Australian Plants Society NORTH SHORE GROUP
Ku-ring-gai Wildflower Garden

RAINFORESTS

Did you know that?

- Rainforest now is only a fraction of that found millions of years ago.
- In Sydney, Rainforest is only in moist sheltered valleys.
- The Central Eastern Rainforests of Australia are World Heritage listed.
- Rainforests are cool and moist because they have a closed canopy.
- Rainforests are threatened by a host of factors including logging and fire.

History and Extent of Rainforest

About 65 million years ago (mya), Australia was still joined to Antarctica and South America. The seas around the south-eastern coast were much warmer than today and rain bearing winds penetrated much further inland. Rainforest (RF) was the major vegetational formation over much of Australia. This situation remained until Australia broke away from Antarctica and started to drift northward. As a consequence, the Antarctic Ocean's circum-polar cold currents developed about 30 mya. This produced much drier conditions, so that with the continuing movement northwards of Australia, rainforest retreated to more favourable regions.

In Australia the relative abundance of rainforest has reduced from about 85% abundance 22 mya to 22% about 250 years ago. An estimate in 1989 found that the remaining intact RF was only 20% of that in 1788. The reduction is due to clearing for agriculture, logging and the effect of fire.

RF on the mainland of Australia is almost confined to the eastern portion from Cape York in the north to Cape Otway in the south. It is found on coastal lands, coastal highlands and parts of the Great Dividing Range. Its distribution is discontinuous. Some small patches and strips may only be several metres in breadth. Typical situations include along watercourses, in sheltered moist valleys, damp mountain gorges or basalt-capped mountain tops with higher rainfall than the surrounding areas. In Tasmania, there are considerable areas of temperate RF, including the extensive beech (*Nothofagus cunninghamii*) forests of the north-west and west coast.

The Central Eastern Rainforest Reserves of Australia are World Heritage listed, an international recognition of their global significance.

Factors Affecting Distribution

Six major factors determine the distribution of RF in NSW. These are climate, topography, micro-climate, soil, fire and competition. Climatic factors include rainfall or supplementary moisture such as cloud, mist and dew. Exposure to desiccating or cold winds will often determine where RF will occur. As for topography, aspect is important. Southern and eastern aspects generally favour RF development, as do gully situations. RF canopy is essential in modifying the environment by reducing the light intensity, wind and precipitation to produce a humid cool shady micro-climate. Basalt and other igneous rocks produce a soil high in phosphorus, a key element in determining RF distribution. RFs are not adapted to fires, which encourage their replacement by sclerophyll forests. One of the reasons for loss of RF is its ease of clearing. RF trees when felled and burnt are killed whereas Eucalyptus and many open forest species survive and re-shoot. Gaps in RF may be filled by vigorous woody exotic weeds such as Camphor Laurel.

Broad Types of RF in South-Eastern Australia

Sub-forms of RF recognised in NSW:-Sub-tropical RF (**STRF**), Dry RF (**DRF**), Warm Temperate RF (**WTRF**), Cool Temperate RF (**CTRF**), Littoral RF (**LRF**) and Vine Thickets (**VTs**). Reference is often made to other types, namely Swamp Rainforest, Gallery Rainforest, Headland Rainforests, Gorge Rainforest and Mixed Forest. (Harden et al, 2006).

In the area around Sydney, the remnant RF is mostly **WTRF** which is less diverse than **STRF** and commonly has species with leaves which are simple with toothed margins. A few species of large epiphytes are found and ground ferns frequently occur, and a fairly high rainfall occurs. The most common dominant trees are usually Coachwood (*Ceratopetalum apetalum*) or Sassafras (*Doryphora sassafras*).

STRF is found mostly on the Northern Tablelands in warmer areas with high rainfall.

DRF is also found on the Northern Tablelands where the rainfall is fairly low but the soils are richer.

CTRF is found in areas of very high rainfall and high altitude. The commonest and often the only dominant tree is the southern beech (*Nothofagus moorei*).

