

## VEGETATION SURVEY OF BRISBANE WATER NATIONAL PARK AND ENVIRONS

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### ABSTRACT

*Benson, J. S.\* and Fallding, H. (National Herbarium of New South Wales, Royal Botanic Gardens, Sydney, New South Wales, Australia 2000) 1981. Vegetation survey of Brisbane Water National Park and Environs. Cunninghamia 1 (1): 79-113. The vegetation of Brisbane Water National Park and environs is described and mapped at a 1:50 000 scale, using air photo interpretation and ground survey. Fifteen plant communities are described in detail. The number of communities reflects the diversity of the region; this is mainly determined by physical factors such as geology, topography and proximity to the sea. 657 plant species are recorded. Ten species are considered to be rare or at risk and several others are uncommon or restricted in distribution.*

### INTRODUCTION

The Sydney region is floristically rich and varied. Some plant habitats however are very localized, and many species show very restricted distribution patterns. With the continuous exploitation and clearance of natural vegetation for development the National Parks and nature reserves of the area become 'islands' in a sea of altered habitats. They may be the only areas where representative samples of ecosystems can be preserved and rare species protected. The Brisbane Water National Park and its adjacent relatively undisturbed bushland areas provide an excellent example of the vegetation typical of coastal areas of the Sydney region. The present account arises from a vegetation survey undertaken at the request of the New South Wales National Parks and Wildlife Service to provide basic information on the vegetation of the region. The aims of the survey were firstly, to describe the plant communities in the region and discuss their distribution and importance, and secondly, to study species composition and distribution and identify the uncommon and rare species requiring protection or particular types of management.

### THE STUDY AREA

The Brisbane Water National Park, (lat. 33° 30' S, long. 151° 15' E) is an area of c. 7 800 ha, 40 km north of Sydney. The survey also covered extensive areas of natural vegetation of the upper Mooney Mooney Creek catchment (c. 3 000 hectares in area) directly north of Brisbane Water National Park, and the Strickland State Forest (474 hectares) north-east of the Park (Figure 1).

### Climate

The area receives an annual rainfall of about 1 250 mm, with a relatively wet season between January and June, during which about 60% of the annual rainfall is received. March is the wettest month, with a mean monthly rainfall of 147 mm, while October is the driest, with a mean monthly rainfall of 76 mm (data for Gosford, Bureau of Meteorology, 1979). Temperatures in the area are fairly mild, with an average maximum of 27° C in summer and 17° C in winter. Average minimum temperatures range from about 17° C in summer to 4° C in winter.

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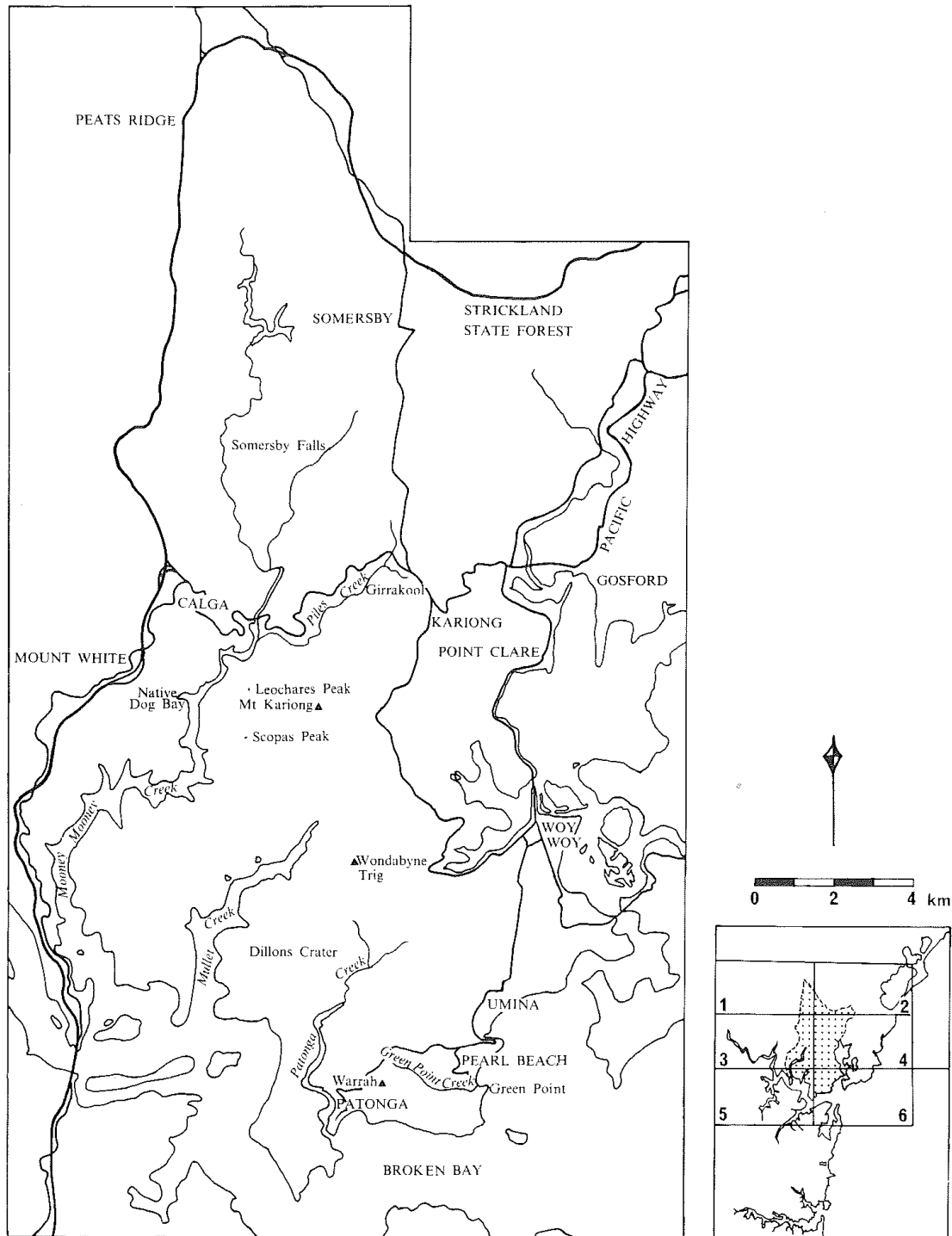


Figure 1. Locality map of Brisbane Water National Park and environs. Inset shows Lands Department 1:25 000 topographic sheets: 1 = Mangrove, 2 = Wyong, 3 = Gunderman, 4 = Gosford, 5 = Cowan, 6 = Broken Bay.

The most frequent winds throughout the year are light southerly to southwesterly and northeasterly. On-shore winds predominate during the spring and summer, while westerly and northwesterly winds occur mainly in autumn and winter. Local and low pressure frontal storms, particularly from the southeast in summer, bring gale-force winds.

### Topography, geology and soils

The study area is part of the Triassic Hawkesbury Sandstone plateau which covers much of the Sydney region (New South Wales Dept. of Mines, 1966). During its uplift this plateau was dissected by deep valleys which cut through the Hawkesbury sandstone to expose the underlying strata of the Narrabeen Group, also of Triassic age. The lower sections of these valleys have been subsequently drowned by rising sea level to give the present shallow estuaries of Mooney Mooney and Mullet Creeks. Stream patterns on the sandstone plateaux are dendritic but are influenced by the jointing patterns in the sandstone. Valley profiles are typified by cliffs of the more resistant Hawkesbury Sandstone, steep slopes (with angles of ca. 25°) from the underlying Narrabeen Group and narrow valley floors or drowned river valleys. More resistant remnants of sandstone form higher peaks on the plateaux, such as Kariong and Wondabyne Trigs. The Hawkesbury Sandstone is composed mainly of lenticular beds of quartz-rich sandstone, with occasional shale and siltstone lenses (Standard in Packham, 1969). A variety of soil types is found. On ridges and slopes, soils vary from shallow skeletal siliceous sands to deeper duplex soils with a sand to sandy loam A horizon, and a sandy clay to medium clay B horizon. On ridges in the south of the Park, exposed shale lenses weather to light clay soils with gradational profiles. On plateaux (particularly in the north) distinctive yellow earthy soils are developed. These have gradational profiles and often are associated with ironstone nodules.

The Narrabeen Group, composed in this area mainly of shales, underlies the Hawkesbury Sandstone. Exposures of Narrabeen Group vary, reaching a maximum in Strickland State Forest and Mooney Mooney Creek in the north, and decreasing to the south of the study area near Patonga. These rocks form deep clay-rich soils with duplex to gradational profiles.

Small intrusions of Tertiary basaltic rock are found at Dillons Crater and the Woy Woy rubbish tip in the southeast of the study area. These intrusions weather to deep dark clay soils (rich in iron and magnesium) with gradational or uniform profiles.

Quaternary and Recent deposits of unconsolidated sands and silts occur along the major watercourses, e.g. Mooney Mooney Creek.

### Land use and human influences

Attempts at agriculture in the Brisbane Water area were begun in the 1820's but proved unsuccessful and were replaced by timber getting and boat building. These remained the major industries into the 20th century when they were replaced by tourism and recreation, and increasing urbanization (Strom *et al.*, 1979).

In the Park there has been past logging activity, particularly along Mooney Mooney and Piles Creeks. Sand extraction on the banks of Mooney Mooney Creek, upstream from the Pacific Highway bridge, no longer occurs, but was formerly extensive.

The southern half of the Park has various 'incursions', private holdings, such as quarries, farms, a rifle range and a National Fitness Camp. Quarrying for sandstone is still active in the Girrakool-Kariong area, but not within the Park.

The main northern railway passes through the Park, along the eastern bank of Mullet Creek and through a long tunnel to Woy Woy. A large settlement (several

hundred people) existed in the area above the tunnel during the construction of the railway in the 1880's. Several major roads pass through the study area: the Pacific Highway from Calga to Kariong and Gosford, and a main road from Kariong to Woy Woy. The Sydney to Newcastle Freeway forms the western boundary of the Park. A number of fire trails and walking tracks have been constructed within the Park.

In the east, the coastal flats along Brisbane Water have been almost entirely developed for residential purposes and both north and south of Gosford urbanization is extensive. Kariong, Calga and Somersby are small settlements on the boundaries of the Park. The northern catchment of Mooney Mooney Creek is bounded to the west and east by farms and quarries. Since many creeks originate in this area the catchments have been and will continue to be affected by this type of land use. Two dams have been built on Mooney Mooney Creek, as part of Gosford's water supply.

Strickland State Forest was the site of the first Australian Forestry School but it only lasted a few years, until the National Forestry School was set up in Canberra in 1925. The trees of *Araucaria bidwillii* (Bunya pine) planted in the Forest are remnants of an arboretum. The forest is now being managed as a reserve, with no logging.

## METHODS

Colour aerial photography (New South Wales Dept. of Lands, 1976, Gosford-Newcastle Project Misc. 971. Scale 1:25 000) was used for the initial recognition of plant community boundaries. Field work was carried out to check the community boundaries and to determine the composition and variation in communities recognized. Vehicle traverses were made along almost all vehicular tracks in the area. Additional traverses were made on foot.

Plant communities were classified on structure and floristics. Initial classification was by structure (according to Specht, 1970), though the gradational nature of much of the vegetation made clearcut distinctions impossible. Some communities therefore include considerable variation in structure (e.g. low open-forest to open-forest). Where possible further subdivisions were made, based on floristic differences, which were generally associated with particular habitats. A structural floristic distinction based on a moist or dry shrub understorey was also used. A moist understorey is one with a strong species component of mesophyllous 'rainforest type' shrubs such as *Backhousia*, *Acmena* and *Rapanea*. A dry understorey is dominated by sclerophyllous shrubs such as *Oxylobium*, *Pultenaea* and *Dillwynia*. There is a gradation between the two types.

Field work involved recording lists of species for each of the communities, with observations on understorey structure, dominant species and effects of fire, disturbance, soil type and aspect.

The vegetation map was compiled using the New South Wales Department of Lands 1:25 000 topographic map series sheets Broken Bay, Cowan, Gosford, Gunderman, Mangrove and Wyong. This map has been reduced to a scale of 1:50 000 for publication.

## THE VEGETATION

The types of vegetation present have been discussed in general terms in Pidgeon (1937, 1938, 1940, 1941). Fifteen plant communities have been recognized. The most common structural formations are low open-forest, low open-woodland and open-woodland with either dry or moist shrub understorey. These extend over the ridges and slopes on Hawkesbury Sandstone, which covers much of the total area. Open-forest communities are found on cooler aspects and on Narrabeen Group outcrops along the watercourses. More restricted communities include sedgeland and open-scrub in higher, poorly-drained locations, closed-forest with rainforest

species in valleys or along creeks (mainly on the Narrabeen Group outcrops), mangroves (tall open-scrub) and reedland/rushland along tidal watercourses, coastal heath and rock outcrops with pockets of heath.

The distribution of the plant communities is shown on the map "Vegetation of Brisbane Water National Park and Environs" (located in back pocket).

### Description of plant communities

Each plant community is described in terms of its structure, habitat and distribution, together with the main species present arranged in life-form groups. Any variation in structure or species composition related to variation in geology, topography, drainage, aspect, fire history etc. is discussed. A full species list for the area, together with species recorded for the different communities is given in Table 1.

