# The Native Vegetation of the Sydney Metropolitan Area

## Volume 2: Vegetation Community Profiles

**Version 2.0**


NSW GOVERNMENT | Catchment Management Authority


NSW GOVERNMENT | Office of Environment & Heritage

# THE NATIVE VEGETATION OF THE SYDNEY METROPOLITAN AREA

## VOLUME 2: VEGETATION COMMUNITY PROFILES

Version 2.0

October 2013

# TABLE OF CONTENTS

# NSW THREATENED ECOLOGICAL COMMUNITIES

# COMMONWEALTH THREATENED ECOLOGICAL COMMUNITIES

# USING THE VEGETATION COMMUNITY PROFILES

This volume contains the vegetation community profiles which describe each of the vegetation communities occurring within the Sydney metropolitan area. The interpretation of vegetation communities as set out in this volume requires an understanding of the methods of data capture and classification that were used to produce them. The methods used to derive the communities are outlined in detail in *The Native Vegetation of the Sydney Metropolitan Area Volume 1: Technical Report.* Section 2.7 and section 4.12 are particularly relevant to the understanding and use of species lists.

Please note that references cited in this volume are listed in *The Native Vegetation of the Sydney Metropolitan Area Volume 1: Technical Report.*

The following three pages provide a summary explanation of the vegetation community profiles presented in this volume.

**Statewide Class:** Assigned from Keith (2004)
NSW Plant Community Type: Sourced from OEH (2013c)
Biometric Number(s): Sourced from OEH (2013c)

A photo from one of the sample sites is included as a means of illustrating the structural characteristics of the community.

## Description

The description provides an overview of the environmental characteristics of the community, in particular soil or geology type, elevation gradients and/or climatic features and spatial distribution within the study area.

It may also describe prominent (and conspicuous) plant species found in the community using common names where available.

## Floristic Summary*

Vegetation community structure data has been compiled from the systematic floristic sample sites which define each map unit. The sites used in the Sydney metropolitan area analysis come from a wide variety of sources and not all sites had structural data recorded. Where structural data has been recorded, summary statistics have been compiled in the floristic summary table. It is assumed that all surveys recorded per cent cover in the same way. The data in these tables should be used with caution, paying particular note to how many samples were used to derive the summary figures.

Floristic summary tables contain the following data for each stratum:

average height (with standard deviation)

recorded minimum and maximum upper heights

average percentage projected foliage cover (with standard deviation)

recorded minimum and maximum percentage projected foliage cover

typical species.

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 30 m ±4<br>25-35 | 61% ±17<br>40-85 | **Example Species:** *Ficus obliqua, Toona ciliata, Ceratopetalum apetalum, Doryphora sassafras, Dendrocnide excelsa, Livistona australis* |
| Smaller Trees | 15 m ±5<br>10-20 | 50% ±31<br>15-75 | **Example Species:** *Polyosma cunninghamii, Clerodendrum tomentosum, Pittosporum undulatum, Claoxylon australe, Ficus coronata, Livistona australis* |
| Ground Covers | 1.0 m ±0.0<br>1.0-1.0 | 55% ±30<br>35-90 | **Example Species:** *Adiantum formosum, Microsorum scandens, Calochlaena dubia, Gymnostachys anceps, Arthropteris tenella, Pteris umbrosa, Doodia aspera* |
| Vines & Climbers | N/A | N/A | **Example Species:** *Pandorea pandorana, Smilax australis* |

*This note below the table shows the number of sites that were used to compile the floristic summary tables.

Large variations in the recording of structural strata have been noted in some vegetation types. This may be due in part to modified structural complexity as a result of past disturbance in some sample sites. It is also the result of differences in methods of recording strata complexity, with some observers recording simple strata, and others a more complex set of

strata. To simplify structural data in vegetation communities where multiple components were recorded within a stratum (e.g. two shrub layers), the figures used for the stratum are:

recorded minimum and maximum upper heights across all component layers

recorded minimum and maximum percentage projected foliage cover of the component layers

average cover, average height and associated standard deviation.

Within some vegetation types there was considerable overlap in height between strata, particularly between the shrub and small tree layers. Where separation between the strata could not be resolved, the two layers were combined into one shrub/small tree layer and summary figures provided for the combined layer.

## Threats

Key threats that have been identified as impacting upon the vegetation community are outlined. These threats have been compiled from: determinations made under the NSW *Threatened Species Conservation Act 1995* (TSC Act) or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); aerial photograph interpretation (API); field observations; other vegetation mapping reports; floristic sample sites; and relevant references.

## Conservation Status

The first paragraph or two in this section summarises the conservation status of the vegetation community in the study area including: whether the community is a Threatened Ecological Community (TEC), or component of a TEC, that is listed under the NSW TSC Act and/or the EPBC Act; whether the community is protected in reserves and if so some example reserves. Note that TECs encompass communities that have been listed as either critically endangered, endangered or vulnerable.

The table in this section provides figures that summarise the amount of the vegetation community contained within reserves in relation to the total extant area.

The figures for the study area were derived from an intersection between the digital vegetation map layer and a spatial data layer defining reserves (public or private lands managed for nature conservation under secure legal or corporate arrangements with effective land management, see section 2.12.2 of *The Native Vegetation of the Sydney Metropolitan Area Volume 1: Technical Report*). For each value the figure in grey is the total area of the community that has a very high level of disturbance (a disturbance index of 4 as defined in section 2.12.1 of *The Native Vegetation of the Sydney Metropolitan Area Volume 1: Technical Report*) and the figure in black is the total area of the community with a low, moderate, high or 'not assessed' level of disturbance. Note that only the latter is presented for the 'Total extant' figure. It is considered that a very high level of disturbance severely reduces the ecological integrity of the patch and its potential to recover from the disturbance.

The figures presented for the study area are the following:

Total NPWS reserves – total area (hectares) of the vegetation community contained within NPWS estate and proportion (per cent) of extant area excluding patches with a very high level of disturbance.

Total reserved – total area (hectares) of the vegetation community occurring within any reserve (see section 2.12.2 of *The Native Vegetation of the Sydney Metropolitan Area Volume 1: Technical Report* for definition of what constitutes a reserve). Note that this total is inclusive of the above 'Total in NPWS reserves'. Also presented is the proportion (per cent) of the extant area excluding patches with a very high level of disturbance.

Total non-reserved – total area (hectares) of the vegetation community occurring outside of reserves.

Total extant – total area (hectares) of the vegetation community mapped within the study area. Note that this figure in black excludes areas with a very high level of disturbance.

Note that figures in this table (in each vegetation community profile) were calculated using non-rounded raw data. Data is displayed here using rounding to an appropriate number of significant figures. This has resulted in what appear to be minor discrepancies in total areas for some vegetation communities.

Reservation status figures for the Sydney basin, and estimates of pre-clearing area and percentage cleared, were derived from the equivalent regional community data provided in Tozer et al. (2010) and (where relevant) NPWS (2000c). Where the vegetation community is only a component of the equivalent regional community, these figures overestimate the regional extent (this is noted by use of an asterisk *).