Littoral RF (**LRF**) is not really a structural sub-form but is a distinctive series of communities found close to the sea either on nutrient-enriched deep sands or on soils derived from slates, basalt, etc.

Canopy

RF has a closed canopy. Sub-tropical RF has the greatest number of species in the canopy followed by Dry RF. Warm-temperate RF and Cool-temperate RF have the least number.

Leaves

There is a trend from large entire compound in Sub-tropical RF to small toothed entire leaves in Warm-temperate and Cool-temperate RF. Leaves are generally thinner than in surrounding sclerophyll or open forest. Many species have a drip tip to help drying of the leaf and to help increase photosynthesis. Leaves of some species have other features such as *domatia*, the function of which is not fully understood, but which help in identification.

Bark

The RF bushman, often a logger, could identify trees by their bark. They used colour, texture, pattern and smell, features which were available at eye-level.

They often 'blazed' a piece of the bark to assist this process. Many RF trees have thin bark, but thick rough-barked species are commonly found in the transition zone between RF and open forest, where insulation of the cambium from heat damage is necessary.

Flowers and Fruits

While the flowers of RF plants can be quite spectacular, it is possible that the fruits can be equally or more so. They may be fleshy or dry. They are often edible, if not by people then certainly by other species, especially birds.

Timber

Many RF species are treasured for their timber. Talk to a cabinetmaker or a builder and the value of RF timber soon becomes apparent.

Special Life Forms

Examples of special adaptations for life in RF include buttresses, coppice shoots and stranglers. Palms are a feature of tropical RF and vines and epiphytes are often found. Epiphytes can be vascular or non-vascular. Vascular epiphytes include many orchids and several fern species. e.g. bird's nest ferns, elkhorns, staghorns and basket ferns. In certain RF types a number of large leaved herbs and ground ferns are found. Tree ferns are common along sheltered gullies or watercourses in cooler mountain areas. Some tree fern species with their accumulated leaf bases on the stems provide a suitable habitat for

the germination and growth of epiphytes and some shrub or tree species. Good examples of this feature may be seen in the shadehouse.
Cauliflory (or the production of flowers and fruit on the branches and trunk) is a common feature and is found in Sub-tropical RF in NSW (e.g. *Syzygium moorei* and *Ficus coronata*). Ground ferns may be common in Sub-tropical RF, particularly along creek banks. They are also found in Cool-temperate RF as a very well-developed fern layer.

Identification of Rainforest Plants

Rainforest species may be identified by their flowers and fruits as is the most usual means of identification e.g. in NSW, by using *The Flora of New South Wales* (ed. Harden) but because of the difficulty of getting flowers and fruit, a more commonly adopted method is to identify species by the features of their leaves and branchlets, e.g. using ***Rainforest Trees and Shrubs*** and ***Rainforest Climbing Plants, Field guides to their identification*** each **by Harden, McDonald & Williams.**

Growing RF in Gardens

RF plants often make attractive garden plants. Because of their size, many are grown in pots and are frequently suitable as indoor plants.

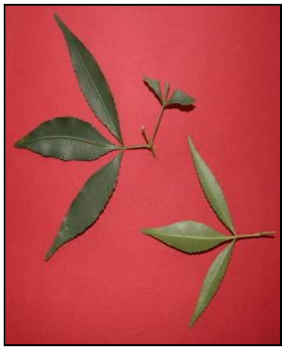
Rainforest Species found in the Ku-ring-gai Wildflower Garden Trees

Ceratopetalum apetalum **(Coachwood,** Family **Cunoniaceae)** is a medium sized tree which grows from Bega to the McPherson Range and on Mt Mee and Kroombit Tops (near Gladstone, Qld). It has smooth bark with distinctive horizontal scars. It has interpetiolar stipules, leaving transverse scars at the nodes. Leaves are oblong - linear, 6 -14 cm long with an apex shortly pointed and finely toothed margins. They are green with a paler undersurface. The petiole is 1 – 2 cm long with a prominent swelling or point at the apex. The fruit is a nut surrounded by 5 reddish enlarged sepals.

