species.

Note: This issue is date June 2008 to maintain sequence. It was, however, compiled in June 2009.

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Front Cover: *Eucalyptus maculata* and *Macrozamia communis* in bushland on Wagonga Inlet, Narooma (Photo: Margaret Lynch)

Back Cover: Eurobodalla Regional Botanic Gardens (Photo: John Knight)

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Native Plants in South East NSW

An Introduction

Bob Ross

The southeast corner of NSW is a diverse part of Australia – both from the standpoint of its plants, scenery and geology (see Jackie Miles' description of the far south coast of NSW starting on page 244). It isn't crowded, however, and the 70,000 people who live in the region (from north of Batemans Bay to the Victorian border, and between the ocean and the tablelands) are spread out in a number of small towns scattered mainly along the 250 kilometres of coastline.

The Far South Coast NSW "includes some of the most pristine and vulnerable ecosystems in Australia."¹ The area was the last part of coastal NSW to benefit from paved roads and coastal steamers were a major transport link to Sydney until after the Second World War. As a result the southeast part of NSW is relatively unspoilt, "where many small villages are separated by large natural areas."^(ibid) 33 percent of the region is in reserves managed by the National Parks & Wildlife Service. The region has six wilderness areas totalling over 109,000 hectares and it includes the only coastal wilderness area in NSW.² An estimated 70 percent of the coastline is in national parks.

Clearing for residential development is damaging ecosystems, however the major threat facing the plant communities of southeastern NSW is the growing incidence of drought and fire caused by global warming. Our involvement with growing and studying Australian native plants is complicated by the race to keep up with the growing variability of the weather. We can see our gardens adapting to increasing temperature variations and decreasing average annual rainfall and the bush is also struggling to cope with the changing weather patterns.

The superb national parks and bushland that surround us in this part of Australia are not well understood, but those of us who live here are well placed to report on the changes in our native plant landscapes. Our own native gardens mirror what is going on in the nearby bush and we may end up in the front line of attempts to protect native plant communities as our part of Australia continues to warm up and dry out.

1. 'Illawarra and South Coast Regional Strategies', NSW Government Department of Planning, Sept. 2005
2. NSW National Parks & Wildlife Service, Far South Coast Region Operations Plan 2004-2005



Plant Communities of the Far South Coast

Jackie Miles

The far south coast embraces the Shires of Eurobodalla and Bega Valley, extending from north of Batemans Bay to the Victorian border and west to the top of the coastal escarpment. The region is promoted as the "Nature Coast" to the north and "Sapphire Coast" in the south, justifiably, since it boasts many beautiful and remote beaches, coastal lakes and lagoons and, at times, sapphire-coloured seas. From sea level it rises to the edge of the Southern Tableland, varying in height from around 600 to 1100 metres.

The region is geologically diverse, with metamorphosed Ordovician siltstones, Devonian sandstone and conglomerate and granites being the most widespread rock types. Past volcanic activity has produced small patches of more fertile soils derived from basalt, monzonite or gabbro and patches of extremely infertile acid soils derived from rhyolite. These areas carry interesting, and often restricted, vegetation communities. Climatically, the region is on the edge of the summer and winter rainfall zones, with rain being relatively evenly spread throughout the year, but unreliable. The Snowy Mountains cast a rain shadow over the southern part of the region, intercepting moist air masses from the west. A low coastal range also intercepts some rain from the east, so that parts of the Bega Valley have an average rainfall not much higher than that of the nearby Monaro Plateau to the west. Rainfall varies from as little as 400mm in parts of the Bega Valley in a drought year, up to an average of 1200mm or more on the coastal escarpment and is generally higher in the north than the south. Temperatures also decline from north to south and occasional light snow falls occur on the escarpment. Consequently the region supports a wide variety of native plant communities.

Beaches and headlands

Most of the coastline is rocky, but there are numerous beaches scattered between headlands. Sand deposits are generally narrow, with little development of large dune fields, such as are found on the NSW north coast. An exception is the area around Broulee, north of Moruya. Typical beach vegetation is dominated by spinifex grass (*Spinifex sericeus*) and coast wattle (*Acacia longifolia* ssp *sophorae*), but considerably more minor native species (such as the dune thistle, *Actites megalocarpa*) persist on the far south coast than on the more "domesticated" beaches of the Illawarra and Sydney region. A typical succession behind the beach moves from coast wattle to coast banksia (*Banksia integrifolia*), then to saw banksia (*B. serrata*) and bangalay (*Eucalyptus botryoides*) with increasing dune age and soil development. Bangalay Sand Forest is listed as an Endangered Ecological Community (EEC) in NSW, as many stands have been cleared for residential development close to beaches.



Dune vegetation, Bar Beach, Narooma All photos in this article by J. Miles

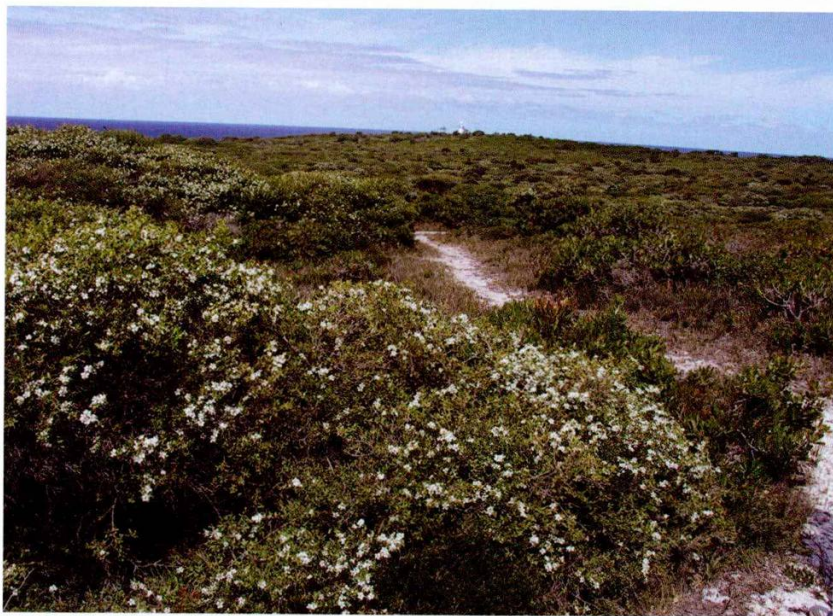


Headland grassland at Goalen Head

Headlands often carry a narrow band of salt and dessication tolerant scrub dominated by small trees, bracelet honey myrtle (*Melaleuca armillaris*) or drooping sheoak (*Allocasuarina verticillata*) and shrubs such as sea box (*Alyxia buxifolia*) and coastal rosemary (*Westringia fruticosa*). A few headlands, often on heavy clay soils derived from volcanic rocks, carry grasslands dominated by kangaroo grass (*Themeda australis*) or poa tussock (*Poa labillardierei*). Although all of these headlands were grazed in the past and the exotic pasture grass kikuyu has claimed some of them, most are now within Eurobodalla National Park (Mullimburra Point, Bingie Bingie Point, Jemison's Point) or Mimosa Rocks NP (Goalen Head). In the best examples, a good diversity of native wildflowers can still be found among the grass. In the absence of the Aboriginal burning which probably helped keep these areas open, many are being colonised by coastal scrub species. While this may be good for the birds, it is regrettable for botanical diversity. Themeda headland grasslands are listed as an EEC in NSW.

Coastal heath

Heaths are absent in the northern part of the region, where headlands are on either siltstones or volcanic clay soils. South from about Pambula infertile Devonian sandstones or Tertiary sediments form most of the headlands and heath is present on many of these. Trees are excluded by the shallow soils, occasional waterlogging and fire. Heath, being a highly flammable community, reaches its best development in Nadgee Nature Reserve, which covers much of the coastline south from Eden. As this is now a Wilderness Area, a high



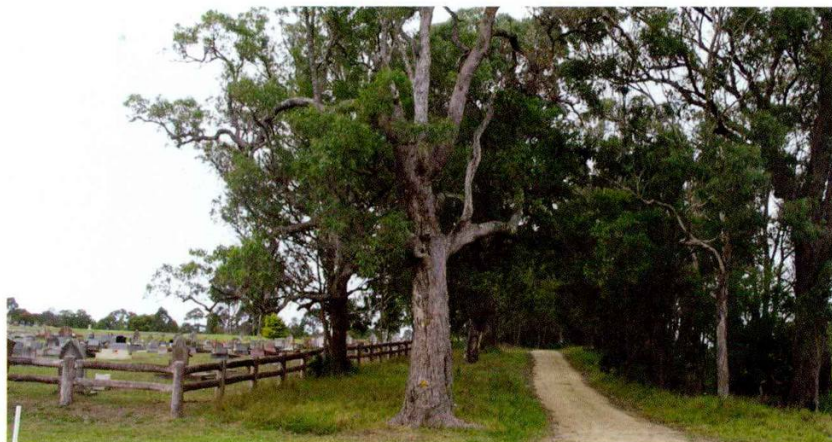
Coastal heath at Greencape

degree of fitness and determination is needed to visit these heaths. Fortunately Green Cape, in Ben Boyd National Park a little further north, carries similar and much more accessible heath. The heath can be drab if visited at the wrong time, but in a wet spring it can turn on a magnificent display of flowering shrubs. Several plants reach their northern limit of distribution in these heaths, ranging from the shrub *Hakea ulicina*, which is often dominant in dry heath, to less conspicuous species such as *Spyridium cinereum*, *Wahlenbergia gymnoclada* and the hidden violet (*Viola cleistogamoides*). Others are at their southern limit, including *Banksia paludosa* and *Symphionema paludosum*. The Nadgee area also shares a number of plants with the Sydney sandstone flora, despite the gap of over 200 kilometres between Nadgee and the most southerly outpost of the sandstone flora at Ulladulla. Notable among these is coastal teatree (*Leptospermum laevigatum*), which has a natural distribution gap between Green Cape and Jervis Bay. This is being steadily eroded by misguided planting of this species in the intervening coastal area.

Wetlands and riparian forests

The coastal strip is relatively narrow on the far south coast, the rivers short and the potential for wetland development limited. Of those wetlands that existed at the time of European settlement, many have been destroyed, deliberately or by accidental drainage resulting from gully erosion, by grazing and weed invasion. Numerous wetlands, however, still occur on the Moruya River floodplain, some protected within Eurobodalla National Park and Illawong Nature Reserve. Less disturbed wetlands often show a zonation from deep to shallower or sporadically wet areas, featuring sedges and floating aquatic plants in the middle, and swamp oak (*Casuarina glauca*) or swamp paperbark (*Melaleuca ericifolia*) around the edges. Saline wetlands (saltmarshes) are common as a narrow discontinuous fringe on coastal lakes and on estuaries such as the Clyde River, but are seldom extensive, since most of these have steep, forested shores with few flat areas. Many lakes are frequently closed to the sea and both salinity and water level fluctuate, making these areas difficult for plant life. A constant, slow-motion tug-of-war occurs on these shores, between swamp oak, which colonises at times of low water levels and saltmarsh plants such as samphire (*Sarcocornia quinqueflora*) which thrives when the lake mouth is open. Mangroves are absent from intermittently open lakes, but well developed mangrove stands are present on estuaries which remain open even in drought.