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | Est. 6310-8200 hectares |
| Estimated percentage cleared | Not available | 35-50% |
| Total NPWS reserves | 2.5 +<.1 hectares<br>21% of extant area | 440 hectares<br>11% of extant area<br><10% of pre-clearing area |
| Total reserved | 2.5 +0 hectares<br>21% of extant area | Not available |
| Total non-reserved | 9.5 +<.1 hectares | Not available |
| Total extant | 12.0 hectares | 4100 hectares |

## Example Locations

o   Some example occurrences of the community are presented here, particularly recognisable or accessible localities.

## Species Richness

Number of sites    total number of systematic floristic sample sites in the study area that were used to define the vegetation community.

Total native species    total number of native plant species recorded in sites defining the vegetation community.

Average no. native species per site  average number of native plant species recorded in sites defining the vegetation community ±standard deviation

Note that both of the latter figures were derived after application of the taxonomic review (see section 2.6.2 of *The Native Vegetation of the Sydney Metropolitan Area Volume 1: Technical Report*).

## Variations and Dynamics

Any floristic or structural variations recognised in this vegetation community are outlined. Methods which may be used to separate these variations are also described.

## Relationship to Other Communities

The relationship of this community to related vegetation communities in similar habitats is outlined. Features that may be used to separate these vegetation types are also described.

In addition, any vegetation types the community may grade into with changes in environmental variables (e.g. rainfall or increased shale enrichment) are identified.

## Accuracy

This section provides an assessment of sampling density within the study area; the sampling density classes are defined in section 2.7.2 of *The Native Vegetation of the Sydney Metropolitan Area Volume 1: Technical Report*. The information and sources of data that were used to derive the map line work are also described. In many cases a qualitative assessment of the accuracy of mapping of the vegetation community is also provided.

This list comprises species that fall into one of three fidelity classes: positive diagnostic, constant and uninformative (see section 2.7.3 and section 4.12 of *The Native Vegetation of the Sydney Metropolitan Area Volume 1: Technical Report.*). Fidelity classes are a measure of the relative likelihood that a species will be recorded in a 0.04 hectare systematic floristic sample site that is randomly located in the vegetation community. Obtaining such a sample is a pre-requisite for the use of the positive diagnostic species list. The number of positive diagnostic species present in a sample site can be used to identify the vegetation community by ruling out all but a few feasible alternatives. The presence of the minimum number of positive diagnostic species in a sample site is strong evidence that the sample belongs to the vegetation community. This assumes that all vascular plant species occurring in the sample site area were correctly identified and that the total number of native species recorded in the sample site exceeds the specified minimum (species-poor sites can not be tested).

| Species Name | Group Score (50 percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia irrorata* | 1 | 25% | 1 | 3% | Uninformative |
| *Acmena smithii* | 3 | 100% | 2 | 6% | Positive diagnostic |
| *Adiantum formosum* | 2 | 75% | 2 | 1% | Positive diagnostic |
| *Alectryon subcinereus* | 2 | 25% | 1 | 1% | Positive diagnostic |
| *Aphanopetalum resinosum* | 2 | 25% | 2 | 0% | Positive diagnostic |
| *Arthropteris tenella* | 2 | 50% | 2 | 0% | Positive diagnostic |
| *Asplenium australasicum* | 3 | 50% | 1 | 2% | Positive diagnostic |
| *Asplenium flabellifolium* | 2 | 25% | 1 | 4% | Uninformative |
| *Baloghia inophylla* | 3 | 25% | 0 | 0% | Positive diagnostic |
| *Ceratopetalum apetalum* | 3 | 75% | 2 | 5% | Positive diagnostic |
| *Cissus antarctica* | 2 | 25% | 2 | 2% | Uninformative |
| *Cissus hypoglauca* | 2 | 25% | 2 | 8% | Uninformative |
| *Claoxylon australe* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Clematis aristata* | 2 | 50% | 1 | 7% | Constant |
| *Clerodendrum tomentosum* | 2 | 25% | 1 | 5% | Uninformative |

The group score is the **median cover score** recorded for the species within sites used to define **this** community. In this case, a median score of 3 = greater than five and less than 20 per cent cover

Non-group frequency indicates **how often** the species occurs in sites in **other** vegetation communities. In this case, the species occurs in five per cent of sites in other communities.

The non-group score is the **median cover score** for the species within sites in all other communities in the study area. In this case a score of 2 = common and less than five per cent cover)

Group frequency indicates **how often** the species occurs within the sites used to define this community. In **this** case the species has been found at 75 per cent of sites

See volume one of this report for definition of the fidelity classes and how they have been derived.
**Positive diagnostic** species occur more frequently in this community than in all sample sites combined.
**Constant** species occur frequently in this community as well as other communities and are therefore characteristic rather than diagnostic of this community.
U**ninformative** species are included to present a more comprehensive species list; they are not diagnostic or necessarily characteristic. All species with 10 per cent group frequency or greater are included.

| | |
|---|---|
| Illawarra Escarpment Subtropical Rainforest | S_RF01 |
| Coastal Sandstone Gallery Rainforest | S_RF02 |
| Coastal Warm Temperate Rainforest | S_RF03 |
| Hinterland Dry Rainforest | S_RF05 |
| Coastal Dune Littoral Rainforest | S_RF06 |
| Coastal Escarpment Littoral Rainforest | S_RF07 |
| Coastal Headland Littoral Thicket | S_RF08 |

# ILLAWARRA ESCARPMENT SUBTROPICAL RAINFOREST S_RF01

## Description

Illawarra Escarpment Subtropical Rainforest is the most luxuriant form of rainforest found in the greater Sydney region. However, only small areas of these grand forests are present in the Sydney metropolitan area. This subtropical-warm temperate rainforest is tall, often with emergent rainforest trees billowing above a closed canopy. Both the emergent and canopy layers carry a variety of species including red cedar (*Toona ciliata*), giant stinging tree (*Dendrocnide excelsa*), native tamarind (*Diploglottis cunninghamii)* and figs (*Ficus* spp.). Other trees in the lower canopy include those that are common within the Coastal Warm Temperate Rainforest assemblage (S_RF03) such as coachwood (*Ceratopetalum apetalum*) and laurels (*Cryptocarya* spp.). Scattered stands of tall cabbage tree palms (*Livistona australis*) may also join the lower canopy. An abundance of lianes often extend from the ground to the tops of the tallest trees. Together these layers exclude most light from the forest floor, enough only to support a sparse cover of shade-tolerant ferns.

These rainforests require high mean annual rainfall (greater than 1300 millimetres), deep clay soils and warm humid conditions associated with low elevation coastal environments (less than 300 metres above sea level). In Royal National Park (NP) there are small patches of this rainforest at Lost World and also small areas on the Hacking River flats. South of the study area this community is more extensive on benches and gullies of the Illawarra Escarpment (NPWS 2002, Mills and Jakeman 1995). The broader regional classification of Tozer et al. (2010) suggests that closely related rainforests extend across a range of substrates south to Milton. These forests have a long history of disturbance, having been exploited for the valuable red cedar in the early years of settlement and cleared for agriculture and coal mining on accessible sites.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 30 m ±4<br>25-35 | 61% ±17<br>40-85 | *Ficus obliqua, Toona ciliata, Ceratopetalum apetalum, Doryphora sassafras, Dendrocnide excelsa, Livistona australis, Diploglottis cunninghamii, Pennantia cunninghamii, Cryptocarya glaucescens, Cryptocarya microneura* |
| Smaller Trees | 15 m ±5<br>10-20 | 50% ±31<br>15 - 75 | *Polyosma cunninghamii, Clerodendrum tomentosum, Pittosporum undulatum, Claoxylon australe, Ficus coronata, Livistona australis, Acmena smithii* |
| Ground Covers | 1.0 m ±0.0<br>1.0-1.0 | 55% ±30<br>35-90 | *Adiantum formosum, Microsorum scandens, Calochlaena dubia, Gymnostachys anceps, Arthropteris tenella, Pteris umbrosa, Doodia aspera, Arthropteris tenella, Microsorum scandens, Livistona australis* |
| Vines & Climbers | N/A | N/A | *Pandorea pandorana, Smilax australis, Palmeria scandens, Eustrephus latifolius, Morinda jasminoides, Marsdenia flavescens, Cissus hypoglauca, Piper novae-hollandiae* |

*Compiled from 4 sites with structural data recorded.