The communities described are:

1. CLOSED-FOREST to LOW CLOSED-FOREST with emergent trees
- 2A. OPEN-FOREST—dry understorey, Narrabeen group
- 2B. OPEN-FOREST—moist understorey, Narrabeen group
3. OPEN-FOREST—coastal alluvial flats
4. OPEN-FOREST to LOW OPEN-FOREST—slopes on Hawkesbury Sandstone
- 4P. OPEN-FOREST to LOW OPEN-FOREST—plateau tops
- 4S. OPEN-FOREST—remnant shale outcrops
5. LOW OPEN-FOREST—coastal
6. LOW WOODLAND TO LOW OPEN-WOODLAND
7. TALL OPEN-SCRUB—Mangroves
8. CLOSED to OPEN-SCRUB
9. Rocky outcrops with pockets of HEATH
10. HEATH—coastal
11. REEDLAND/RUSHLAND with *Casuarina glauca* and *Melaleuca styphelioides*
12. SEDGELAND

#### Community 1 CLOSED-FOREST to LOW CLOSED-FOREST with emergent trees.

Structure: Emergent trees up to 30 m high; small trees 8–12 m high with a dense canopy cover; moist understorey of small trees, shrubs, ferns and herbs (Figure 2).

Habitat: Deep, moist valleys of varying geology but usually on the Narrabeen Group; cool, southern and eastern aspects.

Distribution: Along many of the watercourses in the area. The most extensive examples are at the northern end of Mooney Mooney Creek and in Strickland State Forest. The largest examples in the Park are along Piles Creek and near Dillons Crater. This community is found as far south as below Warrah Lookout.

Main species present:

Emergent trees: *Angophora floribunda*, *Eucalyptus deanei*, *Syncarpia glomulifera*, *Acacia elata*.

Small trees: Rainforest species such as *Backhousia myrtifolia*, *Acmena smithii*, *Ceratopetalum apetalum*, *Doryphora sassafras*, *Livistona australis*.

Shrubs: *Trochocarpa laurina*, *Tristania laurina*, *Notelaea* spp., *Wilkiea huegeliana*, *Eupomatia laurina*.

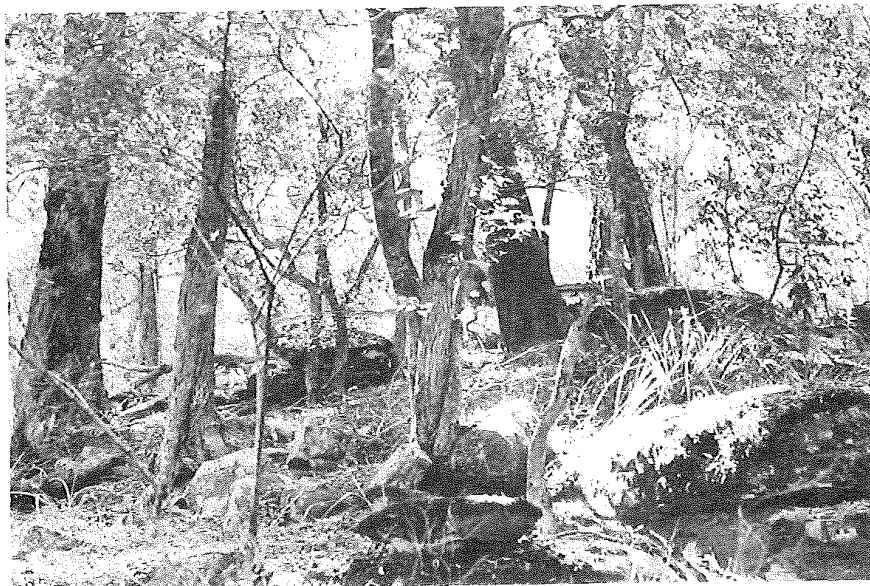


Figure 2. Low closed-forest with *Backhousia myrtifolia* (Community 1) near Mooney Mooney Creek.

Ferns: *Blechnum cartilagineum*, *Calocitica dubia*, *Asplenium* spp., *Hymenophyllum cupressiforme*, *Doodia aspera*.

Others: Many climbers such as *Smilax* spp. and *Cissus* spp., herbs including orchids, other monocotyledons.

Comments: Variation is due to differences in geology, aspect, valley shape and size, and proximity to the sea. The Narrabeen Group outcrops support some species not found in the Hawkesbury Sandstone gullies further south, e.g. *Doryphora sassafras*. The species composition of the understorey appears to vary according to the amount of sunlight received.

*Community 2A OPEN-FOREST with dry understorey on Narrabeen Group.*

Structure: Trees 10–20 m high with a mid-dense to open canopy cover. Understorey varies from moist to dry (generally drier than Community 2B); mid-dense to sparse, mainly with shrubs, herbs and monocotyledons.

Habitat: Valley sides, dry northern or western aspects or slopes influenced by sea breezes. Usually on light clayey soils.

Distribution: Along the eastern escarpment of the Park from Warrah in the south to Point Clare in the north; eastern sides of Mooney Mooney and Mullet Creeks as far north as Calga.

Main species present:

Trees: *Angophora floribunda* and *Casuarina torulosa* are dominant. *Eucalyptus paniculata*, *E. punctata*, *E. resinifera*, *Callitris muelleri* may be associated in coastal areas.

Shrubs: *Dodonaea triquetra*, *Oxylobium ilicifolium*, *Persoonia* spp., *Pultenaea* spp., *Lasiopetalum ferrugineum* var. *ferrugineum*, *Dillwynia floribunda*, *Ceratopetalum gummiferum*.

Monocotyledons: *Themeda australis*, *Imperata cylindrica*, *Cymbopogon refractus*, *Xanthorrhoea arborea*, *Patersonia* spp.

Herbs: *Pomax umbellata*, *Dampiera stricta* in coastal areas.

Others: *Kennedia rubicunda*, *Cassytha* spp., *Glycine clandestina* (climbers), *Pteridium esculentum* (fern).

Comments: Variation is the result of fire history and differences in aspect; sheltered aspects have taller trees and moister understoreys. *Callitris muelleri* occurs in the south near Warrah but not to the north. Areas that have been frequently or recently burnt have ground cover dominated by *Imperata cylindrica* and *Pteridium esculentum*.

*Community 2B OPEN-FOREST with moist understorey on Narrabeen Group.*

Structure: Trees 10–30 m high with mid-dense canopy cover and moist understorey of varying density, comprising small trees, shrubs, herbs and monocotyledons.

Habitat: Valleys or on lower valley slopes, on clayey soils, often around pockets of closed-forest (Community 1).

Distribution: Widespread, but most common north of the Pacific Highway, in the Mooney Mooney Creek Catchment and Strickland State Forest. Also along Mullet Creek on cool, southeastern aspects.

Main species present:

Trees: *Eucalyptus deanei*, *E. acmenoides*, *Angophora floribunda*, *Casuarina torulosa*, *Syncarpia glomulifera*.

Shrubs: *Acmena smithii*, *Backhousia myrtifolia*, *Acacia prominens*, *Ficus rubiginosa*, *Rapanea variabilis*.

Ferns: *Doodia aspera*, *Culcita dubia*, *Pteridium esculentum*.

Monocotyledons: *Imperata cylindrica*, *Themeda australis*, *Lomandra* spp.

Herbs: *Hydrocotyle* spp., *Pomax umbellata*, *Schelhammera undulata*.

Others: Climbers such as *Hibbertia scandens*, *H. dentata*, *Cissus hypoglauca*, *Smilax* spp.

Comments: Variation is due to aspect, topographic situation, proximity to estuaries and fire history. There is a dense shrub cover where it surrounds pockets of closed-forest (Community 1) and also in the more constricted valleys north of the Pacific Highway. In these areas the incidence of fire is lower. In areas that have been frequently burned, e.g. along Mooney Mooney Creek near the Pacific Highway crossing, the understorey tends to be more open and dominated by *Pteridium esculentum* and *Imperata cylindrica*. Structure and composition change from north to south. In the upper Mooney Mooney Catchment the community tends to be taller and *Eucalyptus acmenoides* is common. Further south, tree height decreases and *E. acmenoides* disappears.

*Community 3 OPEN-FOREST—coastal alluvial flats.*

Structure: Trees up to 25 m high, mid-dense canopy cover. Understorey moist to dry with shrubs, monocotyledons and herbs.

Habitat: Coastal alluvial flats, cool aspects sheltered from strong winds by beachfront and foredunes. Soil sandy, deep, sometimes poorly-drained.

Distribution: Very restricted, being found behind Pearl Beach but nowhere within the Park; it may have been more widespread before urban development.

Main species present:

Trees: *Angophora floribunda*, *Eucalyptus maculata*, *E. botryoides*, *E. punctata*, *Livistona australis*.



Figure 3. Open-forest on Hawkesbury Sandstone (Community 4) showing dense sclerophyllous shrub understorey.

Shrubs: *Macrozamia communis*.

Monocotyledons: *Imperata cylindrica*, *Pteridium esculentum*, *Goodenia* spp., *Hydrocotyle* sp.

*Community 4 OPEN-FOREST to LOW OPEN-FOREST—slopes on Hawkesbury Sandstone.*

Structure: Trees 8–25 m high; mid-dense canopy cover. Understorey usually dry, mid-dense to sparse with small trees, shrubs, dwarf shrubs, monocotyledons and herbs (Figure 3).

Habitat: On slopes below ridges or in shallow valleys draining the plateaux. Usually well-drained situations on slopes above Communities 2A and 2B, downslope from Community 6.

Distribution: Widespread throughout the study area, but more common in the south. In the north tends to grade into Community 4P on the plateaux.

Main species present:

Trees: *Angophora costata*, *Eucalyptus piperita* subsp. *piperita*, *E. oblonga*, *E. umbra* subsp. *umbra*, *E. gummifera*, *E. haemastoma*, *E. pellita*.

Small trees: *Banksia serrata*, *Casuarina littoralis*, *Tristania laurina*.



Shrubs: Diverse, including *Phyllota phylloides*, *Petrophile pulchella*, *Dillwynia* spp., *Persoonia* spp., *Leptospermum* spp., *Acacia* spp., *Bossiaea* spp., *Pultenaea* spp. and various Epacridaceae.

Ferns: *Pteridium esculentum*, *Culcita dubia*.

Monocotyledons: *Entolasia stricta*, *Lepidosperma* spp., *Lomandra* spp., *Patersonia* spp., *Lepyrodia scariosa*, *Gahnia clarkei*, *Xanthorrhoea media*.

Others: Climbers such as *Cassytha* spp. and a variety of herbs.

Comments: Variation is due to aspect, fire history and drainage. Drainage changes caused by geology and topographic position influence species composition. In wet areas a moist scrub understorey (described as 4/8 on the vegetation map) is often found. This is dominated by *Banksia ericifolia* and *Hakea teretifolia* (see Community 8).

Creek banks are characterized by shrubs, *Tristania neriifolia*, *T. laurina*, *Baeckea linifolia*, *Callicoma serratifolia*, *Leptospermum flavescens*, *Logania albiflora*, *Lomatia myricoides*, *Phebalium dentatum*, *Ceratopetalum apetalum*, *Bauera rubioides*, ferns such as *Gleichenia* spp., *Todea barbara* and *Sticherus flabellatus* and climbers such as *Cassytha* spp. and *Smilax* spp. On dry aspects the understorey is sparse and consists mainly of members of the families Fabaceae and Proteaceae. Areas recently or frequently burned tend to have an open understorey dominated by monocotyledons and shrubs which have regenerated from lignotubers.

#### Community 4P OPEN-FOREST to LOW OPEN-FOREST—plateau tops.

Structure: Trees 10–20 m high with a mid-dense canopy cover. Understorey dry, mid-dense to dense, with tall shrubs, shrubs, monocotyledons and herbs (Figure 4).

Habitat: Plateaux on deep yellow earthy soils. The soils grade from a surface horizon of medium sand to a yellow sandy clay. The depth varies, but is usually 1 m deep; above Warrah Lookout on the Patonga road, it is at least 2 m deep and also noticeably more yellow.

Distribution: Restricted to plateaux. Within the Park, it is found near Warrah Trig in the south and near Kariong in the north. In the upper Mooney Mooney Creek catchment it is locally common northward from Somersby Falls. Formerly more widespread in the Somersby area but much of it has been cleared for orchards and grazing land.

Main species present:

Trees: *Angophora costata*, *Syncarpia glomulifera*, *Eucalyptus gummifera*, *E. haemastoma*, *E. sieberi*, *E. punctata*, *E. oblonga*, *E. capitellata*, *Banksia serrata*.

Tall shrubs and shrubs: *Leptospermum* spp., *Petrophile pulchella*, *Hakea* spp., *Acacia* spp., *Bossiaea* spp., *Lambertia formosa*, *Banksia spinulosa*, *Gompholobium* spp., *Persoonia* spp. Members of the Proteaceae are important e.g. *Telopea speciosissima*, *Xylomelum pyriforme*, *Grevillea* spp.

Monocotyledons: *Xanthorrhoea media*, *Lepyrodia scariosa*, *Tetrarrhena juncea*, *Patersonia* spp., *Lomandra* spp., *Doryanthes excelsa*, *Entolasia stricta*.

Herbs: *Actinotus minor*, *Dampiera stricta*, *Gonocarpus teucrioides*.

Comments: Variation is due to fire history, and soil and water-table depth. Areas to the north (Kariong to Mangrove Mountain Road) have shallower and less yellow soils than near Warrah in the south. *Doryanthes excelsa* is found only in the north. *Eucalyptus sieberi* is also more common in the north than the south; the other tree species are found throughout. On deeper soils and near watercourses the trees are taller.