Riparian forests have suffered a similar fate to wetlands, many being cleared for farming or taken over by weeds in the most fertile parts of the region. Further back in the hinterland river oak (*Casuarina cunninghamiana*) forests remain intact on some of the larger rivers draining rough and inaccessible country, such as the Wadbilliga and Deua Rivers. In the less developed far south some rivers such as the Wallagaraugh and upper Genoa Rivers remain much as they were 200 years ago. As river oak does not occur south of Bega the riparian vegetation of these rivers consists of kanooka or water gum (*Tristaniopsis laurina*) and shrubs such as *Callistemon subulatus*, *Grevillea neurophylla* and various *Leptospermum* species growing among water-smoothed granite in the river bed.



Grassy Woodland at Moruya Cemetery

Grassy woodlands

The areas that supported grassy woodlands on granite-derived soils in the rainshadow areas of the Bega and Towamba valleys in the south and around Moruya in the north have been cleared for farming. There are no undisturbed stands left, but the stature of some old paddock trees, nearly 50 metres high and the high diversity of native wildflowers found in a handful of rural cemeteries hint at a former glory (see article on page 279). Forest red gum (*Eucalyptus tereticornis*) is the signature plant of these communities, although absent in the Towamba valley west of Eden and replaced by Maiden's gum (*E. maidenii*). Tableland trees, yellow box (*E. melliodora*) and snow gum (*E. pauciflora*), occur in a few locations and some of the grassy groundcover species also have tableland affinities. In steeper, marginal parts of the valleys, kurrajongs (*Brachychiton populneus*) and figs (*Ficus rubiginosa*), indicate the presence of the community known as Brogo Wet Vine Forest. Both this and the Lowland Grassy Woodland typical of less steep sites are listed as EECs in NSW.

Eucalypt forests

While the vegetation of the coastal valleys has been heavily cleared, most of the steeper hinterland, mostly on poorer soils, still carries forest. After the battles over woodchip-driven logging of the 1980s and 90s and the Eden and Southern Regional Forest Agreements much of this forest is now reserved in a large number of National Parks. Together, South East Forests, Wadbilliga, Deua, Monga and Budawang National Parks protect much of the coastal escarpment, although large areas of production forest remain in the far south.

Eucalypt forest types are many and varied, but drier forest predominates, except in the relatively well-watered area north of Batemans Bay and on parts of the escarpment. Anyone who has holidayed in the region will remember the spotted gum (*Corymbia maculata*) forests, often with a dense understorey



River flat Eucalypt forest, North Moruya



Wet Escarpment Forest, tree ferns

of burrawangs (*Macrozamia communis*), which dominate the coastal areas between Batemans Bay and Bega. Spotted gum does not occur south of Bega, where the sandier soils derived from Devonian sandstone are more suitable for red bloodwood (*Corymbia gummifera*), silvertop ash (*Eucalyptus sieberi*) and white, yellow and blue-leaved stringybarks (*E. globoidea*, *E. muelleriana*, *E. agglomerata*) which are the dominant species of more southerly eucalypt forests.

Fire has a great influence on these forests, with the understorey often colonised by more mesic (moisture-loving) shrubs in long-unburnt areas. Forest in more fire-prone locations tends to be dominated by shrubs which are capable of resprouting after fire, sometimes only a handful of species being present. The highly diverse understoreys common in the Sydney sandstone flora are rare on the far south coast, but occasionally found on patches of similar poor sandy soils.

Wetter eucalypt forests occur along the top of the escarpment, where higher rainfall makes fire a relatively infrequent event. Typical trees of this area include brownbarrel (*E. fastigata*), messmate (*E. obliqua*), monkey gum (*E. cypellocarpa*), mountain gum (*E. dalrympleana*) and narrow-leaved peppermint (*E. radiata*). Soft tree ferns (*Dicksonia antarctica*) and ground ferns are a prominent feature of the wetter areas and patches of basalt-derived fertile soils.

Rainforests

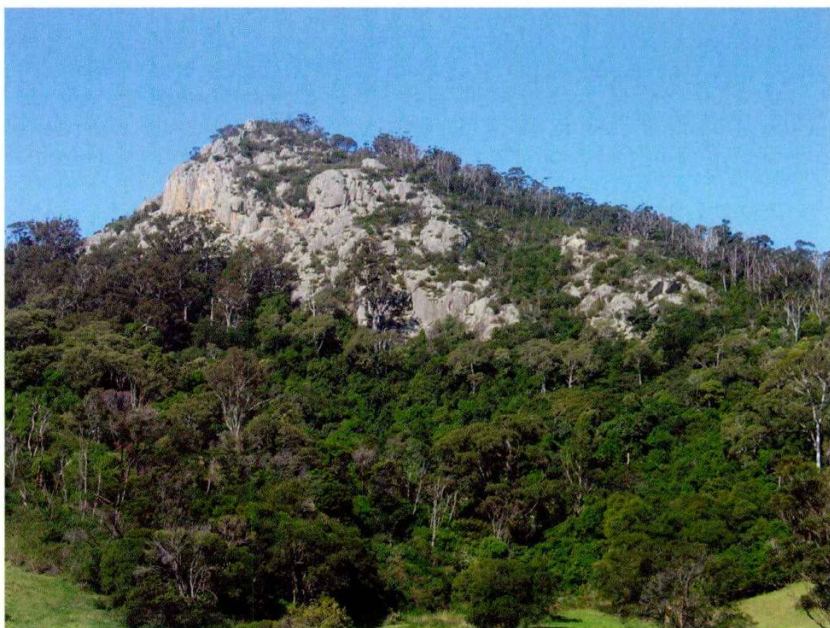
Rainforests are up against it in the far south of NSW. The lower summer rainfall makes the area more fire-prone than the north and central coasts, so that rainforest tends to be confined to protected parts of the landscape, mostly gullies with a sheltered (south or easterly) aspect. The high sandstone cliffs of the Sydney Basin, that provide topographic protection from fire, are also lacking. Despite the shortage of rainforest niches, there are still a number of different types in the region. Cool temperate rainforest is largely restricted to



Brogo Wet Vine Forest near Tilba Tilba



Backhousia Dry Rainforest near Bodalla



Little Dromedary Rock Scrub and Subtropical Rainforest

the escarpment and dominated by pinkwood (*Eucryphia moorei*) in the north and black oliveberry (*Elaeocarpus holopetalus*) in the south. In the far south both of these species occasionally occur almost to sea level. Warm temperate rainforest is the most widespread type, with typical dominants being lillypilly (*Syzygium smithii*, formerly *Acmena smithii*) and sassafras (*Doryphora sassafras*). Subtropical rainforest, with a greater diversity of tree species and more epiphytes such as bird's nest fern (*Asplenium australasicum*) and elkhorn fern (*Platycerium bifurcatum*), is found in a few favoured areas with fertile soils and a mild maritime climate, most notably north of Batemans Bay and at Gulaga (Mount Dromedary) south of Narooma. Gulaga is the southern limit for several rainforest plants, although the presence of relict small-leaved fig (*Ficus obliqua*) in paddocks north of Tathra suggests that subtropical rainforest formerly extended further south on pockets of fertile volcanic soil.

Dry rainforests in the region take two forms. Grey myrtle (*Backhousia myrtifolia*), grows in more exposed gullies than those which harbour other rainforest types, and Port Jackson or rusty fig (*Ficus rubiginosa*) grows on rocky slopes, often north-facing. Both types have low species diversity. Littoral rainforest grows on sea cliffs, sand bars at the mouths of coastal lakes and other fire-protected coastal sites, but is much less extensive and diverse than stands found further north.

Rock scrubs

While these communities occupy very little of the region in terms of physical space, they carry a disproportionate number of interesting plants, many of them local endemics. Plants in this habitat have to be very drought-hardy, growing as they do in skeletal, usually very infertile, soils, often on cliff-tops. Rhyolite scrubs occur in two areas, in Deua National Park west of Moruya and the Yowaka-Nullica area west of Pambula. The latter area has several rhyolite endemics, all listed as threatened: shrubs *Zieria formosa*, *Z. parrisiae* and *Z. buxijugum* are each known from a single location (see article on page 274), while *Westringia davidii*, *Leionema ralstonii* and the orchid, *Genoplesium rhyoliticum*, are known from several outcrops. Another shrub, *Grevillea irrasa* ssp *irrasa*, is known only from the same area, but occurs in forest, not scrub. In the Deua scrubs there is *Grevillea rhyolitica* ssp *rhyolitica* and *Pomaderris gilmourii*. By contrast, the shrub *Zieria tuberculata* grows only in the Central Tilba area, where it is found around monzonite outcrops. Soil derived from monzonite is quite fertile, and this species is threatened by past clearing, stock grazing (many remaining populations are in paddocks) and invasion of its habitat by lantana.

The mallee eucalypts *E. wilcoxii* and *E. spectatrix* and the tree wattle *Acacia georgensis* grow on cliffs in Wadbilliga National Park and the adjacent Bemboka Section of South East Forests NP. The latter two species can be seen more easily on Dr George Mountain east of Bega, while *E. wilcoxii* is visible on cliffs at the upper end of Brogo Dam. These small trees are attractive and hardy and deserving of a place in our gardens, although unfortunately the mallee habit is often lost in cultivation.

More Than a Pretty Plant

A look at uses of some Australian plants

Margaret Lynch

The plants chosen for our garden on Wagonga Inlet, Narooma have a variety of qualities: beautiful flowers and fruits, attractive foliage, interesting forms and textures. Some even smell nice and together they attract a multitude of birds and provide homes for many other creatures, but many Australian plants have additional attributes used by people in times past.

To Aboriginal people plants were an important source of food and medicines but also provided material for making nets, traps, containers, tools and weapons essential to their survival. Objects for ceremonial use and decoration also came from plants.

When the plant hunters travelled the world in search of new species they were often looking for "useful" plants as well as the unusual. It was no coincidence that many had medical backgrounds as most medicines were plant-derived and botany was a prerequisite for medical training. Those times were also characterised by natural products providing material needs, leading to interest in nature and hence the plants of the world.

Early settlers to Australia needed to supplement meagre supplies and looked for native plants with similar characteristics to those used in Europe. Products suitable for export were also keenly sought. The first book to record uses of Australian plants was published in 1889, *The Useful Native Plants of Australia* by JH Maiden, then curator of the Technological Museum of New South Wales and later director of Sydney Botanic Gardens, 1896-1924. In a present day world of synthetics, plant uses beyond the garden landscape are almost forgotten, perhaps with the exception of forests, essential oils such as eucalyptus, some crafts and the now popular bush foods.