Callicoma serratifolia **(Black Wattle,** Family **Cunoniaceae)** is a small tree or shrub which grows in regrowth or margins of rainforest north from North of Batemans Bay to Blackall Range and Kroombit Tops (near Gladstone). It has interpetiolar stipules and its leaves are elliptic to oblanceolate. They are 3 -12 cm long with regular prominent teeth. The upper surface is green and hairless and the lower surface is white or pale gray with a covering of soft hairs and a petiole 3 -6 cm long. The flower is white in globose heads and the fruit a capsule clustered in globose heads 3 – 6 mm in diameter.

Tristaniopsis laurina **(Water Gum,** Family **Myrtaceae)** is a small to medium-sized tree mostly along watercourses in rainforest or open forests North from Bairnsdale to the Bundaberg district. The bark is pale and rather smooth. Leaves are oblanceolate, often narrowly so, leathery to stiff and 5 – 14 cm long. The apex is pointed. The upper surface is dark green and shiny, the lower surface is dull and pale green to white and usually hairy. The lateral veins are faint and oil dots mid dense to rather sparse, not always visible in older leaves. The fruit is a capsule, 3 valved, ovoid 5-6 mm long, the seeds are winged.

Elaeocarpus reticulatus ***(*****Blueberry Ash,** Family **Elaeocarpaceae*****)*** is a shrub or small tree found on the margins of rainforest or adjacent sclerophyll forest north from Wilsons Promontory. Leaves are oblong-elliptic, 5-11cm long with an acuminate apex, margins regularly toothed, lateral veins 8-15 pairs and old leaves turning reddish before falling. They have small, hairy domatia and a petiole 1-2 cm long and an apical joint, sometimes obscure. Flowers are usually white, but sometime pink and fringed. The fruit is a blue ovoid to globose drupe, 0.8-1.2 cm long.



Ceratopetalum gummiferum **(NSW Christmas Bush,** Family **Cunoniaceae)**

An erect shrub, it is usually 2–4 m high. In rainforest it can be up to 30m high. Often also found in woodland on sandstone, its leaves are opposite, 3-foliate, finely toothed and hairless. Flowers are small, numerous in axillary cymes, white but in December-January the fruiting calyces swell and turn bright red.

Glochidion ferdinandi **(Cheese Tree,** Family **Phyllanthaceae)** is a small tree, usually 4-8 m tall in and on the margins of rainforest north from Moruya. Its leaves are 2-ranked in a pseudo-pinnate arrangement and elliptic to oblong-elliptic, 4-11cm long, both surfaces green, but upper surface is glossy. The fruit is a capsule, with 8-12 seeds, each enclosed in a red aril and its appearance is thought to resemble a cheese. Its flowering time is summer.

Other species:
Billardiera scandens, Breynia oblongifolia, Clematis aristata, Hibbertia dentata, Kennedia rubicunda, Homalanthus populifolius, Morinda jasminoides, Pandorea pandorana, Pittosporum revolutum, Pittosporum undulatum, Polyscias sambucifolia.

Some of the Rainforest Species planted in KWG

Acacia elata, Acacia prominens, Araucaria bidwillii, Araucaria cunninghamii, Archontophoenix cunninghamiana, Auranticarpa rhombifolia, Backhousia citriodora, Buckinghamia celsissima, Caldcluvia paniculosa, Castanospermum australe, Cissus antarctica, Cyathea australis, Davidsonia jerseyana, Dicksonia antarctica, Diploglottis campbellii, Doryanthes palmeri, Doryphora sassafras, Eupomatia laurina, Ficus coronata, Ficus macrophylla, Glochidion ferdinandi, Hicksbeachia pinnatifolia, Hymenosporum flavum, Livistona australis, Lophostemon confertus, Macadamia tetraphylla, Melia azedarach, Melicope elleryana, Morinda jasminoides, Myrsine subsessilis, Pittosporum multiflorum (prev. Citriobatus multiflorus) , Polyscias elegans, Schefflera actinophylla, Sloanea australis, Stenocarpus sinuatus, Syzygium australe, Syzygium luehmannii, Syzygium oleosum, Syzygium paniculatum, Syzygium smithii, Toona ciliata, Trema tomentosa var. aspera, Trochocarpa laurina, Vesselowskya rubifolia, Wollemia nobilis.

