

# RAINFOREST REMNANTS ON HEADLANDS IN THE MANNING VALLEY: THEIR COMPOSITION AND CONSERVATION SIGNIFICANCE

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## ABSTRACT

Remnant rainforest communities on headlands in the Manning Valley, northern coastal New South Wales are discussed. A preliminary list of native tree and shrub species from sites at Crowdy Head, Saltwater, Redhead and Black Head is provided and management problems are noted. The occurrence of a dry rainforest community at Black Head, containing *Backhousia sciadophora*, a species previously unrecorded from maritime sites, is discussed.

## INTRODUCTION

Littoral rainforest is the name applied to rainforest stands occurring on coastal headlands, on beach sands and on some islands in estuaries and coastal lakes (Adam 1987, Clough 1979, Floyd 1990, Williams, Harden and McDonald 1984). The term "littoral" is possibly an unfortunate one as it implies occupation of, or immediate proximity to, the inter-tidal zone (the closed forests in this zone are normally called mangroves), so that a more appropriate adjective would be maritime (or paramaritime). Unfortunately existing usage is too well entrenched for change.

Littoral rainforest is distributed along the length of the New South Wales coast in a series of small, geographically disjunct stands. Approximately 1300 ha of littoral rainforest survives in the state (Pople and Cowley 1982, Floyd 1987, 1990).

The environment of littoral rainforest has a number of distinctive features. Although rainfall on the coast is, by Australian standards, predictable it is low compared with that in rainforest stands further inland. However, proximity to the sea results in equitable temperatures and high humidity (Floyd 1990). Proximity to the sea also means that vegetation on exposed aspects experiences high inputs of salt spray. The seaward side of stands is often wind-pruned; the aerofoil canopy profile created by wind-pruning permits taller, and less salt tolerant vegetation to develop further inland. Damage to the seaward fringe may result in extensive salt spray damage further inland (Department of Environment and Planning 1988). Salt spray may introduce substantial amounts of nutrients, but contra to the suggestion of Floyd (1990) the phosphorus content of salt spray is very low and is unlikely to be a significant input.

There are few data on soil nutrient content in Australian rainforests. It is likely that nutrient levels in headland rainforests are higher than those in dunes, although as headlands of the New South Wales coast have a variety of geologies the resulting range of soil nutrient levels is probably considerable. Within a sand dune landscape, although soil nutrient contents are generally low, there will be heterogeneity in nutrient distribution. The tall rainforests on Fraser Island are found on more nutrient-rich dune soils than dry sclerophyll forest, but whether the rainforests on dunes in New South Wales are restricted to the more nutrient-rich sands is unknown.

An important factor determining the boundaries of rainforest stands is fire. On headlands, fire on steep seaward-facing slopes is likely to be uncommon. However, if fire does occur, recovery may be slow. On dunes there is less topographic protection from fire and although rainforest vegetation is less flammable than sclerophyll communities dune rainforest may be vulnerable to fire damage.

Rainforests on headlands and dunes have similarities in structure and floristics but may have different histories. Treated as a whole littoral rainforest can be regarded as a maritime variant of subtropical rainforest (Floyd 1990). However, rainforest patches can be found on dune coasts around much of northern Australia, and elsewhere in the tropics. While there is geographic pattern in

the composition of these dune rainforest thickets there is a strong overall similarity and floristically they may represent a distinct lineage which has been present in Australia, as a separate entity, for many millions of years. The headland rainforests appear to be more directly derived from the regional subtropical rainforests but with an influx of species from the near-by dune forests.

Neither headland nor dune rainforests yielded much timber of commercial value, so in the Forestry Commission classification of forest types (Baur 1965, Forestry Commission of N.S.W. 1989), only two types were recognized. The Tuckeroo type, dominated by *Cupaniopsis anacardioides* occurs on dunes and estuarine sites while the Headland Brush Box type (dominated by *Lophostemon confertus*) occurs on North Coast headlands. The Headland Brush Box type varies structurally from a very low scrub to a closed forest up to 15m tall but floristically is a relatively homogenous and distinctive vegetation type. However, it is not the only type of rainforest to be found on headlands.

The Tuckeroo type is very variable in its composition. Floyd (1990) has proposed a more comprehensive floristic classification. He recognized a number of distinctive communities which collectively form the *Cupaniopsis anacardioides* - *Acmena* spp. alliance. The Headland Brush Box type is recognized as the *Lophostemon confertus* suballiance while four other suballiances, collectively, broadly correspond to the heterogenous Tuckeroo type of the Forestry Commission classification.