Following is an example of the uses for some plants that grow well in our garden. While not recommending gardeners use plants for these purposes it may add some extra interest and focus in the story of gardening. What lies behind many other pretty Australian plants?

Acacia ssp (wattles) have been used by humans for thousands of years in Australia. Aboriginal peoples in many areas used the seeds of some wattles as a food either eaten green or as a flour ground from mature seeds, mixed with water or breast milk and cooked in hot coals. Wattle gum was also eaten, some bark used as medicine and wood made into tools and weapons. Early settlers used saplings for construction of their wattle and daub huts. This involved interweaving branches and overlaying with mud, a commonly used construction method in Europe and termed 'wattling'. It was from this use that the name 'wattle' eventually became associated with the acacias. Early tanning industries were also founded using the bark of some wattle species. Our floral emblem *A. pycnantha* and *A. mearnsii* formed the basis of an extensive industry due to the high tannin content of their bark.

Wattle seed has made a comeback with the interest in bush foods, ground seed being used to flavour products such as breads, biscuits, pasta and even ice cream. A warning though, only a small proportion of species (around 50) have edible seeds and many contain toxins so stick to commercially available wattle seed products!

With a huge number of species and cultivars varying from prostrate and low-growing to larger shrubs and trees there is a wattle for every garden. These useful leguminous plants with nitrogen-fixing bacteria in root nodules enhance soil fertility. Wattles are fast growing and will provide excellent shelter or screening. Most respond to pruning after flowering and a regular prune will extend the life of the plant. Seeds are also an important source of food for many birds. King parrots and rosellas have been munching away in the trees here for weeks. Among the favourites for this area are *A. covenyi* and *A. cognata*, both with beautiful foliage as well as bearing masses of flowers.

Alphitonia excelsa (red ash) is a small tree with silver-backed leaves that produces creamy-white flowers in summer followed by black berries. Birds are attracted by both the berries and the insects which feed on the leaves. Aboriginal people in some areas used the crushed leaves and berries to stun fish in small pools. Various parts of the plant were used as medicine. For example, crushed leaves relieved headache; bark and root were used as a gargle for toothache; young shoots were chewed for stomach upsets. The timber has been used for cabinet work. The leaves have a high content of saponin (as do *Pittosporum revolutum*) and can be used as a soap substitute.

Banksia, grevillea and ***callistemon*** species that are grown in our gardens for their colourful floral displays provide sweet nectar which was often relished by Aboriginal people and sometimes used to sweeten water. Dried old banksia cones were also used to carry fire between campsites.

Billardiera scandens (apple berry) is a sprawling climber with pendulous yellow-green bell-shaped flowers in summer followed by oval fruits. The fruit when ripened to a pale brown colour and soft were eaten by Aboriginal people



Acacia covenyi



Billardiera scandens photos: J. Knight

raw or sometimes quickly roasted. These were among the first plants tried by early settlers.

Brachychiton populneus (kurrajong), a small tree with attractive bell-shaped flowers, provided food and fibre to Aboriginal people. The seeds were eaten as well as the roots. The inner bark was made into string for fishing lines and used to weave nets. Early explorers were reported to have ground the seeds as a substitute for coffee. The foliage is sometimes used as a fodder in times of drought where trees still exist on farms.

Clematis glycinoides, an attractive climber with white starry flowers in spring, is known as headache vine to Aboriginal people. The leaves were crushed and inhaled to relieve headaches and colds.

Crinum pedunculatum (swamp lily), a stunning large lily with broad upright leaves and clusters of white flowers in summer, was used by coastal Aboriginal peoples to soothe marine stings. The sticky substance released when the leaf is broken numbs the skin and calms the irritation.

Dianella spp. (blue flax lilies), clumping lilies with flax-like leaves, produce spikes of bright blue flowers in spring and summer followed by equally bright blue berries. The berries were eaten raw by Aboriginal people and the roots roasted and eaten after being pounded on rocks. Fibre from the leaves provided material for nets and baskets. The Aboriginal people of Wreck Bay NSW made a high-pitched whistle from the leaves of *Dianella caerulea* and by imitating the distress call of wrens is said to have attracted snakes which were killed and eaten.

Dodonaea viscosa (hopbush) is a shrub whose common name refers to the use by early settlers of the capsules in the brewing of beer. It is these coloured winged capsules that are the shrub's main attraction though a purple leaved



Macrozamia communis photo: J. Knight



Crinum pedunculatum — Swamp Lily
photo: S. Grahame



Pimelea linifolia photo: J. Knight

form is available. Chewing the leaves without swallowing relieved toothache and in some areas Aboriginal people also used chewed leaves to treat stingray wounds.

Hardenbergia violacea - the leaves were used as a tea substitute by the early settlers. They are said to have a sarsaparilla flavour. It produces masses of purple pea flowers in early spring and these have been used as a dye.

Livistona australis, whose common name of cabbage palm stems from the fact the cabbage-like growing point was eaten by both early settlers and Aboriginal people who also used fibre from the 'bark' for making baskets, fishing lines and nets. Leaves could also be used in this way and for shelter. Cabbage tree hats were much sought after by settlers and made by splitting previously soaked and dried leaves which were then plaited and sown. The stout trunks of the palm formed the corner posts of the early shelters of the first settlements.

Lomandra longifolia has tough leaves which were ideal for Aboriginal people to weave into baskets and mats. They could also be used as bandaging material for wounds and sores. Juicy white leaf bases were eaten as well as the flowers and seeds.

Macrozamia communis (burrawang) is extremely slow growing but the female plant, when mature, produces large cones of red fruit. Aboriginal people used the starchy seeds as a food source but these required considerable pounding, baking and washing in fresh water before being ground into flour to remove dangerous toxins. This cycad was an important source of high quality natural starch in the early 1900s. The starch was extracted from the tuberous stems, the first extraction used as laundry starch and the second used to make adhesive paste. Starch from the seeds could be used in a similar way.

Melaleuca spp. (paperbarks), whose papery bark is mainly made up of thin layers of cork cells and is a waterproof material that was useful to Aboriginal people in many ways. Pieces were used to wrap babies and sheets used as blankets in cold weather. Bark could keep rain off, protect feet from stones, wrap injured limbs, be made into small canoes, knife sheaths and temporary shelters. Bark was laid over meat and hot stones in ground ovens to retain moisture and heat. Settlers used the bark for insulation, packing and caulking boats. It has also been used to fill mattresses and pillows. The aromatic leaves of some, such as *Melaleuca hypericifolia*, were used to relieve headaches and colds and clear congestion. Both *Melaleuca* and *Leptospermum* spp. are commonly termed teatrees relating to the use of their aromatic leaves by early settlers as a tea substitute.

Pimelea linifolia (rice-flower) has extremely tough bark which was used to make a strong string. Other *Pimelea* species were also used for this purpose and commonly referred to as 'bootlace bush'. Aboriginal people gathering in the high country during summer used the string to make fine nets to catch bogong moths.

Tetragonia tetragonoides is a sprawling plant with bright green leaves and perhaps the first plant to be used by Europeans on the east coast of Australia. The leaves were collected by the crew of the Endeavour in 1770, cooked and eaten to prevent scurvy. Seeds were taken back to England where it became favoured as a summer 'spinach'. It is now used extensively as a bush food and marketed by the more attractive name 'warrigal greens'.

Xanthorrhoea spp. (grass trees). All parts of the bush icon had a use for Aboriginal people. The white bases of young leaves were eaten, roots could be baked and eaten, edible grubs were often found at the base of the trunk and nectar was collected from the mass of tiny white flowers which were also soaked in water to make a sweet drink. The stem of the flower spike made a shaft for spears and its soft wood also made a base for firedrills. Seeds from the flower stem could be crushed to make flour. Resin collected from the trunk when melted was used as an adhesive to attach axeheads to handles and tips to spears as well as waterproofing bags and making other tools. Europeans used the resin in the manufacture of a cheap alternative to shellac. It has also been used as a metal coating. There are some reports of its use in the manufacture of gunpowder.

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Grevilleas of the Lower South Coast NSW

John Knight, Manager, Eurobodalla Regional Botanic Garden

Our local grevilleas may not have the flashy flowers of the many northern hybrids such as the ubiquitous *Grevillea* 'Robyn Gordon' or *G.* 'Moonglow', but our avian visitors do not seem to mind.

Grevilleas are appreciated as valuable garden plants because they are long flowering and a ready source of nectar for honeyeaters. Most are reliable provided the soil is well drained. Even local grevilleas are susceptible to root rot diseases during the warmer, humid months if planted in poorly drained soil. Grevilleas also appreciate plenty of light, and full sun is best for most species. There are some which grow and flower well in shade and most will do well in dappled light, such as that provided by overshadowing of open canopied eucalypts.

Like most Australian plants, grevilleas respond to pruning to maintain a compact shape, but some do not appreciate a severe cutting back and may not grow away if pruned back to old wood. For safety, it is best to prune regularly, during or just after flowering, removing most of the current year's growth. As cut flowers, grevilleas may last only a few days, but can make a change to the usual floral displays in our vases. If cutting for floral display, it is best to remove the soft new growth to prevent early wilting which would see the flowers wither early as well. The use of hair spray on the flowers will increase vase life.

Which plants should you grow?

Smaller shrubs

Despite its Plain Jane appearance, *Grevillea mucronulata* is hard to beat as a small shrub. Found in drier forests along the coast and adjacent foothills, it grows as a compact mound, up to 1 m high and about 1.5 m across, with small, crowded, light green leaves. Because it hides its tiny flowers among the leaves, is usually overlooked when choosing plants. This is a pity, because the reddish green flowers produce copious nectar which is eagerly sought by New Holland Honeyeaters and Eastern Spinebills in particular. These birds are so busy gathering food that they take no notice of busybody gardeners closely observing their routine.

G. mucronulata flowers mostly through winter to early summer, but some flowers appear at other times, especially following a growth period after pruning. You can grow this plant in full sun or part shade, and it thrives under eucalypts. Once established it requires little maintenance and is quite happy with what nature provides.

Grevillea lanigera is found in coastal heath in the far south and also at higher elevations, with a number of forms. Coastal forms are generally low growing,



Grevillea mucronulata All photos in this article by J. Miles



Grevillea lanigera

with small, tightly grouped dark green leaves, and grow about 50 cm high with a spread of about 1.2 m. Those from higher elevations are rounded shrubs to 1.2 m with larger, noticeably hairy mid-green leaves with a more open habit. Interestingly those at higher elevations occur naturally along creek banks, in close company with other shrubs, but are apparently happier in the garden when grown in the open. This may be because the hairy leaves are affected by our high coastal humidity. Leaf drop is noticeable during summer when grown under other plants, but not when grown in the open. A strongly upright shrub to about 1.5 m has proved a difficult form to maintain, as only the new growth remains on the plant, with old leaves falling early. Pruning does not help. Bird attracting bright pink and white flowers are displayed right along the branches from winter through spring and Crimson Rosellas have been observed destroying the flowers whilst busily and noisily feeding.

