Australia's Iconic Plants Walks

Documentation for Individual Families/Genera and Species.

Contents

Acacia

SPECIES *Acacia spp.*	**FAMILY**: **MIMOSACEAE**

NAME

Name: *Acacia*: from the Greek *akis,* 'a sharp point' referring to the name for Egyptian thorn and the thorny acacias of tropical Africa and Asia. The name was given to an African species in 1750's – long before the white settlement of Australia. Australian acacias are generally thornless.

Common Name: Wattle: the term 'wattle' used for the Australian species of Acacia is derived from the Anglo Saxon building technique in which mud was daubed on panels (i.e. wattles) of interwoven twigs and branches. This 'wattle and daub' method was used by Australia's early European settlers and the tree most often used was *Callicoma serratifolia*, popularly known as 'Black Wattle' (its sap produces a black stain). This tree is not an acacia but its flowers look like those of acacias, and so acacias in general became known as wattles in Australia – a case of botanical error.

LOCATION

- About 250 spp – Sections 1, 2 & 3 Acacia sections and throughout the Gardens.

HABITAT/DISTRIBUTION

- *Acacia* occupies vast areas of the Australian continent dominating vegetation in areas of less than 300 mms per annum rainfall. They appear in all states and in varying climatic and soil conditions from coastal to sub-alpine regions and from high rainfall areas to arid inland regions.
- Native to most habitats from coastal, woodland to sub alpine regions and from high rainfall rainforest to arid Mallee and Red Centre areas. Acacias thrive in a range of conditions such as sandy heaths, gravelly soil, water courses and rocky sandstone hillsides. The greatest diversity of acacias is in the semi-arid inland region of south west Western Australia along the boundary separating the Arid Zone from the more humid South West Botanical province.

BOTANICAL FEATURES

- The family classification has been unstable. The ANBG takes the view that it is in the Mimosaceae family.
- Diverse forms - small low growing herb-like shrubs, prostrate plants to tall trees, enormous range of shape, foliage and flowers demonstrating adaptations to environment.
- Key factors in defining an *Acacia* are the flower heads, phyllodes versus true leaves, the extra floral nectary or gland on the leaf stem or phyllode, legume-type seed pods that follow the flowers, root nodules and rhizobium bacteria, ant associations.
    - Leaves are feathery (bipinnate) when young and in most species these are replaced by phyllodes (flattened leaf stalks) or cladodes (simply modified stems).
    - The difference between leaves and phyllodes is that the leaves are always bipinnate i.e. divided into leaflets as in *A. baileyana* (Cootamundra Wattle) while the phyllodes are undivided. Structurally the phyllodes are highly flattened petioles (leaf stems).
    - Phyllodes and leaves are covered with very fine hairs and wax, which protect them from moisture loss and contribute the characteristic blue-grey colour.
    - Stomata, which are fewer in phyllodes than in leaves, can be closed off to the air to conserve moisture.
    - Phyllodes' edges face the sun; the phyllodes may be flat and broad, narrow, needle-like,

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small spines, or triangular. Phyllodes, because of their origin, are tougher and resist desiccation better than leaves.

- Leaves, phyllodes and cladodes (see below) have no scent when bruised. It is now thought that, since phyllodes developed before the drying out of Australia, they are an adaptation to low phosphorus soils rather than to aridity.
- A very few species (e.g. *A. glaucoptera*) have cladodes instead of leaves or phyllodes. The difference between phyllodes and cladodes is that a phyllode is 'a branch-like leaf', a flattened petiole (i.e. stalk) of a leaf and not a flattened stem as is the cladode. *A. alata* has phyllodes merging into cladodes.

- Flower heads are either round or cylindrical, composed of 300-500 flowers. Usually white or yellow.
- Phyllodes have extra floral nectaries which produce nectar ten times sweeter than flower nectar. These nectaries are to attract ants. Most *Acacia* seeds have an aril, or more technically an elaiosome, which is a fleshy, well developed stem from the pod to the seed and often brightly coloured. This is favoured food for ants which harvest seeds from the ground, take them to their nest and consume the arils and inadvertently bury many of the seeds.
- Acacias are legumes with tap roots and nodules accommodating bacteria that fix atmospheric nitrogen which can be incorporated by the plant into amino acids and then proteins. On the plant's death it adds nutrients to the soil. Australian soils are exceptionally deficient in nitrogen and phosphorus.
- Acacias are vulnerable to fire.
- Acacias, like many other legumes have" hard" seeds. This is a technical term describing seeds which have a seed coat impermeable to moisture. This seed coat prevents the seed from germinating quickly and the coat must be broken before germination. In nature this happens over time as the coat gradually breaks down or it may happen through heating as in a fire. Hard seed can germinate decades after the seed was shed.
- They are generally opportunistic plants germinating rapidly after fire or after the parent plant's death, growing rapidly, short-lived and setting large quantities of long lasting seed.
- In arid and semiarid zones *Acacia* is often a dominant tree in the plant communities. Brigalow (*A. harpophylla*), gidgee (*A. cambagei* or *A. georginae*), jam (*A. acuminata*), lancewood (*A. shirleyi*) and mulga (*A. aneura*) are some of the dominants. *Acacia* tends to dominate as a single species compared to *Eucalyptus* in wetter areas where several species share dominance.
- Acacias are generally good garden plants, particularly in the southern states. Are quick growing so may be used effectively for screening, quick shelter or a nurse crop for smaller plants. Propagation is from scarified seed or by soaking in boiling water for an hour to break the hard seed coat. Cuttings are difficult except in some short phyllode species. The main pests are stem borers (impale with a flexible wire or inject a few mls. of methylated spirits into the hole), galls (removing the affected branches can reduce the problem), and acacia bug, which may require insecticide (it only attacks wattles with phyllodes).
- The large bulbous galls often seen on *Acacia* spp. are caused by a rust fungus, *Uromycladium tepperianum* which is often secondarily infested by numerous insects.

CULTURAL FEATURES

- Australia's national colours, green and gold come from the wattle. Acacias were chosen as the national floral emblem because they flower in every state. It is also said that you will find a wattle

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flowering somewhere in Australia on any day of the year. The Golden Wattle, *A. pycnantha* (Qld, NSW, Vic, SA, NT, an environmental pest in some areas), is Australia's national floral emblem. There is a specimen in Section 224 at the side of the VIC , and there is a beautiful framed embroidered artwork above the information desk inside the VIC. Wattle is the symbol of spring in the bush, a symbol of celebration, of joy, of sadness and remembrance. Historically prior to development of antibiotics, wattle was identified with grieving for the death of indigenous and settlers children – diseases would increase with the hotter weather at the time wattles were in flower.

- Wattle Day is celebrated on 1 September each year. The Gardens run special guided walks in the first week of September to showcase our flowering wattles. Each year the ANBG receives hundreds of yellow ribbons as a gesture of friendship from the Acacia Appreciation Society of Hiroshima in Japan. It is said that a wattle (*A.dealbata*) was the first plant to bloom after the atomic bomb destroyed Hiroshima in 1945.
- Henry Lawson's poems *The Wattle* , the *Waratah and Wattle*, *Freedom on the Wallaby* speak of Australia as a land of independence, land of new beginning, the wattle as a symbol of happiness, sunshine and goodness of a heart of gold.
- Examples of wattle art http://www.anbg.gov.au/campbell.wattle/index.html.

HISTORICAL FEATURES

- *Acacia* was a major timber in ancient Egypt- it was used to make clasps for the coffins of mummies, for boats and furniture. Scholars think the "shittim wood" from which the Ark of the Tabernacle was made (Exodus 25:10) was acacia wood.
- *Acacia* may have existed in Gondwana, although the oldest *Acacia* pollen fossils date from only 25 mya. It was one of the plant genera (also *Eucalyptus*) that speciated prolifically with the Miocene drying of the Australian continent following the opening of the circumpolar sea-way and movement north of Australia.
- *A. melanoxylon* - Kow Swamp boomerang 10,000 years old; its hard light timber wood was used for frames of the first "Sunshine" harvester in 1885.

INDIGENOUS FEATURES

Used as food, materials (shelter, adhesive , shields, spears), medicine:

- Seeds eaten both green and dry or roasted and ground for damper
- Gum collected from notches cut in the bark of trees and soaked with honey or manna to make a sweet liquid - gums are good sources of dietary fibre. Gums may also be used as adhesive.
- *A. melanoxylon* wood was used for spear throwers and shields; bark infused in water to bathe rheumatic joints; the inner bark was used to make string. Tannins used as a fish poison.
- *A. cognata* (Banks Walk) – timber springy, used for tool shafts and handles.
- *A. aneura* (Rock Garden) –seeds for food, wood for boomerangs, shields, spears, wood for tourist items. See *A. aneura* documentation
- *A. kempeana* from central Australia and arid parts of WA is the witjuti bush, well-known for the cossid moth larvae, witjuti grubs, which feed in its roots and are a mainstay of Aboriginal diet.

USES

- Invaluable to both settlers and indigenous people. The sap of some made gum Arabic (dying, ink making, mucilage), others used as medicines, soaps, dyes, and bark for tanning; perfumes, fibre, wood for fuel; *A.melanoxylon* wood - very hard, knot free and close grained and used in furniture and musical instruments.
- Contemporary use: wattle seed is one bush food product collected almost exclusively by Aboriginal people from wild populations for Australia's bush food industry. There are 47 known spp whose

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seeds and fruits are edible. These *Acacia* seeds are exceptionally nutritious, high in energy, protein, carbohydrate and fat. Ground roasted seeds are used for flavouring sauces and ice cream, dairy desserts, granola, bread and biscuits because of their chocolate, coffee, hazelnut flavour profile. Wattle seed is not grown on a commercial scale and the demand far exceeds the supply. Despite this, small quantities are exported to the US, Canada, UK, France, Japan and SE Asia. Ground roasted acacia seeds are used for flavouring sauces and ice cream, and in breads, pasta and biscuits. The low glycaemic index of acacia seed suggests potential in the diet of diabetics. Baron's Brewery in Sydney makes Wattle Seed Ale, a spiced ale that is lightly flavoured with wattle seed.

- *A. colei is g*rown as famine food in Africa.
- *Acacia* wood is strong, very hard, dense and heavy. Much of it is durable in the ground and impervious to white ants, it makes excellent fence posts. In the colonial era it was highly favoured for furniture making – it is a finely grained wood – but is now considered too heavy. Wattles have been used, and in some cases still are used, for housing, firewood, stock fodder during droughts, and to produce essential oils for perfumes.
- *A. melanoxylon* is the most widely used *Acacia* wood. Most, harvested from Tasmanian forests, is used for flooring and benches and smaller items such as cutting boards. It is suitable for timber because it is tall growing and long lived.
- Some species are a good source of pollen for honey.
- The bark of some Australian species has a high tannin content and have been widely used for tanning. *A. pycnantha, A. decurrens* and *A. mearnsii* have some of the highest tannin levels (up to 45%, 40% and 35% respectively). *A. mearnsii* was introduced to South Africa and other countries for tannin production and has become a serious weed.
- *Acacia cyclops* was introduced into South Africa for sand dune stabilisation and has become a serious weed.

OTHER INTERESTING INFORMATION

- Australia's largest genus of flowering plants, with about 1020 spp in Australia and about 20 occurring outside Australia. *Acacia* was once considered to be a cosmopolitan Southern Hemisphere genus of about 1400 spp occurring in Australia, Africa, the Americas and Asia/Pacific with the bulk in Australia. DNA studies over the last decade indicated the genus should be split into 5 distinct genera. The name *Acacia* was conserved for the largest group in Australia by the International Botanical Congress in Vienna in 2005.
- Over 70 countries grow plantations of Australia's *Acacia* species for perfume oils, cut flowers, timber, and re-forestation, to help solve dry-land salinity and fight soil dehydration.
- Some wattles have scents. *A. redolens* smells like vanilla. *A. dictyophleba* has a resinous aroma. *A. acuminata* smells like raspberry jam. *A. pendula* and *A. cambagei* smell like tom cats. In these cases the scent is not produced by the flowers. In *A. acuminata*, for example, it comes from the freshly cut wood. In other acacia species the smell does come from the flowers.
- Possums (Squirrel Gliders and Sugar Gliders) eat wattle sap, bees eat wattle pollen and honey eaters drink nectar from the tiny phyllode glands. Some wattles are host plants for butterflies and homes for thrips. Because of their root nodules *Acacia* plants tend to have high protein levels and so are attacked by legions of insects.
- *A. dunnii* from the Kimberley and adjacent NT has the largest phyllodes of any *Acacia*. *A. elata* from the NSW central coast has the largest true leaves.
- A Wattle Myth: Wattles do not normally cause hay fever. A few people might be allergic to wattle

pollen, but the pollen is relatively heavy, appears in clumps (polyads) of 4, 8, 16 and 32 grains, and is not carried on the wind or not carried far. Hay fever is usually the result of the pollen of wind-fertilised grasses which flower at the same time as wattles.

- Some species of *Acacia* have sap which bleeds from the tree when the tree is damaged by borers. This sap dries producing a pale honey –coloured gum. This gum is very pleasant sucking and was widely used by early settlers and is still enjoyed by those aware of it. Sometimes the exuded gum is darker in colour and has been fouled by the tannins in the tree and is unpalatable.
- All the *Acacia* in Western Australia are phyllodinous. *Acacia* with true leaves are only in the east. *Acacia* relatives overseas all have true leaves.
- Australian acacias are now cultivated in more than seventy countries.
- Some significant acacias with particular features:
    - *A.cognata,* Green Mist, Banks Walk. Prostrate variety, 1mHx2mW; SE NSW and Vic. Weeping habit, highly ornamental evergreen foliage, pale yellow flowers in spring, no pruning required, low maintenance, easy to grow.
    - *A. alata*, Winged Wattle. Opposite Ellis Rowan Garden at the further end from the café. Grows in sand, loam, gravel. A most unusual large leafless shrub (2mH, 1mW) found mainly along water courses throughout the jarrah forests of WA. Phyllodes are almost reduced to cladodes, giving the appearance of winged stems.
    - *A. aphylla* , Leafless Rock Wattle. A very unusual Australian native, without leaves (hence the name), but rather with many thin, multi-branching, blue-green, pointed stems, and an occasional flurry of yellow flowers. The phyllodes exist but are very small – they have been 'reduced to deciduous scales'. From arid areas – good in a pot. Hardy zone 10 upwards (9 with protection). Lack of leaves allows it to survive in very hot dry conditions. Grows to 2m in height. Confined to two small areas of WA (Darling Ranges east of Perth and the Northam area in the south-west) and found only in 1970. Endangered species.
    - *A. covenyi,* Blue Bush. Very attractive. Suckers quite badly. Recommended for gardens instead of *A. baileyana*. Rare – occurs only in the Bendethera district, west of Moruya on the Southern Tablelands. For such a spectacular tree, it is surprising that it was only found in 1966 – by E.F. Constable. Named after R. Coveny, botanical collector at the Royal Botanic Gardens, Sydney.
    - *A. leprosa,* 'Scarlet Blaze'. Victoria's Federation flower. Very rare, probably extinct in the wild. The flowers are red-pink. Two young specimens outside Ellis Rowan Bdg Seed produces yellow-flowered tree, cuttings pink. Flowers mid-late September. (*A. leprosa* is Cinnamon Wattle.) Short-lived in cultivation.
    - *A. melanoxylon* (*mela* - black, *oxylon*- wood), Blackwood. Cafe Bridge. Second tallest of acacias (35mH, 1-1.5mW in trunk). Flowers are small and often inconspicuous, spring-summer. (Can be seen best from café bridge.) Grows on tablelands and escarpments of eastern Australia (from Tasmania to 200km north of Brisbane) and in cooler south on undulating coastal lowlands. Has become a pest in South Africa. Tannin content is about twenty per cent. Excellent timber for cabinet work and furniture, nowadays mainly in veneers; excellent acoustic qualities hence used in sounding boards etc. in musical instruments; excellent timber for beer and wine barrels; used in making boats and tools.

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Takes a high polish. Beautiful grain/colour. Like teak. Similar in quality to walnut. Used in High Court building interior. When worked, dust particles are barbed and may cause serious lung disease. Logged mainly in Tasmania. Ants eat the aril (the fatty tissue tying the seeds to the pods) and feed it to their young in the nest.

- *A. pubescens* , Downy Wattle (S174) Sydney area. Use magnifying glass to show hairs on leaves, describe bipinnate leaves made up of pinnules. Cultivated 1803 in Empress Josephine's garden at Malmaison.
- *Vacheli caven.* (S2) South American/Peru – not an Aust native. Left in gardens to illustrate diversity. Note thorns, probably for protection against grazing animals. Thorned acacias sometimes whistle – ants eat off ends of thorns and burrow into interior to make home for young. Later the wind blows in the hollow, making the whistling sound. By contrast, Australian wattles with soft foliage sometimes whisper.

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PROP

- Jar of wattle seeds (smell aroma).
- Aboriginal tourist shield or boomerang (used for October 2013 RCG exhibition, any available?).
- Photos of leaves, flowers.

Acacia aneura

SPECIES *Acacia aneura*	**FAMILY**: **MIMOSACEAE**

NAME

Name: *Acacia*: from the Greek *akis* meaning a sharp point which refers to the thorny acacias of tropical Africa and Asia. The name was given to an African species in 1750's – long before white settlement. Australian acacias are generally thornless.

aneura: from '*a'* without, and *'neuron',* nerve, in relation to the phyllodes, which do not have veins.

Common Name: Mulga. Mulga is the Aboriginal name for a narrow shield. The name also denotes the vegetation type that is dominated by these species.

LOCATION

- Section 217.
- Rock Garden: several near the sundial (sections 15r, 15l), section 14 to the right of the grass trees at top of rock garden looking up towards Acacia section.
- Red Centre Garden: above the Rocky escarpment next to path going towards upper viewing platform from Western Mallee section.

HABITAT/DISTRIBUTION

- *A. aneura* is the most common wattle in Australia, usually grows south of latitude 20^0 from the Indian Ocean to the Great Divide.
- Widespread on dry interior plains, occasionally on hillsides and ridges, often forming dense stands in low open woodlands and tall open shrublands.
- About 20% of the continent is covered by mulga dominated communities and hummock grasslands wooded with mulga. Mulga does not grow in semi arid areas that experience regular summer or winter drought. However, it requires only 200-500mm of rain per annum. For a description of mulga woodlands see *The Red Centre Garden, Part II The Red Centre of Australia.*

BOTANICAL FEATURES

- A highly variable small tree or large shrub 7-10m high by 7 m across, with a slender trunk, often multi-stemmed and an open crown of markedly ascending branches bearing silver-grey phyllodes. Partly deciduous in the dry season.
- Phyllodes are of variable length and width in different varieties, thick and leathery, silver grey with very fine hairs, straight or curved with many fine parallel veins.
- Flowers are in rods, bright yellow, very small with numerous protruding stamens. Flowers in autumn or other times, depending on rain.
- In favourable conditions young plants will grow at a rate of 1 metre every 10 years until the tree reaches its maximum height of 10 metres. Reduced rainfall will slow growth or bring it to a halt, which means that a mature tree will usually be more than 100 years old. As species of *Acacia* go this is very long lived.
- Currently 10 varieties are recognised. The mulga-complex is the subject of a joint genetic study in Perth and Canberra (Centre for Australian Biodiversity Research), and species and subspecies changes can be expected. The classification of the *Acacia* species formerly included in *A. aneura* is complicated with some new species described from a complex of many species swarms and forms. Most of these are not recognizable to the normal person and in this walk should be referred to

SPECIES *Acacia aneura*	**FAMILY**: **MIMOSACEAE**

simply as *A. aneura*. These notes refer often to information available before this classification review and in few cases would it be possible to know which of the recent taxa were involved.

- Adapted to low nutrient soils mulga makes the most efficient use of available rainfall (mulga is not a very drought tolerant tree) include:
    - Seedlings grow slowly in height but establish a strong tap root system - plants 10cm tall may have a tap root 3m in length. Lateral roots are extensive in the top 30cm of the soil.
    - Root nodules in which bacteria fix nitrogen, helping to compensate for the low nutrient status of soils.
    - Phyllodes (of various width and length in different varieties) are designed to minimise water loss. Thick cuticles, sunken stomata, abundant hairs and high oil content all reduce transpiration, and by shedding leaves in dry times the plants are enabled to outlast droughts and to recycle their own nutrients from the leaf-fall zone when rain comes.
    - Phyllodes are borne in upright position so that a minimum area is exposed to direct sunlight and they act to channel any rainwater that falls on the plant. Rain runs down them, along the branches to the main trunk and straight down into the soil around the roots. This enables mulga bushes to get effective use of at least three times the rainfall that is registered over the general area.
    - The grey-green colour of mulga phyllodes and branches works to the plant's advantage, reflecting more heat than a dark green colour would.
- Mulga is killed by fire and regenerates from hard seed in the soil. It can therefore only be burnt at very long intervals indeed.
- Mulga occurs on very gently sloping plains and is usually found in a grove pattern The trees are grouped into boomerang-shaped stands aligned along the contours with areas of bare ground between them. This patterning is important because during heavy downpours the water runs off the inter-grove areas, is halted by the grass and leaf litter under trees and thus soaks into the root zones.
- Stands of mulga are extremely sensitive to landscape water movement patterns. It is a common sight to see the mulga on one side of a road dead and healthy on the other. A result of the road interfering with natural drainage patterns.
- Propagation is from scarified seed.