Brief Notes on selected planted species

Doryphora sassafras **(Sassafras,** Family **Atherospermataceae)** is a medium-sized to large tree growing from Eden to near Nambour. It has opposite leaves with prominently toothed margins on the upper 2/3 and entire on the basal margins. It has small oil dots and a pleasant nutmeg smell when crushed. Although a dominant species in some RF areas in the Sydney district, **it is not indigenous in KWG**.

Araucaria bidwillii and ***A. cunninghamii*** **(**Family **Araucariaceae)** are the well-known conifers Bunya Pine and Hoop pine respectively. The **Bunya Pine** is a large tree found in Queensland with leaves with distinctive sharp points. It is well known for the large cones with edible fruits. The **Hoop Pine** is also a large tree from NSW and Qld with smaller leaves, well known for its soft white, high quality timber. The rare **Wollemi Pine** (***Wollemia nobilis*****)** is also in the **Araucariaceae** family. A large emergent tree, it is found only in a sheltered gorge in Wollemi National Park. There are 3 forms of leaves and they are closely spaced with numerous closely spaced longitudinal parallel veins.

Archontophoenix cunninghamiana and ***Livistona australis*** in the Family **Arecaceae** are **Bangalow** or **Piccabeen** and **Cabbage Tree** Palms respectively. The Bangalow palm grows north from Durras Lake and has large leaves several metres long. The Cabbage Tree Palm grows north from Victoria and has fan shaped leaves. It grows often in swampy areas.

Backhousia citriodora (**Lemon Myrtle,** Family **Myrtaceae**) is a shrub or small to middle sized tree north from Brisbane. The leaves are narrow-elliptical, 4-15cm long, with numerous oil dots. An essential oil, citral, provides the powerful lemon scent of this beautiful plant.

Castanospermum australe **(Black Bean,** Family **Fabaceae)** was a reliable food source for the Aborigines It grows from the Bellinger River to Cape York. It has shiny large compound leaves and showy red and yellow flowers. Its fruit is a large woody pod 7-25cm long and 5 cm diameter.

Davidsonia jerseyana **(Davidson's Plum,** Family **Cunoniaceae)** grows in the Brunswick and Tweed River areas. It has large compound leaves and a rachis with a narrow toothed wing. The leaflets and rachis area dull green with brownish hairs. It is famous for its fruit, a purple drupe which produces a brilliant red pulp, rather sour, but delicious when made into jam.

Eupomatia laurina (**Bolwarra,** Family **Eupomatiaceae)** is shrub or small tree with arching stems that grows from East Gippsland to just north of Bundaberg. The leaves are 2 ranked 6-12 cm long, glossy and oblong-elliptic. The flowers have a green cap and many whitish petal-like staminodes. The flowers have an intense 'perfume' and open for one day only. They are pollinated by tiny weevils and produce edible fruits.

Ficus coronata ***(*****Sandpape*r* Fig,** Family **Moraceae)** is a small tree, especially along creeks. The ovate to oblong leaves are sandpapery**.** The figs are 1.5-2.5 long, hairy and purple-black when ripe and grow in axils of leaves or in clusters on older branches (cauliforous).

Hicksbeachia pinnatifolia **(Red Bopple Nut,** Family **Proteaceae)** is an endangered plant that grows mostly in the Nambucca-Bellinger and Tweed Valleys**.** The alternate leaves are pinnately divided or lobed. It has purplish flowering spikes in spring and bright red nuts in mid-summer.

Macadamia tetraphylla ***(*****Macadamia,** Family **Proteaceae)** is a small tree, uncommon in the wild, originally from near Lismore, which is extensively cultivated for the edible kernel of the seed (Macadamia nut). It has leaves in whorls of 4, narrowly oblong 10-25 cm long with numerous stiff prickly teeth.