Pruning after flowering is beneficial, and summer watering should be left to nature, although watering during dry spells in autumn and winter would assist with greater flower production. Well drained soil is essential for this very rewarding small shrub.

Another low growing, mounded plant is *Grevillea baueri* ssp *asperula* which is found on the nearby plateaux. Interestingly this plant has been collected from dry stony ground and along permanent streams growing in full shade. The subspecies name "asperula" refers to the leaves which are rough to the touch. As a garden plant, it grows to 1m high, and up to 2m wide. The foliage is a dark green, with contrasting light green or bronze new growth. Flowers are a deep pink, borne in clusters along the branches, similar to *G. lanigera*. In the garden, it is best to provide full sun and well drained soil and you will be rewarded with a long lived, hardy plant. Regular pruning after flowering is beneficial.

Not all grevilleas supply nectar for birds. Those which provide food for butterflies and other insects are just as important. *Grevillea linearifolia* is a generally upright, but lax shrub with white to cream flowers which is found on sandstone derived soils. Plants generally grow as part of a bushy understorey and are quite happy in semi shaded positions in the garden. *G. linearifolia* grows to about 1 to 1.5 m high and about 1.2 m wide, but can be kept smaller by regular pruning. Good drainage is recommended, although this plant is more tolerant of damp conditions. Flowering is from winter through summer and you will notice a variety of insects eager to assist with pollination. These are in turn preyed upon by equally eager birds.

A small suckering plant with pink flowers, thought to be *G. patulifolia*, is a delightful shrub for a rockery, rarely exceeding 30 cm in height. Flowers are well displayed, held in the upper leaf axils. The plant was collected from the Clyde River catchment west of Milton.

Somewhat larger is another related grevillea, *G. neurophylla* which grows more erect, to 2 m high and up to 1.2 m wide. South Coast botanist Jackie Miles has collected *G. neurophylla* ssp *fluviatilis* on the rocky beds of the Genoa and Wallagaraugh Rivers. It has narrow foliage about 40 mm long, with a pungent point and prominent midvein, hence the species name. White to

cream flowers, sometimes suffused with pink tinges are borne during spring and summer. Whilst not common in cultivation, *G. neurophylla* should adapt to most garden soils that do not dry out readily and tolerates both full sun and semi-shade. All grevilleas in the *G. linearifolia* complex respond to light pruning, but do not appreciate cutting into old wood.

Larger shrubs

In recent years *Grevillea victoriae* has been revised and a number of related plants separated. The 1993 publication *Grevillea*, (McGillivray with Makinson) attempted to pigeon hole the many unassigned specimens then lumped with *G. victoriae*. They came up with 11 'races' and many unassigned groupings. This was never going to work. At the same time Olde & Marriott were working to complete their 3 volume "The Grevillea Book" in an attempt to resolve the many anomalies demonstrated in existing publications. Their work proposed a number of new splits at species level, but with *G. victoriae* they noted "Some populations in this complex deserve recognition as species", but retained the groupings proposed by McGillivray. Subsequently Molyneux & Stajsic undertook a detailed assessment of the complex and conducted field research to try to classify *G. victoriae*. This work may not yet be complete, but currently up to 10 species and a number of subspecies have been identified, and are found in "Flora of NSW, Vol 2, 2nd ed" published in 2002.

The ranges west of Moruya sustain large populations of grevillea and many have proved reliable garden plants.

Grevillea sp. aff *victoriae* 'B' has been classified as *G. rhyolitica*. This is a popular shrub, being long flowering and tolerant of shade. As the name suggests, it grows on fine grained rhyolite based soils, often found along creek banks with *Prostanthera* species and *Tristaniopsis laurina*. As a garden plant the ssp. *rhyolitica* can be expected to grow to 2 – 3 m, with an open habit and arching branches.

There is a much more compact form in the trade, known as *Grevillea* "Deua Flame". It has much hairier foliage and leaves somewhat smaller than the typical *G. rhyolitica* and was collected by staff of the Eurobodalla Regional Botanic Garden (ERBG) and Australian National Botanic Garden. It grows in thick scrub with *Crowea exalata*, *Bursaria spinosa* ssp. *lasiophylla* and *Kunzea ambigua*, with very little tree canopy on an east facing slope about 100 m above Coondella Creek, a tributary of the Moruya (Deua) River. Its bright red flowers stood out like a beacon to keen plant collectors. Yarralumla Nursery in Canberra arranged for its propagation and trialling and since being released to the public it has become one of the best selling grevilleas, proving tolerant of most garden conditions other than poor drainage. Once established it is quite hardy and naturally compact, to about 1.5 m, and is rarely without flowers. Pruning should be light only, as the plant is slow to produce flowers following heavy pruning.

Grevillea rhyolitica ssp. *semivestita* (*G. victoriae* race g) generally grows away from creeks and can be found on apparently dry rocky slopes with a sparse canopy of *Eucalyptus sieberi* (silvertop ash) and few other shrubs. As a

garden plant, it can be expected to reach 2.5 m and is fairly compact in habit. It has proved easy to grow where good drainage is ensured and copes with full sun or semi-shade. Unlike the *ssp. rhyolitica*, the branches are more erect and the plant tolerates pruning much better. Recently, a white flowering form was discovered by Ryan Harris, then apprentice at ERBG, and currently working at RBG Cranbourne. In a population of some 400 plants, just one had white flowers and was fortuitously flowering at the time. It has proved easy to grow in cultivation and flowers from winter to early summer.

Grevillea epicroca is also a shrub to about 2.5 m, being found on rocky hillsides again with *E. sieberi* as an open canopy, but generally in moist forests. It is a rare plant, known only from a few isolated populations. Recent bushfires killed one population and only a few seedlings have re-established. The plant is easily propagated and grows readily in well drained soils in full sun or semi shade. Red flowers are borne from summer to early winter, filling in the gap so often left by other grevilleas. *G. epicroca* can be confused with *G. rhyolitica* *ssp. semivestita*, but is distinguished by appressed hairs on the flower bud limb. It is no wonder we have trouble sorting out which is which. However, when growing together the plants are discernibly different.

Grevillea irrasa is another medium shrub to 3 m which has continually confused botanists. McGillivray suggested it was *G. victoriae* 'race I' and Olde & Marriott placed it with *G. miqueliana*. *G. irrasa* ("unshaven") refers to the rough, granular upper surface of the leaves, especially older leaves. This

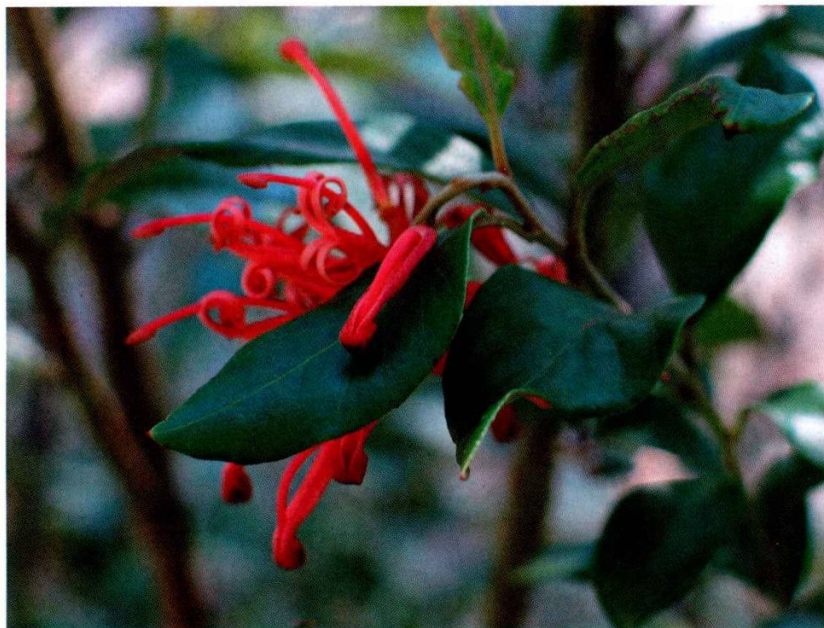


Grevillea irrasa *ssp. irrasa*

character readily identifies the plant. *G. irrasa ssp irrasa* is very restricted in distribution, growing in the South East Forests N.P. Yowaka Section and the adjacent Nullica State Forest, in dry eucalypt forest on poor sandy soil derived from rhyolite. Flowers are prominently held at the end of branches for many months from winter to summer, and the plant copes well with pruning.

G. irrasa ssp didymochiton ("with two types of hairs") grows in the catchment of the Tuross River south-west of Moruya. It is never common, but a number of populations have been noted. It is found on dry rocky soils with plants such as *E. sieberi*, *Allocasuarina littoralis* and *Callitris rhomboidea*. It is often also found with *Callistemon citrinus*. Very hardy in cultivation, long lived and showy, it adapts to full sun and quite shaded situations, surviving on whatever rain falls, once established. There is a procumbent form south of Nerrigundah, also easy to grow, but it remains open and sparse in habit.

Grevillea oxyantha is distinguished from others in the *G. victoriae* complex by its pointed subpyramidal limb of the flower bud. The south coast form, variously known as *G. victoriae* A.C.T. form, and *G. victoriae* 'race a' is a compact medium shrub of 2–3 m with round to ovate leaves. Flowers are dark red, held prominently at the end of the branches, but in some forms the flowers are somewhat hidden amongst leaves. The plant is very hardy in cultivation, tolerating full sun or semi-shade. A form collected from east of Big Badja grows in moist forest in heavy shade and is quite happy in similar conditions in the garden. Pruning should be done regularly, as the plant does not appreciate cutting back to old wood.



Grevillea oxyantha, at Brown Mountain

Two other species have also been raised from the *G. victoriae* complex: *G. parvula* and *G. bemboka*.

G. parvula is a small shrub, 1.5 to 2 m, with leaves 25-40 mm x 10-15 mm, found on the far south coast and adjacent ranges, from about Eden to Mallacoota and west to Wog Wog Mountain. It grows either close to streams or on elevated rocky peaks! Red flowers are sparse and displayed at the ends of young branches. A similar but as yet unassigned form grows near Tabletop Mountain south-west of Moruya on east facing slopes at about 900 m, on scree.

G. bemboka occurs in the South East Forests N.P. Bemboka Section and was first thought to be an intergrade between *G. parvula* and *G. oxyantha*, which grows nearby on Brown Mountain. It is distinguished from these species by its glossy leaf surface and rusty rather than reddish purple new growth. Growing on steep rocky slopes and adjacent creek banks, *G. bemboka* should be hardy in cultivation. In full sun it is generally rounded, to 3 m but in shaded and moister sites is a taller and straggly, more open plant. Red flowers can occur at any time during the year, but usually from late winter to summer.