Recognizing the rarity of littoral rainforest and the threats from development facing many stands, the New South Wales government introduced State Environmental Planning Policy 26 - Littoral Rainforest in 1988. This policy confers a high degree of protection on approximately one hundred mapped stands, or in some cases, groupings of stands. The majority of littoral rainforests outside of National Parks and Nature Reserves in the state are covered by the policy but a small number were omitted (see Mills 1988). While SEPP 26 has halted further loss of littoral rainforest the conservation status of many stands is still poor as the policy does not address on-going management and weed invasion and unrestricted public access are a threat in many instances.

## LITTORAL RAINFOREST ON HEADLANDS IN THE MANNING

There are several headland rainforest remnants on Crown Land reserves in the Manning Region. There are two sites on Crowdy Head, north of Harrington village (unlisted under SEPP 26, figs. 1, 2), at Saltwater, south of Old Bar village (mapping indicated partial incorporation with SEPP 26 site 147/148), at Redhead north of Hallidays Point village (SEPP 26 site 150) and Black Head at Hallidays Point (SEPP 26 site 152c, figs. 3, 4). These five sites constitute the surviving headland rainforests in the Manning Valley. An additional site, Pilot Hill, at Harrington was totally cleared by 1950 (Williams in prep.).

Crowdy Head is an outcrop of Carboniferous lithic sandstone, siltstone, tuff, shale and limestone. The larger of the two remnants occupies a small gully on the northwest slope of the headland and is now surrounded by residential village development. The canopy is degraded, suffering some loss of projective canopy cover, although there appears to be no obvious continuing damage. Vegetation has been removed from much of the lower reserve and frequent mowing inhibits regrowth from relictual trees and vegetation clumps. In effect this lower section functions as a garden-like intrusion from adjoining freehold property. The potential exists for replanting and regeneration in this section to increase the viability of the whole stand.

The second smaller remnant occupies the head of a shallow gully directly to the west of Crowdy Head lighthouse. Rainforest originally continued to the base of this western slope. The remnant is exposed to southerly sea winds and exhibits pronounced canopy deformation typical of exposed sites. The southern and south eastern canopy sections are low (<0.5 - 1.5m) and vegetation rises above 2m only in the protected northwest quadrant.

Most of the littoral rainforest at Saltwater was destroyed by the late 1970's to provide a large recreation area. This included the section of rainforest that possessed the greatest structural and species diversity (developed on Holocene sands), although isolated trees for shade and fringing vegetation strips along Khappinghat estuary were retained. The rainforest was surveyed in 1979 by Alex Floyd (N.P.W.S.) but further clearing post-dates his recommendation for retention and management of the relic vegetation.



**Fig.1** Littoral rainforest, western slope, Crowdy Head, 1991



**Fig. 2** *Banksia integrifolia* dominated revegetation, western slope, Crowdy Head.



Fig.3 Dry rainforest understory, Black Head. *Backhousia sciadophora* left foreground and mid-right background.

Fig. 4 Littoral rainforest, Black Head. Wind-pruned understory dominated by *Synoum glandulosum* below wind-pruned *Lophostemon confertus* canopy. The wind-pruned understory results from disturbance to the frontal vegetation barrier



A small low headland adjoins the presently cleared reserve to the northeast. There is little protection on the headland and the canopy rarely exceeds 8m.

The rainforests at Redhead and Hallidays Point are established on Upper Devonian - Lower Carboniferous mudstones and tuffs. The headland remnant at Hallidays Point is bisected by a road providing access to Pebbly Beach and Nine Mile Beach to the south of the village.

## FLORA AND VEGETATION

A preliminary list of native trees and shrubs from the five stands is given in Table 1. The sites have been visited regularly (by GW) since 1979 but the records in Table 1 came largely from traverses undertaken during 1990 and early 1991 and were incidental to a wider study of the lowland rainforests in the region. Floyd (1979, 1990) listed plant species from Black Head (Hallidays Point) and additional records from Floyd's data and from field traverses by GW at Black Head are incorporated in Table 1. Lists for littoral rainforest on sand dunes in the region are given in Floyd (1979, 1990) and Williams (in prep.).