## Threats

Repeated high intensity fire events are the major threat to this community. Localised weed invasion is prevalent in stands outside the study area along the Illawarra escarpment (NPWS 2002c).

## Conservation Status

This community is a component of Lowland Rainforest in the North Coast and Sydney Basin Bioregions, an Endangered Ecological Community under the NSW TSC Act. The community is represented in Royal NP.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | Est. 6310-8200 hectares |
| Estimated percentage cleared | Not available | 35-50% |
| Total NPWS reserves | 2.5 +<.1 hectares<br>21% of extant area | 440 hectares<br>11% of extant area<br><10% of pre-clearing area |
| Total reserved | 2.5 +0 hectares<br>21% of extant area | Not available |
| Total non-reserved | 9.5 +<.1 hectares | Not available |
| Total extant | 12.0 hectares | 4100 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o   Picnic Point, Lady Carrington Drive, Royal NP

o   Cedar Loop Track, Lady Carrington Drive, Royal NP

## Species Richness

| | |
|---|---|
| Number of sites | 4 |
| Total native species | 76 |
| Average no. native species per site | 31.5 ±5.7 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

Floristically the community is related to Coastal Warm Temperate Rainforest (S_RF03) into which it grades on marginally poorer soils.

## Accuracy

Sampling density is moderate. The total area within the study area is small and restricted to the southern boundary. Mapping may currently under estimate the extent in the study area owing to difficulties discriminating this rainforest from other warm temperate rainforest without field traverse.

A 0.04 hectare site located in this map unit is expected to contain at least 17 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 24 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia irrorata* | 1 | 25% | 1 | 3% | Uninformative |
| *Acmena smithii* | 3 | 100% | 2 | 6% | Positive diagnostic |
| *Adiantum formosum* | 2 | 75% | 2 | 1% | Positive diagnostic |
| *Alectryon subcinereus* | 2 | 25% | 1 | 1% | Positive diagnostic |
| *Aphanopetalum resinosum* | 2 | 25% | 2 | 0% | Positive diagnostic |
| *Arthropteris tenella* | 2 | 50% | 2 | 0% | Positive diagnostic |
| *Asplenium australasicum* | 3 | 50% | 1 | 2% | Positive diagnostic |
| *Asplenium flabellifolium* | 2 | 25% | 1 | 4% | Uninformative |
| *Baloghia inophylla* | 3 | 25% | 0 | 0% | Positive diagnostic |
| *Ceratopetalum apetalum* | 3 | 75% | 2 | 5% | Positive diagnostic |
| *Cissus antarctica* | 2 | 25% | 2 | 2% | Uninformative |
| *Cissus hypoglauca* | 2 | 25% | 2 | 8% | Uninformative |
| *Claoxylon australe* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Clematis aristata* | 2 | 50% | 1 | 7% | Constant |
| *Clerodendrum tomentosum* | 2 | 25% | 1 | 5% | Uninformative |
| *Coprosma quadrifida* | 2 | 25% | 2 | 0% | Positive diagnostic |
| *Cryptocarya glaucescens* | 3 | 75% | 2 | 1% | Positive diagnostic |
| *Cryptocarya microneura* | 3 | 25% | 1 | 1% | Positive diagnostic |
| *Dendrocnide excelsa* | 1 | 25% | 0 | 0% | Positive diagnostic |
| *Diospyros australis* | 1 | 25% | 2 | 1% | Positive diagnostic |
| *Diploglottis cunninghamii* | 1 | 75% | 1 | 0% | Positive diagnostic |
| *Doodia aspera* | 2 | 50% | 2 | 3% | Positive diagnostic |
| *Doryphora sassafras* | 4 | 75% | 3 | 1% | Positive diagnostic |
| *Elaeodendron australe* | 3 | 25% | 1 | 1% | Positive diagnostic |
| *Eupomatia laurina* | 3 | 50% | 2 | 2% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 25% | 2 | 15% | Uninformative |
| *Ficus coronata* | 2 | 25% | 2 | 1% | Uninformative |
| *Ficus obliqua* | 3 | 25% | 1 | 0% | Positive diagnostic |
| *Flagellaria indica* | 2 | 25% | 2 | 0% | Positive diagnostic |
| *Gahnia aspera* | 2 | 25% | 1 | 3% | Uninformative |
| *Geitonoplesium cymosum* | 2 | 25% | 2 | 9% | Uninformative |
| *Guioa semiglauca* | 2 | 100% | 1 | 1% | Positive diagnostic |
| *Gymnostachys anceps* | 2 | 100% | 2 | 3% | Positive diagnostic |
| *Hedycarya angustifolia* | 2 | 25% | 1 | 0% | Positive diagnostic |
| *Hymenophyllum cupressiforme* | 2 | 25% | 1 | 1% | Positive diagnostic |
| *Lastreopsis acuminata* | 2 | 25% | 2 | 0% | Positive diagnostic |
| *Lastreopsis microsora* subsp. *microsora* | 4 | 50% | 2 | 1% | Positive diagnostic |
| *Livistona australis* | 2 | 100% | 2 | 10% | Positive diagnostic |
| *Marsdenia flavescens* | 2 | 50% | 1 | 0% | Positive diagnostic |
| *Marsdenia rostrata* | 1 | 25% | 1 | 1% | Uninformative |
| *Melodinus australis* | 2 | 25% | 1 | 0% | Positive diagnostic |
| *Microsorum pustulatum* | 2 | 25% | 0 | 0% | Positive diagnostic |
| *Microsorum scandens* | 1 | 50% | 2 | 0% | Positive diagnostic |
| *Morinda jasminoides* | 2 | 75% | 2 | 7% | Positive diagnostic |
| *Myrsine howittiana* | 2 | 25% | 2 | 0% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 25% | 1 | 21% | Uninformative |
| *Palmeria scandens* | 2 | 50% | 2 | 0% | Positive diagnostic |
| *Pandorea pandorana* | 2 | 100% | 2 | 16% | Positive diagnostic |
| *Parsonsia straminea* | 2 | 50% | 1 | 5% | Positive diagnostic |
| *Pellaea falcata* | 2 | 25% | 2 | 2% | Uninformative |
| *Piper hederaceum* var. *hederaceum* | 2 | 25% | 1 | 0% | Positive diagnostic |
| *Pisonia umbellifera* | 4 | 25% | 0 | 0% | Positive diagnostic |
| *Pittosporum revolutum* | 2 | 25% | 1 | 9% | Uninformative |
| *Platycerium bifurcatum* | 1 | 25% | 1 | 1% | Positive diagnostic |
| *Polyosma cunninghamii* | 2 | 25% | 2 | 0% | Positive diagnostic |
| *Polyscias murrayi* | 1 | 25% | 0 | 0% | Positive diagnostic |
| *Pouteria australis* | 3 | 50% | 1 | 0% | Positive diagnostic |
| *Psychotria loniceroides* | 2 | 25% | 1 | 0% | Positive diagnostic |
| *Rhodamnia rubescens* | 3 | 25% | 1 | 0% | Positive diagnostic |
| *Ripogonum album* | 2 | 50% | 2 | 0% | Positive diagnostic |
| *Sarcopetalum harveyanum* | 2 | 25% | 1 | 4% | Uninformative |
| *Scolopia braunii* | 1 | 25% | 2 | 0% | Positive diagnostic |
| *Sloanea australis* | 2 | 25% | 1 | 0% | Positive diagnostic |
| *Smilax australis* | 2 | 25% | 1 | 4% | Uninformative |
| *Synoum glandulosum* subsp. *glandulosum* | 1 | 25% | 2 | 5% | Uninformative |
| *Toona ciliata* | 4 | 25% | 1 | 0% | Positive diagnostic |
| *Trochocarpa laurina* | 2 | 25% | 1 | 2% | Uninformative |
| *Trophis scandens* subsp. *scandens* | 1 | 25% | 2 | 0% | Positive diagnostic |
| *Viola hederacea* | 2 | 25% | 2 | 6% | Uninformative |
| *Wilkiea huegeliana* | 2 | 75% | 2 | 2% | Positive diagnostic |