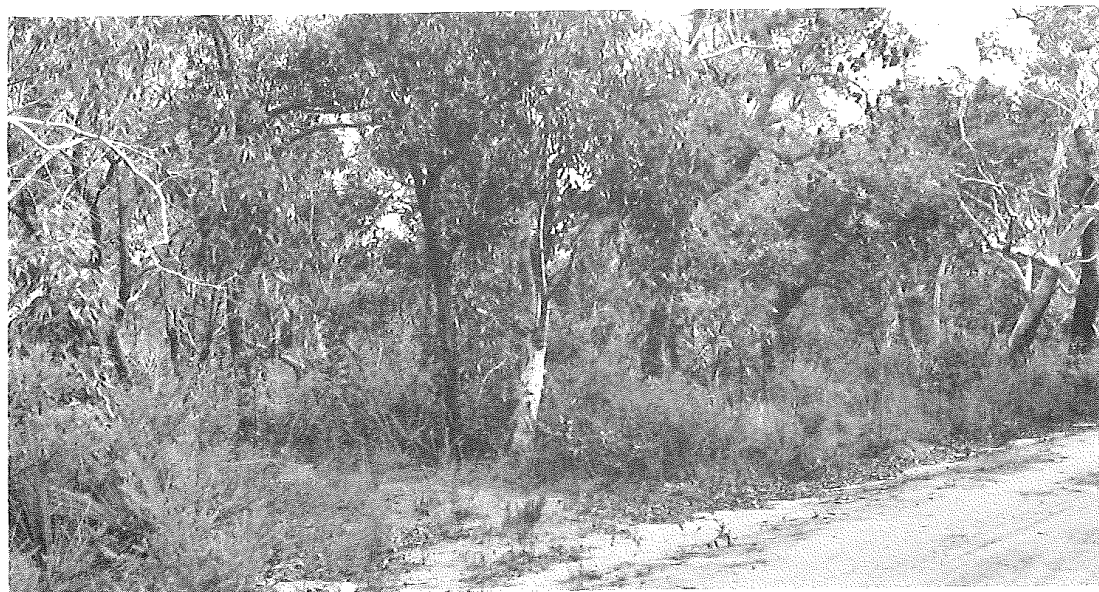


Figure 4. Low open-forest on Hawkesbury Sandstone plateau (Community 4P) with *Banksia serrata* and *Eucalyptus haemastoma*.



Figure 5. Open-forest on remnant shale outcrops (Community 4S). Trees include *Angophora costata* and *Eucalyptus globoidea*.

*Community 4S OPEN-FOREST—remnant shale outcrops.*

Structure: Trees 10–15 m high with a mid-dense canopy cover. Understorey dry, low, mid-dense to sparse; mainly shrubs and monocotyledons (Figure 5).

Habitat: Shale lense remnants on ridge tops. The soil profile shows a surface humus layer up to 2 cm deep, over a sandy clay loam 6 cm deep, which grades to a light clay.

Distribution: Restricted to patches at the southern end of the Park. The largest example is south of Mt Pindar near Wondabyne.

Main species present:

Trees: *Angophora costata*, *Eucalyptus gummifera*, *E. punctata*, *E. globoidea*, *E. umbra* subsp. *umbra*, *Syncarpia glomulifera*.

Shrubs: Dominated by members of the Fabaceae, *Bossiaea stephensonii*, *Gompholobium* spp., *Pultenaea ferruginea* var. *deanei* with *Acacia linifolia*, *Acacia myrtifolia*, *Banksia spinulosa*, *Boronia pinnata*, *Ceratopetalum gummiferum*.

Monocotyledons: *Poa affinis*, *Entolasia stricta*, *Imperata cylindrica*, *Lomandra* spp.

Comments: Variation is mainly due to fire history and soil depth. On deeper soils the trees are taller yet the understorey little changed. Fire alters the structure of the understorey but does not appear to affect greatly the floristic composition. This plant community is floristically distinct from other communities in the area. *Eucalyptus globoidea*, which appears to be restricted to it, is found on Wianamatta Shale near Sydney in areas with a similar rainfall.

#### Community 5 LOW OPEN-FOREST—coastal.

Structure: Trees stunted, usually about 5 m high; mid-dense canopy cover. Understorey mid-dense, varies with both "wet" and "dry" species of shrubs, monocotyledons and herbs.

Habitat: Narrabeen Group: coastal situations subject to onshore winds and salt spray; cooler aspects, on sloping well-drained ground.

Distribution: Restricted to the southern end of the Park near Pearl Beach. Common in nearby Bouddi National Park.

Main species present:

Trees: *Banksia integrifolia*, *Angophora costata*, *Eucalyptus botryoides*, *E. umbra* subsp. *umbra*.

Shrubs: *Lasiopetalum* spp., *Pultenaea daphnoides*, *Pultenaea flexilis*, *Westringia fruticosa*.

Monocotyledons: *Themeda australis*, *Lomandra longifolia*, *Imperata cylindrica*.

Climbers: *Cissus hypoglauca*, *Clematis aristata*, *Hardenbergia violacea*.

Comments: Tree height varies with exposure to wind and soil depth. Creeks running through this community are fringed by "wetter" species such as *Livistona australis* and *Cissus hypoglauca*.

#### Community 6 LOW WOODLAND TO LOW OPEN-WOODLAND

Structure: Trees 5–15 m (occasionally to 15 m) high with sparse canopy cover. Understorey varies from sparse and dry, to mid-dense and wet, with shrubs, dwarf shrubs, monocotyledons and herbs. Species richness is high (Figure 6).

Habitat: Ridges, spurs and slopes with dry aspects.

Distribution: Widespread in the south, less common in the forested north.

Main species present:

Trees: *Angophora costata*, *Eucalyptus gummifera*, *E. eximia*, *E. umbra* subsp. *umbra*, *E. haemastoma*, *E. punctata*.

Shrubs and Dwarf shrubs: Floristically rich, similar to Community 4 including *Banksia* spp., *Acacia* spp., *Hakea* spp., *Leptospermum* spp., *Boronia* spp., *Angophora hispida*; Fabaceae and Epacridaceae common.

Monocotyledons: *Entolasia stricta*, *Lepidosperma* spp., *Lepyrodia scariosa*, *Lomandra* spp., *Schoenus* spp., *Xanthorrhoea media*.

Comments: On rocky ridges with shallower soils, tree height decreases. The understorey varies with topography, drainage and fire history. On well-drained slopes the understorey is sparse, while on some backward sloping sandstone benches, where drainage is impeded, a wetter understorey is developed. As with Community 4, a mosaic of low open-woodland and closed to open-scrub is common. Like Communities 4, 4P and 13, the diversity and floristic composition may depend considerably on fire frequency and intensity. Small patches of the multistemmed "mallees" *Eucalyptus luehmanniana* and *E. multicaulis* are found within this community. They are usually on the cool, southerly aspects of the higher peaks, on sandstone rock shelves with shallow soils and poor drainage. Their distribution is very restricted. They are found in small isolated patches not more than a few hundred meters wide. *Eucalyptus luehmanniana* is on Mt Kariong and just north of Warrah Trig. *Eucalyptus multicaulis* is on the southern slopes of Leochares and Scopas Peaks.

#### Community 7 TALL OPEN-SCRUB—Mangroves.

Structure: Composed of tall shrubs of two distinct heights (8 m and 4 m), reflecting the two species present (Figure 7).

Habitat: Along tidal or on alluvial flats and islands subject to regular tidal inundation. Absent from areas exposed to wave action.

Distribution: Confined to the southern half of the study area: Mooney Mooney Creek, particularly downstream from the Pacific Highway bridge, Mullet Creek, Patonga Creek and other estuarine areas e.g. Woy Woy. Since the Park Boundary is defined in most areas as above the high tide mark, few, if any mangroves are actually located within the National Park.

Main species present:

Shrubs: *Avicennia marina* var. *australasica* forms open-scrub up to 8 m high with *Aegiceras corniculatum* as an understorey shrub about 4 m high, usually landward of *Avicennia*.

Comments: Differences of abundance and distribution between the two species depend on salinity, frequency of tidal inundation, wave action and sediment accumulation. The alluvial flats and islands have dense stands of *Avicennia* along the water's edge, but grade landward into scattered *Aegiceras* stands surrounded by reedland/rushland and *Casuarina glauca* woodland. Saltmarsh of *Sarcocornia quinqueflora* is only located at two sites on Patonga Creek. One of these has been severely damaged by trail bikes. In some areas increased sediment deposition has caused death of mangroves.

#### Community 8 CLOSED to OPEN-SCRUB

Structure: Shrubs 2–5 m high, dense to mid-dense, with a ground cover of monocotyledons (Figure 8).

Habitat: Associated with shallow, sandy, poorly-drained soils on a wide range of topography, including flat ridge tops and along drainage lines; often surrounding sedgeland. Frequently found as understorey in open-forest and low open-forest (Community 4).

Distribution: Widespread throughout the area.

Main species present:

Trees: *Eucalyptus haemastoma*, *E. umbra* subsp. *carnea*, *E. gummifera*.



Figure 6. Low woodland on Hawkesbury Sandstone (Community 6) with *Eucalyptus haemastoma* and *Banksia serrata*.



Figure 7. Fringe of tall open-scrub of mangroves, *Avicennia marina* (Community 7) along Mooney Mooney Creek, with open-forest behind.

Shrubs: *Banksia ericifolia* and *Hakea teretifolia* most common as dominants. Also other *Hakea* spp., *Acacia oxycedrus*, *Banksia aspleniifolia*, *Grevillea* spp., *Leptospermum* spp. and members of the Epacridaceae.

Monocotyledons: *Restio* spp., *Lepyrodia scariosa*, *Xanthorrhoea resinosa*, *Lomandra* spp.





Figure 8. Closed-scrub of *Banksia ericifolia* (Community 8) surrounding small patch of *Callistemon sp.*

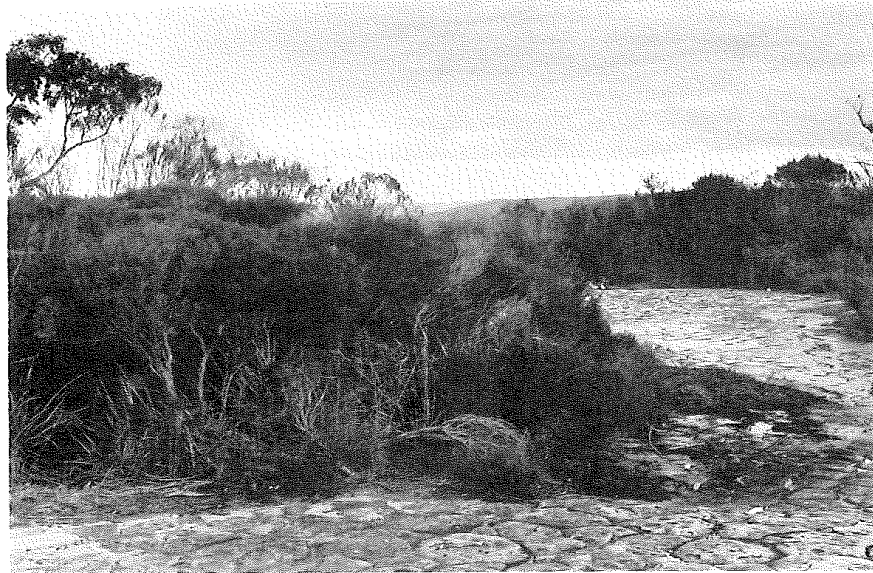


Figure 9. Rock outcrop with patches of *Kunzea ambigua* and *Casuarina distyla* (Community 9).

Comments: Variation is mainly due to drainage and fire history. A mosaic of communities (represented by 4/8 and 6/8 on the vegetation map) is formed by patches of trees on better drained, deeper soils. On poorly drained, organic soils, a transition zone between heath and sedgeland is found (8/12). Fire affects height and density of the heath. In places, unburnt for 15 years or more, height may reach 5 m.

*Community 9 ROCKY OUTCROPS with POCKETS OF HEATH*

Structure: Pockets of closed heath sometimes with low open-woodland on rock outcrops that generally comprises more than 50% of the cover (Figure 9).

Habitat: In isolated depressions, on rock platforms, on ridge tops and slopes on Hawkesbury Sandstone.

Distribution: Mainly found south of the Pacific Highway. Often associated with heath to low open-woodland. Restricted in area.



Figure 10. Coastal heath (Community 10) with *Westringia fruticosa* near Pearl Beach.

Main species present:

Trees: Scattered, often stunted or of mallee form. *Eucalyptus haemastoma*, *E. eximia*.

Shrubs: In pockets on the rock platform. *Casuarina distyla*, *Baeckea brevifolia*, *Darwinia fascicularis* subsp. *fascicularis*, *Darwinia glaucophylla* (which is mainly restricted to this community), *Eriostemon australasius*, *Kunzea ambigua*, *K. capitata*, *Leptospermum* spp., *Grevillea speciosa*, *Boronia serrulata*, *Banksia ericifolia*, *Epacris microphylla* and other Epacridaceae.

Monocotyledons: *Caustis pentandra*, *Lepidosperma laterale*, *L. limicola*, *Restio* spp.

Comments: Soil depth affects size of shrubs, though most areas of this community contain the characteristic species with little variation.

Community 10 HEATH—coastal.

Structure: Dense to mid-dense heath usually less than 2 m high with pockets of *Casuarina glauca* which reach 5 m high. On cliff margins where seepage occurs, a well developed herbaceous layer is found (Figure 10).