CULTURAL FEATURES

- See Acacia spp
- 'Mulga Bill's Bicycle', a poem written by Banjo Patterson in 1896, first published in the Sydney Daily Mail. It is amongst Paterson's most popular works.
- Also used as a synonym for "the bush" or the "out back", like Back 'o Bourke or beyond the Black Stump.

HISTORICAL FEATURES

- Early settlers ate the sweet exudate (see below) and referred to it as "bush lollies".

INDIGENOUS FEATURES

- Aboriginal people made very thorough use of *A.aneura.* The plant is one of the most important plant food sources to aboriginal people.
- The seeds of the plant were separated from their pods by an elaborate process of rubbing, threshing, parching and winnowing until completely pod-free. Seed was also picked from the ground. It was then moistened with water and ground to an edible paste which tasted something like peanut butter.

SPECIES *Acacia aneura*	**FAMILY**: **MIMOSACEAE**

- Stems sometimes ooze lumps of edible gum which is candy hard on the outside and syrupy sweet inside.
- Sap sucking insects produce a sweet liquid called honeydew.
- Mulga 'apples' are sweet, marble-sized edible galls produced by a wasp larva which lies inside.
- Mulga is parasitised by at least three kinds of mistletoe, the fruits of which are edible.
- The roots yield "witchetty" grubs.
- The wood was the most important outback timber for tools such as boomerangs, digging sticks and woomeras.
- In Aranda tradition the mulga tree is associated with a moth larva (*Chlenias inkata*) which feeds on the mulga, and the honeypot ant (jeramba) and the masked lapwing. The larva is the "boss" or totemic leader (Inkata) of the honeypot ant. In spring when the mulga leaves glisten with the sugar secretions of scale insects and the nectar of the extra-floral nectaries, and the honeypot ants are busy, the moth larvae go underground and so the belief of a direction over the ant. The Aranda recognize that the larva becomes a pupa in the soil but not that it turns into a moth.

USES

- Timber used extensively for the mulga wood ornaments sold as Australian souvenirs.
- Seeds harvested for contemporary use in cooking (see *Acacia* spp). Mulga bushes seed prolifically only when rainfall is reasonable and the mulga looks green, not its usual dull grey.

OTHER INTERESTING INFORMATION

- Mulga communities are repositories of significant productivity and biodiversity. They are resource 'hotspots' because of their ability to capture, retain and cycle precious sediments, nutrients and water. Because mulgas channel water to the ground they act as mini-refuges for plants such as grasses and herbs.
- Mulga is the most economically significant *Acacia* of the arid zone, primarily because it is an important source of fodder, especially during times of drought.
- Mulga is the original outback store – It is the hardware (wood), supermarket (seed and witchetty grubs) and lolly vendor (honeypot ants and edible gum) due to the hardness of the wood and its abundance.
- Because mulgas channel water to the ground they act as mini-refuges for plants such as grasses and herbs.
- Wildlife associated with mulga woodlands have adopted strategies to not only survive but thrive in such an environment. A web of life exists that includes ants and termites, spiders, carnivorous marsupials and the greatest diversity of lizards in the world.
- The honeypot ants build their nests under Mulga, from the stems and leaves of which worker ants gather honeydew from sap sucking bugs. This is fed to special individuals deep in the nest causing their abdomens to swell enormously and act as a food storage vessel.

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PROP • Honey pot ant nest photo http://en.wikipedia.org/wiki/Honeypot_ant. • Jar of wattle seeds (smell aroma).	

Anigozanthos

SPECIES ***Anigozanthos spp.***	**FAMILY**: **HAEMODORACEAE**

NAME

Name: *Anigozanthos*: from the Greek *anises* meaning unequal or oblique, and *anthos,* meaning flower, refers to the division of the floral extremities into six unequal parts.

Common name: Kangaroo Paws: the shape of the flower resembles the fore paw of a kangaroo.
look and feel the flowers

LOCATION

- Banks Walk
- Rockery
- Monocot section opposite *Telopea.*

HABITAT /DISTRIBUTION

- Occur naturally only in the southwest of Western Australia, in a variety of habitats and soil types. Tall species are found in the moister Jarrah forests and coastal plain and short species in the kwongan and wheat belt.

BOTANICAL FEATURES

- There are 11 species in the genus.
- Size, flower-stalk height and colour vary between the species. Many new forms have also arisen as the result of deliberate hybridization. The overall colour of the flowers is influenced by fine coloured hairs which cover the flowers and, sometimes, part of the stalk. Flowers appear spring and summer.
- Bird pollinated: the long flower stalks usually rise above the undergrowth and "advertise" the presence of nectar in the flowers. The stalks also provide a perch for visiting birds. The shape of the flowers and the position of the pollen bearing anthers mean the pollen is deposited on the head of feeding birds. This pollen is transferred from flower to flower as the birds feed. Different species usually deposit pollen on different areas of the birds' head. This means that pollen from one species is unlikely to be deposited in the flowers of another species
- All species may be grown from seed (some are more difficult than others) or propagated by division, a slow and with some species, unreliable process. Tissue culture was first successfully carried out at the ANBG and is now used commercially in Australia and overseas.
- Grows from short, underground, horizontal rhizomes. The length and the character of these may vary between the species: some are fleshy, others are fragile. The sap in the root system allows the plants to survive extreme dry spells. In summer, a number of species die back to the rhizome, growing back in autumn.
- **Growing tips:**
  - Excellent drainage – will not tolerate water logging but *A. flavidus* will tolerate less than perfect drainage
  - Kangaroo paws are prone to snail and slug attack.
  - Major disease is a fungus which causes ink disease which appears as large black blotches on leaves. Plants growing in cool moist climates are more susceptible. Ink disease is difficult to treat. Vigorously growing plants are more resistant and dividing clumps after several years helps ensure strong growth. In most cases it is better to remove clumps of diseased plants and plant new ones. To prevent the spread of fungal spores, badly affected leaves should be

SPECIES ***Anigozanthos spp.***	**FAMILY**: **HAEMODORACEAE**

removed and burnt.

- In areas of high summer humidity (eastern coastal Australia, north of NSW south coast) most success is with *A. flavidus* and its hybrids. Other species and hybrids are more challenging to grow and containers may be better. *A. manglesii* and *A. viridis* grow readily from seed and will flower in their first season. Could be treated as annuals or biennials in humid climates. In less humid areas, much wider range of species and cultivars can be grown.

CULTURAL FEATURES

- *Anigozanthos manglesii ,* Red and Green Kangaroo Paw, is the floral emblem of Western Australia and features on the State's Coat of Arms. Named after Robert Mangles, an English horticulturist who collected Western Australian flowers.
- *A. manglesii* featured prominently on the postage stamp commemorating the Perth Commonwealth Games in 1962. After the Olympics stamps in 1956, where more expensive stamps were multi-coloured, it was one of the first multi-coloured standard rate Australian stamps.

HISTORICAL FEATURES

- Genus first named by Jacques Labillardière in his work, *Relation du Voyage à la Recherche de la Pérouse*, issued in 1800. The French botanist collected and described the type species, *Anigozanthos rufus*, during the d'Entrecasteaux expedition's visit to Southwest Australia in 1792.

INDIGENOUS FEATURES

USES

- Good cut flowers – grown commercially in Australia, the US, Japan and Israel.
- Several species widely grown in gardens in Australia and many horticultural hybrid forms are available.

OTHER INTERESTING INFORMATION

REFERENCES

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- Wrigley, JW and Fagg M, Australian native Plants, Cultivation, Use in Landscaping and Propagation, 2013. Reed New Holland.

PROPS

Araucaria bidwillii

SPECIES *Araucaria bidwillii*	**FAMILY**: **ARAUCARIACEAE**

NAME

Name: *Araucaria:* from the Araucani Indians of central Chile in whose territory, the Arauco district, the first known species, *Araucaria araucana*, aka Monkey Puzzle Tree, is found.

bidwillii: named after John Carne Bidwill (1815-1853, Born Exeter, UK). Govt Botanist, Sydney, 1847-48 then appointed Commissioner Crown Lands, Wide Bay, Queensland. Died of starvation marking a new overland route from Wide Bay to Brisbane. Named in 1843 by Sir William Hooker

Common name: Bunya Pine, Bunya-Bunya, Bunya Nut. Bunya is the Aboriginal name for the nuts and was first rendered by Tom Petrie as "bonya" and by others as "bunnia".

LOCATION

- Inside front gate.
- Southern Queensland section of the Rainforest Gully

HABITAT/DISTRIBUTION

- Found in subtropical rainforest
- Bunya Mts, NW of Toowoomba where it is found plentifully in considerable stands. The Bunya Mts are now largely National Park. Lesser occurrences near Gympie and in the Blackall Ranges north of Brisbane. Several very small relict stands near Mt Molloy, northern Qld. In the Bunya Mts areas called "grassy balds" occur, grassy areas adjacent to Bunya pines, Their origin is unclear but may have been induced by aboriginal practices or an earlier climate.

BOTANICAL FEATURES

- With the other Araucariaceae, one of the southern hemisphere gymnosperms. Not a flowering plant.
- Shares with *A. araucana* the short, flattened spiny leaves encrusted on stems, unlike the only other Australian *Araucaria*, *A. cunninghamii* (Hoop Pine) which has very short narrow curved spiny leaves.
- Large tree to 50 m tall of characteristic shape with neat domed crown. Trees monoecious (male and female parts on same plant).
- Female cones very large, weighing about 10 kg, football sized, fall intact and shatter on impact causing damage to objects e.g. cars parked beneath the tree. Pollination occurs around September and cones fall late January or February about 16 months later. There may be 20 cones on a tree.
- Seeds very large 20-30 mm wide, 50-60 mm long. Up to 120 seeds per cone. Edible.
- Possesses a unique germination process where seeds germinate rapidly and send down a shoot up to 25 cm into the soil. Here a tuber forms and the plant transfers the nutrient from exposed seed to buried tuber. When seed is a husk the tuber behaves like a seed and sends a shoot up and a root down in the normal way.
- Trees usually found at an altitude over 1000 m and often, like hoop pines, forming a "Jurassic" sky-line.

CULTURAL FEATURES

- The trees are often pictured to create a Jurassic or Dinosaur impression or just for their attractive domed symmetrical shape.
- The trees were notably painted by Marianne North.

HISTORICAL FEATURES

- Because of their attractive shape Bunya Pines were widely grown as ornamental or specimens trees in the "English" gardens of early country estates around Sydney and along the coast. In this way

SPECIES *Araucaria bidwillii*	**FAMILY**: **ARAUCARIACEAE**

they proved an Australian equivalent to the Deodar (Himalayan Cedar), Moroccan Cedar or Cedar of Lebanon grown in English country Gardens. Anyone taking a bus trip into Sydney can still see today, on the ridges and hilltops where large houses were built to intercept the cool nor'easters in summer, the remaining Bunya Pines from their gardens. Probably planted in the 1850s to the early 1900s these trees still tower above the spreading suburban sprawl. Several trees were planted close to the Lanyon homestead at Tharwa, ACT.

- A beautiful tall spreading Bunya Bunya is at the intersection of Kings Ave (lane driving north) and State Circle just down from Parliament House. The tree was planted by HRH the Duke of York on 10 May 1927 to commemorate the opening of the Federal Parliament in Canberra.

INDIGENOUS FEATURES

- Bunya nuts were a very important source of food for Aborigines. They also dug and ate the subterranean tubers. In a good Bunya Nut year word would go out and the tribes would gather from hundreds of kilometres (up to 300 km is recorded) to feast on the nuts in the Bunya Mts. At this time important trading, dealing and settling disputes could occur between tribes which otherwise rarely contacted each other. It was a time for celebration and marriage negotiations with partners of the right tribe, clan, moiety, totem and so on.
- Like land and access to water Aborigines recognized ownership of nut trees and groves of nut trees and such ownership was passed on from generation to generation. Early explorer, Tom Petrie observed the gatherings for the nut harvest and Ludwig Leichhardt met tribes travelling to the feast.

USES

- Once widely planted as an ornamental or specimen tree it is less commonly planted now because of the damaging cone fall. Tolerant of temperatures to -5^{o}C they may be grown in Hobart, eastern Victoria, in initial shelter in Canberra, through to Qld.
- Once widely milled for timber, cutting ceased in about 1945. The timber is a softwood of similar quality to hoop pine. Bunya pines have not been grown in plantations as hoop pines have.
- Seeds are gathered from garden trees and widely sold in Brisbane and along roadsides during good seeding years (about 1 in 3 years). They may be stored in airtight containers. They are roasted in shell before eating. Heat at 175^{o} C/350^{o} F until cracking sound heard, longer and they may explode. They may also be boiled for 20 mins in shell. They taste like pine nuts with the consistency of chestnuts and are very filling. Any chestnut recipe is suitable.

OTHER INTERESTING INFORMATION

- *A. araucana* is known in England as the Monkey Puzzle Tree.

REFERENCES

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SPECIES *Araucaria bidwillii*	**FAMILY**: **ARAUCARIACEAE**
• http://www.canberrahistoryweb.com/royaltourcanberra1927.htm. • http://asgap.org.au/APOL8/dec97-3.html.	
PROP • Scales from female cone. • Seeds, Rat damaged seeds. • Photos. Photo of Bunya tree planted by HRH Duke of York 10 May 1927	

Backhousia citriodora

SPECIES ***Backhousia citriodora***	**FAMILY**: **MYRTACEAE**

NAME

Name: *Backhousia:* after James Backhouse, (1794-1869), a Quaker, nurseryman and plant collector. Named by Ferdinand von Mueller, Government botanist of Victoria, after Backhouse who was in Australia for 6 years during 1830s. Backhouse wrote a dozen or so reports on missionary work, sociological problems, Aborigines, penal system with recommendations for reform. He also wrote about, and collected plants to send back to Kew. Alexander Maconochie, Superintendent of the penal settlement at Norfolk Island (1840-1844) was influenced by these reports. He applied most of the principles on which modern penology is based on Norfolk Island. The ACT jail is named after Maconochie.

citriodora: lemon scented. Encourage visitors to gently rub a leaf, or crush one from the ground.

Common name: Lemon myrtle, lemon ironwood, lemon scented myrtle, sweet verbena, lemon scented verbena. The latter is also used for *Aloysia citriodora* which is very different

LOCATION

- Section 78 -along Main Path after gymnosperm section and opposite entrance to Rainforest Gully
- Kitchen Garden by Café
- On the Banks Loop

HABITAT/DISTRIBUTION

- Grows in coastal rainforests in Qld, Brisbane to Mackay.

BOTANICAL FEATURES

- There are currently 13 described species in the genus and one undescribed species (APNI)
- Medium sized shrub or small tree growing to 20 m.
- Dark green, glossy, leaves with strong lemon aroma when rubbed.
- White flowers, produced in long-stalked clusters
- Slightly frost-tender when young but okay in sheltered position
- Propagation from tip cuttings taken in March

CULTURAL FEATURES

-

HISTORICAL FEATURES

- *A Narrative of a visit to the Australian Colonies* (1843) by James Backhouse tells of his travels.
- In early 1900's distilled on commercial basis at Eumundi, Qld
- 1920 antimicrobial qualities of distilled steam discovered by Penfold and Grant in Sydney
- During World War 2 Tarax, a soft drink company, used the distilled oil to flavour their drinks.
- 1980's planting as a commercial crop began

INDIGENOUS FEATURES

- Used in cooking and as a healing plant.

USES

- Grown commercially in plantations in southern Qld and northern NSW. Foliage harvested mechanically and leaves either dried for flakes or distilled for oil.
- Culinary – often used as dried leaf flakes – shortbreads, baked fish, tea. Oil widely used for lemon flavoured milk products where the acidity of lemon is a problem

SPECIES *Backhousia citriodora*	**FAMILY**: **MYRTACEAE**
• As a perfume in beauty products. The VIC sells soap and hand cream	
OTHER INTERESTING INFORMATION • During former US President Bill Clinton's visit to Australia in 1996 lemon myrtle tart was dessert at a formal reception • Jamie Oliver uses it!	
REFERENCES • http://www.outbackchef.com.au • Fronds Newsletter 63 • www.anbg.gov.au/cgi-bin/apni	
PROP • Crush a dead leaf from the ground • Lemon myrtle beauty products (available at the VIC Bookstore) • Packet of ground lemon myrtle • Bottle of lemon myrtle oil. One sniff is impressive.	

Banksia spp

SPECIES ***Banksia spp***	**FAMILY**: **PROTEACEAE**

NAME

Name: *Banksia:* after Sir Joseph Banks(http://adb.anu.edu.au/biography/banks-sir-joseph-1737). Named by Linnaeus' son in 1792.

Common Name: Banksias, honeysuckle.

LOCATION

- in Proteaceae section
- throughout the Gardens

HABITAT / DISTRIBUTION

- Banksias are found in a wide variety of landscapes. Most are found in heathlands or low woodlands. There are no banksias in the deserts. Very few species grow on the coast
- 90% of the Banksias are found in SW W.A., from Exmouth to Esperance. In eastern Australia, they are found from the Eyre Peninsula and up to Cape York.

BOTANICAL FEATURES

- See Proteaceae for general information.
- Banksias vary from prostrate species (*B. blechnifolia*) to tall 15m – 30m trees (*B. integrifolia*).
- There are about 170 species of *Banksia* (including *Dryandra*); 90% are endemic to SW Western Australia.
- All but one are endemic to Australia (*B. dentata* occurs on islands to the north of Australia)
- *B. serrata* is the type species named by Carl von Linné.
- All members of the Proteaceae family, including the Banksias, have a distinctive pollen presenter/acceptor feature (see general Proteaceae notes); every flower in the spike (hundreds or even thousands of flowers) has the potential to become a seed, but very few do.
- Most are bird pollinated and so Banksias are good bird attractors. On the NSW coast *B. integrifolia* flowers over a very long season and so is important to birds such as honeyeaters and lorikeets while others, like *B. serrata* have a limited flowering period. Some *Banksia* species hold their spikes high and conspicuously. These are welcoming birds. Others flower less conspicuously and may rely on smaller birds. The prostrate species flower on the ground and mammal pollination may be important. In most the spikes are upright but a few have the flower spikes inverted.
- Some are pollinated by small mammals. The honey possum (*Tarsipes rostratus*) is dependent on nectar in SW WA.
- Most Banksias are killed by fire. Some need heat to release the seeds (e.g. *B. aemula*). These species re-sprout from a lignotuber and can be pruned heavily. Others release seed once it has matured (e.g. *B. ericifolia*) and they will not recover from a fire. They cannot be pruned heavily.
- Banksias are excellent plants to encourage native animals to the garden. They are heavy producers of nectar and attract many birds.

CULTURAL FEATURES

- Margaret Preston used *Banksias* very effectively in her prints.
- May Gibbs immortalized them as the Big Bad Banksia Men. *B. aemula* is probably the species she used in her illustrations.
- Tom Roberts' famous painting, *The Sunny South*, featuring boys bathing near Beaumaris, contains

SPECIES ***Banksia spp***	**FAMILY**: **PROTEACEAE**

unmistakable *B. integrifolia* trees.

HISTORICAL FEATURES

- A specimen of *B. robur* collected by Joseph Banks in 1770 is in the CSIRO herbarium.

INDIGENOUS FEATURES

- Flowering spikes have a lot of nectar – dipped in water to provide a sweet drink.

USES

- Cut flower industry, for example, *B. speciosa*, *B. coccinea* and *B. ericifolia*
- Cones used in the craft trade for salt shakers, coasters.
- Very widely used in horticulture with several species and hybrids commonly seen. *Banksia spinulosa, B. integrifolia* and *B. ericifolia* are frequent in eastern Australian gardens. A prostrate form of *B. integrifolia* is growing in the ANBG.
- Several species popular as bonsai plants.

OTHER INTERESTING INFORMATION

- The Banksia Farm near Mt Barker W.A has all the species of *Banksia* (and *Dryandra*).
- Some *Banksia* species, for example *B. grandis*, have leaf margins which look like they have been trimmed with pinking shears. Species with leaves like this are all Western Australian species.
- The cores of dead infertile spikes made excellent slow matches on cracker night.