# Coastal Sandstone Gallery Rainforest S_RF02

| Statewide Class | Northern Warm Temperate Rainforests |
|---|---|
| NSW Plant Community Type: | 1292: Water Gum-Coachwood Riparian Scrub along Sandstone Streams, Sydney Basin |
| Biometric Number(s): | HN607; ME035; SR660 |



## Description

This depauperate warm-temperate rainforest is found on sandy alluvium or rocky streams in deep protected sandstone gully systems across the greater Sydney region. Coachwood (*Ceratopetalum apetalum*) usually dominates the tallest stratum with black wattle (*Callicoma serratifolia*), lilly pilly (*Acmena smithii*), water gum (*Tristaniopsis laurina*) and tree ferns (*Cyathea* spp.) forming a scattered cover of small trees in the sub-canopy layer. These are rainforests of low species diversity compared to more complex rainforests associated with richer soils. The array of lianes and climbers that are common in other rainforest assemblages are absent here. Instead, the ground cover is an open cover of ferns amongst sandstone boulders and fallen logs.

In the Sydney area these narrow ribbons of rainforest form small disjunct patches restricted to very incised Hawkesbury sandstone gullies and sandstone alluvium. It occurs in higher rainfall zones (greater than 900 millimetres per annum) and as a result is more commonly encountered in the eastern portions of the Hornsby and Woronora plateaus. Other examples outside of the study area are found in the Hawkesbury River hinterland, lower Blue Mountains and the eastern Hunter Range.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Emergent | 24 m ±16 <br> 8-40 | 18% ±19 <br> 5-40 | *Syncarpia glomulifera, Eucalyptus piperita* |
| Trees | 15 m ±7 <br> 10-20 | 55% ±42 <br> 25-85 | *Ceratopetalum apetalum, Callicoma serratifolia, Tristaniopsis laurina, Acmena smithii, Pittosporum undulatum, Melaleuca linariifolia* |
| Shrubs | 4.0 m ±3.5 <br> 2.0-8.0 | 45.0% ±43 <br> 5-90 | *Acacia parramattensis, Acacia longifolia Austromyrtus tenuifolia, Leptospermum polygalifolium* subsp. *polygalifolium, Acmena smithii* |
| Ground Covers | 0.5 m ±0.0 <br> 0.5-0.5 | 36% ±56 <br> 2-100 | *Calochlaena dubia, Doodia caudata, Lomandra longifolia, Juncus usitatus, Oplismenus* spp.*, Viola hederacea* |
| Vines & Climbers | N/A | N/A | *Morinda jasminoides, Cassytha pubescens* |

*Compiled from 3 sites with structural data recorded.

## Threats

Frequent high intensity fires can kill the smooth-barked rainforest trees (Floyd 1990). Weed infestation is present where upstream disturbance associated with urban development sends seed downstream during rainfall events.

## Conservation Status

The extent of this community is unlikely to have significantly altered, given the association with inaccessible and infertile environments. The community is naturally restricted in area but is widespread across the region.

This vegetation community is represented in Lane Cove NP, Dharawal Nature Reserve (NR), Ku-ring-gai Chase NP, Royal NP, Georges River NP, Garigal NP, and Sydney Harbour NP.

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | Est. 3600 hectares |
| Estimated percentage cleared | Not available | 5-10% |
| Total NPWS reserves | 134 +<.1 hectares 57% of extant area | 1500 hectares 45% of extant area 40% of pre-clearing area |
| Total reserved | 205 +0 hectares 87% of extant area | Not available |
| Total non-reserved | 30.0 +<.1 hectares | Not available |
| Total extant | 235 hectares | 3300 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.
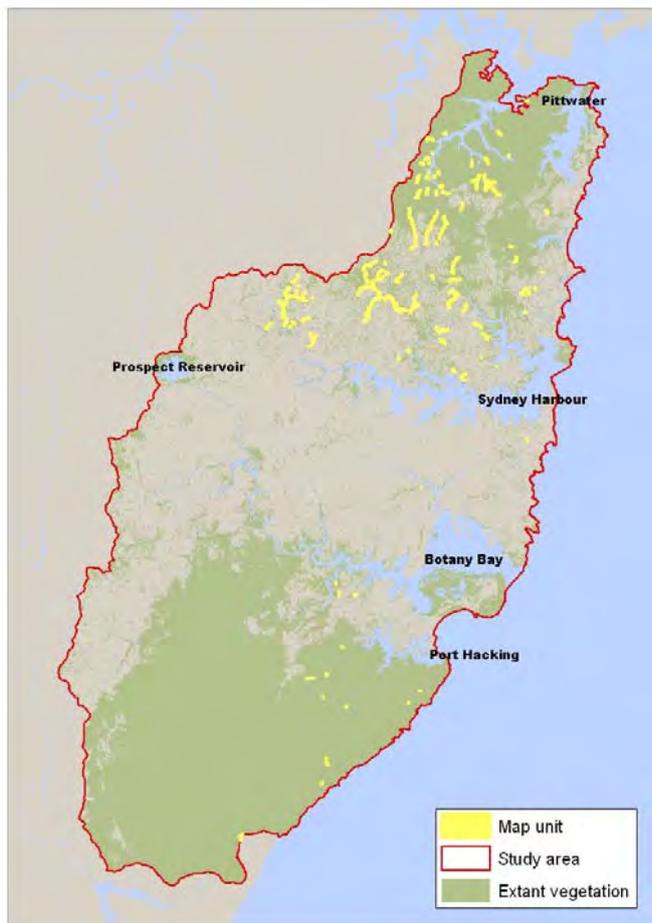


## Example Locations

o   Upper Lane Cove River, Lane Cove NP

## Species Richness

| | |
|---|---|
| Number of sites | 20 |
| Total native species | 162 |
| Average no. native species per site | 22.2 ±10.5 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

The community may grade into Coastal Sandstone Riparian Scrub (S_FoW20) where soil profile thins to bedrock on gouged creeklines or where frequent flood events prevent the establishment of deeply rooted species.