Habitat: Adjacent to the sea on slopes or cliff tops, extending down to the rock platforms. Subject to onshore wind and salt spray.

Distribution: Very restricted in Brisbane Water National Park. Found on Green Point near Pearl Beach. Common in nearby Bouddi National Park.

Main species present:

Trees: *Casuarina glauca*, *Banksia integrifolia*.

Shrubs: *Westringia fruticosa*, *Baeckea imbricata*, *Hakea gibbosa*, *Lasiopetalum macrophyllum*, *Leptospermum laevigatum*, *Pultenaea* spp.

Herbs: *Cotula longipes*, *Lobelia alata*.

Climbers: *Kennedia rubicunda*, *Stephania japonica* var. *discolor*. Also exotic shrubs such as *Lantana camara* and exotic herbs, as a result of the close proximity to urban areas.

Comments: The community is taller where protected from wind. Fire may affect structure and species composition.

**Community 11 REEDLAND/RUSHLAND with *Casuarina glauca* and *Melaleuca styphelioides*.**

Structure: Two structural formations occur:

- (i) REEDLAND/RUSHLAND: dominated by members of the Juncaceae (rushes) and Poaceae (reeds, grasses). Ground cover dense to mid-dense. Saltmarsh and salt couch sometimes present.
- (ii) WOODLAND: *Casuarina glauca*, *Melaleuca styphelioides*. Trees up to 15 m high, mainly sparse canopy cover, with ground cover dominated by monocotyledons (Figure 11).

Habitat:

- (i) REEDLAND/RUSHLAND: occurs on alluvial flats landward of the mangrove community, usually subject to frequent tidal inundation.
- (ii) WOODLAND: *Casuarina glauca*, *Melaleuca styphelioides*. Along tidal channels on alluvial flats, on higher elevations (less saline?) than reedland/rushland but occasionally subject to tidal inundation.

Distribution: Often associated with mangrove communities in Mooney Mooney Creek, Piles Creek, Mullet Creek, Patonga Creek and lowland areas near Umina. On the whole, the community is restricted in area and, in the case of the developed coastal flats, is only a remnant of what originally existed. As with the mangrove community, most of this community is found outside the present Park whose boundaries are set at the high tide mark in most areas. Tidal channels or "backswamps" on the floodplain are dominated by reedland/rushland.

Main species present:

Trees: *Casuarina glauca*, *Melaleuca styphelioides*.

Shrubs: Uncommon, *Myoporum acuminatum*, *Acacia implexa*.

Monocotyledons: *Phragmites australis*, *Juncus kraussii* dominate in "boggy", saline areas. Others include *Baumea juncea*, *Agrostis avenaceus*.

Herbs: On higher, well-drained sand banks. *Viola hederacea*, *Gnaphalium* sp.

Comments: Variation is due to salinity changes and water-table depth. Different species require different saline conditions, e.g. *Juncus kraussii* is tolerant of strongly saline conditions, while *Phragmites australis* requires less saline conditions (Clarke & Hannon, 1970). These differences in saline tolerances are important in determining the relative distribution of these species.

**Community 12 SEDGELAND**

Structure: Dominated by monocotyledons, especially the families Cyperaceae and Restionaceae. Shrubs when present are scattered and less than 2 m high. No trees present (Figure 12).

Habitat: Occurs on swampy, organic soil often formed where impervious shale beds direct the water table to the surface. On plateaux or in shallow basins perched above the valleys.

Distribution: Found as patches of varying size, mainly from Kariang northwards. *Gahnia* swamps are restricted to drainage lines.





Figure 11. Rushland of *Juncus kraussii* with *Casuarina glauca* woodland in background (Community 11). Some mangroves in the foreground have been killed by nearby land reclamation which has altered the degree of tidal inundation.



Figure 12. Extensive area of sedgeland (Community 12) with shrubs of *Banksia robur*.

Main species present:

Shrubs: *Banksia robur*, *Banksia ericifolia*, *Banksia aspleniifolia*, *Hakea teretifolia*, *Sprengelia incarnata*, *Leptospermum juniperinum*.

Monocotyledons: *Restio* spp., *Chorizandra* spp., *Cyathochaeta diandra*, *Gymnoschoenus sphaerocephalus*, *Lepidosperma* spp., *Leptocarpus tenax*, *Schoenus* spp., *Xanthorrhoea resinosa*, *Gahnia clarkei*.

Herbs: *Drosera* spp., *Dampiera stricta*.

Comments: Variation is due to drainage and fire history. In very waterlogged areas *Gahnia clarkei*, *Leptospermum juniperinum* and *Banksia robur* are dominant. In slightly better-drained areas are *Banksia robur* and *Gymnoschoenus sphaerocephalus*, while in drier areas again, *Banksia aspleniifolia* and *Xanthorrhoea resinosa* occur.

A transition between this community and Community 8 is usually present. The boundary of this zone may vary depending on the successional stage after fire (sedges to shrubs) and any changes in soil moisture levels.

## DISCUSSION

### Species Richness

Altogether 657 species have been recorded from the study area. This included 49 Pteridophytes, 3 Gymnosperms and 605 Angiosperms (426 Dicotyledons and 179 Monocotyledons). The high total number of species reflects the great variety of habitats in the region. The greatest species richness is in the shrub species (240 species) and among the Monocotyledons (179 species). The large number of tree species (49 including 20 *Eucalyptus* species) also gives a good indication of the variety of the canopy composition though most of the non-eucalypt species are restricted to closed-forest. The total number of species listed is about 75% of that recorded for nearby Ku-ring-gai Chase National Park (Riddell, 1969) which is very similar geologically, topographically and floristically to Brisbane Water. Almost certainly the number of species known to occur in Brisbane Water National Park will be increased, when more intensive collecting is undertaken, and the exotic species are taken more fully into account.

### Rare and Restricted Species

A number of rare and restricted species have been recorded within the area studied, some of which are considered "vulnerable" or "endangered".\* These may occur as small populations of sporadic localized occurrence distributed over a relatively wide geographical region, or as populations of very restricted distribution, in some cases being confined to the study area.

Species of sporadic occurrence but found over a relatively wide geographical area are:

*Melaleuca deanei* (Myrtaceae), a shrub found in the understorey of low open-woodland (Community 6). Recorded only from the South Coast and Central Coast of New South Wales with its presently-known northern limit within the Brisbane Water National Park.

*Eucalyptus multicaulis* (Myrtaceae), a mallee occurring in open-woodland or low open-woodland on rocky sandstone slopes. In the study area *E. multicaulis* is found only on the slopes of Scopus Peak and Leochares Peak. Although the Type specimen was collected at nearby Mount Kariong Trig, it was not seen on Mount Kariong during this survey. Present also in the Blue Mountains and in a few other areas of the New South Wales Central Coast.

*Eucalyptus luehmanniana* (Myrtaceae), a mallee occurring in low woodland to low open-woodland (Community 6) between rock outcrops on sandstone slopes. This species is restricted to the New South Wales Central Coast, from Helensburgh to Gosford. Within the Park it has been found on the southern side of Mount Kariong and near Green Point Creek in the Old Warrah Sanctuary.

*Leucopogon amplexicaulis* (Epacridaceae), a straggling shrub found in sheltered, moist places near rock outcrops, usually in relatively undisturbed areas with low fire frequency. Recorded only from the South Coast and Central Coast of New South Wales.

\* As defined by Hartley & Leigh (1979) " 'endangered' = species at serious risk of disappearing from the wild state within one to two decades if present land use and other casual factors continue to operate; 'vulnerable' = species not presently endangered but at risk over a long period if land-use patterns are introduced which would be deleterious to the species."

*Leucopogon margarodes* (Epacridaceae), a shrub found in the moist, dense understorey of the open-forest on Hawkesbury Sandstone, in areas not burnt for 8–10 years. Known from southern Queensland and the North Coast of New South Wales as far south as Wondabyne.

*Boronia fraseri* (Rutaceae), a shrub found in the moist understorey of open-forest (Community 2B). Recorded only from the Central Coast of New South Wales (Menangle to Woy Woy) and the lower eastern slopes of the Blue Mountains.

*Allania endlicheri* (Liliaceae), a species showing a disjunct distribution pattern, found on wet rocks in moist gullies with low open-forest in the Piles Creek area of Brisbane Water National Park. Also on Mount Coricudgy and in the Blue Mountains.

Two ferns are of restricted distribution and considered to be vulnerable also. They are:

*Blechnum ambiguum* (Blechnaceae), occurring on wet rocks in caves, under rock ledges, in wet crevices or near waterfalls, in open-forest with a moist understorey (Community 2B). This species is found on the Blue Mountains, South Coast, and Central Coast of New South Wales. It has been recorded at Wondabyne and Girrakool (R. G. Coveny 1969–78) and in the Old Warrah Sanctuary (D. V. Cameron, 1974) although the most northerly herbarium collection was from Narrabeen, south of Brisbane Water National Park.

*Lindsaea dimorpha* (Lindsaeaceae), a tiny fern found twice in the northwestern part of the Park on moist, shallow sandy soil with a high organic content, within scrub (Community 8) and open-woodland with a dense shrub understorey (Community 6). Known from Queensland and in New South Wales mainly from near Nowra on the South Coast. There are also records of it occurring near Penrith and in Dharug National Park; its discovery in Brisbane Water National Park extends the known range.

Taxa showing very restricted distribution patterns include:

*Darwinia glaucophylla* (Myrtaceae), an endemic and highly distinctive species found on rock outcrops with pockets of low scrub (Community 9) and in closed to open-scrub (Community 8) where this occurs close to rock outcrops. It is known only from the Calga-Piles Creek-Kariong area. The only area where its habitat is protected is in the north-western section of Brisbane Water National Park, on rock platforms to the north and west of Mt Kariong, and rock outcrops near Girrakool.

*Darwinia procera* (Myrtaceae), a restricted species recorded on a rocky ridge in low open-woodland (Community 6) with dry scrubby understorey. Known from a number of localities on the Central Coast of New South Wales, it has been collected near Piles Creek, the most northerly limit of its known distribution.

*Grevillea shiressii* (Proteaceae), a tall shrub growing on alluvial soil in open-forest with a moist understorey (Community 2B). This species is known from 2 localities only. Neither is within the present Park boundaries. Hartley & Leigh (1979) list it as a restricted endemic with a limited population range which is endangered.

*Grevillea* sp. aff. *capitellata* (Proteaceae), an undescribed species found in low open-forest (Community 4) with a dense shrubby understorey and in scrub (Community 8). It is only known to occur in the Peats Ridge, Mount White, Calga and Mangrove Mountain area to the west of Mooney Mooney Creek. Within the Park it occurs on the dry sandstone ridges west of Mooney Mooney Creek.

*Grevillea* sp. nov. (Proteaceae), an undescribed, small-leaved species which appears to have a very restricted distribution. It is found occasionally in the low open-forest and low woodland to low open-woodland communities on sandstone ridges on the scarp in the Somersby to Narara area.

*Styphelia laeta* var. *latifolia* (Epacridaceae), found in the dense shrubby understorey of open-forest to low open-forest on Hawkesbury sandstone slopes (Community 4), in low open-forest of plateau tops with earthy soils (Community 4P) and in low woodland (Community 6). This variety is known only from the Gosford-Ourimbah-Kulnura-Peats Ridge area. Another variety of this species, *S. laeta* var. *laeta*, was found in the south of the Park. There appears to be a possibility of hybridization between this variety and *Styphelia longifolia* (J. M. Powell, National Herbarium, pers. comm.); this requires further investigation.

Patches of hybrids between *Conospermum taxifolium* and *C. longifolium* subsp. *longifolium* (Proteaceae) occur in the Park, between Mooney Mooney Creek and Girrakool. (D. McGillivray, National Herbarium, pers. comm.).

If populations of these restricted species are disturbed or damaged in the Park and its environs then recovery is unlikely as local propagule sources are rare or unavailable.

### Plant Community Distributions

The distribution of the plant communities primarily reflects geological, soil, drainage and aspect differences. Several of the communities are uncommon in the area and/or have very restricted distributions, and some are endangered by man's activities.

The southern parts of the study area south of the Pacific Highway, are dominated by ridges and slopes of Hawkesbury Sandstone; open-forest and closed to open-forest (Communities 4 and 8) dominate these areas, often forming a continuum. There are occasional rock outcrops with pockets of heath (Community 9), each of very limited extent, and some *Gahnia*-dominated sedgelands (Community 12) in 'swampy' valleys lining the watercourses. Both communities are uncommon in this area. The open-forest (Community 4S) is an unusual feature of the south of the Park. This community is botanically and ecologically interesting; it is floristically quite distinctive and appears to be restricted to remnant shale outcrops in Hawkesbury Sandstone.

A different group of plant communities predominate in the north of the study area. On the ridgetops and plateaux are deep yellow earth soils with open-forest (Community 4P). Since this soil is favoured by orchardists only small pockets of vegetation remain. An isolated patch of this community occurs in the south of the Park along the Patonga road near Warrah Trig. Sedgelands (Community 12) seem to be far more extensive in the north and are particularly common on the scarp of the Hunter Range east of Somersby. They rely heavily on natural drainage patterns and any changes to these will greatly affect this community. Many sedgelands occur close to farmed areas and are not within the Park.

