



Topic 14: RAINFORESTS

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. In certain RF types a number of large-leaved herbs and ground ferns are found.

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 Trees

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 A field guide to their identification* by Harden, McDonald & Williams and *Rainforest Climbing Plants* by Williams & Harden.

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

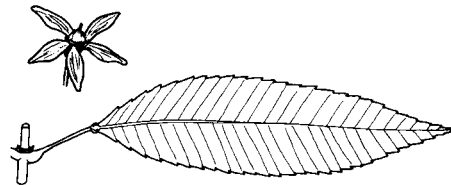
Ceratopetalum apetalum

COACHWOOD

Medium-sized tree in WTRf, CTRf and occasionally STRf; north from Cuttagee Lake (N of Bega) to the McPherson Range, also Mt Mee and Kroombit Tops (SW of Gladstone). **Bark** smooth, whitish, blotched with distinctive horizontal scars, becoming dark, rough and scaly. **Stipules** interpetiolar, leaving transverse scars at the nodes. **Leaves** oblong-elliptic, 6–14 cm long, apex shortly pointed, base tapered, margins finely toothed, leathery, hairless, green, lower surface paler; petiole 1–2 cm long, with a prominent swelling or joint at apex. **Fruit** a nut, ovoid, 2–4 mm diam., surrounded by 5 reddish enlarged sepals.

Family Cunoniaceae

NSW, Qld



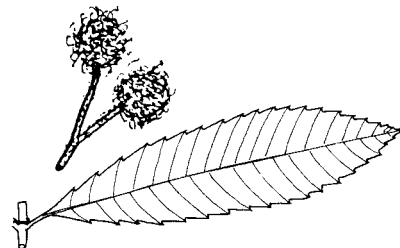
Callicoma serratifolia

BLACK WATTLE, CALLICOMA

Small tree or shrub, very common in regrowth and on the margins of Rf, mostly in WTRf on poorer soils; north from Clyde Mtn (NW of Batemans Bay) to Blackall Range (W of Nambour) and also Kroombit Tops (SW of Gladstone). **Stipules** interpetiolar, leaving transverse scars at the nodes. **Leaves** elliptic to oblanceolate, 3–12 cm long, apex shortly pointed, base tapered, margins regularly and prominently toothed, upper surface green and hairless, lower surface white or pale grey with a dense covering of soft hairs; petiole 3–6 mm long. **Flowers** white, in globose heads 1–2 cm in diam. **Fruit** a capsule, clustered in globose heads 8–10 mm diam.

Family Cunoniaceae

NSW, Qld



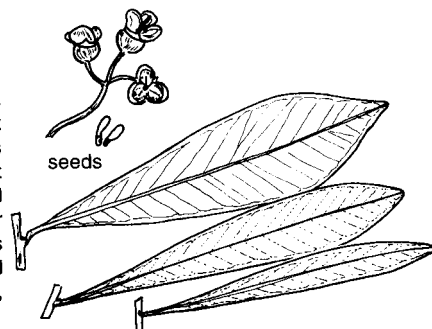
Tristaniopsis laurina

WATER GUM

Small to medium-sized tree, mostly along watercourses, in STRf and WTRf, and often in open forests; north from Bairnsdale district to Bundaberg district. **Bark** pale, rather smooth. **Branchlets** often dark purple. **Leaf buds** whitish silky. **Leaves** oblanceolate, often narrowly so, 5–14 cm long, apex shortly pointed to obtuse but not acuminate, base long-tapered, leathery to stiff, upper surface dark green and shiny, lower surface dull and pale green to whitish and usually finely hairy (older leaves sometimes hairless), lateral veins faint, 13–23 pairs, intramarginal veins faint; oil dots mid-dense to rather sparse, medium-sized, not always visible in old thick leaves; leaves aromatic when crushed; petiole 3–10 mm long. **Fruit** a capsule, 3-valved, ovoid, 5–6 mm long; seeds winged.

Family Myrtaceae

Vic., NSW, Qld



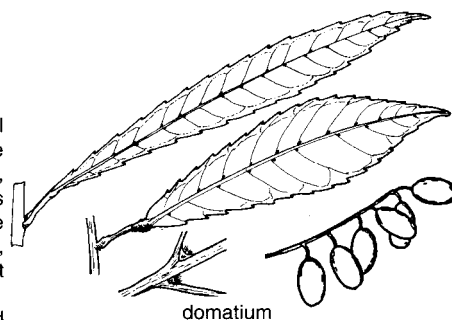
Elaeocarpus reticulatus

BLUEBERRY ASH

Shrub or small tree on margins of STRf, WTRf and LRF, and in adjacent sclerophyll forest; north from Wilsons Promontory. **Old leaves** often turning reddish before falling. **Leaves** oblong-elliptic to elliptic or obovate, 5–11 cm long, apex acuminate, base tapered, margins regularly toothed, hairless or almost so, tough, lateral veins 8–15 pairs, net veins finely reticulate; **domatia** small, hairy, often reddish; petiole 1–2 cm long, reddish, apical joint sometimes obscure. **Flowers** usually white, sometimes pink, fringed. **Fruit** a drupe, ovoid to globose, 0.8–1.2 cm long, bright blue; stone grooved.