Melicope elleryana (**Pink-flowered doughwood**, Family **Rutaceae**) is a tree up to 25 m high. Grows in subtropical rainforest and swamp forest north from the Clarence R. Striking pink flowers summer to autumn.

Schefflera actinophylla ***(*****Umbrella Tree,** Family **Araliaceae)** grows naturally from Rockhampton to Cape York Peninsula and is a popular garden plant because of the large compound, radiating umbrella-like leaflets.

Stenocarpus sinuatus ***(*****Firewheel Tree,** Family **Proteaceae)** has dark glossy leaves and red flowers inside the outer foliage giving it a glowing appearance. It also is a popular garden plant. It grows naturally from the Nambucca River to the Atherton Tablelands.

Syzygium luehmannii ***(*****Riberry,** Family **Myrtaceae)** is one of half a dozen Lilly Pillys growing at KWG. They all have glossy opposite leaves with oil dots and many lateral veins at angles to the main vein of nearly 90°. The colourful edible fruits have been used to make jams.

Toona ciliata **(Red Cedar,** Family **Meliaceae)** is a large deciduous tree with large compound leaflets that grows from Milton to the McIlwraith Range on the Cape York Peninsula. Nan and Hugh Nicholson say "It is renowned for its wonderful timber and the speed with which it disappeared after the coming of Europeans".

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Acknowledgements

These notes contain hyperlinks to materials, including images, illustrations, plant descriptions and a glossary from PlantNET, with the courtesy of The Royal Botanic Gardens & Domain Trust, 2021.
For general access to PlantNET see also http://plantnet.rbgsyd.nsw.gov.au/

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KEY FOR SELECTED RAINFOREST SPECIES

Based on features of the leaves and branchlets

(Species in this key are not necessarily found at Ku-ring-gai Wildflower Garden.)

1.	Climber	**Group A**
1a.	Tree or shrub	2
2.	Leaves with scale leaves or narrow 1 to many veined leaves - Conifer	**Group B**
2a.	Not as above	3
3.	Palms	**Group C**
3a.	Tree or shrub, not a conifer or palm	4
4.	Compound leaves	**Group D**
4a.	Simple leaves	5
5.	Leaves in whorls	**Group E**
5a.	Leaves alternate or opposite	6
6.	Leaves alternate	**Group F**
6a.	Leaves opposite	**Group G**

Group A Climbers

1.	Leaf base encircling the stem	***Hibbertia dentata***
1a.	Leaf base not encircling the stem	**2**
2.	Leaves with 3 distinct longitudinal veins extending to the apex of the lamina	***Smilax glyciphylla***
2a.	Leaves compound or simple without the above	**3**
3.	Leaves simple	**4**
3a.	Leaves compound	**6**
4.	Leaves alternate	**5**
4a.	Leaves opposite	***Morinda jasminoides***
5.	Leaves with tendrils, margins serrate to almost entire	***Cissus antarctica***
5a.	Leaves soft, hairy (at least on the undersurface), margin undulate.	***Billardiera scandens***
6.	Leaves alternate	***Kennedia rubicunda***
6a.	Leaves opposite	**7**
7.	Leaves with 3 toothed leaflets	***Clematis aristata***
7a.	Adult leaves with 5-7 entire leaflets	***Pandorea pandorana***

Group B - Conifers

1.	Leaves larger than 1 cm	***Araucaria bidwillii*** (Bunya Pine)
1a.	Leaves shorter than 1 cm	***Araucaria cunninghamii*** (Hoop Pine)

Group C - Palms

1.	Leaves palmately dissected	***Livistona australis*** (Cabbage Tree Palm)
1a.	Leaves pinnate	***Archontophoenix cunninghamiana*** (Bangalow Palm)