The vegetation of valleys which cut deep into Narrabeen Group strata is better developed in the northern part of the area. These protected moist valleys support closed-forest (Community 1) and open-forest with a moist understorey (Community 2B). The main valleys are those of Mooney Mooney Creek and Narara Creek (in Strickland State Forest). The closed-forest in Strickland State Forest is particularly rich in rainforest species. Drainage from farms into Communities 1 and 2B will bring increased nutrients (from fertilizers and sediment), possibly some pesticides and herbicides, and seeds. Weed problems are likely to increase, particularly along creek lines, e.g. into upper Mooney Mooney Creek.

The coastal and estuarine communities (3, 5, 7, 10 and 11) are not extensive and have been greatly disturbed by urban development. Very few relatively undisturbed areas remain, and few of these are within the Park. The most extensive areas of mangroves (Community 7) left in the study area occur along Patonga and Mooney Mooney Creek. In Native Dog Bay on Mooney Mooney Creek, mangroves have been affected by deposits of sediments from erosion (following highway construction)

upstream. Mangroves play an essential role in estuarine ecosystems and are particularly important to both oyster and fish populations which are harvested commercially. Their conservation and protection is important. Reedland/rushland with *Casuarina glauca* (Community 11) occurs only in small isolated areas along Mooney Mooney, Mullet and Patonga Creeks. The only saltmarsh located during the survey consisted of two areas on Patonga Creek; the larger of these was being destroyed by trail bikes. None of the estuarine-associated plant communities are at present protected by conservation legislation.

### Fire

During the preparation of the vegetation map some relationships were found between fire history and structural formation, species composition and the distribution of some rare species. For example, closed to open-scrub (Community 8) with regular burning appears to become dominated by the seed-regenerating species *Banksia ericifolia* and *Hakea teretifolia*. These species are killed by fire and regenerate from seed. However *Banksia ericifolia*, in particular, takes five years to flower and plants do not carry heavy seed loads until they are 8 to 10 years of age (Recher 1980). Maintenance of this community therefore requires a period between burning of at least 8 to 10 years but less than about 25 years.

The minimum period between fires is probably important for many species. A number of the rare species, for example, *Darwinia procera*, *Leucopogon amplexicaulis*, *L. margarodes* and *Boronia anemonifolia*, were found in areas which had not been burnt for at least eight years. There is much debate on the proper use of fire as a management tool in natural areas. Only when sufficient biological information on communities and species is available can scientifically based conclusions be drawn.

For many other aspects of management, further information is required on the biology and life histories of individual species and the inter-relationships between them. Monitoring of change over time within and between plant communities could be carried out in a number of ways, including permanent quadrats set out on a grid or random basis, colour oblique or low level aerial photography regularly taken over selected sites, or a combination of both quadrats and photography.

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TABLE 1

## Species list for communities identified in Brisbane Water National Park and environs

The species list is compiled from fieldwork records and from existing lists for areas within the Park. These include lists by R. G. Coveny (1969–1978) for the Wondabyne (RGC-W) and Girrorakool (RGC-G) areas and by D. V. Cameron (1974) for the Old Warrah Sanctuary (DVC).

The list is arranged alphabetically within families and genera within the Pteridophytes, Gymnosperms, Angiosperms—Dicotyledons and Angiosperms—Monocotyledons. Exotic species are marked with an asterisk (\*). The communities within which individual species occurred are indicated by the community numbers (as used in the text). Species names are those currently recognized at the National Herbarium of New South Wales (Jacobs & Pickard, 1981).

Botanical name	Community	Other Collectors
<b>PTERIDOPHYTES</b>		
<b>PSILOPSIDA</b>		
<b>PSILOACEAE</b>		
<i>Psilotum nudum</i> .. .. .	4	
<i>Tmesipteris truncata</i> .. .. .		RGC-W
<b>LYCOPSIDA</b>		
<b>LYCOPODIACEAE</b>		
<i>Lycopodium cernuum</i> .. .. .		RGC-W
<i>L. deuterodensum</i> .. .. .	4P	
<i>L. laterale</i> .. .. .	12	
<b>SELAGINELLACEAE</b>		
<i>Selaginella uliginosa</i> .. .. .	2B, 4, 12	
<b>PTEROPSIDA</b>		
<b>ADIANTACEAE</b>		
<i>Adiantum aethiopicum</i> .. .. .	1, 4, 5	
<i>A. formosum</i> .. .. .	1	
<i>A. hispidulum</i> .. .. .		RGC-WG
<i>A. silvaticum</i> .. .. .	1, 2B	
<i>Cheilanthes distans</i> .. .. .		DVC, RGC-WG
<i>C. sieberi</i> .. .. .	2A, 2B	
<i>Pelaea falcata</i> .. .. .		DVC
<b>ASPIDIACEAE</b>		
<i>Lastreopsis decomposita</i> .. .. .		RGC-WG
<i>L. microsora</i> .. .. .		DVC, RGC-WG
<b>ASPLENIACEAE</b>		
<i>Asplenium australasicum</i> .. .. .		RGC-WG
<i>A. flabellifolium</i> .. .. .	1	
<b>BLECHNACEAE</b>		
<i>Blechnum ambiguum</i> .. .. .		DVC, RGC-WG
<i>B. camfieldii</i> .. .. .		RGC-WG
<i>B. cartilagineum</i> .. .. .	1, 2B, 4	
<i>B. nudum</i> .. .. .		DVC
<i>B. wattsi</i> .. .. .		DVC
<i>Doodia aspera</i> .. .. .	1, 2B, 4	
<i>D. caudata</i> var. <i>laminosa</i> .. .. .		RGC-W
<b>CYATHEACEAE</b>		
<i>Culcita dubia</i> .. .. .	1, 2B, 4, 5	
<i>Cyathea australis</i> .. .. .	1	
<i>C. cooperi</i> .. .. .		DVC, RGC-G
<b>DAVALLIACEAE</b>		
<i>Davallia pyxidata</i> .. .. .	1	
* <i>Nephrolepis cordifolia</i> .. .. .		DVC
<b>DENNSTAETIACEAE</b>		
<i>Histiopteris incisa</i> .. .. .		DVC
<i>Hypolepis muelleri</i> .. .. .	1	
<i>H. punctata</i> .. .. .		RGC-G
<i>Pteridium esculentum</i> .. .. .	1, 2A, 2B, 4, 4P, 4S, 5, 6, 10, 11, 12	
<b>GLEICHENIACEAE</b>		
<i>Gleichenia dicarpa</i> .. .. .	4	
<i>G. microphylla</i> .. .. .	4, 12	
<i>G. rupestris</i> .. .. .	4	
<i>Sticherus flabellatus</i> .. .. .	4, 4P	

Botanical name	Community	Other Collectors
<b>GRAMMITIDACEAE</b>		
<i>Grammitis billardieri</i> .. .. .	1	
<b>HYMENOPHYLLACEAE</b>		
<i>Hymenophyllum cupressiforme</i> .. .. .	1	
<b>LINDSAEACEAE</b>		
<i>Lindsaea dimorpha</i> .. .. .	4, 8	
<i>L. linearis</i> .. .. .	4, 4P, 6	
<i>L. microphylla</i> .. .. .	2A, 2B, 4S	
<b>OSMUNDACEAE</b>		
<i>Todea barbara</i> .. .. .	1, 2B, 4	
<b>POLYPODIACEAE</b>		
<i>Dictymia brownii</i> .. .. .	1	
<i>Microsorium scandens</i> .. .. .		RGC-G
<i>Platyserium bifurcatum</i> .. .. .	1	
<i>Pyrrhosia rupestris</i> .. .. .	4	
<b>SCHIZEACEAE</b>		
<i>Schizaea dichotoma</i> .. .. .	1, 4, 4P	
<i>S. rupestris</i> .. .. .		RGC-WG
<b>GYMNOSPERMS</b>		
<b>CUPRESSACEAE</b>		
<i>Callitris muelleri</i> .. .. .	1, 2A, 4, 6, 10	
<b>PODOCARPACEAE</b>		
<i>Podocarpus spinulosus</i> .. .. .	4, 5	
<b>ZAMIACEAE</b>		
<i>Macrozamia communis</i> .. .. .	2A, 3, 4, 4S	
<b>ANGIOSPERMS</b>		
<b>DICOTYLEDONS</b>		
<b>ACANTHACEAE</b>		
<i>Brunoniella ? pumilio</i> .. .. .	4	
<i>Pseuderanthemum variabile</i> .. .. .	1, 2A, 2B, 4	
<b>AIZOACEAE</b>		
<i>Carpobrotus glaucescens</i> .. .. .		DVC
<b>APIACEAE</b>		
<i>Actinotus helianthi</i> .. .. .	4	
<i>A. minor</i> .. .. .	4, 4P, 6, 8	
<i>Apium prostratum</i> .. .. .	11	
<i>Centella asiatica</i> .. .. .	10	
<i>Daucus glochidiatus</i> .. .. .	2A, 2B	
<i>Hydrocotyle acutiloba</i> .. .. .	1, 2A, 2B, 5	
<i>H. laxiflora</i> .. .. .	4	
* <i>H. bonariensis</i> .. .. .	5	
<i>Platysace ericoides ?</i> .. .. .		RGC-W?
<i>P. lanceolata</i> .. .. .	1, 2A, 2B, 4, 5, 9	
<i>P. linearifolia</i> .. .. .	2A, 2B, 4, 4P, 4S, 6, 8	
<i>Xanthosia dissecta</i> .. .. .	4	
<i>X. pilosa</i> .. .. .	2A, 4, 6	
<i>X. tridentata</i> .. .. .	2A, 4, 4S, 6, 12	
<b>APOCYNACEAE</b>		
<i>Parsonsia straminea</i> .. .. .		RGC-WG
<b>ARALIACEAE</b>		
<i>Astrotricha crassifolia</i> .. .. .	4	
<i>A. floccosa</i> .. .. .	1, 4	
<i>Polyscias murrayi</i> .. .. .	1, 4	
<b>ASCLEPIADACEAE</b>		
* <i>Gomphocarpus fruticosus</i> .. .. .	2B	
<i>Marsdenia suaveolens</i> .. .. .		RGC-WG
<b>ASTERACEAE</b>		
* <i>Ageratina adenophora</i> .. .. .	10, 11	
* <i>Ambrosia tenuifolia</i> .. .. .		RGC-W
* <i>Aster subulatus</i> .. .. .	1, 10	
<i>Brachycome</i> sp. .. .. .	1	
<i>Cassinia aculeata</i> .. .. .		DVC
<i>C. denticulata</i> .. .. .		DVC



Botanical name	Community	Other Collectors
<i>C. longifolia</i> .. .. .	11	
* <i>Chrysanthemoides monilifera</i> .. .. .	10	
* <i>Cirsium vulgare</i> .. .. .	11	
* <i>Conyza albida</i> .. .. .	4	
<i>Cotula longipes</i> .. .. .	10, 11	RGC-W
<i>Epaltes australis</i> .. .. .		
* <i>Facelis retusa</i> .. .. .	4	
<i>Gnaphalium</i> sp. .. .. .	2A	
<i>Helichrysum diosmifolium</i> .. .. .	4P, 11	RGC-WG
<i>H. elatum</i> .. .. .		
* <i>Hypochoeris radicata</i> .. .. .	1, 2A, 2B, 4, 10	
<i>Lagenifera stipitata</i> .. .. .	4	
<i>Olearia tomentosa</i> .. .. .	4	
<i>Senecio hispidulus</i> .. .. .	2A, 4	
<i>S. lautus</i> .. .. .	11	
<i>S. minimus</i> .. .. .	11	
<i>Sigesbeckia orientalis</i> .. .. .	1	
* <i>Sonchus oleraceus</i> .. .. .	10, 11	RGC-W
* <i>Tagetes minuta</i> .. .. .		
<b>BAUERACEAE</b>		
<i>Bauera rubioides</i> var. <i>rubioides</i> .. .. .	4, 6, 12	
<b>BIGNONIACEAE</b>		
<i>Pandorea pandorana</i> .. .. .	1, 2A, 2B, 5	
<b>CAMPANULACEAE</b>		
<i>Wahlenbergia</i> spp. .. .. .	2A, 2B, 4, 11	
<b>CAPRIFOLIACEAE</b>		
* <i>Lonicera japonica</i> .. .. .	1	
<b>CASSYTHACEAE</b>		
<i>Cassytha paniculata</i> .. .. .	1, 4, 10	
<i>C. pubescens</i> .. .. .	4, 4P, 8	
<b>CASUARINACEAE</b>		
<i>Casuarina distyla</i> .. .. .	4, 6, 8, 9	
<i>C. glauca</i> .. .. .	10, 11	
<i>C. littoralis</i> .. .. .	4	
<i>C. torulosa</i> .. .. .	1, 2A, 2B, 3, 4	
<b>CELASTRACEAE</b>		
<i>Elaeodendron australe</i> .. .. .	1	
<i>Maytenus silvestris</i> .. .. .	1	
<b>CHENOPODIACEAE</b>		RGC-W
<i>Chenopodium glaucum</i> .. .. .		
<i>Sarcocornia quinqueflora</i> .. .. .	7, 10	
<b>CHLOANTHACEAE</b>		
<i>Chloanthes stoechadis</i> .. .. .	4, 11	
<b>CONVOLVULACEAE</b>		DVC
* <i>Convolvulus arvensis</i> .. .. .		
<i>Dichondra repens</i> .. .. .	2A, 4, 10	
<b>CRASSULACEAE</b>		DVC
<i>Crassula helmsii</i> .. .. .		
<i>C. sieberana</i> .. .. .	4	
<b>CUNONIACEAE</b>		
<i>Callicoma serratifolia</i> .. .. .	1, 4, 4P	
<i>Ceratopetalum apetalum</i> .. .. .	4	
<i>C. gummiiferum</i> .. .. .	2A, 4, 4S	
<i>Schizomeria ovata</i> .. .. .	2A, 2B	
<b>DILLENIACEAE</b>		RGC-W
<i>Hibbertia aspera</i> .. .. .		
<i>H. bracteata</i> .. .. .	4, 4P, 8	
<i>H. cistiflora</i> .. .. .	4, 6, 8	
<i>H. dentata</i> .. .. .	1, 2B, 4	
<i>H. empetrifolia</i> .. .. .	2A, 2B, 4, 4P, 6, 10	
<i>H. fasciculata</i> .. .. .	4	
<i>H. linearis</i> .. .. .	8	