The lists in Table 1 include the majority of tree and shrub species in the stands but unless every single individual plant is to be enumerated, it is difficult for any such list to be totally comprehensive. A number of records are represented by small-sized, single plants which may not persist within the remnant in the long term.

The sites (with the exception of the northwest slope stand on Crowdy Head) were surveyed for scarabaeine dung beetles by Williams and Williams (1985), but we are unaware of any other faunal studies.

### Crowdy Head - northwest slope.

Thirty five species of native trees and shrubs, in 23 families, have been recorded. The remnant is dominated by Euphorbiaceae (4 spp.), Moraceae (3 spp.), Myrtaceae (4 spp.) and Sapindaceae (4 spp.). Laurels are poorly represented although the frequency of a single species *Neolitsea australiensis* is high. Three fig species (*Ficus fraseri*, *F. obliqua*, *F. superba* var. *henneana*) persist in association with the central drainage line which also supports *Alocasia macrorrhizos*, *Alpinia caerulea*, *Asplenium australasicum*, *Cordyline stricta* and *Kreysigia multiflora*, reflecting increases in soil moisture and protection from salt-laden winds.

Several immature Bangalow Palms *Archontophoenix cunninghamiana* were recorded but no mature palms were located and although mature trees may have been removed the possibility of artificial plantings cannot be discounted.

Two notable tree records are *Syzygium francisii* which has a highly disjunct distribution in the Manning - Lower North Coast region and *Mischocarpus pyriformis*, regionally mainly restricted to the rainforests from Harrington to Crowdy Head, but with other populations including one near Lansdowne village approximately 20km to the northwest (Williams 1990) and a recent record from Kiwarrak State Forest (Williams, pers obs). The *Syzygium francisii* record fills in a gap in the distribution given in Floyd (1990), who suggested a disjunction between Bago Bluff Flora Reserve near Wauchope and Cape Hawke near Forster.

The margins and core have been invaded by *Lantana camara*, *Protasparagus* sp, and *Cassia* ? *coluteoides* and these, in conjunction with native vines (e.g. *Smilax australis*, *Ripogonum album*, *Cissus hypoglauca*) inhibit ready entry and movement through the remnant although the vine and weed tangles along the margins militate against additional damage.

### Crowdy Head - western slope

The vegetation is dominated by *Acmena smithii*, *Arytera divaricata*, *Cupaniopsis anacardioides* and *Glochidion ferdinandi* and floristically is reminiscent of the rainforests on old beach sands to the immediate south. Conceivably however, the two Crowdy Head remnants formed part of a continuum of rainforest which persisted more widely on the headland prior to settlement; the floristic and physiognomic variation representing responses to topography, salt deposition, wind exposure and soil fertility and moisture.

This site was originally traversed in 1979/80 and no apparent reduction in size has been noted subsequently. Bitou Bush *Chrysanthemoides monilifera* however, has begun to colonize the northern margin. Bitou Bush has also recently invaded littoral rainforest remnants along the Harrington - Crowdy Head road to the south although the area was completely free of infestation prior to 1984.

*Banksia integrifolia* is re-establishing in the lower gully section and this establishment generally post-dates fires lit on the grassed sections of the headland in the early 1980's where scattered remnant mature and senescent banksias had persisted. A number of rainforest tree species are also re-establishing in this section.

### Saltwater

The rainforest vegetation is primarily developed in association with *Banksia integrifolia*, *Casuarina glauca* and *Melaleuca quinquenervia* but some sections of the canopy are formed exclusively by *Acmena smithii*, *Cassine australis* and *Notelaea longifolia*. *Cupaniopsis* - *Banksia* - *Casuarina* - *Westringia* associations dominate the exposed barrier vegetation. There is an area towards the tip of the headland occupied by a low wind-exposed *Lomandra* - *Isolepis* community. Wind stunted *Acmena smithii*, *Casuarina glauca*, *Cupaniopsis anacardioides* and *Rapanea* sp. grow within and below the *Lomandra* and *Isolepis* plants and the site may be an artifact of storm or wind damage, the original canopy possibly being lost.

Twenty two rainforest tree and shrub species from 17 families are recorded in the rainforest community but the better developed core is dominated by *Acmena smithii*, *Cassine australis*, *Notelaea longifolia* and *Rhodomyrtus psidioides* with the majority of the species listed in Table 1 contributing to the understorey and shrub layer - the depauperate composition reflecting the exposed nature and limited physical and edaphic opportunities of the site. Weed infestation is limited to *Lantana camara*, *Protasparagus* sp. and *Cassia coluteoides*.