Group D - Compound Leaves

1.	Leaves bi-pinnate		***Melia azedarach***
1a.	Leaves not bi-pinnate	**2**	
2.	Leaflets palmate	Entire Leaflets	***Schefflera actinophylla***
		Toothed Leaflets, hairy, 3-12 cm long	***Vesselowskya rubifolia***
		Finely toothed, hairless, 3-7 cm long	***Ceratopetalum gummiferum***
2a.	Leaflets not palmate	**3**	
3.	Leaflets entire	Large leaves with 8-20 leaflets with domatia	***Toona ciliata***
		Large leaves with 9-17 glossy hairless leaflets	***Castanospermum australe***
		Leaves variable, leaf-like stipules present	***Polyscias sambucifolia***
3a.	Leaflets toothed	**4**	
4.	Large leaves with wing along leaf axis		
	Leaves and branchlets hairy, stipules		***Davidsonia jerseyana***
	Leaflets stiff		***Hicksbeachia pinnatifolia***
4a.	Leaves without wings along leaf axis		
	3-5 opposite leaflets with domatia		***Caldcluvia paniculosa***
	Leaflets variable, leaf-like stipules present		***Polyscias sambucifolia***

Group E - Simple Leaves in Whorls

1.	Leaves entire	**2**	
1a.	Leaves toothed	**3**	
2.	Leaves with oil dots, large leathery		***Lophostemon confertus***
2a.	Leaves soft, thin		***Hymenosporum flavum***
3.	Leaves 10-20 cm, thick stiff		***Macadamia tetraphylla***
3a.	Leaves 5-12 cm (some leaves alternate)		***Auranticarpa rhombifolia***

Group F - Simple Alternate Leaves

1.	Leaves sandpapery		***Ficus coronata***
1a.	Leaves otherwise	**2**	
2.	Leaves toothed	**3**	
2a.	Leaves entire	**4**	

3. Leaves 5-12 cm ***Auranticarpa rhombifolia***
3a Leaves 4-9 cm, rough to touch ***Trema tomentosa var. aspera***

4. Veins longitudinal ***Trochocarpa laurina***
4a. Veins otherwise **5**

5. Leaves soft and thin **6**
5a. Leaves leathery or stiff or green and glossy on both surfaces **7**

6. Leaves less than 4 cm length ***Breynia oblongifolia***
6a Leaves 8-16 cm ***Hymenosporum flavum***

7. Leaves up to 14cm **8**
7a. Leaves larger than 14 cm **9**

8 Leaves oblong, green and glossy on both surfaces,6-12cm long, branchlets more or less zigzag, minute translucent dots ***Eupomatia laurina***
8a leaves oblanceolate, 5-14cm, leathery, stiff, undersurface dull or pale green to whitish ***Tristaniopsis laurina***

9. Adult Leaves large glossy green, deeply lobed up to 40cm; saplings unlobed up to 25 cm ***Stenocarpus sinuatus***

GROUP G - Simple Opposite LEAVES

1. Oil dots in leaves- 2
1a. No oil dots 3

2a Leaves entire. Upper surface glossy, lateral veins parallel, at 65-80° with the mid vein Lillypillies. E.g. ***Acmena smithii, Syzygium luehmannii, S. oleosum, S. australe***
2b Leaves toothed in apical 3/4, but not in basal 1/4. Glossy, hairless with small oil dots. A pleasant nutmeg smell when crushed ***Doryphora sassafras***

3. Leaves entire 4
3a. Leaves regularly toothed 5

4. Leaves 6-11 cm long, ovate to elliptic narrowed to a fine apical point. Dark green above, pale green below. Only midrib and main lateral veins distinct
Ligustrum lucidum* (Large-leaved Privet)
4a Leaves 2-5 cm long, oblong - elliptic or ovate, soft and thin, dark green above, green below with only main veins distinct
Ligustrum sinense* (Small-leaved Privet)

5a Leaves regularly toothed, stipules or stipule scars present; green above, pale grey below with a dense covering of soft hair.
Callicoma serratifolia

5b Leaves leathery, hairless, with prominent swelling or joint at junction of petiole and blade (1-foliate) , interpetiolar stipules leaving transverse scars
Ceratopetalum apetalum

* introduced

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