Grevillea macleayana was previously included as a subspecies of *G. barklyana*, but has been raised to species rank. It grows generally as a low sprawling shrub in the Nowra area, but a disjunct population has recently been discovered in the Deua N.P. above Diamond Creek. Here it grows almost tree like, with a stout trunk up to 5 m tall. Leaves are usually entire, but some are variously lobed. Prominent red toothbrush flowers are consistent with other forms, with densely villous ovary, and persistent bracts. Occurring on steep slopes below a high eucalypt canopy, *G. macleayana* grows with such plants as *Phebalium squamulosum* and *Prostanthera ovalifolia*. In cultivation it is at first an untidy sprawling plant, but usually ends up developing a strong leader which becomes trunk like. The best plants in cultivation are growing beneath tall eucalypts with up to 50% shade and regular watering. However plants in full sun and dry soils are more compact and apparently happy, flowering just as well through spring and summer. Propagation by cuttings is successful using firm young growth, but the hairiness of the leaves can cause rotting if too much water is applied. Seed is also successful, especially if sown just before fully ripe.

There are another two grevilleas which should be mentioned, if only because they appear to be relict populations of plants which occur some hundreds of kilometres distant.

G. acanthifolia ssp *paludosa* was known from a single site on the very inaccessible Nalbaugh Plateau in South East Forests N.P. in densely vegetated low hummocks in wet peaty swamps, but in 2001 another population was discovered on the edge of the coastal escarpment north of Brown Mountain. Plants grow up through sphagnum patches on swamp margins and given this preference, it is unlikely to do well in cultivation.

Grevillea johnsonii occurs on sandstone, on the north western edge of the Sydney Basin, in the Goulburn and Capertee River catchments. There was an old record from around the Brogo area and in 2001 Jackie Miles rediscovered



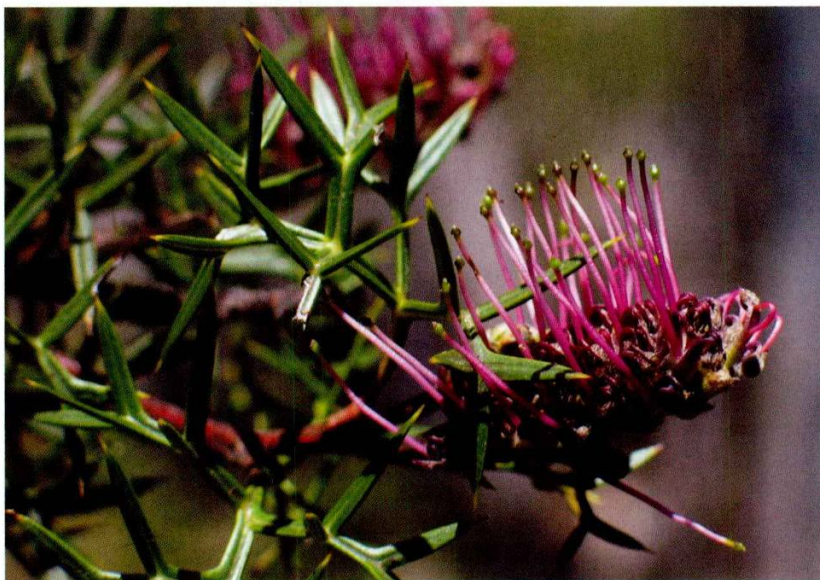
Grevillea parvula, at Imlay Road



Grevillea bemboka, at Desert Creek



Grevillea johnsonii



Grevillea acanthifolia ssp. *paludosa*

the plant growing on cliffs above the upper end of Brogo Dam. *G. johnsonii* is a medium to large shrub, up to 4 m., and has been in cultivation for some time. It is quite an attractive shrub, with showy orange-red flowers, but generally it has proved a difficult plant to keep alive for extended periods.

Hybrid Grevilleas

Over many years growers have been producing a range of new plants, which have either been spontaneous garden hybrids, or a result of intervention breeding. In recent times, Peter Ollerenshaw of Bywong Nursery has been crossing a range of south coast grevilleas to produce some excellent new plants.

G. "Goldfever" is a controlled cross between *G. rhyolitica* and a low form of *G. juniperina* ssp *sulphurea*. The resulting cross is a yellow flowered, low sprawling plant similar in size to the long established *G. "Canterbury Gold"*. The plant was released in 2004, and has proved reliable in cultivation.

G. "Ember Glow" is a controlled cross between *G. juniperina* "Prostrate Red" and *G. rhyolitica*, resulting in a low growing, spreading shrub, about 1 m x 2 m. Foliage is deep green, about 6 mm x 30 mm, slightly prickly. Flowers are red, more like *G. juniperina*, but with a pink style and yellow pollen presenter and are carried for much of the year like those of *G. rhyolitica*. *G. "Ember Glow"* was released in 2001 and is also a reliable garden plant, especially for drier conditions.

G. "Lady O" is a controlled cross between a *G. victoriae* seedling and *G. rhyolitica*. It is somewhat similar in size to *G. "Ember Glow"* and has also proved reliable in cultivation since its release in 2003.

Any of the above grevilleas planted in your garden will add a new dimension to your winter avian visitors, who will appreciate your effort in providing additional food to help them survive.

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Formal Gardens with Australian Plants

Christina Kennedy

Many people think that creating order and formality with Australian plants is like taming kangaroos and wallabies. They feel bush plants should be in a "wild" environment and planned gardens are best created with traditional or exotic plants – and that indigenous plants are for the background. Perhaps some of this thought stems from a general unwillingness to tame and treat native species so that they behave according to a plan for a certain size, shape and effect. At Horse Island we have succeeded in creating and growing a very effective landscaped garden using only Australian plants. The most mature part is now 18 years old and we have therefore had plenty of time to assess the relative merits of our practices.

Design for formality

It seems the main difference between a planted bush garden and a formal garden with bush plants begins with place and method. If a formal garden is the ultimate objective, plan the basic horizontal layout of proper planting beds with reference to the building and the existing landscape.

The gardens at Horse Island were planned like this and grew directly from the visual need for a gentle transition from the buildings to the soft colours of the casuarinas, the eucalypts and the surrounding lake views. The garden beds were designed initially on paper using scaled plans, with the size of the house dictating the garden spaces to assure balance. These preliminary drawings were useful for plotting plant size and placement. Having established the size of plants required in each garden, we began research into which plant material to use. The selected plant species, if they could be found, were then added to the plans. This procedure helped provide order and symmetry with planting.

Making it Happen

There are some guidelines we have used to achieve an ordered looking garden. These principles seem necessary but not exclusive to formal gardens.

Appropriate soil type and levels relating to plant selection

Some people think our native plants will grow in anything! Not so at Horse Island, as we found for optimum results the soil and conditions should be matched to the needs of the plants. We have imported soil into all the garden beds. This allows control of the soil type (some soils can have free draining material added) and makes it easy to contour the vertical shape. The humping and hollowing technique gives different height levels and allows for good drainage which can be improved if necessary with additional rubble drains and agricultural pipes. Where we have not provided adequate drainage we have found plants will flourish for a while but do not have a long life, particularly waratahs and grevilleas.



Centre of driveway, lined with formal hedging All photos by C. Kennedy

Borders to garden beds and lawns

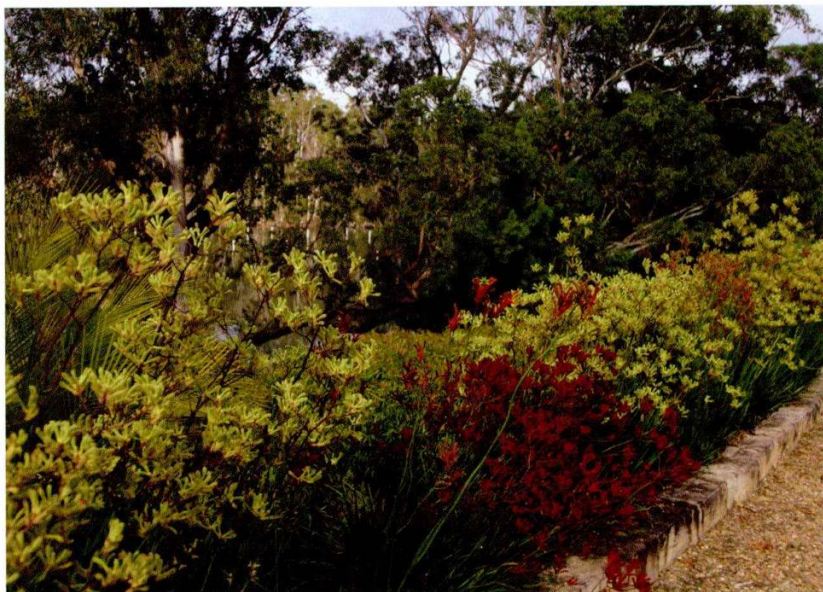
Sharp edging defining the planting areas gives a pleasing visual effect and is useful for mowing lawns right up to the beds. Cut lawns are anathema to some but are useful in a formal garden for spacing and linking beds and different types of planted areas, buildings and points of interest. We have used cut sandstone, river rocks, dry stone walls and around many beds, just a clean cut edge in the lawn.

Plant selection

Choose the plants with a view to the general effect they might achieve.

For aspect

Consider origin of plants when choosing location. We were inspired to use understory shade happy tree ferns and grass trees along the front (southern) side of the house after seeing the effects of light and shadows in Hardy Wilson's sketches of early Australian houses. When mature this combination is beautifully mysterious and softens the strong lines of the house. Along the eastern wall that has lots of shade and some morning sun, multiple use of shiny leaved *Lepidozamia peroffskayana* is interspersed with *Murraya ovatifolia* (native murraya), and underplanted with *Austromyrtus* for a tropical luxuriant appearance.



Sharp edging defines bed of Kangaroo Paws

For repetition

The practice of repeating and alternating a selection of two or three plants is very effective for a curving linear view. We have done this with many different groups of plants around the garden, but possibly most effectively using *Agonis flexuosa* 'nana', *Westringia brevifolia* 'variegata' and *Macrozamia communis* along the driveway. This is not horticulturally exciting but it is visually dramatic.

For colour

Plant foliage has to be the essential mainstay colour of an extensive garden, with great variety of foliage colour for year round interest. Foliage alone can offer a wide spectrum of greens, through to grey, silver, reds and browns. Flower colour provides an additional bonus rather than the *raison d'être* of the planting. We have lots of different greens highlighted with occasional bursts of red from the new foliage growth of the *Callistemon* 'Great Balls of Fire', the seasonal flowering of tree waratahs, firewheel trees, giant kangaroo paws, Illawarra flame trees and grevilleas. Yellow is another powerful incidental colour presented by grevilleas, particularly 'Golden Lyre', various daisies, kangaroo paws and a variety of banksias.

Contrast

To improve this palette of green and occasional colour a further effective measure is to mix plants with different growth habits, shape and leaf structure.