REFERENCES

- '*Banksia Book'* by Alex George
- '*The Banksias'* by Celia Rosser – 3 volume series containing watercolour paintings of every *Banksia*. ANBG library has these books (gift from the Friends).
- Wooller, R. and Wooller, S. [2013]. *Sugar and Sand. The world of the honey possum*. Swanbrae Press, Cottesloe, WA. Pp. 110.
- http://www.anbg.gov.au/banksia/index.html

PROP

- One of Margaret Preston's prints
- An open seed pod, showing the different wood inside the pod and the depression that held the two seeds.
- A picture of the Big Bad Banksia Men from *Snugglepot and Cuddlepie* by May Gibbs.

Banksia aemula

SPECIES ***Banksia aemula***	**FAMILY**: **PROTEACEAE**

NAME

Name: *Banksia*: after Sir Joseph Banks(http://adb.anu.edu.au/biography/banks-sir-joseph-1737)

aemula : from Greek, *aemulus* meaning competing with because it closely resembles B. *serrata*)

Common name: Wallum Banksia

LOCATION

- On MP between markers 101 and 102

BOTANICAL FEATURES

- See general information about the family *Proteaceae* and genus *Banksia*
- Shrub or tree to 8m, closely resembling *B. serrata*. Previously known as *B. serratifolia*. The orange-brown trunk distinguishes it from *B. serrata*.
- Has large grey follicles
- Re-sprouts from a lignotuber and from epicormic buds after fires
- Pollinated by mammals, birds and invertebrates
- Trials in WA have found it to be resistant *to Phytophora cinnamomi*

HABITAT/DISTRIBUTION

- Coastal heath on deep sandy soil
- Along the coast of eastern Australia from Bundaberg to Sydney

CULTURAL FEATURES

- Flower spikes of *Banksia aemula* with their large follicles are thought to have been the inspiration for May Gibbs' 'Big Bad Banksia Men'.

HISTORICAL FEATURES

- *Banksia aemula* was collected by botanist Robert Brown in June 1801 in the vicinity of Port Jackson. Described and published by him in 1810
- One of the first *Banksias* to be cultivated in England in 1788, Illustrated in *Curtis' Botanical Magazine* and the *Botanical Register*.

INDIGENOUS FEATURES

USES

- Used as a rootstock for grafting *B. speciosa*
- Red textured timber has been used in cabinet-making

OTHER INTERESTING INFORMATION

- Grows along the Sunshine Coast. This ecological region referred to as 'Wallum'

REFERENCE

PROP

- Picture of a Big Bad Banksia Man

Blandfordia grandiflora

SPECIES *Blandfordia grandiflora*	**FAMILY**: **BLANDFORDIACEAE**

NAME

Name: *Blandfordia:* after George Spencer-Churchill (1766-1840) Marquis of Blandford and later 5th Duke of Marlborough who had a celebrated garden at Whiteknights, Reading. He was elected MP in 1790 succeeding to the Dukedom in 1817. An honorary member of the Linnean Society he was genuinely interested in botany which he continued in the gardens of Blenheim Palace.

grandiflora: From Greek meaning large flowers

Common name: Christmas Bells because it flowers in Dec- Jan and has colourful elongate bell-shaped flowers

LOCATION

- Usually in pot by VIC in December and January
- Sydney Sandstone garden

HABITAT /DISTRIBUTION

- Grows in damp sandy &/or peaty soils in coastal and tableland areas from Central NSW to S. Qld
- Three of the four species in the genus occur on the coast and tablelands of NSW one reaching Gympie, one is widespread in Tasmania but there are none in Victoria.

BOTANICAL FEATURES

- 4 species in genus.
- Slow growing, tufted perennial plant with grass-like leaves and stems and tubular hanging bell shaped flowers
- Seed-pod papery and looks like long green leaves.
- Sometimes included in the Liliaceae family
- Bird pollinated.
- Flowers profusely after fire.

CULTURAL FEATURES

HISTORICAL FEATURES

- Featured on stamps in 1960 and 1967
- Named in 1810 by Robert Brown, naturalist on the *Investigator*
- A favoured flower to illustrate the earliest printed Australian Christmas cards.
- In the nineteenth century, many botanists grew it in Great Britain because it is easily grown as a potted plant.

INDIGENOUS FEATURES

USES

- Propagated in gardens in Australia as well as, occasionally, Europe and North America.
- Cut flowers

OTHER INTERESTING INFORMATION

- Indiscriminate wildflower collecting around Brisbane is said to have damaged populations early last century. This probably happened in Sydney as well.

SPECIES ***Blandfordia grandiflora***	**FAMILY**: **BLANDFORDIACEAE**
REFERENCES • Baines, JA. 1981. *Australian Plant Genera*. Society for Growing Australian Plants, NSW. p. 406. • Henderson, R.J.F. 1987. Blandfordia. Pp. 175-178. In George, A.S. Ed. *Flora of Australia*. *45 Hydatellaceae to Liliaceae.* Australian Government Publishing Service, Canberra. Pp. 521.	
PROPS	

Brachychiton rupestris

SPECIES ***Brachychiton rupestris***	**FAMILY**: **MALVACEAE** (formerly in STERCULIACEAE)

NAME

Name: *Brachychiton:* from the Greek *brachy* meaning short and *chiton,* a tunic, refers to the loose outer covering on the seed.

rupestris: refers to growing among rocks

Common name: Bottle Tree, Queensland Bottle Tree, Narrow-leaved Bottle Tree. The common name has a dual meaning as water is stored in tissue just under the inner bark and the tree trunk looks like a bottle.

LOCATION

- Section 302 – near the blue pumps
- Section 42 – a bit far away for a routine walk but good specimens
- Entrance to gardens on LHS as arrive

HABITAT/DISTRIBUTION

- Central Queensland south of 22 degrees latitude and west to the 500 mm annual rainfall isohyet through to north-western New South Wales.
- Grows in a soil that consists of a medium to heavy clay, silt, sand and volcanic rocks. Yet the tree is quite hardy and can tolerate a variety of climates and soil types.
- Grows as a tall emergent from the "softwood scrub" or dry rainforest usually associated with plant communities dominated by Brigalow (*Acacia harpophylla*).

BOTANICAL FEATURES

- Succulent, dry season-deciduous tree, tolerant of a range of various soils, and temperatures.
- 18–20 meters in height. Trunk can reach 2 metres in diameter.
- Trunk has the unique shape of a bottle. Swollen trunk is primarily used for water storage.
- Very slow growing initially, bottle shape doesn't show until tree about 5 to 8 years old
- Will drop its leaves before the flowering period which occurs between October and December
- Clusters of yellowy bell shaped flowers are followed by woody boat-shaped fruits.
- Live for many years, certainly over 200 years; they can die prematurely from a root fungus, and will not tolerate poor soil drainage.
- The bark is unusual in being green in parts and photosynthesising like a leaf (helpful when the plant sheds its leaves in late spring, just before flowering.

CULTURAL FEATURES

- Commonly found planted in streets, parks, on farms and as features in gardens. Roma, Queensland is one of many country towns with prominent bottle trees.

HISTORICAL FEATURES

- Very large trees which were described on Mount Abundance (near Roma) by Sir Thomas Mitchell, in 1846, are still growing there.

INDIGENOUS FEATURES

- Young tuberous roots and shoots were cooked and eaten in Qld
- Wood contains a nutritious jelly
- Sap could be obtained by making a hole in the trunk

SPECIES ***Brachychiton rupestris***	**FAMILY**: **MALVACEAE** (formerly in STERCULIACEAE)

- String for making nets was made from fibres in the bark by chewing.
- The seeds are nutritious and widely eaten provided the fine hairs in the pods are removed.

USES

- When the tree drops its leaves it may be heavily pruned back to just the largest branches and the same with the roots. It is then possible to transplant mature trees successfully. This and the good shade it produces are the reason it is very widely grown as a street tree in western Qld.
- They are planted at the entrance to the Geelong Botanic Gardens (38° South Latitude).
- Have been planted successfully in Bendigo.
- Useful indoor plant.
- Has been used for bonsai.
- Foliage can be used as a drought feed for stock but often tree is felled and the trunk cut open and cattle feed on the soft tissue of the trunk.

OTHER INTERESTING INFORMATION

- When collecting the seed it is important to wear gloves as the exterior of the seeds are embedded with fine irritating hairs.
- The name of the bottle tree can be taken literally, as there is a significant amount of water stored between the inner bark and the trunk.
- There are about 34 species of *Brachychiton,* all but one endemic to Australia. Most are deciduous but the well-known Kurrajong*, B.populensis*, is evergreen. The Kurrajong is used as a street tree in Canberra and a large grove is on Mt Majura. Some such as the Illawarra Flame Tree, *B.acerifolius*, are spectacular in flower. The floral emblem of Darwin, the Red-flowered Kurrajong, *B.megaphyllus,* bears orange red flowers when leafless and is a striking feature in the Top End.
- Visitors to the ANBG often ask what the difference is between the Bottle Trees and the Boab Trees (*Adansonia gregorii)*, found in WA and NT. Boab/Baobab is the common name given to the genus *Adansonia* which is now included in the family Malvaceae, the same family as the Bottle Tree. The Boab also has a swollen bottle-like trunk on aging which stores water in the trunk. The African Baobabs are different species of *Adansonia.*

REFERENCES

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PROP

Casuarina cunninghamiana

SPECIES ***Casuarina cunninghamiana***	**FAMILY**: **CASUARINACEAE**

NAME

Name: *Casuarina*: A Latinisation of the Malay name casuari, the cassowary, a bird native to Ceram, some other Indonesian Islands, New Guinea and Australia. Named because the long filament-like branchlets supposedly resembled the feathers of the bird.

cunninghamiana: Named after Allan Cunningham (1791-1839, born Wimbledon, England). Sent by Sir Joseph Banks to collect plants in Australia, he arrived in 1816. Botanist and explorer. He is commemorated in many plant names. He participated in P.P. King's famous survey of the tropical coast of Australia and conducted exploration to the north of Sydney where he discovered Pandora's Pass into the Liverpool Plains, the Darling Downs and Cunningham's Gap through which the Cunningham Highway now passes. He refused the position of Colonial Botanist in Sydney in favour of his brother. The tree was named in 1848 by FAW Miquel, a Dutch botanist.

Common name: River Oak, River Sheoak, Fire Oak. River because the tree grows along rivers or permanent and semi-permanent streams. Oak because of a supposed resemblance of the timber to the unrelated English oak, *Quercus robur*. Sheoak because the timber was judged inferior to oak and the name originated in a time when the feminine gender denoted inferiority.

LOCATION

- In numerous places, most notably around the pond in front of the café.
- On main path, opposite the gymnosperms

BOTANICAL FEATURES

- In spite of the cone-like male flowers at the ends of branchlets and the female cones it is a flowering plant and not a gymnosperm.
- The trees are mostly dioecious (male flowers and female flowers are on different trees). A few species are monoecious. Wind pollinated.
- Large tree to 35 m high. They are long-lived trees and may live to be over 100 years old although frequently seen damaged by flood debris.
- The long photosynthetic "leaves" are actually branchlets as can be demonstrated by the regular nodes along their length. At each node there is a ring of triangular scales which are the much-reduced leaves.
- *Casuarina* and the closely similar *Allocasuarina* may be distinguished by the former having relatively small cones and seed and the latter much larger cones and seed. The seeds are weakly

SPECIES ***Casuarina cunninghamiana***	**FAMILY**: **CASUARINACEAE**

winged but with poor powers of dispersal except downstream. There are 6 species of *Casuarina* in Australia and about 59 species of *Allocasuarina*.

- At one stage *Casuarina cunninghamiana* was listed as a protected plant in NSW because of the important role it played in stream stabilisation and erosion control. The pink dense network of rootlets may be seen in the outflow of the pool below the café.
- *Casuarina cunninghamiana* has an associated mycorrhizal fungus in its roots which aids the plant to obtain nutrients.
- *Casuarina* and *Allocasuarina* are noted for their tolerance of water logging, or strongly saline conditions. The swamp oak (*Casuarina glauca*) grows to the mangrove belt in brackish waters, others grow in the arid zone where saline or alkaline soils are common.
- *Casuarina cunninghamiana* is susceptible to fire. The January 2003 fires killed large sections of the River Oak stands along the Murrumbidgee, Cotter and Molonglo Rivers. Recovery will take many decades.

HABITAT/DISTRIBUTION

- *Casuarina cunninghamiana* usually grows as a single-species stand along streams but sometimes grows as forests on the heavy soils of the northwest slopes of NSW.
- *Casuarina cunninghamiana* is found widely from the Daly River in the NT, the Roper River and around the Gulf of Carpentaria to the Normanby River and south to Bega, NSW. Also in New Guinea. It is found along some western rivers including the Murrumbidgee where it ascends to Canberra. It is clearly not at its climatic limit of distribution at Bega and its absence from the rivers of eastern Victoria and the Snowy River may be a result of the tree not having yet spread south to its limit after the last ice age. Its small seeds and poor dispersal mean it spreads only slowly from one water catchment to another.
- *Allocasuarina* is confined to Australia but *Casuarina* is also found in New Guinea, the Solomon Islands and on New Caledonia. *C. equisetifolia* is found on the strand from central NSW around the northern Australian coast, Indonesia to Madagascar.

CULTURAL FEATURES

HISTORICAL FEATURES

- One of the earliest ships constructed in Sydney was a 30 ton schooner named the *Casuarina* as it was built from sheoak wood. The ship was sold to the French navigator Baudin in 1802 to replace the *Naturaliste* which was going home to France.
- In the days of swagmen, bushmen and drovers, *Casuarina* and *Allocasuarina* wood was well known as good campfire wood. It burnt completely producing a fine white ash.
- The wood from *Casuarina* and *Allocasuarina* was used in early settlement to make shingles and bullock yokes but more recently turnery, cask heads and axe handles. It is hard and very strong

SPECIES ***Casuarina cunninghamiana***	**FAMILY**: **CASUARINACEAE**

and durable.

INDIGENOUS FEATURES

USES

- *Casuarina* is grown widely overseas because of its tolerance of salt and tough conditions and *C. equisetifolia* has been planted to provide protection on sand dunes along the South China Sea and other species have been planted in the Middle East on saline soils.
- *Casuarina cunninghamiana* is widely grown as a street tree or tree of green spaces in NSW and in Canberra where it is hardy and once established does well in dry conditions.

OTHER INTERESTING INFORMATION

- The shingles on St John's church in Canberra are made from *Casuarina cunninghamiana*
- *Allocasuarina decaisneana* (Desert Oak) is probably the most photographed tree in Australia as it frames views of Uluru!

REFERENCES

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- Baines, JA. 1981. *Australian Plant Genera*. Society for Growing Australian Plants, NSW.Pp. 406.
- Hall, N., Johnston, R.D. and Chippendale, G.M. 1975. Forest Trees of Australia. Australian Government Publishing Service, Canberra. Pp. 334.

PROP

- Cones and seed of *Casuarina cunninghamiana* and cones and seed of *Allocasuarina* sp.
- Photo of *Allocasuarina decaisneana* in front of Uluru http://www.lamotte.com.au/images/productimages/outback/CA66.jpg

Cyathea australis

SPECIES ***Cyathea australis***	**FAMILY**: **CYATHEACEAE**

NAME

Name: *Cyathea:* from Greek *cyathos* and/or *kyatheion* meaning cup, refers to the structure that holds the spores.

australis: from the Latin, *australis* meaning 'southern'

Common Name: Rough Tree Fern refers to the roughness of the base of the fronds. Also Hard Tree Fern or Prickly Tree Fern.

LOCATION

- Along the Main Path in the Rainforest gully.
- Section 305 (on the edge of Bass Strait). These examples are almost opposite a few *Dicksonia antarctica*. A good place to point out the difference between the species.

HABITAT/DISTRIBUTION

- Native to SE QLD, NSW, southern VIC, TAS and Norfolk Island (subspecies *norfolkensis*).
- It grows in moist shady forests, gullies, dry forest fringes and along creek banks in quite open areas in both coastal and montane habitats.

BOTANICAL FEATURES

- The genus occurs throughout the world tropics and contains about 550 species
- There are 17 Australian species in the genus.
- Because ferns are dispersed by very light spores many species and genera can be widely distributed.
- Probably the most common Tree Fern in South-eastern Australia.
- *Cyathea australis* can grow to 20m high.
- It will not grow from planting the top portion of the trunk, as *Dicksonia antarctica* does.
- The stalks have rough protuberances on them. The term "rough tree fern" refers to rough protuberances on the stipes (the stalk of the fronds) - this is one feature that distinguishes *C.australis* from another common tree fern, *Dicksonia antarctica* (smooth tree fern).
- Lower down the trunk is covered with matted adventitious rootlets.
- The 'trunk' like structure on a tree fern is a greatly enlarged aerial rhizome growing vertically rather than horizontally.

CULTURAL FEATURES

HISTORICAL FEATURES

- *C. australis* was described by Robert Brown in 1810 from a specimen collected on King Island in Bass Strait.

INDIGENOUS FEATURES

- Pith at the centre of the trunk was eaten by Indigenous people. This killed the plant. Said to be tastier than *Dicksonia antarctica.*
- Young fronds were cooked and eaten.

USES

- Used in horticulture as it is hardy but young fronds can be damaged by frost, adaptable to a variety

SPECIES *Cyathea australis*	**FAMILY**: **CYATHEACEAE**
of climates and soils. • *C. australis* can tolerate a lot of sun provided it is well watered.	
OTHER INTERESTING INFORMATION • Lyrebirds may nest in the centre of the crown. • The modern genera *Cyathea* and *Dicksonia* are recorded from at least 300 million years ago (late Carboniferous).	
REFERENCE • http://www.anbg.gov.au/gnp/interns-2003/cyathea-spp.html • http://museumvictoria.com.au/forest/plants/rough.html • Bostock, PD. 1998. *Cyatheaceae.* Pp. 193-205. In Orchard, AE. Ed. *Flora of Australia. Volume 48. Ferns, Gymnosperms and Allied Groups*. ABRS/CSIRO, Melbourne. Pp. 766.	
PROP	

Dicksonia antarctica

SPECIES *Dicksonia antarctica*	**FAMILY**: **DICKSONIACEAE**

NAME

Name: *Dicksonia:* after James Dickson, (1738-1822) botanist and nurseryman, specialising in cryptogams. Best known for his 7 volume work on British cryptogams.

antarctica: from the Latin *antarcticus* meaning southern.

Common Name: Soft Tree Fern. In Tasmania Woolly Tree Fern, Woolly Ferntree, Manfern, Common Manfern.

LOCATION

- Along the Main Path in the Rainforest gully
- Section 305 (on the edge of Bass Strait)
- In the RF gully next to the Café Bridge

HABITAT/DISTRIBUTION

- Grows from south-eastern Queensland, through the NSW and Victoria coast and in Tasmania.
- This species is endemic to Australia.
- In the wild this species likes to live in moist areas with high water content in wet sclerophyll forests, along creek beds, in gullies and occasionally at high altitudes in cloud forests.

BOTANICAL FEATURES

- There are three species of *Dicksonia* in Australia, all endemic. There are about 30 species altogether, found in Malesia, Australia, New Caledonia, New Zealand and tropical America.
- Trunk grows to 4-5 m exceptionally to 15 m.
- Trunk hairy at the base of the fronds.
- Fronds borne in flushes with fertile and sterile fronds often alternating. Fronds 1-3 m long.
- The "trunk" is the decaying remains of earlier growth of the plant and forms a medium through which the roots grow; trunks are hosts for a range of epiphytic plants including other ferns and mosses; can be cut down and, if they are kept moist, the top portions can be replanted and will form new roots. The stump will not regenerate.
- Distinguished from *Cyathea australis* by the soft bases to the fronds.
- Grows at 3.5 to 5 cm per year and produces spores at the age of about 20 years.

CULTURAL FEATURES

HISTORICAL FEATURES

- Grows well in Cornwall, England. Tree ferns were used as ballast in ships returning to the UK from Australia. A ship was wrecked on the coast of Cornwall where the tree ferns naturalised.
- Named by Charles-Louis L'Heritier, who also gave eucalypts their name.

INDIGENOUS FEATURES

- Pith at the centre of the trunk, a very good source of starch, was eaten either cooked or raw by Indigenous people and was probably the mainstay food of some tribes. This killed the plant. It is said to be less tasty than *Cyathea australis.*
- Uncoiled young fronds were cooked and eaten after roasting or steaming to remove toxins.