## Accuracy

Sampling density is moderate. Sampling has been restricted to areas in Lane Cove, Royal and Dharawal national parks. Mapped boundaries are based on the interpretation of rainforest strips visible in digital photography. Some narrow strips are likely to be obscured by overhanging eucalypts and not mapped.

A 0.04 hectare site located in this map unit is expected to contain at least 3 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 16 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia elata* | 2 | 10% | 1 | 1% | Uninformative |
| *Acacia floribunda* | 2 | 15% | 1 | 4% | Uninformative |
| *Acacia irrorata* | 2 | 20% | 1 | 3% | Positive diagnostic |
| *Acacia longifolia* | 1 | 20% | 2 | 21% | Uninformative |
| *Acacia longissima* | 1 | 15% | 2 | 2% | Uninformative |
| *Acacia parramattensis* | 1 | 30% | 1 | 5% | Positive diagnostic |
| *Acmena smithii* | 3 | 20% | 2 | 6% | Uninformative |
| *Adiantum aethiopicum* | 1 | 40% | 2 | 7% | Positive diagnostic |
| *Allocasuarina torulosa* | 2 | 10% | 2 | 10% | Uninformative |
| *Asplenium australasicum* | 2 | 10% | 1 | 2% | Uninformative |
| *Asplenium flabellifolium* | 1 | 10% | 1 | 4% | Uninformative |
| *Astrotricha latifolia* | 2 | 10% | 2 | 1% | Uninformative |
| *Austromyrtus tenuifolia* | 1 | 30% | 2 | 1% | Positive diagnostic |
| *Backhousia myrtifolia* | 3 | 25% | 2 | 2% | Positive diagnostic |
| *Baeckea linifolia* | 1 | 10% | 2 | 2% | Uninformative |
| *Billardiera scandens* | 1 | 15% | 1 | 37% | Uninformative |
| *Blechnum cartilagineum* | 3 | 10% | 2 | 7% | Uninformative |
| *Callicoma serratifolia* | 2 | 60% | 2 | 5% | Positive diagnostic |
| *Callistemon linearifolius* | 1 | 10% | 1 | 0% | Uninformative |
| *Calochlaena dubia* | 2 | 40% | 2 | 16% | Constant |
| *Cassytha pubescens* | 1 | 20% | 2 | 27% | Uninformative |
| *Ceratopetalum apetalum* | 4 | 90% | 2 | 4% | Positive diagnostic |
| *Ceratopetalum gummiferum* | 2 | 15% | 2 | 17% | Uninformative |
| *Christella dentata* | 1 | 25% | 1 | 1% | Positive diagnostic |
| *Commelina cyanea* | 2 | 10% | 2 | 9% | Uninformative |
| *Dodonaea triquetra* | 1 | 15% | 2 | 23% | Uninformative |
| *Doodia caudata* | 2 | 55% | 2 | 1% | Positive diagnostic |
| *Elaeocarpus reticulatus* | 1 | 25% | 1 | 20% | Uninformative |
| *Entolasia marginata* | 2 | 10% | 2 | 22% | Uninformative |
| *Eucalyptus pilularis* | 1 | 20% | 3 | 14% | Uninformative |
| *Eucalyptus piperita* | 4 | 10% | 3 | 20% | Uninformative |
| *Eustrephus latifolius* | 1 | 30% | 2 | 15% | Uninformative |
| *Gahnia sieberiana* | 2 | 10% | 2 | 7% | Uninformative |
| *Geranium homeanum* | 2 | 10% | 2 | 2% | Uninformative |
| *Glochidion ferdinandi* | 1 | 10% | 2 | 13% | Uninformative |
| *Glycine clandestina* | 1 | 20% | 2 | 18% | Uninformative |
| *Grammitis billardierei* | 1 | 15% | 1 | 0% | Uninformative |
| *Hibbertia dentata* | 1 | 25% | 2 | 8% | Uninformative |
| *Hymenophyllum cupressiforme* | 1 | 15% | 2 | 1% | Uninformative |
| *Hypolepis muelleri* | 1 | 15% | 2 | 5% | Uninformative |
| *Juncus usitatus* | 1 | 35% | 1 | 3% | Positive diagnostic |
| *Leionema dentatum* | 1 | 15% | 1 | 2% | Uninformative |
| *Leptospermum polygalifolium* | 1 | 10% | 2 | 14% | Uninformative |
| *Leucopogon lanceolatus* | 1 | 10% | 1 | 8% | Uninformative |
| *Lomandra fluviatilis* | 1 | 10% | 2 | 1% | Uninformative |
| *Lomandra longifolia* | 2 | 75% | 2 | 46% | Constant |
| *Lomatia myricoides* | 2 | 35% | 2 | 3% | Positive diagnostic |
| *Morinda jasminoides* | 1 | 45% | 2 | 6% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 30% | 1 | 21% | Uninformative |
| *Omalanthus nutans* | 1 | 15% | 1 | 9% | Uninformative |
| *Oplismenus aemulus* | 1 | 35% | 2 | 9% | Positive diagnostic |
| *Oplismenus imbecillis* | 2 | 25% | 2 | 13% | Uninformative |
| *Pandorea pandorana* | 1 | 30% | 2 | 16% | Uninformative |
| *Pittosporum revolutum* | 1 | 10% | 1 | 9% | Uninformative |
| *Pittosporum undulatum* | 2 | 75% | 2 | 24% | Positive diagnostic |
| *Platycerium bifurcatum* | 1 | 10% | 1 | 1% | Uninformative |
| *Poa affinis* | 3 | 15% | 2 | 11% | Uninformative |
| *Pseuderanthemum variabile* | 2 | 15% | 2 | 12% | Uninformative |
| *Pteris tremula* | 1 | 15% | 1 | 1% | Uninformative |
| *Pultenaea daphnoides* | 1 | 15% | 2 | 8% | Uninformative |
| *Pultenaea flexilis* | 1 | 20% | 2 | 6% | Uninformative |
| *Pyrrosia rupestris* | 2 | 10% | 2 | 2% | Uninformative |
| *Smilax glyciphylla* | 2 | 35% | 2 | 33% | Uninformative |
| *Solanum americanum* | 1 | 10% | 1 | 1% | Uninformative |
| *Stenocarpus salignus* | 2 | 15% | 2 | 1% | Uninformative |
| *Sticherus flabellatus* var. *flabellatus* | 2 | 30% | 2 | 3% | Positive diagnostic |
| *Syncarpia glomulifera* | 3 | 25% | 3 | 13% | Uninformative |
| *Tristaniopsis laurina* | 3 | 70% | 2 | 2% | Positive diagnostic |
| *Viola hederacea* | 2 | 10% | 2 | 6% | Uninformative |
| *Xanthorrhoea arborea* | 4 | 10% | 2 | 12% | Uninformative |

# COASTAL WARM TEMPERATE RAINFOREST S_RF03

## Description

Coastal Warm Temperate Rainforest (Tozer et al. 2010) is a tall closed forest characterised by dense stands of coachwood (*Ceratopetalum apetalum*) and/or sassafras (*Doryphora sassafras*). Lilly pilly (*Acmena smithii*) and laurels (*Cryptocarya* spp.) may also be prominent. Underneath the canopy tall palms, mesic shrubs, and small trees of various heights occur above a sparse ground cover of ferns. These rainforests are very shaded environments, free of regular intense fire. This promotes a high diversity of ferns and vines, including epiphytes such as the birds nest fern (*Asplenium australasicum*) that are found high up on the branches of the trees, and rhizomatous ferns that climb on rocks, logs and tree trunks.