Botanical name	Community	Other Collectors
<i>H. obtusifolia</i> .. .. .	4, 4P, 6, 9	
<i>H. stricta</i> .. .. .	8	
<i>H. scandens</i> .. .. .	2B	
<b>DROSERACEAE</b>		
<i>Drosera auriculata</i> .. .. .	2B, 4, 4P, 6, 8	
<i>D. binata</i> .. .. .	12	
<i>D. peltata</i> .. .. .	4, 6, 8	
<i>D. pygmaea</i> .. .. .		DVC, RGC-WG
<i>D. spathulata</i> .. .. .	4, 12	
<b>ELAEOCARPACEAE</b>		
<i>Elaeocarpus reticulatus</i> .. .. .	1, 2B, 4	
<b>EPACRIDACEAE</b>		
<i>Acrotriche divaricata</i> .. .. .		RGC-WG
<i>Astroloma pinifolium</i> .. .. .	4	
<i>Brachyloma daphnoides</i> .. .. .	4, 4S, 6	
<i>Dracophyllum secundum</i> .. .. .	2A	
<i>Epacris crassifolia</i> .. .. .		RGC-WG
<i>E. longiflora</i> .. .. .	4, 6	
<i>E. microphylla</i> .. .. .	4, 6, 8, 9	
<i>E. obtusifolia</i> .. .. .	4, 6, 8, 12	
<i>E. pulchella</i> .. .. .	4, 4P, 4S, 6, 8, 9, 10	
<i>E. purpurascens</i> var. <i>purpurascens</i> .. .. .		DVC
<i>Leucopogon amplexicaulis</i> .. .. .	4	
<i>L. ericoides</i> .. .. .	4	
<i>L. esquamatus</i> .. .. .	6, 8, 9	
<i>L. margarodes</i> .. .. .	4	
<i>L. microphyllus</i> .. .. .	6, 8, 9, 12	
<i>L. parviflorus</i> .. .. .	10	
<i>Melichrus procumbens</i> .. .. .	4	
<i>Monotoca elliptica</i> .. .. .	3	
<i>M. scoparia</i> .. .. .	2A, 4, 4P, 4S, 6	
<i>Sprengelia incarnata</i> .. .. .	8, 12	
<i>Styphelia laeta</i> var. <i>laeta</i> .. .. .	4, 4P	
<i>S. laeta</i> var. <i>latifolia</i> .. .. .	4, 4P	
<i>S. longifolia</i> .. .. .		DVC
<i>S. tubiflora</i> .. .. .	4	
<i>Trochocarpa laurina</i> .. .. .	1, 2B, 4	
<i>Woollisia pungens</i> .. .. .	4, 6, 9	
<b>ESCALLONIACEAE</b>		
<i>Abrophyllum ornans</i> .. .. .	1, 2A	
<b>EUPHORBIACEAE</b>		
<i>Amperea xiphoclada</i> .. .. .	2B, 4	
<i>Breynia oblongifolia</i> .. .. .	1, 2B	
<i>Glochidion ferdinandi</i> .. .. .	2A, 2B, 4	
<i>Micrantheum ericoides</i> .. .. .	4	
<i>Monotaxis liniifolia</i> .. .. .	12	
<i>Phyllanthus gasstroemii</i> .. .. .	1, 2A, 2B	
<i>P. thymoides</i> .. .. .	2A, 4, 4P, 4S, 6, 10	
<i>Poranthera ericifolia</i> .. .. .	4	
<i>P. microphylla</i> .. .. .	1, 2A, 2B, 10	
<i>Pseudanthus pimeleoides</i> .. .. .		DVC
<i>Ricinocarpos pinifolius</i> .. .. .	4, 6, 8	
<b>EUPOMATIACEAE</b>		
<i>Eupomatia laurina</i> .. .. .	1	
<b>FABACEAE</b>		
<i>Aotus ericoides</i> .. .. .	1	
<i>Bossiaea ensata</i> .. .. .	6, 8	
<i>B. heterophylla</i> .. .. .	4, 4P, 6	
<i>B. obcordata</i> .. .. .	4, 4P, 6	
<i>B. scolopendria</i> .. .. .	4, 4P, 6, 8	
<i>B. stephensonii</i> .. .. .	4, 4S, 6	
<i>Daviesia alata</i> .. .. .		DVC

Botanical name	Community	Other Collectors
<i>D. ulicifolia</i> .. .. .	4S	RGC-W
<i>Desmodium rhytidophyllum</i> .. .. .		
<i>D. varians</i> .. .. .	2B, 4	
<i>Dillwynia floribunda</i> .. .. .	2A, 4, 8, 9, 12	
<i>D. retorta</i> .. .. .	4, 4P, 6	
<i>D. sericea</i> subsp. B .. .. .	4	
<i>Glycine clandestina</i> .. .. .	2A, 2B, 4	
<i>Gompholobium glabratum</i> .. .. .	6	
<i>G. grandiflorum</i> .. .. .	4, 4P, 4S, 6	
<i>G. latifolium</i> .. .. .	2A, 2B, 4, 4P, 4S	
<i>Hardenbergia violacea</i> .. .. .	2A, 4, 5	
<i>Hovea linearis</i> .. .. .	2A, 6	
<i>Indigofera australis</i> .. .. .	1, 2B	
<i>Kennedia rubicunda</i> .. .. .	1, 2A, 2B, 10	
<i>Mirbelia rubrifolia</i> .. .. .	6, 8	
<i>Oxylobium ilicifolium</i> .. .. .	1, 2A, 2B, 4S	
<i>Phyllota phyllicoides</i> .. .. .	4, 4P, 6	
<i>Platylobium formosum</i> .. .. .	2A, 4P, 4S, 5	
<i>Pultenaea daphnoides</i> .. .. .	2A, 4, 4S, 5, 10	
<i>P. elliptica</i> .. .. .	2A, 4, 4S, 6	
<i>P. ferruginea</i> var. <i>deanei</i> .. .. .	2A, 4, 4S, 10	
<i>P. flexilis</i> .. .. .	1, 2A, 2B, 4, 5	
<i>P. paludosa</i> .. .. .	12	
<i>P. rosmarinifolia</i> .. .. .	4, 4P, 4S, 6, 9	
<i>Sphaerolobium vimineum</i> .. .. .	8	
<i>Viminaria juncea</i> .. .. .	8	
GERANIACEAE		
<i>Geranium solanderi</i> .. .. .	2B	DVC
<i>Pelargonium australe</i> .. .. .		
<i>P. inodorum</i> .. .. .	2A	
GOODENIACEAE		
<i>Dampiera stricta</i> .. .. .	2A, 2B, 4, 4P, 6, 8, 12	DVC
<i>Goodenia bellidifolia</i> .. .. .	4, 4S, 8	
<i>G. dimorpha</i> var. <i>dimorpha</i> .. .. .	4	
<i>G. heterophylla</i> .. .. .	2A, 4, 6	
<i>G. ovata</i> .. .. .	1, 10	
<i>G. paniculata</i> .. .. .		
<i>Scaevola ramosissima</i> .. .. .	4, 4P	
<i>Velleia lyrata</i> .. .. .		
HALORAGACEAE		
<i>Gonocarpus micranthus</i> .. .. .		RGC-W
<i>G. salsoloides</i> .. .. .	8, 12	DVC
<i>G. tetragynus</i> .. .. .		
<i>G. teucroides</i> .. .. .	2A, 4, 4P, 5, 6	
HYPERICACEAE		
<i>Hypericum japonicum</i> .. .. .		RGC-W
LAMIACEAE		
<i>Hemigenia purpurea</i> .. .. .	6, 9	RGC-W
<i>Plectranthus parviflorus</i> .. .. .	2B, 4	
<i>Prostanthera linearis</i> .. .. .	4	
<i>P. rhombea</i> .. .. .		
<i>Westringia fruticosa</i> .. .. .	10	
LAURACEAE		
<i>Cryptocarya glaucescens</i> .. .. .	1	DVC, RGC-G
<i>Endiandra sieberi</i> .. .. .	1, 4	
LENTIBULARIACEAE		
<i>Utricularia dichotoma</i> .. .. .		DVC
<i>U. lateriflora</i> .. .. .		
<i>U. uliginosa</i> .. .. .	6, 8	

Botanical name	Community	Other Collectors
<b>LOBELIACEAE</b>		
<i>Lobelia alata</i> .. .. .	10, 11	
<i>L. dentata</i> .. .. .		DVC
<i>L. gibbosa</i> .. .. .		RGC-W
<i>Pratia purpurascens</i> .. .. .	2A, 2B, 4, 5	
<b>LOGANIACEAE</b>		
<i>Logania albiflora</i> .. .. .	4	
<i>Mitrasacme polymorpha</i> .. .. .	4, 4P, 6	
<b>LORANTHACEAE</b>		
<i>Amyema miquelii</i> .. .. .	4, 6	
<i>Muellerina celastroides</i> .. .. .		RGC-W
<i>M. eucalyptoides</i> .. .. .		RGC-W
<b>MALVACEAE</b>		
<i>Howittia trilocularis</i> .. .. .		DVC
* <i>Sida rhombifolia</i> .. .. .	1	
<b>MELIACEAE</b>		
<i>Synoum glandulosum</i> .. .. .	1	
<b>MENISPERMACEAE</b>		
<i>Sarcopetalum harveyanum</i> .. .. .	4	
<i>Stephania japonica</i> var. <i>discolor</i> .. .. .	1, 10	
<b>MIMOSACEAE</b>		
<i>Acacia elata</i> .. .. .	1, 2B, 4	
<i>A. farnesiana</i> .. .. .		RGC-W
<i>A. fimbriata</i> .. .. .		RGC-W
<i>A. floribunda</i> .. .. .	1	
<i>A. implexa</i> .. .. .	1, 2A, 2B, 4, 11	
<i>A. irrorata</i> .. .. .	1	
<i>A. linifolia</i> .. .. .	2A, 4, 4P, 4S	
<i>A. longifolia</i> .. .. .	2A	
<i>A. maidenii</i> .. .. .	4	
<i>A. myrtifolia</i> .. .. .	4P, 4S	
<i>A. oxycedrus</i> .. .. .	4, 6, 8, 9, 12	
<i>A. parramattensis</i> .. .. .	5	
<i>A. prominens</i> .. .. .	2B	
<i>A. schinoides</i> .. .. .	2B	
<i>A. suaveolens</i> .. .. .	4, 4P, 5, 6, 8, 12	
<i>A. terminalis</i> .. .. .	2A, 4, 4P, 6	
<i>A. ulicifolia</i> .. .. .	2A, 4, 4P, 4S, 6	
<b>MONIMIACEAE</b>		
<i>Doryphora sassafras</i> .. .. .	1	
<i>Palmeria scandens</i> .. .. .	1	
<i>Wilkiea huegeliana</i> .. .. .	1	
<b>MORACEAE</b>		
<i>Ficus coronata</i> .. .. .	1	
<i>F. rubiginosa</i> .. .. .	4, 10	
<i>F. superba</i> var. <i>henneana</i> .. .. .		DVC
<b>MYOPORACEAE</b>		
<i>Myoporum acuminatum</i> .. .. .	7, 11	
<i>M. insulare</i> .. .. .	10	
<b>MYRSINACEAE</b>		
<i>Aegiceras corniculatum</i> .. .. .	7	
<i>Rapanea howittiana</i> .. .. .	1	
<i>R. variabilis</i> .. .. .	1, 2A, 2B, 4, 5	
<b>MYRTACEAE</b>		
<i>Acmena smithii</i> .. .. .	1, 2B, 4, 5	
<i>Angophora costata</i> .. .. .	1, 2A, 3, 4, 4P, 4S, 5, 6, 10	
<i>A. floribunda</i> .. .. .	1, 2A, 2B, 3, 4, 10	
<i>A. hispida</i> .. .. .	4, 5, 8, 9, 12	
<i>Austromyrtus tenuifolia</i> .. .. .	4, 11	
<i>Bacchousia myrtifolia</i> .. .. .	1, 4,	
<i>Baeckea brevifolia</i> .. .. .	9	
<i>B. diosmifolia</i> .. .. .	6	
<i>B. imbricata</i> .. .. .	4, 8, 10, 12	