We thread structurally strong plants through softer groupings and have found that this worked well with the strong upright leaves of Gynea Lilies among the horizontal layering of *Grevillea* 'Golden Lyre' and the filtered dark red leaves of *Agonis* 'Afterdark'.

Pruning and shaping

Regular pruning keeps nearly all plants lush, but controlling shape and height creates a playful three dimensional effect. Pruning is a subject of continuous debate and endeavour at Horse Island, because if done well it is integral to achieving interest in the garden and the continued health and vigour of the plants. We are always experimenting with pruning, both with timing and severity. We do this with a wide range of shrubs like *Leptospermum* 'Pink Cascade' and small trees like Blueberry Ash with great results. When we see the black leaves appear on the *Parahebe derwentiana* it is time to cut low and wait for fresh growth; likewise with any plants that start to look ragged.

It pays to be audacious when it comes to pruning. Peter Olde has offered much helpful advice to us and remarked recently that it is good policy never to believe a plant label. "A plant is a metre tall unless it gets to 3 metres"! Generally to achieve the luxuriant look a certain amount of cruelty with cutting back is necessary and Peter encouraged us to chop many older grevilleas off close to the base. We have had good success with this practice, and do not necessarily wait for flowering to finish before pruning. Rule of thumb for us is to avoid pruning in seriously cold parts of the Winter and ideally to do the bulk of it in late Spring. It never seems too early in the life of the plant to start pruning.

Mulching

Mulch encircling the base of a tree or spread over the garden bed gives a finished pampered appearance. When all the garden beds and trees are freshly mulched it gives a wonderfully unifying and finished look to the garden. As the mulch wears down and compacts we have found that it needs to be lifted and turned to allow aeration and moisture penetration.

Replacing plant material

Plants will not always have a long life or behave in an expected fashion. We are comfortable knowing that plants have a certain life span. Some selected shrubs can look great in the garden for short periods and we think it is worth refreshing these by replanting. It is helpful to plan for this by propagating new material in preparation for replacement. We do this with native daisies, smaller kangaroo paws, *Scaevola* species and even the long flowering Geraldton Wax varieties. We have also learnt to be ruthless in removing plants which do not meet expectation.

Maintaining views and vision

Provide an occasional surprise view with a line of vision to an interesting focal point. The vista can be made more interesting if framed by a gap in a stretch of trees or hedge or if seen through a filmy plant structure. We have

some great tree-framed vistas in and from the garden inspired by the ideas of Capability Brown in his 18th century English garden designs. To maintain these we sometimes have to cut overgrowing tree branches and remove rampant planted areas.

Symmetry

The use of symmetry with planting is intrinsic to the traditional classical garden. A desire to maintain planting pattern and constant form can lead to frustration when a plant changes from the expected habit or worse, expires. We resolve this dilemma by placing a pot or a piece of garden statuary in the offending place until such time as another plant can be located and grown for replacement.

Pathways

Trails, roads and paths are an essential design element to link garden areas and add interest. At Horse Island a new pathway showcases a range of some of the most exciting grafted standard grevilleas. These are handsome plants, which are best grown in an open landscape. The path meanders through these tall standards allowing appreciation of the multiple planting from a distance and encouraging the walker to a closer inspection of the sensational and subtle flowers. Elsewhere we are connecting multiple garden paths to form a "Grand Walk" which is an idea borrowed from formal garden design for large estates and which will help to connect separate or different areas into a cohesive arrangement.

Stone, rocks, ponds, lattice, garden ornaments and hedges

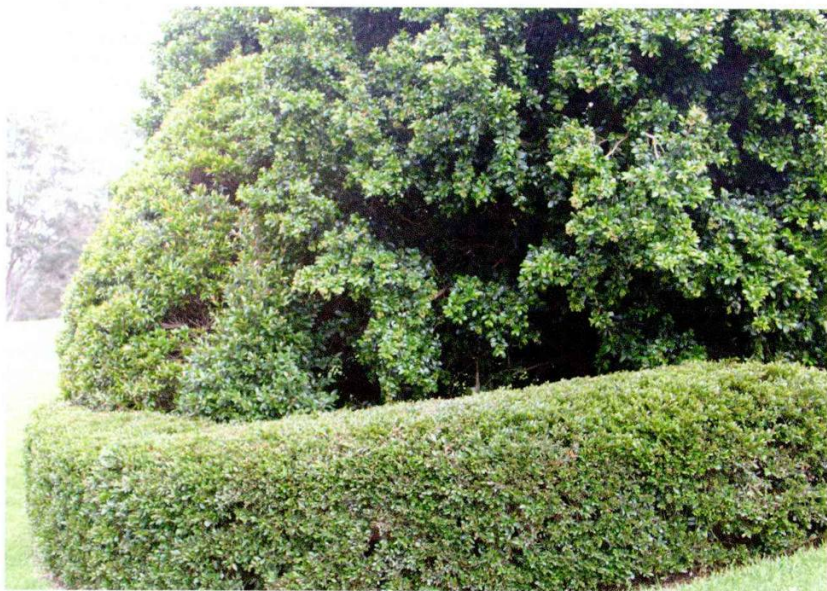
These elements are useful to hide unattractive functional fixtures around the garden, like tanks, hoses and satellite dishes or to draw the eye away from an unattractive view. We fix taps to rock slabs, screen the gas tank with a hedge of *Alogyne huegelii* and attach the satellite dish to a tree with a tall surround of *Callistemon* 'Dawson River'. *Syzygium* 'Tiny Trev' is a wonderful alternative to the exotic box hedge for a low screen and we use a variety of *Syzygium* for whichever dense screen height is required.

General care

A garden the size of Horse Island, which covers many acres, cannot look good without constant attention. Keeping an orderly, neat and formal appearance requires ongoing maintenance and vigilance. Many wonderful people have contributed ideas and expertise, but the day to day maintenance and care is what really makes the difference. This article is drawn from my experience at Horse Island with technical help from Craig Lavis and Nathan Benbow.



Waratahs (*Telopea* "Shady Lady") and *Leptospermums* showing that colour provides added interest



Various large *Syzygium* shrubs behind smaller pruned *Syzygium australe* 'Tiny Trev' hedge

Managing An Endangered Species On Private Property - *Zieria formosa*

Sue Sullivan

Why *Zieria formosa*? There are a number of *Zieria* species in the bush on the South Coast of NSW (e.g. *Zieria littoralis* on the headlands south of Tathra) but you will not see *Z. formosa* in the bush unless you come to Lochiel, about 6 km to the west of Pambula.

Distribution: *Zieria formosa* occurs as only a single population, over an area of approximately 1 hectare on our 2.36 hectare property and that of our neighbour at Lochiel. Together with two other *Zieria* species, *Z. buxijugum* and *Z. parrisiae* located on similarly restricted sites a further 8 km to the west, this species is listed as endangered in NSW and nationally. The three species do not co-occur. They have been the subject of a formal Recovery Plan implemented in 2002 for 5 years.

Description and Habitat: *Z. formosa* is a dense, rounded shrub which grows to a height of 2-3m and a width of 1-2m. The leaves have a pungent, not unpleasant (to my nose) aroma when handled. The leaves consist of three leaflets growing in opposite pairs along the branches. The leaf surfaces are covered with short, dense hairs, giving the foliage a greyish-green appearance. The upper leaf surface is also covered with numerous small warts and the lower surface is less warty. The flowers are generally pale pink (some are brighter) and about 8mm across with four oval shaped petals. They occur in large clusters which cover the bush in spectacular fashion for more than two months between July and October.

Z. formosa occurs amongst an outcrop of broken surface rock (rhyolite) with an open and exposed north easterly aspect, amongst a shrub dominated community and also along an adjacent rocky watercourse. The plants grow mainly in full sun, often in hot and dry conditions in summer.

The Recovery Plan: The previous owner told us we had a species listed as endangered on our land when we purchased it in 1997 but we were unaware of its extent or any implications. The NSW National Parks and Wildlife Service Threatened Species Unit started liaising with us in 1999 when they came to do a recount of the population of 'adult' plants. In 2001 they commenced monitoring surveys, pegging out three survey plots in which they counted the plant population in height classes.

A Recovery Plan was also developed at that stage because of the limited occurrence of the three *Zieria* species and because of a severe reduction in the population of adult *Z. formosa* plants from the original survey in 1987 to the recount in 1999. This reduction was attributed to drought in 1997/8. The Plan required us to get approval for the house site and drainage plan from the Threatened Species Unit. We were encouraged to control weeds and to apply for a Voluntary Conservation Agreement.



Watercourse on Sullivan's property showing Rhyolite rocks & *Zieria* habitat
Photo by R. Ross



Zieria formosa flowers
Photo by S. Sullivan



Zieria formosa
Photo by S. Sullivan

Developments: As part of a larger cattle property, most of our land had been cleared in the past, except the rocky outcrop on which the *Zieria* plants occur. Livestock has been excluded since 1997 and regeneration of native vegetation, including native grasses, has been encouraged. Our house was built in 2002. Much effort has been put into the control of weeds, many of which are a continuing problem due to our location on an arterial road, with a watercourse from the surrounding properties passing through our land and the *Zieria* habitat. Natural dispersal of kangaroo grass (*Themeda australis*) seed is reducing the amount of kikuyu in open areas and we help by harvesting the seed by hand when it matures in January and by spreading it in selected areas.

Ornamental Gardens: The ornamental gardens around our house are mainly rock gardens, using rock from the house site. They are planted entirely with Australian native plants, with developing emphasis on plants of local provenance. Two of these gardens contain plants sourced only from this property, including, in a north facing garden, *Z. formosa*, *Platysace lanceolata*, *Lomandra longifolia* and *L. multiflora*, *Hibbertia linearis* and *Bulbine semibarbata* which germinates opportunistically from seed under suitable weather conditions and, in a south facing garden, transplanted rough tree ferns (*Cyathea australis*) together with four varieties of small ground ferns. The area around the house has a lawn grown from *Microlaena stipoides* and kangaroo grass seed. Kangaroo grass is also used as an ornamental and as a border plant in the rock gardens. It endures drought conditions (as currently prevail) better than the *Microlaena* and makes a good lawn when mowed. In the rock gardens, it is easy to cut back with a brush cutter after seed collection in January.

We are making a feature of *Zieria formosa* in our rock gardens with two successful cuttings taken (with permission) in 2003 and planted out the following year, together with **one** only successful seedling from seed collected that same year. From these three plants we have continued to make and to plant out more cuttings. These plants have responded well to pruning, with watering, after flowering. The naturally occurring *Z. formosa* plants are being severely stressed and in a few cases have died during the continuing drought and prolonged heatwave this Summer.

The Future: Since drought and perhaps global warming appear to be the major threats to the long term survival of this species the ex-situ collections of propagating materials and plants at both ANBG in Canberra and at the Mount Annan annex of the Royal Botanic Gardens (MABG) remain of significant importance. These collections, made in 1986, contain 6 genotypes at ANBG and 3 different genotypes at MABG. A further large collection of seed and unknown number (to me) of genotypes was made in 2006 by two officers from MABG for a Bicentennial Seed Bank.