SPECIES *Dicksonia antarctica*	**FAMILY**: **DICKSONIACEAE**
• Known by the Tasmanian Aborigines as 'lakri'.	
USES • Used in horticulture and Is usually the tree fern grown in home gardens	
OTHER INTERESTING INFORMATION • Crimson rosellas eat the young leaflets and the spores. • Modern genera of *Dicksonia* and *Cyathea* are recorded at least 300 million years ago (late Carboniferous).	
REFERENCES • http://www.anbg.gov.au/gnp/interns-2003/dicksonia-antarctica.html • Jones, DL. 1998. *Dicksoniaceae.* Pp. 189-191. In Orchard, AE. Ed. *Flora of Australia. Volume 48. Ferns, Gymnosperms and Allied Groups*. CSIRO Publishing, Melbourne. Pp. 766.	
PROP	

Doryanthes excelsa

SPECIES ***Doryanthes excelsa***	**FAMILY**: **DORYANTHACEAE**

NAME

Name: *Doryanthes:* from two Greek words: *doryatos* meaning spear and *anthos*, flower.

excelsa: from Latin, *excelsus*, meaning high or lofty. Refers to the height of the plant

Common name: Gymea Lily: Gymea is the Wodi Wodi (tribe of the Illawarra district near Sydney) name for the plant. Flame Lily: due to colour of flower. Spear Lily (more usually applied *to Doryanthes palmer*i), Giant Lily, and Illawarra Lily.

LOCATION

- Section 15 – rockery
- Section 8 – main path
- Section 191 – Sydney Sandstone

HABITAT /DISTRIBUTION

- Endemic to the NSW coastal areas around Sydney from Karuah to Bulli.
- Grows in wet sclerophyll forest on sandy soils containing some clay

BOTANICAL FEATURES

- There are two species in *Doryanthes.* The other species, *D. palmeri*, which has a shorter flowering stem and a linear inflorescence, is found in northern NSW and southern Qld. It also has a limited distribution on Mt Warning and near Springbrook. *D. excelsa* can be found in the Sydney Sandstone Region.
- Red flowers in a globular inflorescence atop a very tall flowering stem.
- Flowering stems grow up to 6m high
- Flowers August to November
- Flowers frost sensitive
- Gymea lilies can be dug up, moved and planted bare rooted
- Growing tips:
  - Suitable for large rockeries and gardens. An ideal position would be below an elevated patio where its tall flower spike can be appreciated
  - Well-drained, deep soil, in full sun or partial shade.
  - Keep well watered.
  - Apply a small quantity of blood and bone or a slow release fertiliser in Spring

CULTURAL FEATURES

- Sydney suburbs of Gymea and Gymea Bay named after the lily.
- Inflorescence famously painted in 1807 and in 1810 by artist J.W. Lewin and by Ferdinand Bauer in 1813.
- *Doryanthes excelsa* has also inspired the naming of Doryanthes, the journal of history and heritage for Southern Sydney founded by Dharawal historian Les Bursill.

HISTORICAL FEATURES

- The genus *Doryanthes* was first described in 1802 by the Portuguese priest, statesman, philosopher and botanist José Francisco Correia de Serra (1750–1823), a close friend of Sir Joseph Banks.

INDIGENOUS FEATURES

- Flowering stems were cut when young (about 0.5m long and thicker than a man's arm), and

SPECIES *Doryanthes excelsa*	**FAMILY**: **DORYANTHACEAE**
roasted • Roots were roasted and made into a sort of cake • There is a story (a myth?), that birds feed on the nectar, get drunk and fall to the ground, where they are picked up by waiting Indigenous hunters!	
USES • The leaves contain fibres, which have been used for brush making and matting • Sometimes grown in gardens and more frequently recently in suburban landscaping.	
OTHER INTERESTING INFORMATION • It's an incredibly tough plant. It grows from an evergreen bulb which has contractile roots which pull the plant right down into the soil, where it can resist drought and bush fire – which triggers it to flower.	
REFERENCES •	
PROPS • Picture/photo of flower head as it is hard to see. The VIC shop has cards depicting the plant.	

Eucalyptus, Angophora, Corymbia

GENUS ***Eucalyptus, Angophora, Corymbia***	**FAMILY** **MYRTACEAE**

NAME

Name: *Eucalyptus:* from the Greek roots, *eu* and *calyptos* meaning well-covered, because of the operculum which covers the bud.

Angophora: from two Greek words meaning vessel or goblet and to bear or carry refers to the shape of the fruits.

Corymbia: from the Latin *corymbus* meaning bunch of flowers refers to flat topped flower head

Common name: Gum trees: named by Cook and his party as they sailed up the NSW and Qld coast because the trees were exuding gum. In countless publications English names have been given to all the species. In a few cases, particularly in SW WA the English names are borrowed from the Aborigines, Tuart (*E. gomphocephala*), Jarrah (*E. marginata),* Marri *(E. calophylla),* Wandoo (*E. wandoo*) and Karri *(E. diversicolor).*

LOCATION

- On the Eucalypt Lawn
- Throughout the Gardens

HABITAT/DISTRIBUTION

- There are Eucalypts in all Australian landscapes, except for the deserts.
- Eucalypts are found throughout Australia, except for the most arid interior areas.

BOTANICAL FEATURES

- All species were initially considered to belong to the genus *Eucalyptus* or *Angophora*. More recently, *Eucalyptus* has been split into *Eucalyptus* and *Corymbia.*
- There are more than 900 species: ca. 758 *Eucalyptus*, ca 93 *Corymbia* and ca 10 *Angophora*.
- *E. deglupta, E. urophylla, E. orophila and E. wetarensis* are the only species not found in Australia. *E. deglupta* is found from Papua New Guinea to the southern Philippines.
- *E. tereticornis* (Sydney Red Gum) has a huge latitudinal range being found from eastern Vic. to PNG.
- *Eucalyptus* may be distinguished from *Angophora* in having alternate leaves (except juvenile foliage) and in having the operculum. *Angophora* has opposite leaves and the bud opens without a displaced operculum.
- The term Gum Tree is used in common parlance for all species of *Eucalyptus* and *Corymbia*. Up until about 1900 it was applied only to those with smooth bark and this is still done in technical publications.
- Fossil *Eucalyptus* have been found in Argentina dating back to 65 mya, long before Australia separated from Gondwana. These fossils are identical to modern *Eucalyptus* and belong in the section Monocalyptus.
- Eucalypts speciated rapidly in the Miocene after Australia separated from Gondwana and became hotter and drier. Fossil leaves and buds and fruits have been found in the Warrumbungle basalts laid down about 14-17 million years ago.
- Australian Myrtaceae can be broadly put into two groups. The sclerophyll forest and dry country species which have dry woody fruit including *Eucalyptus, Melaleuca, Leptospermum*. And the soft

GENUS ***Eucalyptus, Angophora, Corymbia***	**FAMILY** **MYRTACEAE**

fruited species mostly found in rainforest including *Acmena, Syzygium, and Rhodomyrtus*.

- Eucalypts are adapted to hot dry climates – the leaves hang downwards, with only the narrow edge exposed to the sun. Leaves are leathery, which helps prevent them from collapsing under water stress, and usually a grey-green colour. With a few exceptions like *Corymbia ficifolia* (Red-flowering Gum) and *Eucalyptus grandis* (Flooded Gum, Rose Gum) there are no upper and lower surfaces of the leaves; both being similar. This is reflected in the cellular structure of the leaf.
- Identification of Eucalypts is greatly aided by recognizing the type of bark. There are smooth or gum barked species, iron barks, box barks, stringy barks, bloodwoods, and half barks. *E. caesia* even has a bark type called minni ritchi.
- Most Eucalypts are tall single-stemmed trees. However, many that are native to more arid and exposed areas, have a distinctive multi-stemmed, or mallee form.
- Eucalypts are fire-adapted – most regenerate from epicormic buds along the trunk and branches or from lignotubers. A few (some of the alpine species) regenerate only from seed and are killed by fire.
- Some species which are not mallees, for example *E. blakelyi*, when young have the rudiments of a small lignotuber. These species can be more successfully transplanted when young than others.
- The loose bark and oil content of the leaves encourages fires. It is thought that this may be an adaptive means, given most Eucalypts tolerance of fire, to out-compete more fire sensitive plants.
- Eucalyptus leaves have a high oil content and the oil glands can often be seen with a hand lens; the oil in the leaves volatilises and can be extremely flammable causing fireballs.
- Juvenile leaves are different to the adult leaves. Juvenile leaves are usually opposite while adult leaves are alternate; leaves of the *Angophora* species are opposite.
- *E. camaldulensis* (River Red Gum) is the most widely distributed; *E. regnans* (Mountain Ash) is the tallest with extant trees known at 96 m and stories of taller ones. *E. regnans* grows in Gippsland and in the wet valleys of Tasmania and is the tallest flowering plant in the world. The Californian Redwoods, reaching a similar height and more are gymnosperms. Of the Eucalypts, E. *vernicosa* (Varnished Gum) which often grows as a dwarf shrub 1 m high is the smallest.
- Eucalypts do poorly in cold climates which include northern Europe and North America except for California and the most southern states of the USA. In Central Otago in NZ they grow into very large trees but the rare days of heavy ice will kill them.

CULTURAL FEATURES

- Hans Heysen painted the River Red Gums (*E. camaldulensis*) in South Australia.
- Albert Namatjira was famous for his water colours paintings of Ghost Gums (*C. apparerinja*, previously *E. papuana*). The Seekers song "We are Australian" mentions the Ghostly Gums.
- May Gibbs' stories feature the Gumnut Babies – Snugglepot and Cuddlepie.
- Norman Lindsay's Blinky Bill lived on *Eucalyptus* leaves. Bunyip Bluegum ate puddin'.
- *E. globulus* in the floral emblem of Tasmania
- Murray Bail's book *'Eucalyptus'* is a novel about a man who grew all the Eucalypts (see also Dr Dean Nicolle in Other Interesting Information).
- Eucalypts have a place in colloquial Australian English such as 'Up a Gum Tree' (i.e. in difficulties); they feature in songs such as 'Waltzing Matilda' (*E. coolabah*).
- Many Australian authors have commented on the Cathedral-like appearance of tall Eucalypt forest with the grand white columns reaching sky-ward. Most ethereal are forests of *E. grandis* (Flooded or Rose Gum), *E. saligna* (Sydney Blue Gum) and *E. diversicolor* (Karri).

HISTORICAL FEATURES

- The type species was collected by David Nelson from *E. obliqua* (Messmate) on Bruny Island in 1777, on Cook's third voyage. It was described and named by a Frenchman, Charles-Louis L'Héritier

GENUS ***Eucalyptus, Angophora, Corymbia***	**FAMILY** **MYRTACEAE**

in 1788.

- Eucalypts were introduced to Italy to drain the swamps and reduce the risk of malaria.
- Early settlers found Eucalypts foreign and bleak after the soft trees of England. It took a generation before they were accepted. It also took a long time for a Eucalypt to be depicted in paintings in a way one would recognize as a Eucalypt. Visitors, notably DH. Lawrence, were also repelled by Eucalypts.

INDIGENOUS FEATURES

- Lerp insects cause honeydew to form on the leaves of Eucalypts. The honeydew is eaten by Indigenous people.
- Many species used as medicines for many disorders.
- Bark paintings from Arnhem Land use the bark of *E. tetrodonta* (Darwin Stringybark)

USES

- *Eucalyptus* species (particularly *E. globulus* and *E. grandis*) have been planted throughout the world where they are a valued source of timber; they are the most widely planted hardwood in the world. Eucalypt plantations exist in Portugal, Spain, north Africa, Brazil and California.
- The juvenile foliage is used in the floristry trade. Eucalypts (e.g. *E. cinerea,* known as Floristry Gum or Argyle Apple)are coppiced, to produce a continuous source of juvenile leaves
- Flowers are an important source of honey (particularly *E. melliodora*, the Yellow Box)
- Timber is used for woodchips (pulp and paper), in construction industry, for furniture. Modern clear felling of forests causes much conservation concern and controversy.
- *Eucalyptus marginata* (Jarrah) from SW WA was widely used for railway sleepers but now is used for flooring and furniture producing beautiful deep red tables and chairs.
- Oil is used as a disinfectant, insecticide and solvent. *E. polybractea* has the highest concentration of oil. Many other species have been used including *E. piperita* (Sydney Peppermint) first distilled in 1788 and other peppermints were exploited with a widespread industry developing in the middle of the 19th century. The oil content and composition varies greatly with the species and with individuals. 1,8-cineole gives the oil its characteristic aroma. *Eucalyptus dives* (Broad-leaved Peppermint) has a very refreshing oil which is piperitone rich and can be used in the manufacture of menthol (inhalant) and thymol (bactericidal, e.g. mouth wash).
- Widely grown in horticulture and on farms in Australia. *Corymbia ficifolia* (Red-flowering Gum) is a very common sight and the hybrids from it. Many other species are grown such as *E. priessiana* (Bell-fruited mallee)*, E. caesia* (Caesia)*, E. macrocarpa* (Mottlecah)*, E. ptychocarpa* (Swamp Bloodwood)*, E. erythrocorys* (Illyarrie) and *E. citriodora* (Lemon-scented Gum)). The tube stock list for the Forest Nursery at Wagga Wagga includes 46 species of *Eucalyptus* and *Corymbia.*

OTHER INTERESTING INFORMATION

- Some Eucalypts drop large limbs unexpectedly and are often referred to as Widow Makers.
- The volatile oils are responsible for the blue haze that gives the Blue Mountains their name.
- The tapestry in the Great Hall in Parliament house features a Eucalypt forest.
- Common names are confusing. Compare Sydney Blue Gum with Tasmanian Blue Gum.
- Dr Dean Nicolle established the Currency Creek Arboretum in SA, which has over 1,000 species of Eucalypts. This number includes many subspecies.
- These are some well-known Eucalypt species – *E. camaldulensis* (River Red Gum. most widely distributed); *E. pauciflora* (Snow gum, which can be identified by its parallel venation); *C. maculata* (Spotted Gum, which is found with *Macrozamia communis* on the Clyde Mountain road); *E. viminalis* (Manna gum, a food source for koalas); *E. macrocarpa* (Mottlecah, largest flowers of all Eucalypts and large gum nuts).

GENUS ***Eucalyptus, Angophora, Corymbia***	**FAMILY** **MYRTACEAE**

- Australians returning by boat from Europe could sometimes smell the Eucalypts before the WA coastline was in sight. I experienced something similar when flying back from England and I was hit by the smell of Eucalypts immediately leaving the airport terminal in Sydney.
- *Corymbia torelliana* (Cadaghi) is widely planted as a street tree and in gardens due to its shady foliage. It is the centre of a controversy among stingless-bee apiarists. The flowers produce abundant nectar and pollen favoured by stingless bees (*Trigona* spp.). However when the seeds reach maturity the gum nuts produce a resin attractive to the bees (they use it to make their hive)which it is believed induces the bees to disperse its seeds which can lead to the bees rejecting other resin sources, clogging the hive and exhausting of bees loaded with seeds.
- The three most common Eucalypts growing naturally in the ANBG *are E. macrorrhyncha* (Red Stringybark), *E. mannifera* (Brittle Gum) and *E. maculosa* (Scribbly Gum).
-

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- Ridley, J. and Fagg, M. 2001. *Eucalypts - A Celebration*. Allen and Unwin, Sydney.
- The Wiki has many interesting stories about Eucalypts. See Anecdotes, Stories and Trivia.

PROP

- Self-guided *Eucalyptus* Discovery Walk
- A hand lens to show the oil glands to visitors.
- Variety of gum nuts; timber samples.

Eucalyptus spp (Mallee form)

SPECIES ***Eucalyptus spp* (Mallee form)**	**FAMILY**: **MYRTACEAE**

NAME

Name: *Eucalyptus:* from the Greek roots, *eu* and *calyptos* meaning 'well-covered' refers to the operculum which covers the bud.

Common name: *Mallee:* from an aboriginal word for a multi-stemmed eucalypt tree, based on the word mali for water. A reference to the Water Mallee (*E.socialis*) referring to water coming from cut roots. There are common names for some different species of mallee, Bull Mallee (*E. behriana*) and Green Mallee (*E. viridis*). Bull Mallee is also a mallee form with few trunks while whipstick mallee is a form with many thin trunks.

LOCATION

- Section 221: Below the VC
- Section 30: Next to the Main Path
- Many others in the Gardens

HABITAT/DISTRIBUTION

- Mallee species (up to 100) are found across southern Australia in the semi-arid areas (e.g. 250-400 mm rainfall), and on the ridges of the Great Dividing Range in NSW..
- Two areas of Australia are referred to as Mallee – Eastern Mallee, on the border between Victoria and South Australia; Western Mallee in the south of WA, in the vicinity of Hyden and Lake Grace.
- Mallee eucalypts are found from Ardlethan and near Dubbo west to the wheat belt of WA where soil is sandy.
- In western NSW they mostly occur on red sands which, during the Pleistocene, were the sandy parts of the bed of Lake Dieri. Following the drying of Lake Dieri wind-blown sand dunes developed in some areas now occupied by mallee.

BOTANICAL FEATURES

- See general information about the genus *Eucalyptus* (and *Angophora* and *Corymbia*)
- Many Eucalypts are multi-stemmed and are said to have a Mallee form.
- Mallees regenerate from a lignotuber.
- *E. polybractea* (Blue Mallee) has the highest oil content of all Eucalypts.
- Mallee gums are not necessarily closely related within *Eucalyptus*.
- Some *Eucalyptus* species can grow as normal trees under favourable conditions and as mallees under harsh conditions. Most mallee *Eucalyptus* are always mallees.
- Mallee is really a growth form of *Eucalyptus* normally involving the development of the lignotuber and a multi-stemmed growth.
- Most mallee roots spread widely and are shallow. They are unpopular bordering wheat fields as they compete with the wheat but may be tolerated for the shelter they provide. Light falls of rain are more available to plants in a sandy soil than in a clay soil hence the shallow roots.
- The mallee form is an evolutionary response to sandy soils, poor nutrient levels and conditions where trees are exposed to much wind. So they are found on the exposed, leached bed of parts of Lake Dieri and on the ridges of the Great Dividing Range on poor sands, for example *E. stricta*. In effect the mallee form lowers the "centre of gravity" of the tree making it less susceptible to wind throw. In addition one trunk may blow over leaving the remainder intact and so the tree is

SPECIES *Eucalyptus spp* **(Mallee form)**	**FAMILY**: **MYRTACEAE**

essentially intact.

- Prior to white settlement fire in the waterless (in summer) mallee was rarer than in coastal forests so the mallee habit is not a response to fire.

CULTURAL FEATURES

- Mallee has a place in Australian slang. "Fit as a mallee bull" meaning strong and healthy or "Tough as a mallee bull" meaning really tough.
- "Mallee Bull" is a full-bodied, strong ale brewed in Mildura.
- Much mallee was cleared in the 1920s in Victoria and settled too closely, the farms were too small and during the Depression many families did it tough. "A mallee child" was an undernourished child.
- Mallee has given its name to the region of Victoria occupying the northwest corner.
- Some mallees are grown in Australian gardens. *E. moorei*, *E stricta* and *E. viridis* are three. Suitable where a low growing eucalypt is needed as under powerlines. *E. priessiana* (Bell-fruited mallee) is grown for its large lemon-yellow flowers.

HISTORICAL FEATURES

- Large areas of Mallee scrub were cleared for agriculture. Mallee roots are prized for firewood as they burn slowly and very hot.
- John Oxley explored along the Lachlan River in 1817 and in May branched out to the southwest. The battle he and Allan Cunningham had in traversing the mallee to the east of Griffith may have contributed to their turning back from Mt Binya without discovering the Murrumbidgee River.

INDIGENOUS FEATURES

- Lateral roots were removed, cut into pieces up to a metre long, and then stood upright. Water draining from these pieces was collected.

USES

- Source of *Eucalyptus* oil *(E. polybractea* -Blue mallee).
- In 2000 'oil mallee farming' commenced on vast areas of wheat land in SW WA that have become unproductive due to salination. Local spp such as *E. kochii* and *E. polybractea* are being used to keep the water table down and at the same time to produce useful product.
- Roots burn very hot – used for making charcoal.
- Mallee lignotubers are used in wood turning, are prized for their stability and their beautifully marbled grain which takes a superb finish.