Botanical name	Community	Other Collectors
<i>B. linifolia</i>	4, 9	
<i>Callistemon citrinus</i>	4, 12	
<i>C. linearis</i>	4, 9	
<i>Calytrix tetragona</i>	6, 8	
<i>Darwinia fascicularis</i> subsp. <i>fascicularis</i>	6, 8, 9, 12	
<i>D. glaucophylla</i>	8, 9	
<i>D. procera</i>	9	
<i>Eucalyptus acmenoides</i>	2B	
<i>E. botryooides</i>	3, 5	
<i>E. capitellata</i>	4, 4P, 6	
<i>E. deanei</i>	1, 2B	
<i>E. eximia</i>	4, 4P, 6, 9	
<i>E. globoidea</i>	4S	
<i>E. gummifera</i>	2A, 3, 4, 4P, 4S, 6	
<i>E. haemastoma</i>	4, 4P, 4S, 6, 8, 9	
<i>E. luehmanniana</i>	6	
<i>E. maculata</i>	3	
<i>E. multicaulis</i>	6	
<i>E. oblonga</i>	4, 4P, 4S, 6	
<i>E. paniculata</i>	2A, 3	
<i>E. pellita</i>	4	
<i>E. piperita</i> subsp. <i>piperita</i>	2A, 4, 4P	
<i>E. punctata</i>	4, 4P, 4S, 6	
<i>E. resinifera</i>	2A	
<i>E. squamosa</i>		DVC
<i>E. sieberi</i>	4, 4P	
<i>E. umbra</i> subsp. <i>umbra</i>	2A, 4, 4S, 5, 6, 8, 10	
<i>Kunzea ambigua</i>	8	
<i>K. capitata</i>	4, 6, 8, 9	
<i>Leptospermum arachnoides</i>	9	
<i>L. attenuatum</i>	2A, 4, 4P, 6, 8, 9	
<i>L. flavescens</i>	1, 2A, 2B, 4, 4P, 4S, 6, 8, 9	
<i>L. juniperinum</i>	6, 12	
<i>L. laevigatum</i>	10	
<i>L. lanigerum</i>	4	
<i>L. parvifolium</i>	9	
<i>L. scoparium</i>	4, 12	
<i>L. squarrosus</i>	4, 8	
<i>Melaleuca deanei</i>	6	
<i>M. styphelioides</i>	11	
<i>Syncarpia glomulifera</i>	1, 2A, 2B, 4, 4P, 4S, 6	
<i>Syzygium coolminianum</i>	1	
<i>Tristania laurina</i>	1, 2A, 4	
<i>T. nerifolia</i>	4	
OLACACEAE		
<i>Olex stricta</i>	9	
OLEACEAE		
* <i>Ligustrum sinense</i>		RGC-G
<i>Notelaea longifolia</i>	1, 5	
<i>N. venosa</i>	1	
OXALIDACEAE		
<i>Oxalis corniculata</i>	4, 11	
PEPEROMIACEAE		
<i>Peperomia tetraphylla</i>	2B	
PHYTOLACCACEAE		
* <i>Phytolacca octandra</i>	11	
PITTOSPORACEAE		
<i>Billardiera scandens</i>	2A, 2B, 4, 4P, 6	
<i>Bursaria spinosa</i>	1, 2A	
<i>Citriobatus pauciflorus</i>		RGC-W
<i>Pittosporum undulatum</i>	1, 2A, 10	
<i>P. revolutum</i>	1	

Botanical name	Community	Other Collectors
<b>PLANTAGINACEAE</b>		
<i>Plantago debilis</i> .. .. .	4, 10	
* <i>P. lanceolata</i> .. .. .		RGC-W
<b>POLYGALACEAE</b>		
<i>Comesperma ericinum</i> .. .. .	4	
<i>C. sphaerocarpum</i> .. .. .		DVC, RGC-W
<i>C. volubile</i> .. .. .	2B, 4	
<b>POLYGONACEAE</b>		
* <i>Acetosa sagittata</i> .. .. .	10	
* <i>Acetosella vulgaris</i> .. .. .		RGC-W
* <i>Polygonum aviculare</i> .. .. .		RGC-W
<i>P. decipiens</i> .. .. .		RGC-W
<i>Rumex brownii</i> .. .. .		RGC-W
<b>PORTULACACEAE</b>		
* <i>Portulaca oleracea</i> .. .. .		RGC-W
<b>PRIMULACEAE</b>		
<i>Samolus repens</i> .. .. .	11	
<b>PROTEACEAE</b>		
<i>Banksia aspleniifolia</i> .. .. .	4, 6, 8, 9, 12	
<i>B. ericifolia</i> .. .. .	2A, 4P, 6, 8, 9, 12	
<i>B. integrifolia</i> .. .. .	3, 5, 10	
<i>B. robur</i> .. .. .	12	
<i>B. serrata</i> .. .. .	2A, 4P, 6	
<i>B. spinulosa</i> .. .. .	2A, 2B, 4, 4P, 4S, 6	
<i>Conospermum longifolium</i> subsp. <i>longifolium</i> ..	4, 4P, 6	
<i>C. taxifolium</i> (narrow-leaved form) .. .. .	6, 8, 9	
<i>C. tenuifolium</i> .. .. .		RGC-G
<i>Grevillea buxifolia</i> .. .. .	2A, 4, 4P, 6	
<i>G. sp. aff. capitellata</i> .. .. .	4, 8	
<i>G. linearifolia</i> .. .. .	4	
<i>G. sericea</i> .. .. .	4, 4P, 4S, 6, 8	
<i>G. shiressii</i> .. .. .	2B	RGC-W
<i>G. speciosa</i> .. .. .	6, 8, 9, 12	
<i>Hakea dactyloides</i> .. .. .	2A, 4, 4P, 4S, 6, 8	
<i>H. gibbosa</i> .. .. .	4, 4P, 6, 8, 10	
<i>H. propinqua</i> .. .. .	4, 6, 8, 9	
<i>H. salicifolia</i> .. .. .	2B, 4	
<i>H. sericea</i> .. .. .	2A, 4, 4P, 4S	
<i>H. teretifolia</i> .. .. .	4P, 6, 8, 9, 12	
<i>Isopogon anemonifolius</i> .. .. .	4, 4P, 4S	
<i>I. anethifolius</i> .. .. .	2A, 4, 6, 9	
<i>Lambertia formosa</i> .. .. .	4, 4P, 4S, 6, 8, 9	
<i>Lomatia myricoides</i> .. .. .	1, 2A, 4	
<i>L. silaifolia</i> .. .. .	2A, 4, 4P, 4S, 6	
<i>Persoonia lanceolata</i> .. .. .	2A, 4, 6, 8, 9	
<i>P. levis</i> .. .. .	2A, 4, 4P, 4S, 6, 8	
<i>P. linearis</i> .. .. .	1, 2A, 2B, 4, 4S	
<i>P. pinifolia</i> .. .. .	2A, 4, 4P, 6, 8	
<i>P. sp. aff. pinifolia</i> .. .. .	2A, 4, 4P, 6, 8	
<i>Petrophile pulchella</i> .. .. .	4, 4P, 6, 8, 9	
<i>Stenocarpus salignus</i> .. .. .	2B	
<i>Symphionema paludosum</i> .. .. .	9	RGC-WG
<i>Telopea speciosissima</i> .. .. .	4P	
<i>Xylomelum pyriforme</i> .. .. .	4, 4P, 4S	
<b>RANUNCULACEAE</b>		
<i>Clematis aristata</i> .. .. .	1, 2A, 2B, 5	
<b>RHAMNACEAE</b>		
<i>Alphitonia excelsa</i> .. .. .		RGC-W
<i>Cryptandra ericoides</i> .. .. .	8	
<i>Pomaderris ferruginea</i> .. .. .		DVC, RGC-G
<i>P. ligustrina</i> .. .. .		RGC-W
<i>P. multiflora</i> .. .. .		RGC-WG
<i>P. sieberana</i> .. .. .	2A, 4	

Botanical name	Community	Other Collectors
<b>ROSACEAE</b>		
<i>Rubus hillii</i> .. .. .	1	
<i>P. parvifolius</i> .. .. .	2B, 4	
<b>RUBIACEAE</b>		
<i>Canthium coprosmoides</i> .. .. .		RGC-WG
<i>Galium binifolium</i> .. .. .	2B, 4	
<i>G. propinquum</i> .. .. .	4	
<i>Morinda jasminoides</i> .. .. .	1	
<i>Opercularia aspera</i> .. .. .	1, 4, 10, 11	
<i>O. hispida</i> ? .. .. .		RGC-W
<i>O. varia</i> .. .. .	4	
<i>Pomax umbellata</i> .. .. .	1, 2A, 2B, 4	
<b>RUTACEAE</b>		
<i>Asterolasia correifolia</i> .. .. .	1, 4	
<i>Boronia anemonifolia</i> .. .. .	4	
<i>B. fraseri</i> .. .. .	1, 4	
<i>B. ledifolia</i> .. .. .	4, 4P, 6	
<i>B. parviflora</i> .. .. .	12	
<i>B. pinnata</i> .. .. .	4, 4P, 4S, 6, 8	DVC
<i>B. polygalifolia</i> .. .. .		DVC
<i>B. serrulata</i> .. .. .	6, 9	
<i>Correa lawrenciana</i> var. <i>macrocalyx</i> .. .. .		DVC
<i>C. reflexa</i> var. <i>reflexa</i> .. .. .	1, 4, 4S, 10	
<i>Crowea saligna</i> .. .. .	4	
<i>Eriostemon australasius</i> .. .. .	4, 6, 9	
<i>E. buxifolius</i> .. .. .	4, 4P, 6	
<i>Phebalium dentatum</i> .. .. .	4	
<i>P. squamulosum</i> subsp. <i>argenteum</i> .. .. .	2B	
<i>P. squamulosum</i> subsp. <i>squamulosum</i> .. .. .	6, 9	
<i>Philothea salsolifolia</i> .. .. .	6	
<i>Zieria laevigata</i> .. .. .	4	
<i>Z. pilosa</i> .. .. .	4	
<i>Z. smithii</i> .. .. .	1	
<b>SANTALACEAE</b> ..		
<i>Exocarpos cupressiformis</i> .. .. .	4	
<i>Leptomeria acida</i> .. .. .	2A, 4, 4P	
<b>SAPINDACEAE</b>		
<i>Alectryon subcinereus</i> .. .. .	1	
<i>Dodonaea boroniiifolia</i> .. .. .		DVC
<i>D. camfieldii</i> .. .. .		RGC-WG
<i>D. pinnata</i> .. .. .	4	
<i>D. triquetra</i> .. .. .	2A, 2B, 4, 4P	
<i>Guioa semiglauc</i> .. .. .	1	
<b>SCROPHULARIACEAE</b>		
<i>Veronica plebeia</i> .. .. .	1	
<b>SOLANACEAE</b>		
<i>Duboisia myoporoides</i> .. .. .	1	
<i>Solanum campanulatum</i> .. .. .		DVC
* <i>S. mauritianum</i> .. .. .	1	
<i>S. nodiflorum</i> subsp. <i>nutans</i> .. .. .		RGC-W
<i>S. prinophyllum</i> .. .. .	1, 2A, 4, 11	
<i>S. pungetium</i> .. .. .		DVC
<b>STACKHOUSIACEAE</b>		
<i>Stackhousia monogyna</i> .. .. .	2A, 2B	
<i>S. nuda</i> .. .. .		DVC, RGC-W
<i>S. viminea</i> .. .. .	4	
<b>STERCULIACEAE</b>		
<i>Lasiopetalum ferrugineum</i> var. <i>ferrugineum</i> .. .. .	2A, 4, 4S, 5	
<i>L. macrophyllum</i> .. .. .	1, 5, 10	
<b>STYLIDIACEAE</b>		
<i>Stylidium lineare</i> .. .. .	6	
<i>S. productum</i> .. .. .	2A, 4, 6, 8	

Botanical name	Community	Other Collectors
<b>SYMPLOCACEAE</b>		
<i>Symplocos thwaitesii</i> .. .. .	1	
<b>THYMELAEACEAE</b>		
<i>Pimelea glauca</i> .. .. .	8, 12	
<i>P. latifolia</i> subsp. <i>C.</i> .. .. .		RGC-W
<i>P. linifolia</i> .. .. .	4, 4P, 4S, 6, 8	
<i>Wikstroemia indica</i> .. .. .	10	
<b>TREMANDRACEAE</b>		
<i>Tetratheca ericifolia</i> .. .. .	4, 6, 10	
<i>T. shiressii</i> .. .. .	4, 8	
<i>T. thymifolia</i> .. .. .	2A, 4, 4P, 6, 8	
<b>ULMACEAE</b>		
<i>Trema aspera</i> .. .. .		RGC-WG
<b>VERBENACEAE</b>		
<i>Avicennia marina</i> var. <i>australasica</i> .. .. .	7	
<i>Clerodendrum tomentosum</i> .. .. .	1	
* <i>Lantana camara</i> .. .. .	1, 2A, 5, 10	
* <i>Verbena bonariensis</i> .. .. .		RGC-W
* <i>V. rigida</i> .. .. .		RGC-W
<b>VIOLACEAE</b>		
<i>Hybanthus monopetalus</i> .. .. .		DVC, RGC-WG
<i>Viola hederacea</i> .. .. .	1, 2B, 11	
<b>VITACEAE</b>		
<i>Cayratia clematidea</i> .. .. .		RGC-WG
<i>Cissus antarctica</i> .. .. .	1, 2B	
<i>C. hypoglauca</i> .. .. .	1, 2B, 4, 5	
<b>WINTERACEAE</b>		
<i>Tasmania insipida</i> .. .. .	1	
<b>ZYGOPHYLLACEAE</b>		
* <i>Tribulus terrestris</i> .. .. .		RGC-W
<b>MONOCOTYLEDONS</b>		
<b>AGAVACEAE</b>		
<i>Doryanthes excelsa</i> .. .. .	4, 4P	
<b>ARACEAE</b>		
<i>Gymnostachys anceps</i> .. .. .	1, 2A, 4	
<b>ARECACEAE</b>		
<i>Livistona australis</i> .. .. .	1, 2A, 3, 5	
<b>CYPERACEAE</b>		
<i>Baumea acuta</i> .. .. .	4, 8	
<i>B. juncea</i> .. .. .	11	
<i>B. rubiginosa</i> .. .. .		DVC, RGC-W
<i>B. sp. nov.</i> .. .. .		RGC-W
<i>Carex appressa</i> .. .. .	11	
<i>Caustis flexuosa</i> .. .. .	4, 4P, 6	
<i>C. pentandra</i> .. .. .	9	
<i>Chorizandra cymbaria</i> .. .. .	8, 12	
<i>C. sphaerocephala</i> .. .. .	12	
<i>Cladium procerum</i> .. .. .		RGC-W
<i>Cyathochaeta diandra</i> .. .. .	4, 4P, 4S, 6, 8	
<i>Cyperus brevifolius</i> .. .. .		RGC-W
<i>C. laevis</i> .. .. .		RGC-W
<i>C. polystachyos</i> .. .. .	10, 11	
<i>Eleocharis sphacelata</i> .. .. .		RGC-W
<i>Gahnia aspera</i> .. .. .	10	
<i>G. clarkei</i> .. .. .	1, 4, 11, 12	
<i>G. erythrocarpa</i> .. .. .		DVC, RGC-WG
<i>G. melanocarpa</i> .. .. .	10	
<i>G. radula</i> .. .. .	4S	
<i>G. sieberana</i> .. .. .	2B	
<i>Gymnoschoenus sphaerocephalus</i> .. .. .	12	
<i>Lepidosperma elatius</i> .. .. .		RGC-W
<i>L. filiforme</i> .. .. .		DVC