### Redhead

Fifty four species (in 27 families) are recorded from Redhead with the greatest diversity occurring in Euphorbiaceae (6 spp.), Myrtaceae (5 spp.) and Sapindaceae (4 spp.); the rainforest is better developed in the southern half of the site.

Rutaceae are poorly represented although one species, *Sarcomelicope simplicifolia* is abundant, as are *Notelaea longifolia* (Oleaceae), *Planchonella australis* (Sapotaceae), *Scolopia braunii* (Flacourtiaceae) and *Wilkiea huegeliana* (Monimiaceae). Laurels are also poorly represented except for *Cryptocarya rigida* which is common in the shrub layer, in particular in the central eastern boundary where it is associated with *Lophostemon confertus*. Rainforest in the northern and central western sections of the remnant is developed in association with *Eucalyptus* ? *paniculata* and may reflect post-fire succession; large burnt trunk bases occurring throughout the stand indicate the impact of at least one fire within the area of the headland now occupied by rainforest.

There is a distinctive dry rainforest floral component within the otherwise subtropical subformation. This includes *Alchornea ilicifolia*, *Capparis arborea*, *Mallotus philippensis* and notably *Croton insularis* and *Rhysotoechia bifoliolata* but *Aphananthe philippinensis* and *Backhousia sciadophora*, which occur at Black Head, are apparently absent. Neither the rainforests at Redhead nor Black Head appear to possess any of the shrubs (e.g. *Nyssanthes diffusa*, *Alyxia ruscifolia*) nor the xeromorphic epiphytic orchids that are characteristic of the dry rainforests extensively developed in the Manning hinterland. However, these latter rainforests experience some seasonal desiccation and the maritime environment may militate against occupation by such plants.

A small creek bisects the stand and empties onto Shelly Beach; this was traversed but no additional tree or shrub species were located.

### Black Head (Hallidays Point)

The section of rainforest to the west of the beach access road possesses a previously unrecorded dry rainforest subformation established on the drier less fertile hilltop and associated southwest slope. Floristically it belongs to Floyd's (1990) *Backhousia sciadophora* - *Dendrocnide* - *Drypetes* suballiance within his *Choricarpia leptopetala* - *Backhousia* spp. alliance. Along its southern boundary, and towards a sheltered gully, this dry rainforest increasingly grades into a subtropical rainforest that approximates a mosaic of Floyd's (1990) *Lophostemon confertus* and *Drypetes* - *Sarcomelicope* - *Cassine* - *Podocarpus* suballiances.

The dry rainforest is dominated by large *Backhousia sciadophora* trees (approx. 20 mature trees) in association with, *inter alia*, *Alchornea ilicifolia*, *Aphananthe philippinensis*, *Austromyrtus bidwillii*, *Baloghia lucida*, *Canthium* sp. aff. *odoratum*, *Capparis arborea*, *Diospyros australis*, *D. pentamera*, *Elattostachys nervosa*, *Guioa semiglauca*, *Mallotus philippensis*, *Rhysotoechia bifoliolata*, *Sarcomelicope simplicifolia* and *Wilkiea huegeliana*. *Cleistanthus cunninghamii* and less commonly *Dendrocnide photinophylla* occur within the subtropical - dry rainforest ecotone towards the sheltered gully. Voucher specimens of *Backhousia sciadophora* have been lodged with the

National Herbarium, Royal Botanic Gardens, Sydney, and the John T. Waterhouse Herbarium (UNSW), Kensington.

The maritime setting for this dry rainforest community is unusual with the subformation otherwise represented in Kiwarrak State Forest to the west (itself an eastern outlier) and with increased frequency, but with reduction in floristic and structural diversity, west of Wingham. There appear to be no other maritime records of *Backhousia sciadophora* although Morris *et al.* (1990) record *Backhousia myrtifolia* as an associate in the tree layer of a sheltered littoral rainforest community at Norah Head on the New South Wales central coast. In addition, Floyd (1990) documents the occurrence of a number of dry rainforest stands in the Wallis Lake - Port Stephens region in localities protected from the highest exposure to salt spray.

Seventy two tree and shrub species in 33 families have been recorded from Black Head/Hallidays Point. The Euphorbiaceae in particular are well represented with 11 spp.; all but one (*C. insularis*) of the known Euphorbiaceae recorded from the Manning.