Reference

Recovery Plan for Zieria formosa, Zieria buxijugum and Zieria parrisiae, prepared by John Briggs and Genevieve Wright for the NSW National Parks and Wildlife Service (2002), Hurstville NSW.

An Ocean View and a Garden

Jennifer Liney

When my husband and I retired to the south coast village of Potato Point – midway between Moruya and Narooma – we built a home on a double headland block. The block is on a very old dune, with headland bedrock some 2m below. The house is sheltered from the prevailing summer nor-easterlies, but very much exposed to the south and south east.

Firstly, I looked around the neighbouring headlands to see what species grew locally and how the exposure affected them and made my initial list of likely plants. Thereafter, anything that looked grey and tough and hairy was given a trial. Though I tried to stick to Australian plants, I did put in some exotics to provide some variety.

On the eastern side of our block, there was a dense woodland of *Banksia integrifolia*, interspersed with a few small shrubs and somewhat protected from the wind. On the south side, after removal of building activities, there was nothing at all except yellow sand; on the north a narrow strip of Banksias and a neighbouring house and on the west (street frontage) another group of Banksias. Each of the aspects was different in terms of exposure, sun, shade and soil organic matter.

I decided to adopt the principle of growing species already adapted to exposure and not to wear myself out attempting to remake habitats to grow the plants that, in another situation, I might consider desirable.

We attacked the eastern woodland first, removing those plants that we did not want and establishing some rudimentary paths. The sand was grey, obviously containing some organic matter, but not much. Under the Banksias we planted some *Acmena smithii* (lillypilly), *Dicksonia antarctica* (soft tree fern), *Howea forsteriana* (Kentia palm), *Howea belmoreana* (curly palm), a couple of *Archontophoenix cunninghamiana*, (bangalow palm) and a large *Platycerium superbum* (staghorn fern) that we attached to treated pine poles. Beneath all this we put *Doodia aspera* (rasp fern), *Adiantum aethiopicum* (maidenhair), *Adiantum hispidulum* (rough maidenhair), and *Dennstaedtia davallioides* (lacy ground fern). To keep all the rainforest species moist and well watered, we installed an elevated misting system. It was important to keep the sand damp, as once it dried out, water refused to soak in.

Subsequently, the lillypillies grew well, the soft treeferns always suffered a little after heavy storms, but generally came good after a while, the *Howea* palms flourished and the bangalow palms became so tall that the wind shredded the fronds. They had to go. With the exception of the *Adiantum hispidulum*, the ferns made a lovely understorey, particularly the lacy ground fern. The *Platycerium superbum* was indeed superb and in the end I had to give it extra support so that it would not fall.

On the northern side, the poles supporting the upstairs verandah made excellent homes for *Platycerium bifurcatum* (elkhorn fern), and in the terraced

beds below I grew shade loving ground covers and prostrate shrubs. These included *Thryptomene calycina*, *Homoranthus flavescens*, *Austromyrtus dulcis* (Midgeberry), while the indestructible *Dichondra repens* grew in between everything.

Along the boundary fence on the south, we first planted *Acacia saligna*, a West Australian wattle, as a windbreak. These were very successful for some years, then, like the ten green bottles, each in turn succumbed to fungal attack. It was just as well they died, as this species tends to escape and should not be planted near bushland. I gradually replaced them with the West Australian *Melaleuca nodosa*, the local *Allocasuarina verticillata* (drooping sheoak), *Correa alba* (white correa), old faithful *Westringia fruticosa* and the local boobialla (*Myoporum boninense*). I tried some other plants that were supposed to grow in sand and withstand salt winds; such as *Eucalyptus lehmannii* (bushy yate) and *Acacia covenyi* (blue wattle), but conditions were too severe and they did not last long. While these experiments were going on, the local *Rhagodia candolleana* (seaberry saltbush) appeared between the shrubs and I grew some cuttings of the beach saltbush *Atriplex cinerea*.

Further up the slope towards the house seemed a suitable spot for another grove of *Banksia*. These did well, so much so that they required a drastic prune every couple of years. This pruning kept them bushy to the ground and with vigorous growth, maintaining their windbreak qualities. I also tried the lovely silver *Eremophila nivea* as well as *E. glabra*, both smaller shrubs, but they could not develop a strong enough root system in the sand and in the end the wind was too much for them.

Facing south was a slight downward slope adjacent to the driveway. I thought that ground hugging species would be most likely to survive in this very exposed spot. *Calocephalus brownii* (now *Leucophyta brownii*) looked fine for a while, but then grew too top heavy and dead in the middle and the wind blew it over. Pruning did not help. A grey hairy form of *Hemiandra pungens* that appears nice and soft to the touch, but is in fact stiff and spiky, withstood all the elements and while *Zieria littoralis* had promising foliage and is naturally occurring on far south coast cliffs, it grew too tall and succumbed to the wind. A *Rhagodia* that was labelled *R. spinescens* did well too, but it was very spiky and nasty to weed under.

The garden on the western side of the house was more protected, but I was loath to thin out the *Banksias* and nothing much would grow underneath them. However, around the edges, where light levels were higher, I planted the very low *Ziera prostrata* 'Carpet star' and several exotics.

On the garden front, our time at Potato Point had its highs and lows. It was a garden that was always in a state of transition; some species were constant and grew nicely, while others stayed a while then progressed to the compost or the chipping machine. It was never static and dull, always interesting and challenging.

Gardening with Grassy Woodland Plants

Jackie Miles

As a consultant botanist, I worked in 1999-2000 on a survey of remnant vegetation on public land in the farming areas of Bega Valley Shire. While about 70% of the Shire is still forested, the farming areas have been largely cleared and remnants are poorly conserved. My survey included roadsides, cemeteries, sports grounds and other small reserves. I discovered a few remnants with a high species diversity of native grasses and forbs (or "wildflowers") and sixteen plant species that had not been recorded in the region before. Most were plants of grassy woodlands more typical of the tablelands and slopes than the coast.

Grassy woodland or secondary grasslands left after tree clearing are typical of the farming areas and different from all other forest types found in the region. Typical species are forest red gum (*Eucalyptus tereticornis*), rough-barked apple (*Angophora floribunda*) and less commonly yellow box (*E. melliodora*) or snow gum (*E. pauciflora*), with a grassy groundcover dominated by kangaroo grass (*Themeda australis*) and shrub patches including blackthorn (*Bursaria spinosa*), dogwoods (*Cassinia* and *Ozothamnus* species) and occasionally *Jacksonia scoparia*.

During my survey I noticed that often the most diverse and least weedy grassy remnants were found on exposed slopes and cutting tops with very shallow soils. These limit weed establishment and may also keep grass cover more open, giving the forbs a chance to proliferate. At the time I had an area in my garden with no topsoil and was wondering how to rehabilitate it. Our house site is deeply benched into a north-facing hillside on our 40 hectare rural block, with areas of exposed granite-derived gravelly subsoil around it. An area next to the house had been used to make mud-bricks and had been left to grow a thin veneer of weeds. It seemed that many of the interesting plants I had been finding might be ideal to colonise this waste area. I started collecting seed in December 1999 and sowed it at the nursery where I worked part-time. The seed collection and propagation period lasted five months as different plants seeded at different times and the speed of germination was very variable.

I selected species on the basis of their occurring in grassy woodland habitat anywhere in Bega Valley Shire. Some are quite ornamental, but some are inconspicuous and a few downright weedy in appearance. I propagated 14 grasses, 9 daisies, 6 lilies, 10 peas and 11 other forb species, with variable success. Some species' flowers and fruits were so small I could not collect seed easily and I resorted to transplanting some from my property into the garden, such as the small dryland sedges *Carex inversa*, *Carex breviculmis* and *Cyperus gracilis* and the lily *Tricoryne elatior*. With a tiny-flowered prostrate forb, *Scleranthus fasciculatus*, I transplanted a single plant from my property into a tube in the middle of a tray and spread the branches out over surrounding tubes filled with potting mix. In no time I had a tray full of seedlings. The daisy *Chrysocephalum semipapposum* refused to grow from seed, but I managed to grow a few plants from cuttings, though the strike rate was poor.

Planting took place in October 2000, after spraying the weeds a couple of times in early spring and watering to get the "soil" well wetted. Plants were grown in short tubes, since the depth of soil into which they were going was only a few centimetres at best. All were planted as tubestock except for kangaroo grass, seed of which had been collected the previous autumn and was broadcast thinly over the site shortly after the planting. I watered regularly for the first season and still water weekly in hot, dry weather. While the plants clearly survive in the wild without extra water, I feel that the almost complete absence of topsoil on the site makes it harsher than most and to keep it from developing bare patches I probably need to water a bit. It takes very little extra water to keep green.

Eight years on the site has a good vegetation cover, with little weeding needed, although I did a bit in the first year. Many species have not persisted and the diversity has slowly declined. However, there are enough forbs still present to put on a good flowering display in spring and summer and the grassland certainly looks a lot better than the weeds that preceded it. Without expensive and risky (due to the prospect of introducing weeds) importation of topsoil, the site was unlikely to support any more traditional gardening subjects.

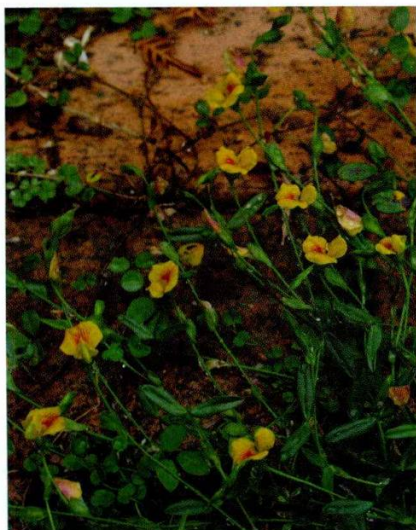
The main problem has been overwhelming of smaller plants by robust grasses, particularly kangaroo grass. Barbed wire grass (*Cymbopogon refractus*) also self sows very readily. Not originally included in the grassland planting, a couple were planted elsewhere as ornamental tussocks. From these a barbed wire grass "lawn" rapidly developed, although lawn is hardly an apt description, since the plants are robust tussocks with flowering stems up to waist height. It has recently colonised the grassland, but the lack of topsoil seems to be keeping it restrained here to a few smaller plants, so far.