Within the Sydney area this rainforest community is found along the deep sheltered gullies of the Hacking River in Royal NP, with less diverse stands in Ku-ring-gai Chase NP. Clay loams derived from the underlying Narrabeen shale and occasionally basalt provide a fertile substrate which, in combination with the high coastal rainfall (greater than 1200 millimetres per annum) and warm climate, are sufficient to support an extensive area of this rainforest. This rainforest occurs in sites less than 350 metres above sea level. Elsewhere the community is distributed north from around Batemans Bay (Tozer et al. 2010) to Mountain Lagoon in the lower Blue Mountains and north into the Watagan Ranges on the Central Coast (NPWS 2000c).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Emergent (1 site only) | 40 m | 40% | *Eucalyptus pilularis, Eucalyptus saligna, Syncarpia glomulifera* |
| Trees | 21 m ±8 <br> 10-30 | 49% ±32 <br> 10-85 | *Ceratopetalum apetalum, Doryphora sassafras, Cryptocarya glaucescens, Callicoma serratifolia Schizomeria ovata, Polyosma cunninghamii* |
| Small Trees | 12 m ±6 <br> 3-20 | 42% ±25 <br> 10-70 | *Acmena smithii, Synoum glandulosum, Guioa semiglauca, Ficus coronata, Livistona australis, Eupomatia laurina, Diospyros australis* |
| Shrubs | 1.7 m ±0.8 <br> 1.0-3.0 | 35% ±39 <br> 5-80 | *Trochocarpa laurina, Wilkiea huegeliana, Notelaea longifolia, Tasmannia insipida* |
| Ground Covers | 0.8 m ±0.3 <br> 0.5-1.0 | 12% ±10 <br> 1-25 | *Blechnum cartilagineum, Doodia aspera, Adiantum formosum, Gymnostachys anceps, Calochlaena dubia, Pyrrosia rupestris, Lastreopsis microsora , Pseuderanthemum variable* |
| Vines & Climbers | N/A | N/A | *Eustrephus latifolius, Morinda jasminoides, Smilax australis, Pandorea pandorana, Parsonsia straminea* |

*Compiled from 8 sites with structural data recorded.

## Threats

Weeds such as lantana (*Lantana camara*) and Crofton weed (*Ageratina adenophora*) may be locally abundant particularly near disused coal mines and urban areas. Repeated high intensity fires may threaten stands.

## Conservation Status

The distribution within the Sydney area is concentrated in Royal NP, with smaller stands present on northern beaches escarpments and in Ku-ring-gai Chase NP.

Patches of Coastal Warm Temperate Rainforest that adjoin Illawarra Escarpment Subtropical Rainforest (S_RF01) may form a component of Lowland Rainforest in the North Coast and Sydney Basin Bioregions, an Endangered Ecological Community under the NSW TSC Act. However these will require site by site assessment.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Est. 34,000 hectares |
| Estimated percentage cleared | Not available | 5-15% |
| Total NPWS reserves | 305 +<.1 hectares<br>75% of extant area | 7900 hectares<br>30% of extant area<br>20% of pre-clearing area |
| Total reserved | 314 +0 hectares<br>77% of extant area | Not available |
| Total non-reserved | 92.0 +4.2 hectares | Not available |
| Total extant | 406 hectares | Est. 27,000 hectares |



Map unit
Study area
Extant vegetation

## Example Locations

o   Lady Carrington Drive, Royal NP

## Species Richness

| Number of sites | 25 |
|---|---|
| Total native species | 193 |
| Average no. native species per site | 34.4 ±8.6 |

## Variations and Dynamics

Some variation occurs between stands found on deeper shales and alluviums and those on Narrabeen sandstone. Laurels are noticeably absent in the latter.

## Relationship to Other Communities

This rainforest grades into another more complex rainforest, S_RF01, in several places in Royal NP. It grades into tall eucalypt forests (S_WSF05, S_WSF33).

## Accuracy

Sampling density is high. Mapped boundary accuracy is likely to be high as stands are easily discriminated from surrounding eucalypt forests.