OTHER INTERESTING INFORMATION

- The Mallee is home to the endangered Mallee Fowl. The Riverland Mallee Important Bird Area, near Waikerie, comprises several pastoral areas and conservation areas. Pulletop Tank Reserve was established for the mallee fowl but proved too small. Round Hill and Gluepot are two other reserves in NSW.
- Also important habitat for native marsupials (Eastern Quoll, Mallee Ningaui); ¼ of all Australian reptiles occur in the mallee areas. In fact the mallee teems with life.
- In the mallee the tree tops are brought close to the ground and so humans can much more easily observe the life in the mallee than in a tall eucalypt forest where much life is high up.
- The mallee occurring in arid and semiarid environments has large areas of bare ground as there is too little moisture in summer to support trees growing close together. Yet these areas may be quite moist in winter. In winter a mat of algae, mosses and lichens grows on the soil surface. This dries out completely in summer but the "soil crust", as it is called, provides vital protection for the soil from wind erosion in summer.
- *Eucalyptus moorei* is found on the exposed areas near Nerriga and further north. It has a mallee habit. It also has leaves with parallel venation like, for example, *E. pauciflora* (Snow Gum or White

SPECIES	***Eucalyptus spp* (Mallee form)**	**FAMILY**:	**MYRTACEAE**
Sally) and *E. stellulata* (Black Sally or Muzzlewood). The name "sally" is said to be a corruption of "sallow", the European *Salix caprea*. I like to think of *E. moorei* as a mallee and a sally.			
REFERENCE • http://andc.anu.edu.au/australian-words/meanings-origins?field_alphabet_value=181			
PROP • *Eucalyptus* oil.			

Eucalyptus cypellocarpa

SPECIES ***Eucalyptus cypellocarpa***	**FAMILY**: **MYRTACEAE**

NAME

Name: *Eucalyptus:* from the Greek roots, *eu* and *calyptos* meaning 'well-covered' refers to the operculum which covers the bud.

cypellocarpa: from the Greek *cypellon* (cup) + *carpus* (fruit)

Common Name: Monkey Gum; Mountain Grey Gum

LOCATION

- Main Path, opposite marker 20

HABITAT/DISTRIBUTION

- Grows in wet schlerophyll forests with rainfall between 700mm and 130mm pa.
- Mainly in the Dandenong ranges but it also occurs in the western valleys of the Yarra

BOTANICAL FEATURES

- Small to very tall tree
- Leaves are up to 35 cm – among the longest of the *Eucalyptus* leaves

CULTURAL FEATURES

HISTORICAL FEATURES

- One of the species that are a food source for koalas. Early settlers observed the koalas and assumed that they were monkeys. This species became known as the Monkey Gum.
- See Other Interesting Information for more information about koala food sources

INDIGENOUS FEATURES

USES

OTHER INTERESTING INFORMATION

- *Eucalyptus* leaves are very low in nutrients and also contain toxins. Koalas have developed a mechanism for digesting eucalypt leaves. The leaves are metabolised very slowly. Due to this slow metabolic activity, the koala is generally sluggish and may sleep for up to 18 hours a day. Koalas eat 200 to 500g of leaves each day.
- Eucalypts with a higher protein level in the leaves are favoured by koalas. Between 40 and 50 species are eaten. The main target species include *E. cypellocarpa, E. melliodora, E. viminalis, E. microcorys, E. teretricornis*
- Koalas have been known to eat other species e.g. species of *Acacia* and *Melaleuca*

REFERENCE

- Ridley, J. and Fagg, M. 2001. *Eucalypts - A Celebration*. Allen and Unwin, Sydney.

PROP

Eucalyptus globulus

SPECIES ***Eucalyptus globulus***	**FAMILY**: **MYRTACEAE**

NAME

Name: *Eucalyptus:* from the Greek roots, *eu* and *calyptos* meaning well-covered, because of the operculum which covers the bud.

globulus : diminutive form of the Latin *globus* meaning globe

Common name: Tasmanian Bluegum

LOCATION

- Bottom of the car park, at the top of the stairs leading into the Tasmanian section of the Rainforest

HABITAT/DISTRIBUTION

- Grows in moist schlerophyll forests in Tasmania and southern Victoria.
- There are naturalized non-native occurrences in southern Europe, southern Africa. New Zealand, western United States, Hawaii and Micronesia and Caucasus

BOTANICAL FEATURES

- See general information about the genus *Eucalyptus* (and *Angophora* and *Corymbia*)
- *E. globulus* is a tall tree, generally between 30m and 55m and reaching 70m
- Juvenile leaves are blue-grey, stem clasping and waxy, giving this species its common name
- Grows rapidly and adapts readily to a range of conditions. It is especially well-suited to countries with a Mediterranean-type climate, but also grows well in high altitudes in the tropics

CULTURAL FEATURES

- Tasmanian floral emblem

HISTORICAL FEATURES

- First described by the French botanist Jacques Labillardière in 1803. He collected specimens at Recherche Bay during the d'Entrecasteaux expedition in 1792

INDIGENOUS FEATURES

USES

- One of the most widely cultivated trees native to Australia. Wood is used for construction, firewood, railway sleepers and paper.
- Comprises 65% of all plantation hardwood in Australia
- Wood for construction, firewood, railway sleepers and paper.
- *E. globulus* is the primary source of global eucalyptus oil production, with China being the largest commercial producer. They are also grown in Spain and Portugal for oil

OTHER INTERESTING INFORMATION

- It has become naturalized in many overseas countries where it is sometimes considered to be a weed e.g. in California and South Africa.
- Introduced to California in 1856 by entrepreneur Frank Haven. He established nine plant nurseries in and around San Francisco.
- Many local people in California believe eucalypts to be native to California and campaign against their removal. Others refer to them as 'gasoline trees' because of their flammability.

SPECIES *Eucalyptus globulus*	**FAMILY**: **MYRTACEAE**
REFERENCE • Ridley, J. and Fagg, M. 2001. *Eucalypts - A Celebration*. Allen and Unwin, Sydney.	
PROP	

Eucalyptus regnans

SPECIES ***Eucalyptus regnans***	**FAMILY**: **MYRTACEAE**

NAME

Name: *Eucalyptus:* from the Greek roots, *eu* and *calyptos* meaning well-covered, because of the operculum which covers the bud.

regnans: from the Latin *regnare* meaning to rule.

Common name: Mountain Ash and White Mountain Ash (Victoria). Also known as Giant Ash, Victorian Ash, Swamp Gum, Giant Oak, Stringy Gum (Tasmania).

LOCATION

- Bottom of the RF Gully

HABITAT/DISTRIBUTION

- Occurs in cool temperate rainforests in VIC in the wetter parts of the Great Dividing Range from Healesville almost to the NSW border with an isolated population in the Otway Ranges. In Tasmania mostly at lower altitudes in the north and southeast of the state.
- It is a tree of sheltered situations in hilly terrain on rich soils with a high rainfall.

BOTANICAL FEATURES

- See general information about the genus *Eucalyptus* (and *Angophora* and *Corymbia*).
- *E. regnans* is the tallest Angiosperm (flowering plant); a living tree "Centurion" is recorded at 100m, it is the second tallest tree in the world, exceeded by California Redwood. Records of now dead trees up to 133m exist such as the "Ferguson Tree" in the Watts River region of Victoria. There are many unverifiable reports from Victoria of much taller trees varying from 128 to 160m. It can live for 400 years so existing trees protected in forests may reach that height in the future.
- Bark rough at base to 15m then smooth, white, shedding in long strips.
- In spite of the size of the tree the nuts are quite small; 5-9 mm long 4-7 wide. Flowers white.
- Unlike the rainforest-margin tree *E. grandis* the Mountain Ash has retained its sclerophyllous, dry-adapted leaves and leaf-hanging habit.
- Large trees may develop extensive buttresses.
- Trees typically tall, straight with no branches until near the crown. Lower branchlets developed during growth are lost by the self-pruning habit of Eucalypts.
- Can often grow as single-species stands.
- *E. regnans* regenerates from seed. Seeds are held high in the canopy and are released by heat. Smoke assists germination. Trees do not bear seed until they are about 20 years old. Two fires within 20 years can wipe out a forest of *E. regnans*.

CULTURAL FEATURES

HISTORICAL FEATURES

- A favourite subject of "tall tales and true from the legendary past" in the largest tree league.

INDIGENOUS FEATURES

USES

- Woodchips

SPECIES *Eucalyptus regnans*	**FAMILY**: **MYRTACEAE**

- Furniture, flooring (where its very pale blonde colour is highly prized), panelling, veneer, plywood, window frames, general construction.

OTHER INTERESTING INFORMATION

- *E. regnans* is the tallest Eucalypt. *E. vernicosa*, often less than 1m high, is the smallest
- *E delegatensis,* Alpine Ash, grows in the high parts of the ACT and also regenerates from seed and not epicormic buds. It is consequently killed by fire.
- The tallest tree in the world is the Coast Redwood or California Redwood (*Sequoia sempervirens*, in the family Cupressaceae) where a living tree is known at 115.5m. As a gymnosperm it is in a different category to the Mountain Ash. There are also records of a Douglas Fir (*Pseudotsuga menziesi*) at 119m which fell in 1924 and claims of taller ones.
- The Karri (*Eucalyptus diversicolor*) from the south western edge of WA is among Australia's tallest trees with a maximum recorded height of 87m. Many are preserved in the Valley of Giants.
- It may well be no coincidence that the California Redwood and the Mountain Ash occur at similar latitudes both sides of the equator. Closer to the equator and there are the mid-latitude dry belts. On the equator very tall trees are more vulnerable to cyclonic winds and storms. Further from the equator and it may be that such large trees will not get enough sunlight to support their huge bulk.
- Leadbeater's Possum, an endangered species, with precise requirements inhabits Mountain Ash forests.
- In Tasmania it is possible to estimate the time since the last wildfire by the size of the Mountain Ash trees. With several hundred years without a fire the Mountain Ash forest will gradually be replaced by cool temperate rainforest. A burn and the cycle starts again.

REFERENCES

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PROP

Grevillea spp

SPECIES *Grevillea spp*	**FAMILY**: **PROTEACEAE**

NAME

Name: *Grevillea:* after Charles Francis Greville, 1749-1809 Charles Francis Greville, keen botanist. Lived in a house facing Paddington Green with a large garden with glasshouse. Interested in rare tropical plants. Founded Royal Horticultural Society in 1804. Friend of Sir Joseph Banks. Named by Robert Brown in 1809.

Common Names: Spider flower. Many have a common name including the word grevillea, spider flower or oak, e.g. Gully Grevillea is *G. barklyana*, Red Spiderflower is *G. Speciosa*, Brown Oak is *G. Baileyana*, Silky Oak is *G. robusta,* and Beefwood is *Grevillea striata.*

LOCATION

- Proteaceae section
- Throughout the Gardens

HABITAT/DISTRIBUTION

- Grows in a wide variety of habitats all over Australia

BOTANICAL FEATURES

- Ca. 360 species and almost 100 subspecies making Grevillea the third largest genus in the Australian flora. Most endemic to Australia but ca 5 species occur in New Guinea, New Caledonia and Sulawesi.
- Member of Proteaceae family and thus roots have evolved to survive in very poor soils. They do not appear to have a Mycorrhiza fungus associated with them but they produce "proteoid roots", masses of tiny rootlets, which possibly aid the absorption of nutrient from poor soils.
- Huge variation in shape and sizes from ground covers, shrubs to tree.
- Flowers are small and occur in inflorescences. Three basic forms – spider e.g. *Grevillea speciosa,* toothbrush e.g. *Grevillea asplenifolia,* and brushes e.g. *Grevillea robusta*
- *Grevillea* flowers characteristically have a short floral tube and a long pollen presenter.
- Huge variation in leaf types from fairly normal *Grevillea shiressii* or *G. laurifolia* to highly dissected in *G. dryandri*, to rolled and deeply dissected and pungent pointed *G. ramosissima*, G. *acanthifolia*, long and strap-like in *G. striata*, holly-like in *G. wickhamii* and many others.
- Flower at most times of year but winter to early spring is peak flowering period.
- Thin walled seed pods, containing one or two seeds, which fall and open when seed is mature. Often the seed have a papery wing for dispersal but this is not a universal feature. *Grevillea glauca* has woody persistent pods.
- Copious nectar production attracts honey-eating birds
- Some species, e.g. *Grevillea leucopteris* bear their flowers on long branches well above the vegetative parts, presumably to be most apparent to birds
- Most species are excellent bird attractors as they produce huge amounts of nectar. Some species insect pollinated.
- Contains allergens which can cause dermatitis. *Grevillea banksii*, *Grevillea* "Robyn Gordon" and *Grevillea robusta* are examples

CULTURAL FEATURES

SPECIES *Grevillea spp*	**FAMILY**: **PROTEACEAE**

- The species was illustrated on Australian stamps issued in 1960, Christmas 1967 and also in 2003 - *Grevillea 'Superb',* a cultivar bred from *Grevillea banksii* and *G. bipinnatifida.*

HISTORICAL FEATURES

- Leichardt in 1847 described a member of his party developing a blistering eruption after grevillea pods near his skin.

INDIGENOUS FEATURES

- Flowers used for the sweet nectar – used as is or mixed with water to make a sweet drink.
- More rarely seeds eaten.
- The gum from *G. striata* was used as a cementing agent.

USES

- Many species widely used in gardens and many hybrids developed.
- Some of the most popular ground cover plants in gardens are *Grevillea* hybrids e.g. Poorinda Royal Mantle.
- With few exceptions they have horticultural potential.

OTHER INTERESTING INFORMATION

- Some species have very limited natural ranges. In our local area there is *Grevillea diminuta* known only from the higher peaks of the Brindabella Range. *Grevillea rivularis* is known only from Carrington Falls near Robertson, *G. renwickiana* is known only from the Nerriga area, *G. iaspicula* is known only from the Wee Jasper area and *G. wilkinsoni* is known only from Goobarragandra near Tumut. Some of these are listed as endangered.
- The Grevillea Park at Bulli on the south coast of NSW has a huge collection of grevilleas and is worth a visit.

REFERENCES

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- Makinson, RO. 2000. *Grevillea*. Pp. 524. In Wilson, AJG. Ed. *Flora of Australia. Volume 17a. Proteaceae 2 Grevillea*. Environment Australia and CSIRO Publishing, Melbourne. Pp. 524.
- Wrigley, JW. and Fagg, M. 1989. *Banksias, Waratahs & Grevilleas and all other plants in the Australian Proteaceae Famil*y. Collins, Sydney. Pp. 583.

PROP

- Timber sample from Guides' Office
- Wood samples ruler

Grevillea robusta

SPECIES ***Grevillea robusta***	**FAMILY**: **PROTEACEAE**

NAME

Name: *Grevillea* after Charles Francis Greville, 1749-1809, co-founder of London Horticultural Society

robusta: from Latin *robustus* meaning hard, strong, or robust and refers to size of species

Common name: Silky Oak, Southern Silky Oak, Australian silver oak. It is not related to true oaks*, Quercus* nor to the she oaks, *Casuarina* and *Allocasuarina*

LOCATION

- Section 78, up the hill from the *Backhousia citriodora;* in with the Gymnosperms

HABITAT/DISTRIBUTION

- Rainforests of eastern coastal Australia
- From Guy Fawkes River, northern NSW to Bundaberg, southern Qld

BOTANICAL FEATURES

- Fast growing, upright evergreen tree
- At 18-35m tall it is the largest plant in *Grevillea* genus
- Leaves are dark green and deeply divided and lobed. They are large being 15-30cm long with greyish-white underside.
- Flowers: golden-orange brush shaped, 8-15cm long, Oct-Dec. The flowers have no petals instead they have a calyx that splits into 4; Often flowers in alternate years
- Seeds mature in late winter.
- Tolerant of poor soils
- Often used as grafting stock for standards of other *Grevillea* species
- The wood has the heavily rayed structure of other Proteaceae timbers and when cut across the rays has a most attractive appearance.
- It is primarily bird pollinated, honey eaters and lorikeets often swarm in trees
- It is the only *Grevillea* that is deciduous. Its deciduous habit is not a winter deciduousness as in oaks, elms or beeches but a pre-flowering deciduousness. By losing its leaves the flowers stand out like a beacon to pollinating birds. In this it resembles the Illawarra flame tree but in the case of the flame tree there is a history of dry-season deciduous in the genus *Brachychiton*.

CULTURAL FEATURES

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HISTORICAL FEATURES

- First described by explorer and botanist Allan Cunningham in 1830

INDIGENOUS FEATURES

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USES

- Timber once used for window joinery before aluminium because of its resistance to wood rot.

SPECIES ***Grevillea robusta***	**FAMILY**: **PROTEACEAE**

- Timber used in manufacture of furniture, cabinetry and once used for fences but now far too expensive.
- Timber from other rainforest Proteaceae may be sold in the trade as silky oak.
- Used for reclamation of deforested land in Africa and America.
- Young plants can be grown for their foliage – attractive indoor plant
- Recently used for the sides and back of guitars because of its tonal and aesthetic qualities.
- Planted as a shade tree in tropical and subtropical areas, for example in Kunming in south-western China it has been planted as a street tree.
- Widely planted as a street tree in country towns of NSW where it is remarkably drought tolerant.
- Fuel wood in Sri Lanka and East Africa

OTHER INTERESTING INFORMATION

- Leaves and flowers contain allelopathic compounds which inhibit the establishment of other plants, and can cause skin irritations
- While the nectar is very popular with birds and produced in copious quantities so that trees may sometimes drip, the nectar is not pleasant to the human palate. This is in contrast to *Lambertia formosa* which has glorious nectar.

REFERENCES

- http://www.kew.org/plants-fungi/Grevillea-robusta.htm
- http://www.environment.gov.au/cgi-bin/species-bank/sbank-treatment.pl?id=5723

PROP

- Sample of wood in Guides' Office
- Wood sample ruler

Lagarostrobos franklinii

SPECIES ***Lagarostrobos franklinii***	**FAMILY**: **PODOCARPACEAE**

NAME

Name: *Lagarostrobos:* from two Greek words: *lagaros* meaning lax and *strobos,* cone. Referring to the loosely constructed female cones with separated scales.

franklinii: named after Sir John Franklin, 1786-1847, naval captain, arctic explorer and governor of Tasmania from 1836-1843. In 1845 he led an expedition to chart and navigate the North West Passage through the Canadian Arctic. The entire crew perished when they become ice-bound.

Common name: Huon Pine – named after the Huon River, Tasmania where it was found. Captain Huon de Kermandec was the commander of the French ship, *L'Esperance*, on d'Entrecasteaux's expedition to find the lost expedition of La Perouse. Although called a pine it is not actually a true pine. Also called the Macquarie pine.

LOCATION

- Section 67 – Tasmanian Rainforest gully
- Section 14 – Rockery
- Section 105 - Gymnosperms

HABITAT /DISTRIBUTION

- Species of conifer native to the wet south western corner of Tasmania
- Grows among river-bank rainforest and also in a few subalpine lake shore forests.
- Usually killed by fire and is drought sensitive, so are restricted to cool, wet areas.
- Huon pines are often associated with rainforest species such as myrtle (*Nothofagus cunninghamii*), leatherwood (*Eucryphia lucida*) and sassafras (*Atherosperma moschatum*).

BOTANICAL FEATURES

- Huon Pine is a gymnosperm. It is a relic of Gondwana - the first pollen records date back 135 million years
- Slow growing – 0.3 – 2mm/year in diameter , long-lived tree - some living specimens of this tree are in excess of 3000 years in age.
- Grows to 10 to 20 m tall, exceptionally reaching 40 m, with arching branches and pendulous branchlets.
- Dioecious, with male (pollen) and female (seed) cones on separate plants
- Seeds are dispersed a short distance around the tree and spread by birds and by water .
- Also reproduce vegetatively by layering. Tree branches reaching the ground start to root and establish themselves as a new tree, which eventually breaks away from the parent. Branches breaking off trees can also take root.
- A stand of trees reputed to be in excess of 10,500 years in age was found in Western Tasmania on Mount Read, near Roseberry. Each of the trees in this stand is a genetically identical male that has reproduced vegetatively. Although no single tree in this stand is of that age, the stand itself as a single organism has existed that long.
- Growing tips:
  - *Lagarostrobos franklinii* is cultivated as an ornamental in some botanical collections and arboreta, but this slow-growing tree is not common in cultivation.

SPECIES	***Lagarostrobos franklinii***	**FAMILY**:	**PODOCARPACEAE**

- Will tolerate part shade. Prefers a cool and moist position. Moderately frost and snow hardy.

CULTURAL FEATURES

HISTORICAL FEATURES

- One of the of the reasons for establishing a convict settlement at Sarah Island in Macquarie Harbour was to harvest Huon pine from the Gordon River. From 1822 until 1833 convicts were forced to cut timber and float log rafts from the lower reaches of the river to the Sarah Island settlement. There they were pit sawn into frames and planks to build ships for the Government.
- This continued as a commercial operation after the convict era. Felled trees continued to be floated down the river to Sarah Island where they were picked up and taken to the mill at Strahan. From 1890 till the present day, the small port of Strahan, on Tasmania's west coast has been the main centre. However, from 1850 until 1880, the Davey River settlement in the southwest, supplied the majority of the market.