Partly to counter the tendency of the kangaroo grass to dominate I now burn the grassland in late August, to open up the inter-tussock spaces and encourage recruitment of forbs into the gaps. Most years lately have been dry and watering is not adequate to induce recruitment of most species, but this style of management has favoured a few plants. Native bluebells (*Wahlenbergia communis*) have increased considerably, possibly by rhizomes. The daisy *Chrysocephalum apiculatum* recovers rapidly and flowers soon after a burn. Some peas do well, particularly *Glycine tabacina*, *Desmodium varians* and *Zornia dyctiocarpa*, which have become quite abundant. *Glycine* species twine up the grass stems, adding a bit of visual interest with their suspended purple or mauve flowers. I can recommend this as a method of garden management, although obviously not suited to the urban situation. Standing by with a garden hose to wet down plants which you do not want scorched makes the fire readily controllable. However, regular use of fire has probably contributed to the reduction of some species in the grassland. Bulbine lilies (*Bulbine glauca*) and blue flax lilies (*Dianella longifolia*, *D. revoluta*) don't flower in the season after they have been burnt, so although they do recover there is no seed production and hence no recruitment. I have never mowed the area, but prior to using fire I used to whipper-snip it occasionally. This created a dense mulch which may have smothered some species. Bringing in a friendly herbivore for a period is another method of biomass reduction, but there are drawbacks. Lately we have

had a large eastern grey kangaroo who nips off bulbine lily and *Wahlenbergia* plants, as well as eating the grass.

While I did not get the natural recruitment I hoped for in most seasons, there were one or two years when well-timed rain produced a flush of seedlings. Most came up in the gravel path which bisects the grassland from where I transplanted them. Some species have proven quite good at relocating themselves into areas of bare ground elsewhere in the garden. *Zornia* plants have come up in the cracks in a dry-laid brick path. Yellow burr-daisy (*Calotis lappulacea*) was planted along path edges, as its low habit and long flowering period made it a good edging plant. However, I had reckoned without the small burrs which follow the flower heads. These positively leap at passing socks and subsequently colonised several other areas of the garden. Fuzzweed (*Vittadinia cuneata*), with its wind-blown seed, is spreading across the nearby kikuyu "lawn", which becomes very sparse in a dry year.

After the modest success of my grassland, I persuaded Bega Valley Council staff to let me replace the moribund lavender bed in front of the Council offices with a similar grassland garden (leavened with a few local shrubs). Members of the Australian Plants Society helped me with the propagation, planting and maintenance. This planting was done in April 2002, a few months before the valley was plunged into a protracted drought. Much the same range of species was used. In this planting a heavy woodchip mulch was applied to smother weeds and reduce drying, since the site was unlikely to get much management. This prevented recruitment and even buried some smaller plants. Although gravel appears to be a good mulching material for planted grasslands, organic mulches generally seem to be counter-productive. The presence of mature eucalypts nearby made it hard to keep plants alive, although in areas away



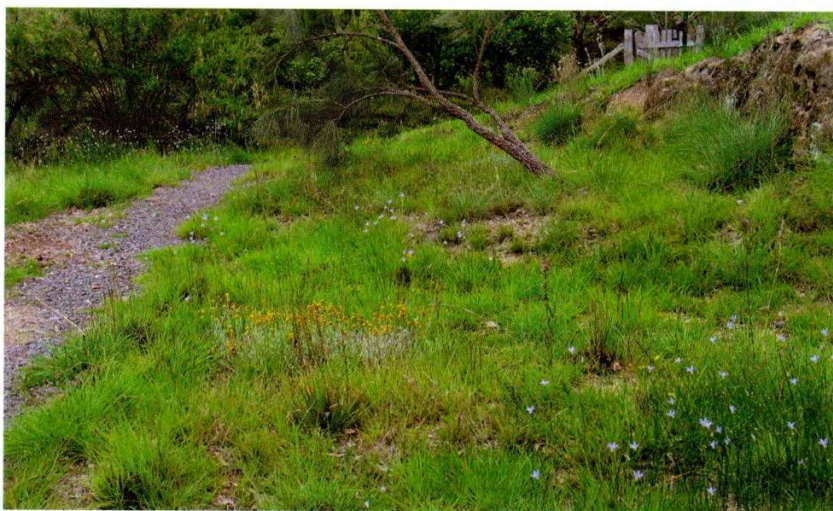
Zornia dyctiocarpa growing in bricks



Desmodium varians All photos by J. Miles

from the influence of the trees they did well for the first year or two, and survived the first extremely dry summer with flying colours. Eventually the grasses proliferated, the forbs declined and the garden came to be seen as too drab by some. It has been revamped by thinning of the grasses and planting of more flowering shrubs by APS members.

My feeling is that this style of garden could be kept in a more interesting state by on-going propagation and planting of more attractive flowering plants, use of gravel mulch to encourage natural recruitment and regular thinning of the dominant grasses. I am reluctant to recommend excluding kangaroo grass altogether since it is so attractive in flower and is the single most typical species of grassy woodlands and grasslands, at least on the coast. It does need to be kept sparse in the garden if it is not to exclude most other species. Fire appears to be a good way of achieving this.



Garden grassland, December 2008



Wahlenbergia communis with a native bee



Calotis lappulacea

Species used in the planting

Grasses

Themeda australis
Sorghum leiocladum
Poa labillardierei
Sporobolus creber
Austrostipa verticillata
Austrostipa scabra
Chloris truncata
Chloris ventricosa
Austrodanthonia tenuior
Austrodanthonia pilosa
Notodanthonia longifolia
Dichelachne micrantha
Elymus scaber
Bothriochloa macra

Sedges

Carex inversa
Carex breviculmis
Cyperus gracilis

Daisies

Chrysocephalum apiculatum
C. semipapposum
Calotis lappulacea
Leptorhynchus squamatus
Leucochrysum albicans
var albicans
Vittadinia muelleri
Vittadinia cuneata
Picris angustifolia
Senecio quadridentatus

Peas

Bossiaea buxifolia
Cullen microcephalum
Desmodium varians
D. brachypodum
Glycine tabacina
Glycine sp.
Hardenbergia violacea
Lespedeza juncea
Lotus australis
Zornia dyctiocarpa

Miscellaneous Forbs

Cynoglossum suaveolens
Hypericum gramineum
Geranium solanderi
Linum marginale
Polygala japonica
Stylidium graminifolium
Scleranthus fasciculatus
Velleia paradoxa
Wahlenbergia communis
W. gracilis
W. stricta

Lillies

Bulbine glauca
Bulbine semibarbata
Arthropodium milleflorum
Burchardia umbellata
Dianella longifolia
Dianella revoluta



Leucochrysum albicans



Glycine sp. and *Chrysocephalum apiculatum*

Eurobodalla Regional Botanic Gardens, Batemans Bay

John Knight, Manager, ERBG

Early History

During 1985 Pat Speirs, President of Coastwatchers, the local environment group, moved to protect the shrubs and trees of the coast being threatened by development. Discussions were held with Eurobodalla Council and Forests NSW to assess the possibility of establishing a botanic garden on land at Deep Creek 5 kms south of Batemans Bay.

A "Friends of the Gardens" group was established in 1986, soliciting support for the project from the community. A Management Committee was then formed to work out a long term plan which could be presented to Council and the community. John Wrigley, former Curator of Australian National Botanic Gardens Canberra assisted committee members in developing a framework for the project.

The Landscape Design Centre, Canberra College of Advanced Education produced a landscape plan which was used to gain further community support.

With the establishment of an Herbarium to house a collection of local plants, and completion of a site plan, the Gardens were said to be "on the way". Not wishing to waste any time, members of the Friends completed the first walking track during November 1988, followed by a nursery to propagate plants for the project. In 1992, Council agreed to fund a Supervisor's position, and in July that year the first employee, John Knight commenced duties.

On the 6th January 1994 bushfires swept through the Eurobodalla, totally burning the gardens' site. The Friends' determination was tested as a divided local community debated the merits of the Gardens, but after a lengthy (2 year) review process, Council decided to continue support for the project and to fund a modest Visitor Centre. The Friends and volunteers completed the Visitor Centre and adjacent Herbarium over the next 2 years and at the official opening by then NSW Premier Bob Carr, Council guaranteed ongoing funding for the Gardens, to resounding acclaim from the audience.

Eurobodalla Regional Botanic Gardens, 21 years on

The Gardens Management Committee has chosen to adopt as the official beginnings of the Gardens the date of the first Management Committee meeting in 1987.

The Gardens, set within 42 ha of Mogo State Forest, feature over 4 kms of wide, easy- grade gravel paths, suitable for every visitor to use. The paths provide access to themed garden beds, including a sensory garden, xeriscape garden, sand dune garden, an embryonic rainforest and a recently completed

sandstone garden featuring plants from the Budawang and Morton National Parks. Lakes and water features provide habitat for water plants and refuge for animals and over 130 bird species that have been recorded at the Gardens.

Deep Creek flowed through the gardens site prior to building a dam to supply back-up water for the shire. Paths now lead through an amphitheatre to the Arboretum, which features most of the trees found in the region, including rainforest species.

Our children's walk with its model animals attracts a younger audience and for the more adventurous about 5 km of bush tracks have been established through a range of ecosystems, with informative signage to highlight various features.

Our Garden is unique in a number of ways

1. The Gardens was conceived by the community, with a specific aim in mind, to display only the local flora, and limit the range that plants are collected from to the catchments of the 3 major rivers which flow through the Eurobodalla Shire, the Clyde River, the Deua (Moruya) River and the Tuross River.
2. The original aims of the Gardens, **Recreation, Education and Conservation**, have not changed materially from those agreed to from day one. Ours is the only Gardens in the world which displays only the plants of the Eurobodalla region. It is this point of difference which will ensure our place in the world of botanic gardens.
3. The community provided the initial impetus and continues after 21 years to provide the bulk of labour. Volunteers to this Council project average over 12000 hours per year. Volunteers are involved in all aspects of the Gardens, from construction to curating, guiding to growing, management to mowing and from planning to promoting. There is no doubt that without volunteers the ERBG would not exist.
4. Our Herbarium houses a comprehensive collection of the flora of our region. It is mostly the work of volunteers, ably led since 1984 by Curator, Jennifer Liney, who ensures the Herbarium collection maintains scientific integrity.
5. Collection of propagation material is another area which requires enormous volunteer input. All plants growing at the Gardens have been sourced, under licence where necessary, from wild populations. The volunteers propagate all plants needed by the Gardens. Many thousands more are grown for sale to community groups and our small retail nursery is very popular with locals. All funds raised from sales are used for Gardens' capital projects.

Ongoing maintenance is a never ending battle. Like most Botanic Gardens there is never enough labour to maintain the gardens to a level where we can sit back and say we are on top of the seemingly endless tasks of weeding, pruning, mulching and so on. But we can be justifiably proud of the quality of our Gardens, in all facets, where visitors can gain a meaningful experience of the flora of the Eurobodalla, **"Your Gardens in the Bush"**.



Wide, easy grade gravel paths provide access to many features of the Gardens.



Volunteers enjoy the final stages of a new development -- the plant out.



The dwarf form of *Banksia spinulosa* produces a colourful autumn display.



Macrozamia communis, the ERBG emblem, showing cones with bright red seeds.

All photos by J. Knight

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