A 0.04 hectare site located in this map unit is expected to contain at least 17 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 27 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Abrophyllum ornans* | 1 | 12% | 1 | 0% | Uninformative |
| *Acacia irrorata* | 1 | 12% | 1 | 3% | Uninformative |
| *Acmena smithii* | 3 | 96% | 2 | 5% | Positive diagnostic |
| *Adiantum formosum* | 2 | 24% | 2 | 1% | Positive diagnostic |
| *Adiantum hispidulum* | 2 | 20% | 1 | 1% | Positive diagnostic |
| *Alectryon subcinereus* | 2 | 16% | 1 | 0% | Uninformative |
| *Allocasuarina torulosa* | 1 | 12% | 2 | 10% | Uninformative |
| *Aphanopetalum resinosum* | 2 | 16% | 2 | 0% | Uninformative |
| *Arthropteris tenella* | 2 | 24% | 2 | 0% | Positive diagnostic |
| *Asplenium australasicum* | 2 | 44% | 1 | 1% | Positive diagnostic |
| *Asplenium flabellifolium* | 2 | 32% | 1 | 3% | Positive diagnostic |
| *Backhousia myrtifolia* | 2 | 32% | 3 | 2% | Positive diagnostic |
| *Blechnum cartilagineum* | 2 | 72% | 2 | 6% | Positive diagnostic |
| *Blechnum nudum* | 1 | 12% | 2 | 0% | Uninformative |
| *Blechnum patersonii* | 2 | 20% | 2 | 0% | Positive diagnostic |
| *Breynia oblongifolia* | 1 | 24% | 1 | 17% | Uninformative |
| *Callicoma serratifolia* | 2 | 24% | 2 | 5% | Positive diagnostic |
| *Calochlaena dubia* | 2 | 48% | 2 | 16% | Positive diagnostic |
| *Ceratopetalum apetalum* | 4 | 80% | 2 | 4% | Positive diagnostic |
| *Cissus antarctica* | 2 | 40% | 2 | 1% | Positive diagnostic |
| *Cissus hypoglauca* | 2 | 64% | 2 | 7% | Positive diagnostic |
| *Claoxylon australe* | 1 | 28% | 1 | 0% | Positive diagnostic |
| *Clematis aristata* | 1 | 20% | 1 | 7% | Uninformative |
| *Clerodendrum tomentosum* | 1 | 12% | 1 | 5% | Uninformative |
| *Cryptocarya glaucescens* | 2 | 64% | 2 | 0% | Positive diagnostic |
| *Cryptocarya microneura* | 1 | 28% | 1 | 1% | Positive diagnostic |
| *Cyathea australis* | 1 | 24% | 1 | 2% | Positive diagnostic |
| *Cyperus tetraphyllus* | 2 | 16% | 2 | 0% | Uninformative |
| *Davallia solida* var. *pyxidata* | 1 | 12% | 1 | 0% | Uninformative |
| *Dichondra repens* | 1 | 12% | 2 | 14% | Uninformative |
| *Diospyros australis* | 2 | 32% | 1 | 1% | Positive diagnostic |
| *Doodia aspera* | 2 | 52% | 2 | 3% | Positive diagnostic |
| *Doryphora sassafras* | 3 | 60% | 3 | 0% | Positive diagnostic |
| *Elaeodendron australe* | 2 | 20% | 1 | 1% | Positive diagnostic |
| *Eucalyptus pilularis* | 1 | 16% | 3 | 14% | Uninformative |
| *Eucalyptus saligna* | 2 | 16% | 3 | 3% | Uninformative |
| *Eupomatia laurina* | 2 | 20% | 2 | 2% | Positive diagnostic |
| *Eustrephus latifolius* | 1 | 52% | 2 | 15% | Positive diagnostic |
| *Ficus coronata* | 2 | 28% | 2 | 1% | Positive diagnostic |
| *Flagellaria indica* | 2 | 12% | 2 | 0% | Uninformative |
| *Gahnia aspera* | 2 | 24% | 1 | 3% | Positive diagnostic |
| *Gahnia melanocarpa* | 1 | 12% | 2 | 3% | Uninformative |
| *Geitonoplesium cymosum* | 1 | 40% | 2 | 9% | Positive diagnostic |
| *Glochidion ferdinandi* | 1 | 12% | 2 | 13% | Uninformative |
| *Guioa semiglauca* | 2 | 32% | 1 | 1% | Positive diagnostic |
| *Gymnostachys anceps* | 2 | 64% | 1 | 2% | Positive diagnostic |
| *Hydrocotyle laxiflora* | 1 | 12% | 2 | 3% | Uninformative |
| *Hymenophyllum cupressiforme* | 2 | 28% | 1 | 1% | Positive diagnostic |
| *Hypolepis muelleri* | 2 | 16% | 2 | 5% | Uninformative |
| *Lastreopsis microsora* subsp. *microsora* | 2 | 48% | 1 | 0% | Positive diagnostic |
| *Livistona australis* | 3 | 96% | 2 | 9% | Positive diagnostic |
| *Lomatia myricoides* | 1 | 16% | 2 | 3% | Uninformative |
| *Microsorum scandens* | 2 | 28% | 1 | 0% | Positive diagnostic |
| *Morinda jasminoides* | 2 | 84% | 2 | 6% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 52% | 1 | 21% | Positive diagnostic |
| *Notelaea venosa* | 1 | 12% | 1 | 1% | Uninformative |
| *Omalanthus nutans* | 1 | 24% | 1 | 9% | Uninformative |
| *Oplismenus aemulus* | 2 | 20% | 2 | 10% | Uninformative |
| *Oplismenus imbecillis* | 1 | 56% | 2 | 12% | Positive diagnostic |
| *Palmeria scandens* | 2 | 32% | 2 | 0% | Positive diagnostic |
| *Pandorea pandorana* | 2 | 44% | 2 | 16% | Positive diagnostic |
| *Parsonsia straminea* | 2 | 48% | 1 | 4% | Positive diagnostic |
| *Pellaea falcata* | 2 | 24% | 2 | 2% | Positive diagnostic |
| *Pittosporum multiflorum* | 2 | 24% | 2 | 0% | Positive diagnostic |
| *Pittosporum revolutum* | 1 | 16% | 1 | 9% | Uninformative |
| *Pittosporum undulatum* | 1 | 36% | 2 | 25% | Constant |
| *Platycerium bifurcatum* | 2 | 32% | 1 | 1% | Positive diagnostic |
| *Plectranthus parviflorus* | 1 | 12% | 2 | 3% | Uninformative |
| *Polyosma cunninghamii* | 2 | 32% | 2 | 0% | Positive diagnostic |
| *Polystichum australiense* | 2 | 16% | 3 | 0% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Pseuderanthemum variabile* | 2 | 60% | 2 | 12% | Positive diagnostic |
| *Psychotria loniceroides* | 1 | 12% | 1 | 0% | Uninformative |
| *Pteris tremula* | 1 | 12% | 1 | 1% | Uninformative |
| *Pyrrosia rupestris* | 2 | 52% | 2 | 1% | Positive diagnostic |
| *Ripogonum album* | 2 | 12% | 2 | 0% | Uninformative |
| *Sarcopetalum harveyanum* | 1 | 16% | 1 | 4% | Uninformative |
| *Schelhammera undulata* | 2 | 20% | 2 | 3% | Positive diagnostic |
| *Schizomeria ovata* | 1 | 36% | 2 | 1% | Positive diagnostic |
| *Smilax australis* | 2 | 56% | 1 | 3% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 28% | 2 | 33% | Uninformative |
| *Stenocarpus salignus* | 2 | 12% | 2 | 1% | Uninformative |
| *Stephania japonica* | 1 | 28% | 1 | 6% | Positive diagnostic |
| *Sticherus flabellatus* var. *flabellatus* | 2 | 20% | 2 | 4% | Positive diagnostic |
| *Syncarpia glomulifera* | 2 | 44% | 3 | 13% | Positive diagnostic |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 68% | 2 | 5% | Positive diagnostic |
| *Tasmannia insipida* | 1 | 28% | 1 | 0% | Positive diagnostic |
| *Todea barbara* | 2 | 12% | 1 | 2% | Uninformative |
| *Toona ciliata* | 1 | 12% | 4 | 0% | Uninformative |
| *Trochocarpa laurina* | 1 | 44% | 1 | 1% | Positive diagnostic |
| *Trophis scandens* subsp. *scandens* | 2 | 12% | 1 | 0% | Uninformative |
| *Tylophora barbata* | 1 | 12% | 2 | 5% | Uninformative |
| *Wilkiea huegeliana* | 2 | 68% | 2 | 2% | Positive diagnostic |