INDIGENOUS FEATURES

USES

- The rich creamy yellow wood is soft, durable, smooth, oily and light weight. The wood is very easy to work with and takes a high polish. Huon pine is probably the most durable of Australian timbers. Logs which apparently have lain on the ground for several hundred years are still being harvested and milled. The durability of the wood is due to the presence of the essential oil, methyl eugenol, which gives Huon pine its unique odour. The oil also has preservative qualities and deters insect attack. It has been said 'the only thing slower than a Huon pine's growth is its decay!
- Highly prized for its timber. Excellent timber for building boats, furniture, and for joinery and turning. Now widely used for craft items.
- Today, the tree is wholly protected and cannot be felled. However, wood on the forest floor, or buried in river beds, remains usable after hundreds of years and is still prized by modern woodworkers.
- Sources include areas flooded by Hydro Tasmania schemes and previously heavily cut-over areas, particularly the Teepookana State Forest near Strahan. The annual sawlog cut of 500 cubic metres per year from these sources is expected to last more than a century.
- Because it thrives in some of the roughest terrain, it has been more difficult to harvest than other Australian timbers. This has resulted in Huon pine traditionally being at least triple the price of common hardwoods, and, with its scarcity today, that has increased to a factor of six or seven.

OTHER INTERESTING INFORMATION

- Huon pine is one of the few native timbers that float when green.
- Estimates of the area of living Huon pine vary, but are in the order of 10,500 hectares. In addition there are about 800 hectares of standing, fire-killed pine. The current area of remaining pine is the remnant of a much wider original range that has been reduced by fire, inundation, logging and mining. Today most of the remaining stands are well protected within reserves, the majority within the World Heritage Area.
- It has been planted in the grounds of Crathes Castle, Aberdeenshire, Scotland and has done well. Two healthy specimens can also be found at Torosay Castle, Isle of Mull.
- Huon Pine was discovered soon after Hobart was settled, when logs were found that had washed down the Huon River. The durability and quality of these "driftwood" trees was recognized before the living tree was discovered.

SPECIES *Lagarostrobos franklinii*	**FAMILY**: **PODOCARPACEAE**

REFERENCES

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- The Gymnosperm Database, Earle. J. 2013

PROPS

- Timber Sample from Guides' Office
- Timber sample ruler

Livistona australis

SPECIES ***Livistona australis***	**FAMILY**: **ARECACEAE**

NAME

Name: *Livistona:* after Patrick Murray, Baron Livingstone. Patrick Murray was a Scottish horticulturist, (died 1671). HIs living plant collection became the basis of the Edinburgh Botanic Gardens in 1680, the second oldest botanic gardens in Britain. Named by Robert Brown in 1810

australis: southern

Common name: Cabbage Tree Palm, Cabbage Palm, Fan Palm (not to be confused with the most common NQ Fan Palm, *Licuala ramsayi*).

LOCATION

- Rainforest Gully

HABITIAT/DESCRIPTION

- Frost-free, moist coastal areas from near Orbost in eastern Vic to Fraser Island, south-east Qld.
- It is usually found in rainforest or rainforest margins
- It is the most widespread as well as the most southerly palm in Australia

BOTANICAL FEATURES

- The palms contain the largest monocotyledonous plants
- The tree has a slender, single, grey trunk up to 30m tall.
- Leaves are glossy, dark green, fan shaped, and up to 1.8m across; The leaves are incised to about half way and droop at the tips; Leaf stalk up to 3 m long, spined
- Flowers in spring and summer, creamy white flowers; Flowers borne on a large spreading, drooping inflorescence
- Fruits are red turning black when ripe, up to 1.5 cm in diameter
- Very hardy

CULTURAL FEATURES

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HISTORICAL FEATURES

- Cabbage Tree Hat - Early settlers made hats from untreated strips of the fronds. More sophisticated hats made using fronds that were boiled, then dried and bleached, then cut into very fine strips. These strips were woven into hats, usually with a high domed crown and wide, flat brim.
- The crew of the Endeavour sampled “palm cabbages” but probably of another species at Endeavour River.

INDIGENOUS FEATURES

- Growing tip used as food but harvesting kills the plant
- Fibrous bark used to make fishing lines, nets
- Leaves used for roof thatch, basket making and fishing lines and nets

USES

- Early settlers made troughs and slab walls from the trunks
- Early settlers also used the fleshy growing point, cooked or raw, for food and so the name Cabbage Palm

SPECIES *Livistona australis*	**FAMILY**: **ARECACEAE**
• Widely grown in gardens and parks in south-eastern Australia and overseas.	
OTHER INTERESTING INFORMATION • It is interesting to compare the two tall NSW palms which grow around Sydney which are growing side-by-side in the rainforest gully. *Livistona australis* with its palm or fan-like leaves (black seeds) and the Bangalow Palm*, Archontophoenix cunninghamiana* with a pinnate leaf with a long rachis (red seeds).	
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Macrozamia/M. communis

SPECIES *Macrozamia/M. communis*	**FAMILY**: **ZAMIACEAE**

NAME

Name: *Macrozamia:* from the Greek words *macros meaning* large and *zamia,* an American cycad genus in the Zamiaceae family.

communis : from the Latin, meaning common or occurring in abundance, in communities

Common Name: Burrawang from the aboriginal Dharuk language and this has subsequently been misapplied to other Australian cycads. Barwang to Bundjalung people.

The genus *Macrozamia* is part of the ancient gymnosperm group of plants known as Cycads**.** Cycads are named from the Greek *koikos*, as used by a Greek naturalist student of Aristotle for the north African doum palm.

LOCATION

- Section 105: In the Conifer/Gymnosperm– several species, including *M. communis* on the RHS of the unsealed path going up from the Main Path, beyond the *Callitris rhomboidea* (Port Jackson pine).
- Sections 104, 158: In the Rainforest, in addition to *Macrozamia* there are examples of *Lepidozamia* – which are also in the Zamiaceae family and can grow quite tall (3m), and *Cycas* in the Cycadaceae. All are called Cycads)
- Banks Walk (*M. johnsonii*, *M. moorei*) with their substantial trunks.
- Entrance to the Gardens *(M. moorei*).

HABITAT/DISTRIBUTION

- Cycads occur throughout the world tropics and subtropics but *Macrozamia* is endemic to Australia.
- Macrozamias occur in NSW, QLD, Central Australia, NT, and WA. Forty one species of *Macrozamia* occur in eastern Australia, one in central Australia and one in the south-west of WA. Many species have very restricted distributions.
- *M. communis* grows over large sections of coastal New South Wales and adjacent slopes and ridges of the Great Dividing Range, from Taree to Tathra, NSW. It is the most southerly cycad in the world.

BOTANICAL FEATURES

Macrozamias generally:

- Cycads are the most abundant group of gymnosperms and earliest extant seed plants. Appeared in the early Permian 280 mya. They survived the massive end-Permian extinction and then became so dominant the period is often called the Age of Cycads and Dinosaurs (the Mesozoic era) and then all but disappeared 80 million years ago. They then diversified at 15mya, a view being that this was caused by the development of a close association with insect (weevil) pollinators (ANBG Science Group meeting 3/11/13).
- Cycads are the earliest extant plants with secondary thickening although they do not have a cambium and so they can develop true roots. The ferns have rootlets and never develop true roots. The secondary thickening gives rise to the caudex or trunk protected by leaf bases. The cortex (core) of the trunks of cycads is starch rich.

SPECIES *Macrozamia/M. communis*	**FAMILY**: **ZAMIACEAE**

- Plants are low growing, have dark green palm like leaves up to 1-2m long arching outwards from a central trunk, which in some species may be underground.
- *Macrozamia* are dioecious, they have separate male and female plants. Female *Macrozamia communis* have large cones, resembling pineapples in size and shape. The large seeds are red/orange when ripe and germinate readily. The male cones are longer and narrower and rapidly die after pollen is shed. Cycads have large motile sperm unlike other gymnosperms. Seeds are borne in a large cone on the female plant, have a red orange outer coat, are large (3-8cm long) and mature in winter and spring.
- *Macrozamia* may be distinguished from other cycads by the upright spine on the end of the sporophylls (cone segments).
- Pollen eating beetles /weevils are pollinators. The cones heat up during pollination and may reach a temperature of 17 degrees Celsius above ambient temperature. The temperature varies with time of day, warmest in the late afternoon or early evening. Cones also give off an odour which also peaks in the late afternoon or evening.
- Cyanobacteria in coralloid roots provide source of nitrogen which is released to the plant. The coralloid roots may be near the surface but sometimes are quite deep in the soil.
- Cycads have contractile roots particularly when young. This allows the plant to maintain the growing point below ground level when it is small, and later in very small species, protecting it from damage and grazing.

M. communis:

- In its natural habitat *M. communis* can form extensive colonies as an understory in eucalypt forests. As a general rule *M. communis* usually forms a subterranean caudex on coastal sand dunes (due to the action of contractile roots), whereas in shallow soils and on quartzite and sandstone ridges it tends to form an aerial extension of the caudex or a short columnar trunk. Despite this comment, however, the old adage that the only consistent factor about cycads is their inconsistency applies to this species, as trunked specimens are common in some stands that have formed on coastal sand dunes. Near Batemans Bay on the south coast, *M. communis* is ubiquitous and can be found growing in dense and extensive stands, in association with *Corymbia maculata*. There are literally thousands upon thousands of plants growing within a 20 kilometre radius of Batemans Bay (albeit that many stands have been decimated in the name of progress to make way for homes, farms or tourist developments).
- Seeds poisonous (carcinogenic and neurotoxin) to animals and humans – humans experience an immediate reaction/vomiting whereas cattle develop toxicity slowly, over about a year their spinal cords disintegrate- develop the condition 'zamia staggers'.
- Pollination is thought to be an intricate co-ordination of cone traits and behavioural responses by the weevil, *Tranes lyteriodes*. Male cones produce heat and emit volatile compounds during pollen release forcing the weevils out of the male cones to visit the female cones in pollination (ANBG Botanical Science Group 3/11/13).
- Propagated from seed, good drainage essential, good container plant, may take 5 years to be noticed as a feature plant.

CULTURAL FEATURES

HISTORICAL FEATURES

- *M. communis* was described and named in 1959 by the late Dr L. A. S. Johnson (a former Director of the Royal Botanic Gardens Sydney) because of its habit of growing in large communities.
- Raw or cooked cycad seeds caused poisoning of expeditions of early Australian explorers including Cook, La Perouse, Flinders, Leichhardt, Stuart.

SPECIES *Macrozamia/M. communis*	**FAMILY**: **ZAMIACEAE**

INDIGENOUS FEATURES

- The red/orange seeds in the large female cone are a rich source of carbohydrate are easily collected as the plants are low growing, produce an abundance of seeds in the cones, are easily harvested and stored. However, most seeds are toxic (carcinogenic and neurotoxin) in their raw state. *M. macdonnellii* (Red Centre Garden) is the only cycad not eaten by aborigines.
    - Seeds were cooked, broken up, and then soaked for up to three weeks in running water. In Western Australia, only the outer red part was eaten, after treatment by washing and burying. Different tribes had different methods of preparation.
    - Aborigines could trigger seeding by use of fire and the abundant seed so produced sustained large social gatherings of hundreds for weeks or even months at a time. Surplus seeds could be ground and fermented in water, providing food months after the seeding ended.

USES

- Good container plants - may be grown from seed.

OTHER INTERESTING INFORMATION

- Some of the mature Macrozamias in the Gardens have come from road construction sites

REFERENCE

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PROP

Melaleuca spp

SPECIES *Melaleuca spp*	**FAMILY:** MYRTACEAE

NAME

Name: *Melaleuca:* from the Greek *melas* meaning black and l*eucos* meaning white. Named by Linnaeus in the 18th century in reference to the bark. This could refer to the blackened lower bark and white upper bark of some species resulting from fire.

Linnaeus described and named the first *Melaleuca* (*leucadendra*) in 1767, before Australia was even settled by Europeans, from a collection from what was then the Dutch East Indies. He described it without ever having travelled to the region, a not uncommon practice for the time.

Common Name: Paperbarks in the tree forms and honey myrtles in the smaller forms. These names refer to the flaky bark of many species and the nectar produced in flowers. The term 'tea tree' is also used occasionally but this is more commonly used with the related genus *Leptospermum.*

LOCATION

- Section 11: *M. linariifolia* (east coast of Australia) and *M.cuticularis* (west coast of Australia) across path opposite each other
- Section 12: *M.alternifolia*
- Section 143: *M. quinquenervia*

HABITAT/DISTRIBUTION

- Widely distributed throughout Australia except for some areas around Lake Eyre. There are 290 species currently. Overseas from Indochina (*M. cajuputi* from Vietnam to northern Australia) to the Society Islands Papua New Guinea and New Caledonia (several species).
- Generally plants of open forest, woodland or shrub land. Often found along watercourses or along the edges, and in, swamps.

BOTANICAL FEATURES

Paperbarks generally:

- They bear showy inflorescences like bottlebrushes made up of many tiny flowers; bird and insect and mammal pollinated. The showy parts of the flowers of *Melaleuca* are the stamens, the petals being small and inconspicuous. The stamens are often brightly coloured with red, pink, mauve, purple and yellow being common. The *Melaleuca* "flower" is really an inflorescence formed by a cluster of small flowers. Peak flowering for most species is spring however, flowering at other times is not unusual. The flower clusters may occur terminally at the ends of branches or in short spikes along the branches. Following flowering, three-celled woody seed capsules develop with each capsule containing many small seeds. The seed pods of some species remain tightly closed unless stimulated to open by fire or by the death of the plant.
- The many layers of thin, papery bark act as insulation and sunscreen. Trees, adapted to a habitat with a wet season or regular flooding, store air inside their trunks enabling them to breathe when submerged.
- Leaves and twigs are highly flammable.
- With one exception, melaleucas have not become weeds outside of their natural habitat. *M.*

SPECIES *Melaleuca spp*	FAMILY: MYRTACEAE

quinquenervia, a large tree from eastern Australia, is a serious pest in the Florida Everglades in the USA. This particular species is widely used as a landscaping plant in many parts of Australia.

- Melaleucas are highly variable not only between, but within species, making taxonomy and subsequent diagnosis difficult (see taxonomic rearrangement below). Partly this is due to their generalist nature (especially in regards to pollination) that does not favor the evolution of differentiating characters.
- Like many plants, 'species' of *Melaleuca* can be hard to define due to a 'swarm' like nature (similar *to Eucalyptus*) where what are generally recognizable 'species' in one location merge into other 'species' in other locations. Untangling the role of local environment and hybridization will be interesting future research.

M. linariifolia, Flax-leafed Paperbark, Snow in Summer: rivers and swamps east coast NSW and SE Qld. Flowers late spring - early summer; height up to 10m; propagation by seed or cuttings, dwarf cultivars available from nurseries with names such as Snowstorm and Snowflake. Many years ago was introduced to England where it is now widely cultivated as 'Snow-in-Summer'. Birds in search of insects frequent paperbarks during the flowering season. Limited use in manufacture of tea tree oil.
M. cuticularis, *S*alt water Paperbark: SW WA, unusual in being a large swampland paperbark reaching tree proportions; small white flowers June to October. In places e.g. Denmark WA it can be seen as the only tree in waterlogged pastures, may grow almost on the shoreline with its feet in salt water. Worthy of cultivation for its graceful form.

CULTURAL FEATURES

- Bark widely used as collage in paintings. The bark used for indigenous bark paintings comes from *Eucalyptus tetradonta.*

HISTORICAL FEATURES

INDIGENOUS FEATURES

- The papery bark had many uses,
  - As a blanket, mattress, disposable nappy, wrapping around a broken limb as a splint.
  - Sheets of the soft, spongy bark were stripped off to wrap up food, to bake food or lining ground ovens, to make containers for food.
  - To make water-repellent roofing material, to light fires , mend holes in canoes.
- A sweet drink is made from the nectar which is extracted by washing the flowers in coolamons in water. The scented flower also produces an amber coloured honey; it is strongly flavoured and candies readily.
- Leaves make an aromatic, lemon flavoured tea, which is tasty but not as pleasant as tea made from *Leptospermum*.
- The wood of tree species is used in the construction of canoes, shields and coolamons
- *M. argentea* leaves were burnt to repel mosquitoes.

USES

- Manufacture of Tea Tree oil from *M.alternifolia* for use as a topical anti-fungal and antibacterial medicine, also claims for use assisting in healing of sprains and burns, as a mild anesthetic, steam inhalant to ease bronchial congestion, coughs and colds, used in soaps, sun blocks, sun lotions, and shampoos. Today, it is produced on a commercial scale in the Northern Rivers region of NSW and marketed as Tea Tree Oil. The germicidal properties of tea tree oil in treating wound infections was identified in the 1920s, in WW2 all Australian soldiers were provided with a bottle of tea tree oil as

part of their standard kit. Towards the end of the war use of the oil was replaced with the newly discovered antibiotics and the tea tree oil industry was almost forgotten until it was reborn in the 1970s with the interest in natural products.

- *M.linariifolia* is closely related to *M alternifolia* and produces small quantities of commercial tea tree oil.
- *M. cajuputi* is widely used in Indonesia to produce cajuput oil used as a liniment and inhalant.
- Feature landscaping trees and shrubs.
- Very few other species of *Melaleuca* have other commercial uses. The timbers *of M. leucadendra* and *M. quinquenervia* have been used for fairly minor applications such as railway sleepers, fence posts and mine props. Useful in honey production and using as cooking wraps in barbeques.
- *M. hamaturorum* and some other species are highly tolerant of saline conditions and are used in reclamation of salted land.
- *M. uncinata* (broombush) has been widely used in brushwood fencing. Now of decreasing popularity because it is so flammable.

OTHER INTERESTING INFORMATION

- Recent molecular work on *Melaleuca* taxonomy has produced results which will force a change in their classification. Craven & Dawson (1996) for New Caledonian species and Craven (2006) for the remaining Australian species, combined *Melaleuca* and *Callistemon* in one genus but the changes will probably need to be much greater than this. The taxonomists have two options. One is to split *Melaleuca* into many different genera including many new ones. The other is to expand the concept of *Melaleuca* to include a series of genera currently separated. These include *Beaufortia, Calothamnus, Conothamnus, Eremaea, Lamarchia, Phymatocarpus* and *Regelia* (currently in preparation). Any other options would result in an inconsistent classification. There is considerable nostalgic resistance to this reclassification, especially in relation to the synonymy of *Callistemon*, with some institutions reluctant to recognize these changes (interesting to point out that new nomenclature is adopted or rejected, not imposed). The ANBG has not yet changed its naming.
- *M. linearifolia* (Narrow-leaved Paperbark) and *M. linariifolia* (Flax Leaved Paperbark) should not be confused. The former normally has red flowers and long linear leaves while the latter has narrow elliptical leaves and masses of showy sweet smelling white flowers. The latter has a leaf arrangement along the stem with four neat columns of leaves.
- There is currently active research on the oil types and yield of most *Melaleuca* and promising species for development have been identified.

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PROP

- Bottle of tea tree oil

Proteaceae

SPECIES	**FAMILY**: **PROTEACEAE**

NAME

- **Name:** *Proteaceae*: named after the Greek god Proteus, who could assume many forms. Refers to the variety and diversity of flowers and leaves. It was first used for the species now known as *Leucadendron argenteum* (Silver Tree, South Africa) which has very different male and female flowers and probably the wide range of flowers in *Protea* was involved. This was an incredibly prescient name as the favoured form Proteus took was an old hunchback, a good description of the pollen presenter of Australian Proteaceae. Named by Antoine Laurent de Jussieu in 1789. Jussieu was the first to publish a natural classification of flowering plants. It was based on work by his uncle, also a botanist. Much of his system is in use today.

Common Name :

LOCATION

- Proteaceae Section - Main Path markers 26- 38 and also throughout the gardens.

HABITAT/DISTRIBUTION

- Throughout Southern Hemisphere. Good example of a Gondwana family. Thought to have diversified well before breakup, thus well over 90m years old.
- Australia and South Africa have the greatest concentrations of diversity.

BOTANICAL FEATURES

- About 80 genera with about 1,600 species. Protea, Banksia, Embothrium, Grevillea, Hakea, Dryandra and Macadamia all belong to this family.
- Flowers: large and showy inflorescences,
- Pollination: in most species pollination is highly specialised with the use of a 'pollen presenter".
- Proteoid roots: these are masses of lateral roots and hairs produced in the leaf litter layer during growth cycles. They are a response to the poor phosphorous-deficient soils in Australia. Access to water and nutrients is increased by the release of carboxylates which immobilise phosphorus. This adaptation means that the plants are vulnerable to dieback and also fertilization is not effective.
- Because of the Proteoid roots, Proteaceae are one of a few flowering plants that do not form symbiotic relationships with mycorrhizal fungi.
- Many species are fire adapted. Two major strategies are resprouters (have a thick rootstock buried in the ground which sends up new shoots after a fire) and reseeders (plant is killed by fire but the seeds are stimulated by smoke to germinate, take root and grow)

CULTURAL FEATURES

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HISTORICAL FEATURES

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INDIGENOUS FEATURES

- *Macadamia* and *Persoonia* eaten
- Nectar from inflorescences used in drinks.
- Traditional medicines obtained from infusions of roots, bark, leaves or flowers.