The two Crown Land rainforests at Redhead and Black Head together possess at least eighty four tree and shrub spp. (in 35 families) and constitute a large example of headland littoral rainforest linked by an intervening Crown beach reserve. Such formations have been heavily reduced in extent and distribution since European settlement while headland vegetation generally is inadequately conserved (Adam *et al.* 1989). Williams and Williams (1985) recorded 11 scarabaeine dung beetle spp., representing all three tribes, from rainforest at Black Head. In addition the Southern Angle-headed Dragon *Hypsilurus spinipes* was also recorded from Black Head during the current field traverses (juvenile, March 1991) and although having a disjunct distribution in southeast Queensland and northeastern New South Wales is otherwise unknown from maritime forests (H.G. Cogger pers. comm.). Thus the rainforests at these two sites possess significant plant community and faunal values that are presently inadequately protected and managed.

## DISCUSSION

Table 1 indicates that although many species are shared by all (or most) of the stands, each stand is nevertheless unique in terms of its floristic composition. Although some interchange of both flora and fauna between headlands may have been possible via intermediary rainforest stands on dunes, headlands have largely functioned as isolated habitat islands over the last 6,000 years since sea level reached its present position. Following loss and disturbance to dune rainforests (particularly from sandmining, Floyd 1990) and developments on or adjacent to headlands the rainforests are probably now more isolated one from another than earlier in their history. This greater isolation, coupled with the presence of aggressive weed species, makes the stands extremely vulnerable in the event of disturbance.

It is hoped that this note will stimulate more detailed investigation of the sites and the initiation of management programs to ensure their long-term conservation.

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TABLE 1 PRELIMINARY SPECIES LIST - NATIVE TREES AND SHRUBS

Key: 1 Crowdy Head N.W. slope; 2 Crowdy Head W. slope; 3 Saltwater  
4 Redhead; 5 Hallidays Point - Black Head.

Taxon	1	2	3	4	5
<b>Podocarpaceae</b>					
<i>Podocarpus elatus</i>	x				
<b>Agavaceae</b>					
<i>Cordyline stricta</i>					
<b>Arecaceae</b>					x
<i>Archontophoenix cunninghamiana</i>	x				
<i>Livistona australis</i>				x	x
<b>Alangiaceae</b>					
<i>Alangium villosum</i>					x
<b>Anacardiaceae</b>					
<i>Euroschinus falcata</i>				x	x
<b>Araliaceae</b>					
<i>Polyscias elegans</i>	x			x	
<i>Polyscias sambucifolius</i>				x	
<b>Capparaceae</b>					
<i>Capparis arborea</i>				x	x
<b>Celastraceae</b>					
<i>Cassine australis</i>		x	x	x	x
<i>Denhamia celastroides</i>				?	
<b>Cunoniaceae</b>					
<i>Schizomeria ovata</i>				x	
<b>Ebenaceae</b>					
<i>Diospyros australis</i>				x	x
<i>Diospyros pentamera</i>	x			x	x
<b>Elaeocarpaceae</b>					
<i>Elaeocarpus obovatus</i>	x	x	x		
<b>Euphorbiaceae</b>					
<i>Alchornea ilicifolia</i>				x	x
<i>Baloghia lucida</i>	x			x	x
<i>Bredelia exaltata</i>					x
<i>Breynia oblongifolia</i>		x			x
<i>Claoxylon australe</i>				x	x
<i>Cleistanthus cunninghamii</i>					x
<i>Croton insularis</i>				x	
<i>Croton verreauxii</i>					x
<i>Drypetes australasica</i>	x	x	x	x	x
<i>Glochidion ferdinandi</i>	x	x	x		x
<i>Mallotus philippensis</i>				x	x
<i>Omalanthus populifolius</i>	x				x
<b>Eupomatiaceae</b>					
<i>Eupomatia laurina</i>	x				x
<b>Fabaceae</b>					
<i>Goodia lotifolia</i>			x		
<b>Flacourtiaceae</b>					
<i>Scolopia braunii</i>	x			x	x
<b>Lauraceae</b>					
<i>Cryptocarya ?meissneriana</i>				x	
<i>Cryptocarya microneura</i>				x	
<i>Cryptocarya rigida</i>				x	x
<i>Endiandra sieberi</i>		x			
<i>Litsea reticulata</i>				?	x
<i>Neolitsea australiensis</i>	x	x			
<b>Malvaceae</b>					
<i>Hibiscus heterophyllus</i>			x	x	x
<b>Meliaceae</b>					
<i>Dysoxylum fraseranum</i>				x	x
<i>Dysoxylum rufum</i>				?	
<i>Synoum glandulosum</i>	x	x		x	
<b>Mimosaceae</b>					
<i>Pararchidendron pruinosum</i>	x				x
<b>Monimiaceae</b>					
<i>Wilkiea huegeliana</i>	x	x	x	x	x
<b>Moraceae</b>					
<i>Ficus fraseri</i>	x	x		x	x
<i>Ficus obliqua</i>	x				x
<i>Ficus rubiginosa</i>		x	x	x	x
<i>Ficus superba</i> var. <i>henneana</i>	x				