Family Elaeocarpaceae

Vic., NSW, Qld



(from Williams *et al* 1984)

Other species:

Billardiera scandens, *Breynia oblongifolia*, *Clematis aristata*, *Ceratopetalum gummiferum*, *Hibbertia dentata*, *Kennedia rubicunda*, *Omalanthus populifolium*, *Pandorea pandorana*, *Pittosporum revolutum*, *Pittosporum undulatum*, *Polyscias sambucifolia*.

Some of the Rainforest Species planted in KWG

Acacia elata, *Acacia prominens*, *Acmena smithii*, *Araucaria bidwillii*, *Araucaria cunninghamii*, *Archontophoenix cunninghamiana*, *Auranticarpa*(*Pittosporum*) *rhombofolia*, *Buckinghamia celsissima*, *Caldcluvia paniculosa*, *Castanospermum australe*, *Davidsonia jerseyana*, *Doryphora sassafras*, *Eupomatia laurina*, *Ficus coronata*, *Glochidion ferdinandi*, *Hicksbeachia pinnatifolia*, *Hymenosporum flavum*, *Livistona australis*, *Lophostemon confertus*, *Macadamia tetraphylla*, *Melia azedarach*, *Schefflera actinophylla*, *Stenocarpus sinuatus*, *Syzygium luehmannii*, *Syzygium oleosum*, *Syzygium paniculatum*, *Toona ciliata*, *Trema tomentosa* var. *aspera*, *Trochocarpa laurina*, *Vesselowskya rubifolia*, *Wollemia nobilis*.

References:

Harden Gwen, McDonald Bill & Williams John. *Rainforest Trees and Shrubs A field guide to their identification* 2006.
Williams, J B & Harden, G J. *Rainforest Climbing Plants*. 1988.
Floyd, A G. *Rainforest Trees of Mainland South-eastern Australia*. 1989.
Nicholson, Nan & Hugh. *Australian Rainforest Plants. Books I – VI*.
Robinson Les. *Field Guide to the Native Plants of Sydney*. 2003.

Acknowledgements

Figures from *Trees & Shrubs of New South Wales & Southern Queensland* by Williams, Harden & McDonald 1984 reproduced with permission.

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, 2011.

For general access to PlantNET see also <http://plantnet.rbgsyd.nsw.gov.au/>

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Leaves of some Rainforest Trees



[Ceratopetalum apetalum](#)



[Tristaniopsis laurina](#)



[Elaeocarpus reticulatus](#)



[Callicoma serratifolia](#)



[Doryphora sassafras](#)



[Glochidion ferdinandi](#)



[Ceratopetalum gummiiferum](#)

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 1 |
| 1a. | Tree or shrub | 2 |
| 2. | Leaves with scale leaves or narrow 1 to many veined leaves | Conifer
Group 2 |
| 2a. | Not as above | 3 |
| 3. | Palms | Group 3 |
| 3a. | Tree or shrub, not a conifer or palm | 4 |
| 4. | Compound leaves | Group 4 |
| 4a. | Simple leaves | 5 |
| 5. | Leaves in whorls | Group 5 |
| 5a. | Leaves alternate or opposite | 6 |
| 6. | Leaves alternate | Group 6 |
| 6a. | Leaves opposite | Group 7 |

Group 1 Climbers

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

Group 2 - Conifers

- | | | |
|-----|--------------------------|--|
| 1. | Leaves larger than 1 cm | <i>Araucaria bidwillii</i> (Bunya Pine) |
| 1a. | Leaves shorter than 1 cm | <i>Araucaria cunninghamii</i> (Hoop Pine) |

Group 3 - Palms

- | | | | |
|-----|----------------------------|--|---|
| 1. | Leaves palmately dissected | | <i>Livistona australis</i> (Cabbage Tree Palm) |
| 1a. | Leaves pinnate | | <i>Archontophoenix cunninghamiana</i>
(Bangalow Palm) |

Group 4 - Compound Leaves

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

Group 5 - Leaves in Whorls

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

Group 6 - Alternate Leaves

- | | | | |
|-----|-------------------|--|------------------------------|
| 1. | Leaves sandpapery | | <i>Ficus coronata</i> |
| 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 7 - 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