USES

- Cut flower industry particularly – Proteas, Banksias, Leucadendron
- Macadamia is a valuable food crop. Australia produces approx 40% of annual global production. First commercial orchard was planted in the early 1880s near Lismore, NSW. Seeds were imported

SPECIES	**FAMILY**: **PROTEACEAE**
to Hawaii in 1882 and in the 1920s it was extensively planted there. Many people think that the plant comes from Hawaii.	
OTHER INTERESTING INFORMATION •	
REFERENCES •	
PROP •	

Nothofagus cunninghamii

SPECIES *Nothofagus cunninghamii*	**FAMILY**: **NOTHOFAGACEAE**

NAME

Name: *Nothofagus:* From Greek *nothos* and hence Latin *nothus* meaning false and Latin *Fagus* meaning European beech tree. Named by Carl Ludwig von Blume (1796-1862, b. Braunschweig, Germany) in 1851.

cunninghamii: Named after Allan Cunningham (1791-1839, born Wimbledon, England). Sent by Sir Joseph Banks to collect plants in Australia he arrived in 1816. Botanist and explorer. He is commemorated in many plant names. He participated in P.P. King's famous survey of the tropical coast of Australia and conducted exploration to the north of Sydney where he discovered Pandora's Pass into the Liverpool Plains, the Darling Downs and Cunningham's Gap through which the Cunningham Highway now passes. He refused the position of Colonial Botanist in Sydney in favour of his brother. Named by Sir William Hooker in 1840.

Common name: Myrtle, Southern Beech, Myrtle Beech. Myrtle tends to be used in Tasmania and Beech in Victoria

LOCATION

- Tasmanian and Victorian/NSW sections of Rainforest Gully.

HABITAT /DISTRIBUTION

- Grows in cool temperate rainforest in Tasmania and Victoria.
- There are three species of *Nothofagus* in Australia. *Nothofagus cunninghamii*, found in Tasmania and a few scattered localities in Victoria including the Otway Ranges. *Nothofagus moorei* (called the Antarctic Beech or Nigger Head Beech) found from Barrington Tops to the Border Ranges of NSW and Lamington National Park in Qld above about 1000 m and also a large tree. *Nothofagus gunnii* (known as tanglefoot or Fagus) is usually a tangled shrub and is found in the western and central mountains of Tasmania. *Nothofagus gunnii* is notable as the only truly native winter-deciduous tree in Australia.

BOTANICAL FEATURES

- A flowering plant, one of the southern hemisphere beeches. Male and female flowers and fruit small. Monoecious (male and female flowers on the one tree.
- Wind pollinated with a distinctive pollen type. Copious pollen produced and pollen important in determining the geological history of the plants, forest types and climate.
- Evergreen tree to 50 m tall but much shorter and shrubbier near tree-line in Tasmania.
- There are three species of *Nothofagus* in Australia. *Nothofagus cunninghamii*, Nothofagus *moorei* (called the Antarctic Beech or Nigger Head Beech) and *Nothofagus gunnii* (known as tanglefoot or Fagus).
- *N. cunninghamii* and *N. moorei* are easily distinguished by their leaves with the leaves of the myrtle up to 25mmlong and those of the Antarctic Beech up to 80mm long..
- Late in 2013 two New Zealand botanists published a new classification where *N. cunninghamii* and *N. moorei* were placed in the genus *Lophozonia* and *N. gunnii* was placed in *Fuscospora*. These names had been used for sections within *Nothofagus*. The new classification is not due to any

SPECIES *Nothofagus cunninghamii*	FAMILY: NOTHOFAGACEAE

inconsistency in the old classification but was used as a matter of judgement of the degree of difference between the genera.

- All species in Australia tend to grow in single-species stands and *Nothofagus cunninghamii* is the dominant tree over large stands of temperate rainforest in Tasmania but also grows with Leatherwood, *Eucryphia lucida* and Sassafras, *Atherospermum moschatum.*
- Both tree species (*N. cunninghamii* and *N. moorei*) tend to reproduce when in a forest by suckering. Counting suckers as part of one tree then the trees must live to be hundreds of years old,
- Mast years, which occur in New Zealand *Nothofagus* forests, do not occur in Australia. Mast years are when all the trees seed heavily in one year and there is a gap of about 6 years before they do so again.
- When Australia was attached to Antarctica (Gondwana) it possessed a wide range of vegetation. In the more northern parts the flora contained grasses, sedges, lily-like plants and Myrtaceae, Proteaceae, Lauraceae and many smaller rainforest families like the Cunionaceae and Winteraceae. In the southern parts near the break *Nothofagus* and *Eucryphia* forests were common. Penance Grove in Monga National Park may be the closest existing plant community similar to the Gondwanan cool temperate rainforests. It is dominated by *Eucryphia moorei* (Plum Wood, Pink Wood, and Eucryphiaceae). When Australia split (say 40- 35 mya) away from Antarctica a circumpolar sea-way was created which altered the circulation of the Pacific and Indian Oceans, Australia dried out and Antarctica froze. Imagine the climate; say at Casey Base, before the split. It was warm enough for tree growth but in winter there were months of darkness. The small seedlings of *Nothofagus* and *Eucryphia* may have had trouble surviving the dark in a deep forest. This may be an explanation for the propensity of the tree *Nothofagus* and *Eucryphia* in Australia to usually reproduce by suckering.
- The world distribution of *Nothofagus* has become a classic example of plant distribution mediated by the break-up of Gondwana. There are three aspects of this to consider here. The first is the current distribution of *Nothofagus* where it is found in southern South America, New Zealand, Australia, New Caledonia and New Guinea. This distribution is best explained by the break-up of Gondwana. The second aspect is the contribution of fossils, particularly pollen, which indicate the ancient distributions of the different groups of species within *Nothofagus*. The third is the observation that *Nothofagus* is a forest plant with poor seed dispersal capabilities. Its ability to disperse across oceans must be low. There is evidence of the poor expansion capabilities of a *Nothofagus* forest. (For those who wish to follow this up the "Beech Gap" in New Zealand is an eye-opener). *Eucryphia* has a similar history and current distribution but is only found in Chile and Australia.

CULTURAL FEATURES

- Parts of the film version of Tolkien's "Lord of the Rings" like Fangora Forest were filmed in New Zealand red and silver beech, *Nothofagus*, forests. *Nothofagus* forests are a favourite subject when hoary, mossy, waterlogged old forests are pictured.

HISTORICAL FEATURES

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INDIGENOUS FEATURES

- *N. moorei:* an orange fungus*, Cyttaria septentrionalis,* about the size of a golf-ball, which was eaten raw may grow on this tree. Other species of *Nothofagus* in Tasmania and Victoria bear a related fungus, which was also eaten.

USES

- The timber is pinkish brown and takes a fine polish. It has been used for cabinet work, joinery and floor boards. The tree is not an important source of timber.
- The distribution of *Nothofagus* and its fossil record as explained above have had an important

SPECIES *Nothofagus cunninghamii*	**FAMILY**: **NOTHOFAGACEAE**

impact on scientific ideas.

- The myrtle forests of Tasmania exert a significant influence on tourism principally through bushwalking.

OTHER INTERESTING INFORMATION

- You will not forget the generic name if you remember that is 'not a fagus', that is not an European Beech.

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PROPS

- Timber sample
- Photograph of a Tasmanian Myrtle Forest

Swainsona formosa

SPECIES ***Swainsona formosa***	**FAMILY**: **FABACEAE**

NAME

Name: *Swainsona:* after English horticulturalist Isaac Swainson (1746-1812). His garden was funded from profits of a remedy for venereal disease *Velno's Vegetable syrup* which was based on vegetables rather than mercury which is highly toxic.

formosa: from the Latin, 'formosa', meaning 'beautiful'

Common Name: Sturt's Desert Pea: for Charles Sturt, explorer, who recorded seeing them in central Australia in 1844. He was convinced that there was an inland sea in the centre of Australia. He did not find this, but he has two floral emblems named after him – Sturt's Desert Pea and Sturt's Desert Rose (*Gossypium sturtianum)* the NT floral emblem.

LOCATION

- Red Centre Garden
- During the summer months usually in a pot outside the VC.

HABITAT/DISTRIBUTION

- Native to the arid regions of central and north-western Australia; range extends into all mainland Australian states with the exception of Victoria

BOTANICAL FEATURES

- Taxonomy has been changed twice (*Clianthus dampieri, Clianthus formosus, Swainsona formosa)*
- Short-lived annual but can persist as a perennial. Seeds have a long viability and can germinate after many years (when it rains). Establishes a deep taproot very quickly.
- Usually a prostrate species, however forms growing to about 2 metres in height are known from the Pilbara region in north Western Australia.
- The classic flower is red with a black boss (the enlarged structure at the centre of the flower). Colour variations are known, ranging from red through pinks to yellow and albino forms.
- Seeds have a long viability and can germinate after many years. They are hard coated and are slowly cracked by high temperatures or worn down by sand abrasion.
- Leaves are grey, pinnate, hairy and soft to touch.

CULTURAL FEATURES

- Floral emblem of South Australia
- Has been featured on Australia Post stamps on several occasions

HISTORICAL FEATURES

- First collected by William Dampier in 1699

INDIGENOUS FEATURES

USES

OTHER INTERESTING INFORMATION

- Plants in the ANBG have been grafted on to the NZ species, *Clianthus puniceus*.

REFERENCE

SPECIES *Swainsona formosa*	**FAMILY**: **FABACEAE**
• http://www.anbg.gov.au/gnp/interns-2011/swainsona-formosa.html • http://anpsa.org.au/s-formos.html	
PROP	

Telopea speciosissima

SPECIES ***Telopea speciosissima***	**FAMILY**: **PROTEACEAE**

NAME

Name: *Telopea:* from a Greek word *telopos* meaning seen from afar. Refers to the conspicuous bright red flowers.

speciosissima: From two Latin words, *speciosus* meaning showy and *issimus* meaning most. Some sources give *speciosus* as meaning beautiful or handsome.

Common name: Waratah – from the Aboriginal word for the plant. Also Sydney Waratah and New South Wales Waratah.

LOCATION

- Section 24- Main Path
- Section 191 – entrance to Sydney Basin

HABITAT /DISTRIBUTION

- New South Wales from the Watalgan Mountains southward to Ulladulla, with a relatively widespread distribution in the Central Coast region. Much of its range occurs in the Sydney Basin.
- Usually occurs as an understory shrub in dry sclerophyll forest on sandy soils in areas with moderately high rainfall, receiving on average around 1200 mm a year. Dappled shade from eucalypt (*Eucalyptus*) trees reduces sunlight by around 30%.

BOTANICAL FEATURES

- Shrub to 3 or 4 m high and 2 m wide.
- Several stems arise from a pronounced woody base known as a lignotuber.
- Striking large red springtime inflorescences (flower heads), each including hundreds of individual flowers. These are visited by the eastern pygmy possum (*Cercartetus nanus*) and birds such as honeyeaters (Meliphagidae), and various insects
- There are five species of Waratah (*Telopea*); *T. aspera* (From Gibraltar Range, Northern NSW, *T. speciosissima* from the Sydney Basin, *T. mongaensis* from southern NSW, *T. oreades* from Gippsland to southern NSW and *T. truncata* from Tasmania. In Monga National Park *T. mongaensis* and *T. oreades* grow close together both at the ends of their range. In southern New South Wales and the ACT, several Waratah hybrids have been developed, notably *Telopea* "Braidwood Brilliant", "Canberry Coronet" and "Shady Lady". These tolerate more shade, frost and suboptimal drainage than required by their *Telopea speciosissima* parent. The other parents of these hybrids are the two species from the southeastern corner of Australia; *Telopea oreades* (Gippsland Waratah for "Shady Lady") and *T. mongaensis* (Monga Waratah or Braidwood Waratah for "Braidwood Brilliant" & "Canberry Coronet").
- *T. mongaensis* is a many branched shrub with numerous unspectacular flowers which grows often on the margins of swamps and so hybridizing this with *T. speciosissima*, which has few branches, showy flowers and requires excellent drainage, can produce a much branched shrub with showy flowers with greater tolerance to poor drainage In Section 30 a hybrid is growing between the two parents to illustrate this.
- Will regenerate from the base. ANBG horticulturalists cut shrubs right back and then water and feed them well. There are no flowers the following year but the year after that there will be large numbers of blooms.

SPECIES *Telopea speciosissima*	**FAMILY**: **PROTEACEAE**

- Growing tips:
  - Excellent drainage - they will not tolerate water logging
  - Assured moisture (especially in summer, in contrast to most other Proteaceae)- but freely draining
  - Good light - at least half sun, though many species prefer some shade while young.
  - Soils with at least some nutrient retaining potential, either from thick mulching or some degree of clay content (eg sandy to clay loams).
  - Can be temperamental and somewhat fussy when young (first two years or so), though usually become hardier once they have become established.
  - Vulnerable to various fungal diseases and pests

CULTURAL FEATURES

- Floral emblem for NSW
- Has featured prominently in art, architecture, and advertising, particularly since Australian federation. Was a popular motif in Australian art in the late nineteenth and early twentieth century and was incorporated in art nouveau designs of the time. Matchboxes, paperweights and especially tins have been decorated with the flower.
- Telopea , is the name of a journal of Plant Systematics of the NSW Department of Agriculture, National Herbarium of NSW and the Royal Botanic Gardens, Sydney.
- NSW Rugby Union team is known at the Waratahs, or 'Tahs.
- Telopea Park is a well-known Canberra landmark and hence Telopea Park High School.

HISTORICAL FEATURES

- First described by botanist James Edward Smith in his 1793 book A Specimen of the Botany of New Holland, from "very fine dried specimens sent by Mr. White". He gave the species its original binomial name of *Embothrium speciosissimum*. *Embothrium* had been a wastebasket taxon at the time, and Robert Brown suggested the genus *Telopea* for it in 1809, which was published in 1810. Richard Salisbury had published the name *Hylogyne speciosa* in 1809 but Brown's name was nomenclatural conserved.

INDIGENOUS FEATURES

- The word Waratah is derived from the Eora Aboriginal people, the original inhabitants of the Sydney area.
- The Dharawal people of the Illawarra region knew it as mooloone, and mewah is another aboriginal name. The Dharawal people regarded it as a totem, using it in ceremonies and timing ceremonies to its flowering.
- Aborigines sucked the flowers for nectar.
- The New South Wales waratah featured prominently in the folklore of the Darug and Dharawal people in the Sydney basin and Gandangara people to the southwest. A Dreamtime legend from the Eora tells of a female Wonga Pigeon searching for her husband who has been lost while out hunting. A hawk attacks and wounds her, and she hides in a waratah bush. Her husband calls and as she struggles in the bush her blood turns the white waratah blooms red.
- A tale from the Burragorang Valley tells of a beautiful maiden named Krubi, who wore a red cloak of rock wallaby adorned with the feathers of the Gang-gang Cockatoo. She fell in love with a young warrior who did not return from battle. Grief-stricken, she died, and up from the ground grew the first waratah.

USES

- Commercially grown in several countries including Australia as a cut flower.
- Also cultivated in home gardens.

SPECIES *Telopea speciosissima*	**FAMILY**: **PROTEACEAE**

OTHER INTERESTING INFORMATION

- A number of cultivars with various shades of red, pink and white flowers are available.
- A white form of *T. speciosissima* called "Wirrimbirra White" is grown in the Gardens. Introduced into cultivation by Thistle Stead at the Wirrimbirra Environmental Centre near Bargo, NSW.
- Pyrogenic-flowering species, relying on post-fire flowering followed by production and dispersal of non-dormant seeds to take advantage of favourable growing conditions in the altered environment following a fire. Of the woody re-sprouter species of south-eastern Australia, it is one of the slowest to produce seedlings after bushfires, taking at least two years. Re-sprouts from a lignotuber that stores energy and nutrients as a resource for rapid growth of new shoots after a bushfire. Waratahs dominate the understorey around two years after a fire, but are later overtaken by the slower-growing banksias and wattles. Fire also serves to strip away diseases and pests. Flowering may be prolific at this time.

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PROPS

- When in flower, no props needed, but could be interesting to have an example of the use of the flower in art such as a copy of Margaret Preston's woodblock: http://www.anbg.gov.au/waratah/preston.waratah.html

Toona ciliata

SPECIES ***Toona ciliata***	**FAMILY: MELIACEAE**

NAME

Name: *Toona*: from *toon* the Indian name for the tree.

ciliata: from Latin *ciliatus* meaning ciliated or having fine hairs at the margin. Referring to the hairy tufts on the underside of some leaflets.

The tree has been known by several botanical names, most commonly *Cedrela toona, Cedrela australis* and *Toona australis*. The name *Toona ciliata* is used in the latest (2013) volume of *Flora of Australia*. If confused use Red Cedar as then you will be understood. Named by M. Roemer in 1846 from Madras, India.

Common name: Red Cedar in Australia. This is a misnomer as the classical cedar, for example the Cedar of Lebanon, is a gymnosperm *Cedrus libani*. Overseas the tree is called mahogany or Moulmein Cedar.

LOCATION

- Outside the glass Houses.
- In the Southern Qld section of the Rainforest Gully.

HABITAT/DISTRIBUTION

- Red Cedar is found from Benandarah State Forest (near Nelligen, NSW) to Iron Range in northern Qld, in rainforests. Overseas it is found from eastern Pakistan, through India, Southeast Asia to New Guinea and New Britain.

BOTANICAL FEATURES

- There has been much confusion over the correct botanical name of Red Cedar. To oversimplify; *Toona* is used as the generic name of the Southeast Asian species and *Cedrela* is used for the Central American species. If the Southeast Asian species and Australian species are considered the same then *Toona ciliata* is the correct name. If they are considered different then *Toona australis* would be used.
- Large trees to 45 m, sometimes to 60 m, tall with bole 3 m diameter. Trees monecious (with male and female flowers on the same tree).
- Deciduous, a characteristic shared with the related White Cedar (*Melia azedarach*). The tree is not winter deciduous in the same way as, for example, oaks or elms. Red Cedar is a dry season deciduous tree, losing its leaves in the southern spring. It has this in common with a large number of trees, particularly in the seasonally dry monsoon forests of the NT where dry-season deciduousness is common and even some eucalypts lose their leaves. This is probably a response

SPECIES *Toona ciliata*	**FAMILY: MELIACEAE**

to seasonal drought but often the trees flower before regrowing their leaves so it may also emphasise the flowers to pollinators.

- Flowers are small, fragrant and white to pink in terminal panicles. Winged seeds about 2.5 cm long.
- Red Cedar has large compound leaves to 50 cm long with 3 to 8 pairs of leaflets. New leaves are characteristically pink or red. The bark is grey and scaly.
- Red Cedar has been termed "the most favoured and valued Australian timber" and because it is so valuable, millable trees have been eliminated throughout its range unless inaccessible. Young or maimed trees are present but rare.
- The trees are attacked by the Cedar Tip Moth (*Hypsipyla robusta*, subfamily Phycitinae, family Pyralidae). The young larvae bore in the tip of the leader, or principal branch, causing vigorous side shoots and "cauliflowering" of the top of the tree. This is rare in the wild as the moth does not attack the tree until it reaches the canopy which may be 50 m above the ground. If Red Cedar is grown in a plantation then the moth attacks when they are small trees and they are ruined for timber.
- Attempts have been made to cultivate the trees in plantations interspersed with Hoop Pine (*Araucaria cunninghamii*) but have failed as the Red Cedar plants grew poorly. Overseas attempts at cultivation, for example, in Hawaii where the moth is not present have also failed due to poor growth.

CULTURAL FEATURES

...When I look again on the dark-red, polished wood
Glowing in the lamplight and lovely in death, kept dry
And safe while the storm shakes the house, my heart will see
How lovelier yet in the ardour of life it stood....

Nan MacDonald

HISTORICAL FEATURES

- An entire timber industry was based on cutting Red Cedar. The industry persisted for over a century, the centre of it moving as ever more inaccessible areas were exploited. The Illawarra region was the first major source to be exploited, and by 1819, restrictions on cutting cedar in the region were in place because the exploitation had been so rapid and complete.
- Red Cedar was discovered soon after the (1788) settlement of Sydney. During 1789 timber was felled near Rose Hill (Parramatta) and on 13 February 1790 Governor Phillip wrote to Lord Sydney about the wood of these newly discovered trees. There was an added incentive to this as the new settlers had found the eucalypt wood very hard and rapidly blunted their poor quality axes. Some settlers believed the trees to be a sort of mahogany but others thought it was a type of cedar.
- Trees were then rapidly found along the Hawkesbury River and by 1800 increasing quantities were logged at Green Hills (Windsor). James Meehan reported red cedar from the Illawarra in 1805 and

SPECIES *Toona ciliata*	**FAMILY: MELIACEAE**

the first cargo of cedar from there was despatched from the Shoalhaven in 1811.