Taxon	1	2	3	4	5
<b>Myoporaceae</b>					
<i>Myoporum acuminatum</i>					x
<i>Myoporum insulare</i>					x
<b>Myrsinaceae</b>					
<i>Rapanea ?howittiana</i>	x		x		
<i>Rapanea variabilis</i>		x	x	x	x
<b>Myrtaceae</b>					
<i>Acmena smithii</i>	x	x	x	x	x
<i>Austromyrtus bidwillii</i>				x	x
<i>Backhousia sciadophora</i>					x
<i>Lophostemon confertus</i>				x	x
<i>Rhodamnia rubescens</i>				x	x
<i>Rhodomyrtus psidioides</i>	x	x	x	x	
<i>Syzygium ?australe</i>		x			
<i>Syzygium francisii</i>	x				
<i>Syzygium oleosum</i>	x				
<i>Tristaniopsis ?laurina</i>				x	x
<b>Oleaceae</b>					
<i>Notelaea longifolia</i>	x	x	x	x	x
<b>Pittosporaceae</b>					
<i>Citriobatus pauciflorus</i>				x	x
<i>Pittosporum revolutum</i>		x		x	x
<i>Pittosporum undulatum</i>					x
<b>Proteaceae</b>					
<i>Banksia integrifolia</i>	x	x	x	x	x
<i>Stenocarpus salignus</i>		x		x	x
<b>Rhamnaceae</b>					
<i>Alphitonia excelsa</i>	x		x	x	x
<b>Rubiaceae</b>					
<i>Canthium coprosmoides</i>					x
<i>Canthium</i> sp. aff. <i>odoratum</i>	x			x	x
<i>Ixora beckleri</i>					x
<i>Psychotria loniceroides</i>					x
<b>Rutaceae</b>					
<i>Acronychia imperforata</i>					x
<i>Acronychia oblongifolia</i>			x	x	
<i>Acronychia wilcoxiana</i>	x				x
<i>Geijera salicifolia</i> var. <i>latifolia</i>					x
<i>Sarcomelicope simplicifolia</i>	x	x	x	x	x
<b>Sapindaceae</b>					
<i>Alectryon coriaceus</i>				x	x
<i>Arytera divaricata</i>	x	x		x	x
<i>Cupaniopsis anacardioides</i>	x	x	x	x	x
<i>Elatostachys nervosa</i>					x
<i>Guioa semiglauc</i>	x	x	x	x	x
<i>Jagera pseudorhus</i>					x
<i>Mischocarpus pyriformis</i>	x				
<i>Rhysotoechia bifoliolata</i>				x	x
<b>Sapotaceae</b>					
<i>Planchonella australis</i>	x	x	x	x	x
<b>Solanaceae</b>					
<i>Duboisia myoporoides</i>	x				x
<i>Solanum stelligerum</i>				x	
<b>Sterculiaceae</b>					
<i>Brachychiton acerifolius</i>					x
<i>Commersonia fraseri</i>			x	x	x
<i>Seringia arborescens</i>				x	
<b>Symplocaceae</b>					
<i>Symplocos thwaitesii</i>					x
<b>Ulmaceae</b>					
<i>Aphananthe philippinensis</i>					x
<i>Celtis paniculata</i>					x
<i>Trema aspera</i>					x
<b>Urticaceae</b>					
<i>Dendrocnide photinophylla</i>					x
<b>Verbenaceae</b>					
<i>Clerodendron tomentosum</i>		x	x	x	x
<b>TOTAL</b>	<b>35</b>	<b>25</b>	<b>22</b>	<b>54</b>	<b>72</b>