Botanical name	Community	Other Collectors
<i>L. flexuosum</i> .. .. .	6, 8, 9, 12	
<i>L. laterale</i> .. .. .	1, 2A, 4, 4P, 5, 6, 9	
<i>L. limicola</i> .. .. .	6, 9, 12	
<i>L. neesii</i> .. .. .		RGC-W
<i>L. squamatum</i> .. .. .		RGC-W
<i>L. urophorum</i> .. .. .	4, 6	
<i>L. viscidum</i> .. .. .		RGC-W
<i>Ptilanthelium deustum</i> .. .. .	4, 8, 12	
<i>Schoenus brevifolius</i> .. .. .	6, 8, 12	
<i>S. ericetorum</i> .. .. .	4, 4P, 6	
<i>S. imberbis</i> .. .. .	4, 6	
<i>S. melanostachys</i> .. .. .	2A, 4, 4P, 6, 8	
<i>S. pachylepis</i> .. .. .		RGC-WG
<i>S. paludosus</i> .. .. .	4, 12	
<i>S. turbinatus</i> .. .. .	6	
<i>S. villosus</i> .. .. .		RGC-G
<i>Scirpus inundatus</i> .. .. .		RGC-W
<i>S. nodosus</i> .. .. .	10	
<i>S. validus</i> .. .. .		RGC-W
<i>Tetraria capillaris</i> .. .. .	6, 8	
<i>Tricostularia pauciflora</i> .. .. .	4, 6	
<b>DIOSCOREACEAE</b>		
<i>Dioscorea transversa</i> .. .. .	1, 4	
<b>HAEMODORACEAE</b>		
<i>Haemodorum corymbosum</i> .. .. .	4, 8, 12	
<i>H. planifolium</i> .. .. .	4, 4P	
<b>IRIDACEAE</b>		
<i>Libertia paniculata</i> .. .. .	4	
<i>Patersonia fragilis</i> .. .. .	4	
<i>P. glabrata</i> .. .. .	1, 2A, 4, 4P, 4S	
<i>P. longifolia</i> .. .. .		DVC
<i>P. sericea</i> .. .. .	2A, 4, 4P, 6, 8	
<b>JUNCACEAE</b>		
* <i>Juncus articulatus</i> .. .. .		RGC-W
<i>J. kraussii</i> .. .. .	10, 11	
<i>J. planifolius</i> .. .. .	4	
<i>J. prismatocarpus</i> .. .. .		RGC-W
<i>J. usitatus</i> .. .. .	11	
<i>J. sp. 'x'</i> .. .. .	11	
<i>Luzula meridionalis</i> .. .. .		DVC
<b>JUNCAGINACEAE</b>		
<i>Triglochin procera</i> .. .. .		RGC-W
<i>T. striata</i> .. .. .	10	
<b>LILIACEAE</b>		
<i>Allania endlicheri</i> .. .. .		RGC-G
<i>Arthropodium minus</i> .. .. .		RGC-W
<i>Blandfordia</i> sp. .. .. .	12	
<i>Burchardia umbellata</i> .. .. .	6	
<i>Caesia vittata</i> .. .. .		DVC
<i>Dianella caerulea</i> .. .. .	1, 2A, 2B, 4, 4P, 5, 6, 11	
<i>D. laevis</i> .. .. .		RGC-W
<i>D. revoluta</i> .. .. .	4, 4P, 4S, 6	
<i>D. sp. aff. revoluta</i> .. .. .	2A	
<i>Laxmannia gracilis</i> .. .. .	6	
<i>Schelhammera undulata</i> .. .. .	1, 2B, 4	
<i>Sowerbaea juncea</i> .. .. .	8	
<i>Stypandra umbellata</i> .. .. .	4, 6	
<i>Thysanotus juncifolius</i> .. .. .		RGC-W
<i>T. tuberosus</i> .. .. .		DVC
<i>Tricoryne elatior</i> .. .. .		DVC

Botanical name	Community	Other Collectors
<b>ORCHIDACEAE</b>		
<i>Acianthus caudatus</i> .. .. .		RGC-W
<i>A. fornicatus</i> .. .. .		RGC-W
<i>A. reniformis</i> .. .. .		RGC-W
<i>A. sp.</i> .. .. .	2A, 4, 4P	
<i>Bulbophyllum crassifolium</i> .. .. .	1	
<i>B. exiguum</i> .. .. .	4	
<i>Caladenia alba</i> .. .. .		DVC
<i>C. carnea</i> .. .. .	1, 4	
<i>Caleana major</i> .. .. .	2B	
<i>Calochilus campestris</i> .. .. .		DVC
<i>C. paludosus</i> .. .. .		DVC
<i>Chiloglottis sp.</i> .. .. .	4	
<i>Corybas sp.</i> .. .. .	1, 2B, 4	
<i>Cryptostylis erecta</i> .. .. .	2B, 4, 8	
<i>Cymbidium suave</i> .. .. .	1, 2A, 2B	
<i>Dendrobium aemulum</i> .. .. .		RGC-W
<i>D. linguiforme</i> .. .. .	4	
<i>D. speciosum</i> .. .. .	4, 9	
<i>Dipodium punctatum</i> .. .. .		RGC-W
<i>Diuris aurea</i> .. .. .		DVC
<i>Eriochilus cucullatus</i> .. .. .	12	
<i>Gastrodia sesamoides</i> .. .. .		DVC
<i>Glossodia major</i> .. .. .	4	
<i>G. minor</i> .. .. .	4, 4P, 6	
<i>Liparis reflexa</i> .. .. .	1, 4	
<i>Lyperanthus nigricans</i> .. .. .		RGC-W
<i>L. suaveolens</i> .. .. .		RGC-W
<i>Microtis unifolia</i> .. .. .		DVC
<i>Plectorrhiza tridentata</i> .. .. .	1	
<i>Prasopphyllum aureoviride</i> .. .. .		RGC-W
<i>P. elatum</i> .. .. .		DVC
<i>P. fimbriatum</i> .. .. .		RGC-W
<i>P. morrisii</i> .. .. .		DVC
<i>Pterostylis curta</i> .. .. .	1	
<i>P. grandiflora</i> ? .. .. .		RGC-G ?
<i>P. longifolia</i> .. .. .	1, 2B, 4, 6	
<i>P. nutans</i> .. .. .	2B	
<i>P. pedunculata</i> .. .. .		RGC-W
<i>Rimacola elliptica</i> .. .. .		RGC-WG
<i>Spiranthes sinensis</i> .. .. .		DVC
<i>Thelymitra ixioides</i> .. .. .	4, 6	
<b>PHILESIACEAE</b>		
<i>Eustrephus latifolius</i> .. .. .	1, 2A, 2B, 4, 5	
<i>Geitonoplesium cymosum</i> .. .. .	1, 2A	
<b>PHILYDRACEAE</b>		
<i>Philydrum lanuginosum</i> .. .. .		RGC-W
<b>POACEAE</b>		
<i>Agrostis avenacea</i> .. .. .	11	
* <i>Andropogon virginicus</i> .. .. .	1, 2A	
<i>Anisopogon avenaceus</i> .. .. .	2A, 4, 4P, 4S, 8	
<i>Aristida benthamii</i> .. .. .		RGC-W
<i>A. vagans</i> .. .. .		RGC-WG
<i>A. warburgii</i> .. .. .		RGC-W
* <i>Axonopus affinis</i> .. .. .		RGC-G
* <i>Briza maxima</i> .. .. .	10	
* <i>B. minor</i> .. .. .	11	
* <i>Chloris gayana</i> .. .. .		RGC-W
<i>Cymbopogon refractus</i> .. .. .	2A, 4	
<i>Cynodon dactylon</i> .. .. .	11	
<i>Dichelachne micrantha</i> .. .. .	2B	
<i>D. rara</i> .. .. .	2B	
<i>Digitaria parviflora</i> .. .. .	2A	

Botanical name	Community	Other Collectors
<i>D. sp.</i> .. .. .		RGC-W
* <i>Echinochloa crus-galli</i> .. .. .		RGC-W
<i>Echinopogon caespitosus</i> .. .. .	1, 11	
* <i>Eleusine indica</i> .. .. .		RGC-W
<i>Entolasia marginata</i> .. .. .	11	
<i>E. stricta</i> .. .. .	1, 2A, 2B, 4, 4P, 4S, 6, 8	
<i>Eragrostis brownii</i> .. .. .	4, 11	
<i>Hemarthria uncinata</i> .. .. .	1, 4, 11	
<i>Imperata cylindrica</i> var. <i>major</i> .. .. .	1, 2A, 4, 4S, 5, 6, 10	
<i>Microlaena stipoides</i> .. .. .		RGC-W
<i>Oplismenus aemulus</i> .. .. .		RGC-W
<i>O. imbecillis</i> .. .. .	2A, 2B, 4	
<i>Panicum simile</i> .. .. .		RGC-WG
<i>Paspalidium radiatum</i> .. .. .	7, 11	RGC-W
<i>Phragmites australis</i> .. .. .	10, 11	
<i>Poa affinis</i> .. .. .	1, 4S	
* <i>Setaria geniculata</i> var. <i>pauciseta</i> .. .. .		RGC-W
<i>Stipa pubescens</i> .. .. .	4	
<i>Tetrarrhena juncea</i> .. .. .	4, 4P	
<i>Themeda australis</i> .. .. .	1, 2A, 2B, 4, 4P, 4S, 5, 10	
RESTIONACEAE		
<i>Empodisma minus</i> .. .. .	4, 6, 8, 12	
<i>Hypolaena fastigiata</i> .. .. .	11	
<i>Leptocarpus tenax</i> .. .. .	2B, 6, 9, 12	
<i>Lepyrodia scariosa</i> .. .. .	4, 4P, 6, 8, 9, 12	
<i>Restio complanatus</i> .. .. .	8, 12	
<i>R. dimorphus</i> .. .. .	6, 8, 9	
<i>R. fastigiatus</i> .. .. .	6, 8, 9, 12	
<i>R. gracilis</i> .. .. .	8	
<i>R. tetraphyllus</i> subsp. <i>meiostachyus</i> .. .. .		RGC-G
SMILACEAE		
<i>Smilax australis</i> .. .. .	1, 2B, 4, 5	
<i>S. glycyphylla</i> .. .. .	1, 2A, 4, 4P	
XANTHORRHOEACEAE		
<i>Lomandra brevis</i> .. .. .		RGC-G
<i>L. confertifolia</i> subsp. <i>rubiginosa</i> .. .. .	2A, 6	
<i>L. cylindrica</i> .. .. .		RGC-WG
<i>L. filiformis</i> subsp. <i>coriacea</i> .. .. .	4, 4P	
<i>L. filiformis</i> subsp. <i>filiformis</i> .. .. .	1, 4, 4P, 6, 8	
<i>L. glauca</i> subsp. <i>glauca</i> .. .. .	4, 4P, 6, 8	
<i>L. longifolia</i> .. .. .	1, 2A, 2B, 3, 4, 4P, 4S, 5, 11	
<i>L. multiflora</i> .. .. .	2A	
<i>L. obliqua</i> .. .. .	2A, 4, 4S, 6, 8	
<i>Xanthorrhoea arborea</i> .. .. .	2A, 4	
<i>X. macronema</i> .. .. .		DVC
<i>X. resinosa</i> .. .. .	6, 8, 12	
XYRIDACEAE		
<i>Xyris gracilis</i> subsp. <i>gracilis</i> .. .. .	4, 6	
<i>X. gracilis</i> subsp. <i>laxa</i> .. .. .	4P	
<i>X. operculata</i> .. .. .	12	