- "Cedar getting" as it was called became the initial economic industry in many areas of the NSW and Qld coast. Timber was easily floated down rivers for shipping to Sydney. The shipping of timber and supply of the cedar getters led to commercial infrastructure. Wharfs, stores and farms to supply meat and eggs lead to clearing for agriculture and the establishment of towns. In this way cedar played a vital role in the "opening up" of the coast to settlement.
- Cedar and other timbers played a less well known role in creating the Australian (or Kelly) axe. English axes blunted too easily and were poorly balanced. The American two bladed axes were also found unsuitable. The Australian axe we use today is the product of a long evolution initiated by the failure of imported axes.

INDIGENOUS FEATURES

- The seeds are edible but I have found no records of their use as food. Nevertheless there are Aboriginal names recorded for Red Cedar and so it was probably used. Recorded names are polai, woolia, mamin, mugurpul and woota.

USES

- Timber may be had today but only in very small quantities and it is very expensive.
- The timber is deep red in colour, seasons quickly, is soft and easily worked, light , durable, polishes well and it is the timber of preference for furniture, indoor fittings and furnishings, cabinets and so on.
- In India the bark has been used in treating fevers and other disorders.

OTHER INTERESTING INFORMATION

- Like fishing stories there are many "biggest tree" stories. One will suffice. One from the Macleay district of NSW was said to be 14.6 m in girth 3 m from the ground and to yield 198 cubic metres of timber.

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PROP • Photo of tree. • Wood sample.	

Triodia spp

SPECIES ***Triodia spp***	**FAMILY**: **POACEAE**

NAME

Name: *Triodia:* from the Greek *treis* meaning three and *odous* meaning teeth. Referring to the three-toothed or three-lobed lemma (a part of the spikelet of grasses)

Plectrachne: from Greek *plectron* meaning a cock's spur or spear point and *achne* meaning chaff. Referring to the 3-awned lemma. *Plectrachne* is now considered a synonym of *Triodia* but was for many years separated.

Triodia was named by Robert Brown in 1810.

Common name: Spinifex, porcupine grass, Triodia. Many species have individual common names like Hard Spinifex, Soft Spinifex, Bull Spinifex, Weeping Spinifex, Hubbard's Spinifex, Gummy Spinifex and many others.

LOCATION

- Eastern mallee
- Red Centre Garden
- Rockery

BOTANICAL FEATURES

- They are tussocky perennial grasses usually having tightly rolled, rigid, sharp-pointed needle-like leaves.
- Like all grasses they are wind pollinated. I remember camping one night near Alice Springs in the secure shelter of a rocky eminence while a gale raged in exposed places. At night masses of pollen could be seen swirling above in the wind in our bright camp lights.
- There can be confusion because the common name 'spinifex' is applied to *Triodia* and to grasses of the genus *Spinifex* which is unrelated. Species of *Spinifex* are called hairy spinifex or beach spinifex and grow on beaches all around Australia where the two Australian species are very important in dune stabilization.
- Tussocks of *Triodia* can be very long lived. As they age the growing parts tend to spread outwards from a centre forming neat grass rings with bare ground and old stems inside the ring. The rings can be up to 6 m in diameter.
- *Triodia* is a very important component of many arid grasslands and woodlands. These are frequently called hummock grasslands and in such communities *Triodia* is the dominant grass. They are called hummock grasslands because wind erosion of the bare ground between hummocks

SPECIES *Triodia spp*	**FAMILY**: **POACEAE**

tends to lower the exposed surface and the Triodia tends to intercept wind-blown sand forming hummocks under the grass.

- In Central Australia there are two groups of *Triodia*, one group has hard, sharp and quill-like leaves and does not produce resin. The other group called "soft spinifexes" have less rigid and more loosely arranged leaves and do produce resin.
- The very spiny nature of the grass and the tussocks of *Triodia* provide excellent shelter for ephemeral plants and animals. *Triodia* grasslands are the habitat of the Spinifexbird and the arid zone grasswrens of the genus *Amytornis*. They provide protection for numerous other birds, including the night parrot, for a few mammals and hosts of reptiles and invertebrates.
- Ephemeral plants thrive in *Triodia* communities but there are usually few other perennial grasses associated with it.
- *Triodia* is extremely drought resistant.
- *Triodia* spp are highly flammable
- Spinifex roots go down a long way: approximately 3 metres. Generally the roots develop from the same nodes as the shoots so that each shoot has its own personal water supply. The spiky leaves contain a lot of silica which makes them stiff and rigid.

HABITAT/DISTRIBUTION

- The genus *Triodia* contains about 65 species all confined to mainland Australia
- *Triodia* is a very important component of many arid grasslands and woodlands
- *Triodia* is found in large areas of the eastern mallee and very extensively on rocky hills and many other situations throughout the arid zone. There are species found in the southern arid zone but a preponderance of species are found in the northern arid zone and in the north *Triodia* extends into the tropical woodlands across the north and, for example, is widespread in the sandstone plateaux of Arnhem Land, the Kimberley and Cape York Peninsula.

CULTURAL FEATURES

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HISTORICAL FEATURES

- Much cursed by the early explorers for its pungent leaves and lack of feed value.

INDIGENOUS FEATURES

- It is hard to overestimate the importance of *Triodia* to indigenous people. But it was mainly as the mainstay of the plant communities of the centre that it was important. It supported fire well when fire was used in hunting and its protection was important to much wildlife.
- Aborigines did not gather and eat the seed, at least in Central Australia.

SPECIES *Triodia spp*	**FAMILY**: **POACEAE**

- The main and very important, direct use of the plant was for the aromatic and sticky resin produced by the leaves and leaf sheaths. This resin is vital for the making of tools and implements. It is described as a hard, thermoplastic material. Resinous parts of the plant are pounded on a hard surface until the resin is dislodged. Then most of the loose plant material is removed. It is then heated and moulded and compressed with stones. It cools to a black substance setting hard and strong. Plant material adds to the strength of the resin. Resin may also be obtained from ant's nests. Ants of the genus *Iridomyrmex* collect resin to cement grains of sand in their nest, an ant hill about the size of a football. These are constructed in the *Triodia* tussocks which are burnt to expose them. Melting the anthills produces a sandy and inferior resin. *Triodia pungens*, or soft spinifex, was one species used in resin collection.

USES

- *Triodia* plants provide little grazing for stock but the leaves of some species may be eaten when regrowing after fire. In Western Australia softer species can be an asset in drought.
- Its most important rangeland role is as a stabilizer against erosion.

OTHER INTERESTING INFORMATION

- Tussocks are easily torn up by bush-bashing vehicles and frequent stops may be needed to clear under the car.
- Stockmen shelters are constructed in the Simpson Desert by four poles let into the ground and wire netting stretched between the tops of the poles. Then a thick layer of spinifex is piled on top and another layer of netting. Not water proof (who needs that in the desert) but lovely shade.

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PROP • Photographs.	

Wollemia nobilis

SPECIES ***Wollemia nobilis***	**FAMILY**: **ARAUCARIACEAE**

NAME

Name: *Wollemia*: refers to the Wollemi National Park about 100 km W of Sydney in which the plant was found.

nobilis refers to the discoverer David Noble; *nobilis* is Latin for noble, excellent. There is a double meaning here and undoubtedly both meanings were intended.
Wollemia nobilis was named by WG. Jones, KD. Hill and JM. Allen in 1995.

Common name: Wollemi Pine. The press have at times, tongue-in-cheek, called it the lonesome pine.

LOCATION

- Gymnosperm section between the rainforest gully and rockery.
- Inside Visitors Centre

HABITAT /DISTRIBUTION

- Occurs naturally in three stands in deep gorges in sandstone along creeks. Only known from these three sites in Wollemi National Park about 100 km N of W of Sydney. Fewer than 100 trees known.
- Trees occur as emergents above a coachwood (*Ceratopetalum apetalum*) and sassafras (*Doryphora sassafras*) rainforest.

BOTANICAL FEATURES

- With the other Araucariaceae, one of the southern hemisphere gymnosperms. Not a flowering plant.
- It is monoecious, both male and female cones on the one tree.
- Wind pollinated.
- *Wollemia* contains only one extant species, *W. nobilis*.
- Tree growing to 40 m with trunk to 1 m diameter. Trees coppice with age forming younger trunks.
- There are two types of branches, the upright branch forming the trunk and the sideways branch developing from the trunk and forming leaves. The sideways branches do not divide unless damaged.
- Like *Araucaria* old lateral branches fall intact, not the leaves as in the Kauri (*Agathis*).
- Mature leaves 1-4 cm long, leathery. There are young leaves which are bright lime-green. The leaves grown early or late in the season are shorter than those formed mid-season.
- Male cone to 10 cm long borne on tip of branches, green then rapidly browning. Female cones borne on tips of branches but higher in the tree, globular, to 8 cm diameter, spiky looking.
- Cones break up on the tree like those of the Kauri (*Agathis*) but unlike those of *Araucaria* consequently the seeds are winged, again like the Kauri.
- In the Kauri the wing is on one side of the seed while in *Wollemia* the wing encircles the seed.
- The trunk is characteristically covered in nodules or tubercules like bubble plastic and is brown. Trees often have multiple trunks.
- Trees live to a great age. A tree ring analysis and carbon dating of a dead trunk suggested an approximate age of 350 years.
- *W. nobilis* is critically endangered, access to the sites is restricted and monitored.
- The known trees demonstrate very little genetic variation indeed. This suggests a long-term relict population which may have come very close to extinction in the past.

SPECIES ***Wollemia nobilis***	**FAMILY**: **ARAUCARIACEAE**

- Identical pollen has been known since the 1960s and has been called *Dilwynites.* It is known from the period 90 mya to 2 mya. Pollen from 2 mya is probably from *Wollemia* and perhaps even this species.
- Wood fossils are much older as are leaf fossils and they could be *Wollemia* or may not. The genus *Podozamites* from the famous Talbragar fish beds at 160 mya clearly is closely related to *Wollemia* as is the similar *Araucarioides* from fossil beds near Strahan at 50 mya.
- Fossil cone scales from 120 mya in eastern Vic. are strikingly similar showing the winged nature of the seed.

CULTURAL FEATURES

HISTORICAL FEATURES

- The very recent discovery of such a large and interesting tree proved a publicity bonanza with massive public interest. Its close proximity to Sydney added to the interest.
- Ever since Sir Arthur Conan Doyle published *The Lost World* in about 1912 the idea of Jurassic relicts has been a popular one spawning such imaginative productions as *Jurassic Park.*

INDIGENOUS FEATURES

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USES

- Now widely grown in home garden in Australia and Botanical Gardens around the world. Used as a specimen tree, a talking point.
- Now often grown in large pots where it seems frequently more comfortable.
- Tolerates temperatures from -5 to 45 ˚C and favours sandy slightly acid soils.
- Plants may be grown from cuttings or seeds and are slow growing to start with but often reach 1 m after 3 years. Cuttings from branches produce low-growing plants. Plants were released for public purchase around 2006.

OTHER INTERESTING INFORMATION

- Early publicity of the plant suggested a profitable nursery industry. The rights were put to tender and the QLD Dept of Primary Industries won the contract. They rapidly grew thousands of plants for sale.
- Active research continues today on the Wollemi Pine particularly at the Royal Botanical Gardens, Sydney and Mt Annan.
- We should remember that such Jurassic relicts are really only plants that have changed very little since the Jurassic. All living things had ancestors in the Jurassic but in most cases the ancestors then were not very similar to their descendants today.
- Very importantly the Wollemi Pine joins the Ginkgo tree (*Ginkgo biloba*) and the Dawn Redwood (*Metasequoia glyptostroboides*) as a classic example of trees which are critically endangered in nature but are secure through their widespread cultivation. The Wollemi Pine is now cultivated in such botanical Mecca's as Kew Gardens and the Missouri Botanical Gardens and numerous other places around the world and very widely in Australia.
- One of the trees which are planted in a block in the National Arboretum.

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SPECIES *Wollemia nobilis*	FAMILY: ARAUCARIACEAE
PROPS • Pictures of the trunk and mature trees	

Xanthorrhoea spp

SPECIES *Xanthorrhoea* spp	FAMILY: XANTHORRHOEACEAE

NAME

Name: *Xanthorrhoea*: from the Greek *xanthos* meaning yellow and *rheo* meaning flow; refers to yellow resin to be found "flowing" at the base of leaves in the type species *X.resinosa*

Common Name: Grass tree - common name of all xanthorrhoea, refers to distinctive tuft and skirt of grass-like leaves on species developing a trunk; Yacca or Yacka (only in SA); Blackboy (purported similarity in branched species to an aboriginal person standing motionless on one leg holding an upright spear).

LOCATION

- Grass trees in ANBG: *X.glauca subsp angustifolia (formerly X.australis), X. macronema, X. johnsonii,* and *X. arborea.*
- Section 175 in front of VIC
- Between Banks Walk and cafe bridge.
- Grassy Woodlands
- Monocot area
- Top of the Rock Garden.

HABITAT/DISTRIBUTION

- *Xanthorrhoea* spp. occur in all states, NT and ACT.
- Most spp are coastal or sub-coastal with the exception of *X. thorntonii* (Central Australia at Gosse's Bluff and Kings Canyon, and WA). Most have limited geographical distribution.

BOTANICAL FEATURES

- A native genus of monocotyledons, of 29 species and 10 subspecies found only in Australia.
- Wherever these plants grow in the bush, their features dominate the landscape. The flowering spikes may be used as a compass because the flowers on the warmer, sunnier north facing side of the spike open before the flowers on the cooler side facing away from the sun.
- Only half of *Xanthorrhoea* species form a significant trunk. The remainder are sessile inconspicuous plants. The trunk consists of a true stem surrounded by persistent, densely packed leaf bases. As an atypically formed trunk it is called a caudex. A woody portion may form at the base of the trunk. Height growth of trunk 5-25mm/year. Height growth of flower spikes 5-7cm/day. Flower spikes can produce 1000 – 10,000 seeds.
- Survive bushfires and severe drought:
    - Fire effects: immediately after a hot bushfire, melted resin is seen hanging from the trunk, multiple trunks often develop after damage to the main trunk. A couple to several weeks after fire, depending on the species, single or multiple flower spikes grow rapidly, new leaves grow , flower spikes grow rapidly and thousands of seed from the flower spikes germinate.
- Seeds germinate easily but few seedlings reach maturity; seedlings are grazed by rabbits not kangaroos. After germination, contractile roots pull stem base below ground level (ca 15cm) and

SPECIES *Xanthorrhoea* spp	FAMILY: XANTHORRHOEACEAE

protect the growing apex.

- Are long-lived, may live up to 600 years.
- *X. glauca subsp angustifolia*
  - Flowering period: thousands of white flowers/spike, spring to summer or following a bushfire.
  - Height: Normally up to 3m, some up to 7m.
  - Protected species, current threats include illegal removal by humans and the plant disease, Cinnamon fungus, which attacks roots causing collapse and death of the plant.
  - In ACT, carbon dating of a very large *X. glauca angustifolia* gave 350 years of age.
- Propagated by seed, seed germinates 3-6 weeks, semi-mature plants are often available in nurseries; buyers should ensure that these plants are labelled as having been legally collected and are well established in their containers. The nursery industry has been slow to embrace the cultivation potential of grasstrees due to their slow growth rate. In its natural environment *X. glauca* grows 1-2cm per year. *X. glauca, X. macronema, and X. preissii* are more commonly cultivated, need well drained sunny position. Maintenance is minimal after establishment, the plants require little water and are not subject to insect infestations.
- Old leaves droop and die and form a skirt around the trunk. The skirt is highly flammable and the period since the last fire, or how complete the burn was, can be gauged by the skirt. Where the skirt is well developed it is good shelter for small animals.

CULTURAL FEATURES

- Colonial artworks: Grass trees were extraordinary to travellers' eyes and were painted by landscape and other artists, e.g.:
  - The convict artist Thomas Watling who was assigned to doing art for some official reports often included Xanthorrhoea as background in his picturesque paintings of aboriginal gatherings. http://www.nhm.ac.uk/nature-online/art-nature-imaging/gallery/image.do?imageid=105
  - Flower spike painted in detail by William Lewin, 1806.
  - George French Angas, 'Grass trees at Yankallillah, with the red kangaroo'. 1846-47, http://artsearch.nga.gov.au/Detail.cfm?IRN=43824&PICTAUS=TRUE.
  - Rosa Fiveash, 1854–1938, *Xanthorrhoea semiplana (grass tree)* 1893, http://www.artgallery.sa.gov.au/agsa/home/Learning/docs/Online_Resources/SouthAustraliaIllustrated_EducationResource_online.pdf.
- Modern artworks, most well known being Fred Williams landscapes.
- Ted Prior's children's book series character 'Grug', hero of the Australian bush. They were published between 1979 and 1992 by Hodder & Stoughton, Australia, now republished by Simon & Schuster, Australia from the 1st of June, 2009. Grug began his life as the top of a 'burrawang' tree; however the original animation is clearly a grass tree and not a *Macrozamia communis* known as 'burrawang'. Resembling a small, striped haystack with a face, he is fascinated by the world around him and solves everyday problems creatively and without fuss. When dancing instructions are too difficult to understand, Grug invents his own dance and calls it "The Grug".

HISTORICAL FEATURES

- Named by Daniel Solander on a specimen he collected with Sir Joseph Banks in 1770.
- 'Xanthorrhoea' was officially applied by J.E. Smith in England in 1798.

INDIGENOUS FEATURES

- As a food: the bases of the leaves are sweet and nutty, the heart of the stem and tubers were also eaten. Nectar was collected from the tall spike of flowers, fermented to make a slightly alcoholic drink. Beetle larvae were collected from the caudex. In southern WA beetle larvae collected from dead *Xanthorrhoea* trunks were called bardi grubs, a term now widely misapplied.

SPECIES ***Xanthorrhoea* spp**	**FAMILY**: **XANTHORRHOEACEAE**

- Leaves used to cut meat.
- Flower stalks used for fish spear shafts.
- Resin: when heated it melts and then sets hard. Was used to attach spear heads, axe heads, and to repair wooden vessels such as coolamons

USES

- Harvested for resin, seeds, leaves, inflorescences and whole plants.
- One of earliest building materials for European settlers, providing thatch for houses.
- Wood from the fibrous trunks used for brake blocks on wagon wheels in 1800s; and stumps and roots are today used for wood turning and carving.
- Among the first natural resources to be used for medicine as 'Botany bay resin' for chest complaints, diarrhoea and dysentery (1830s).
- Numerous uses of the glassy resin which exudes from the trunks - stove polish, black out for photographic rooms, timber varnish, soap manufacture, linoleum, early gramophone records and incense in churches.
    - Resin industry well established by 1860s, Kangaroo Island last place for significant harvesting, harvesting now done on dead plants.
    - The resin is soluble in alcohol or ether but not in turps. The rich red of the resin was used by shonky operators to varnish wood to look like red cedar.
    - In 1920s most resin was exported to Germany, France, UK and USA. Resin treated with nitric acid produced picric acid used in the production of explosives.
    - More recent use of resin in Australia has been for manufacture of munitions during World War II, the lacquer for tin cans of food. Today the main use is in the manufacture of fireworks.
- Seeds used by the mining industry in seed mixes for site rehabilitation.

OTHER INTERESTING INFORMATION

- Protected species. Harvesting of whole plants for export and domestic use is controlled with a licence and tagging system. Quotas for 'salvage' and non-salvage harvesting. Plants for landscaping mainly go to Europe and Asia or are used in Australia.
- Ecological importance – many marsupials, mammals (squirrel gliders, brown bandicoot, rodents, 60+spp of birds, and insects (350 spp of invertebrates- including ants, termites, native bees, beetles, moths, butterflies, spiders, nematodes are dependent on grass trees or their flowers or skirts.
- When ants infest the flowers the other invertebrates pollinating the flower are repelled. Ants in general, because of their limited mobility, propensity to clean themselves and production of antibiotics from surface glands, are very poor pollinators compared to winged insects.
- *Kingia* and *Dasypogon* are related native plants with a similar growth habit to *Xanthorrhoea* and can be confused with them and misnamed grasstrees. *Kingia australis* (Black Gins), with a tall trunk looks like *Xanthorrhoea* but has multiple globular inflorescences.
- Many of the mature grass trees at the ANBG came from the vicinity of the Cotter Dam at the time of the dam extensions.

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SPECIES ***Xanthorrhoea* spp**	**FAMILY**: **XANTHORRHOEACEAE**
PROP • There are usually samples of the trunk on the ground.	