# HINTERLAND DRY RAINFOREST

## S_RF05
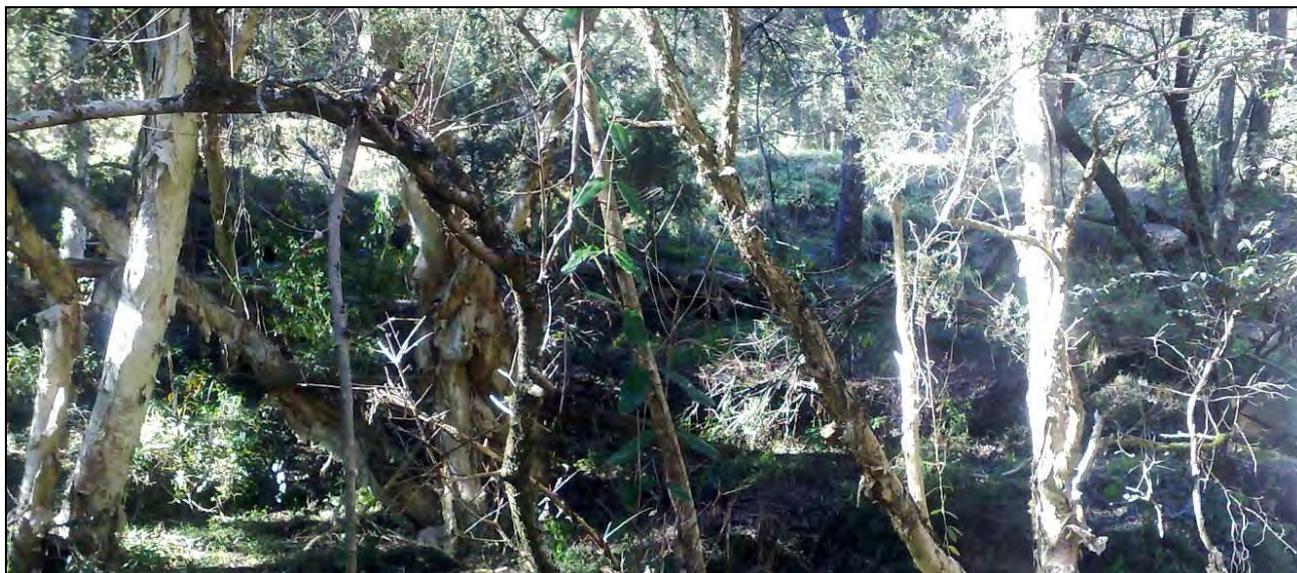
## Description

This community occurs on very sheltered clay-rich soils of the undulating hills and ranges of western Sydney and the southern Blue Mountains. Grey myrtle (*Backhousia myrtifolia*) is the most common and abundant rainforest species. Other locally prominent species include fig (*Ficus rubiginosa*), wild quince (*Alectryon subcinereus*) and whalebone tree (*Streblus brunonianus*). The rainforest canopy may include eucalypts (in the study area spotted gum (*Corymbia maculata*) is common), wattles and paperbarks. The former is more commonly an emergent layer and the latter prevalent in hillside drainage lines. Several mesic shrubs consistently occur including hairy clerodendrum (*Clerodendrum tomentosum*) and large mock olive (*Notelaea longifolia*). The ground cover is a sparse cover of herbs and ferns.

This rainforest community is also known in the immediate Sydney area as Western Sydney Dry Rainforest (NPWS 2002, Tozer 2003) and is recognised as an Endangered Ecological Community under the TSC Act. Within the study area Hinterland Dry Rainforest is severely disturbed and most stands are now obscured by chronic infestation of African olive (*Olea europaea* subsp. *cuspidata*). The plant diversity presented in the diagnostic species list in this profile is derived from highly modified vegetation. Community structural data is similarly affected, with samples situated amongst low regenerating scrubs. It occurs on south-facing aspects generally less than 200 metres in elevation and in zones receiving less than 900 millimetres average annual rainfall. Elsewhere the rainforest is found in areas of higher rainfall and elevation (Tozer et al. 2006, NPWS 2003a) on a variety of clay-influenced soils between the Shoalhaven and Hawkesbury rivers.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 21 m ±13<br>12-30 | 10% ±7<br>5-15 | *Eucalyptus tereticornis, Eucalyptus moluccana, Corymbia maculata* |
| Small Trees | 8 m ±1<br>7-8 | 28% ±18<br>15-40 | *Alectryon subcinereus, Clerodendrum tomentosum, Melaleuca styphelioides* |
| Shrubs | 2.3 m ±1.5<br>1.0-4.0 | 23% ±13<br>10-35 | *Clerodendrum tomentosum, Breynia oblongifolia, Notelaea longifolia* |
| Ground Covers | 0.7 m ±0.4<br>0.4-1.0 | 18% ±4<br>15-20 | *Sigesbeckia orientalis, Oplismenus* spp., *Plectranthus parviflorus, Desmodium brachypodum, Desmodium varians, Adiantum aethiopicum, Cyperus gracilis, Galium propinquum, Galium migrans, Geranium homeanum, Solanum prinophyllum, Wahlenbergia gracilis* |
| Vines & Climbers | N/A | N/A | *Cayratia clematidea, Eustrephus latifolius, Einadia trigonos, Aphanopetalum resinosum, Smilax glyciphylla* |

*Compiled from 2 sites with structural data recorded.

## Threats

The invasive weed species African olive (*Olea europaea* subsp. *cuspidata*) threaten all stands of this community within the study area.

## Conservation Status

This community is a component of Western Sydney Dry Rainforest in the Sydney Basin Bioregion, an Endangered Ecological Community listed under the NSW TSC Act. It is also a component of Western Sydney Dry Rainforest and Moist Woodland on Shale, an Endangered Ecological Community listed under the EPBC Act.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 8120-9200 hectares |
| Estimated percentage cleared | Not available | 15-25% |
| Total NPWS reserves | <.1 +<.1 hectares<br>0% of extant area | 5600 hectares<br>55-75% of extant area<br>75% of pre-clearing area |
| Total reserved | 0.4 +0.3 hectares<br>100% of extant area | Not available |
| Total non-reserved | <.1 +<.1 hectares | Not available |
| Total extant | 0.4 hectares | 6900 hectares |



## Example Locations

o   Calmsley Hill City Farm, Abbotsbury

## Species Richness

| | |
|---|---|
| Number of sites | 2 |
| Total native species | 43 |
| Average no. native species per site | 26.0 ±9.9 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

Floristically the community is related to moist shale woodlands (S_GW01) into which it grades on less protected sites.

## Accuracy

Sampling density is low. Map unit boundaries are based on the field sample sites, topographic position and interpretation of digital imagery. Some examples of this rainforest community may be obscured by profuse weed infestation and may have been overlooked.

# Species

S_RF05

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia implexa* | 1 | 50% | 1 | 5% | Constant |
| *Adiantum aethiopicum* | 3 | 50% | 2 | 7% | Constant |
| *Alectryon subcinereus* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Aphanopetalum resinosum* | 3 | 50% | 2 | 0% | Positive diagnostic |
| *Austrodanthonia racemosa* | 1 | 50% | 2 | 2% | Positive diagnostic |
| *Breynia oblongifolia* | 2 | 50% | 1 | 17% | Constant |
| *Cayratia clematidea* | 2 | 100% | 2 | 4% | Positive diagnostic |
| *Celastrus australis* | 1 | 50% | 2 | 0% | Positive diagnostic |
| *Celastrus subspicata* | 1 | 50% | 0 | 0% | Positive diagnostic |
| *Chloris ventricosa* | 1 | 50% | 2 | 1% | Positive diagnostic |
| *Clerodendrum tomentosum* | 3 | 100% | 1 | 5% | Positive diagnostic |
| *Convolvulus erubescens* | 2 | 50% | 2 | 1% | Positive diagnostic |
| *Corymbia maculata* | 1 | 50% | 3 | 2% | Positive diagnostic |
| *Cymbopogon refractus* | 1 | 50% | 2 | 4% | Constant |
| *Cyperus gracilis* | 2 | 50% | 2 | 1% | Positive diagnostic |
| *Desmodium brachypodum* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Desmodium varians* | 2 | 50% | 2 | 9% | Constant |
| *Echinopogon caespitosus* | 1 | 50% | 2 | 11% | Constant |
| *Einadia hastata* | 1 | 50% | 2 | 4% | Constant |
| *Einadia trigonos* | 2 | 50% | 2 | 1% | Positive diagnostic |
| *Entolasia marginata* | 1 | 50% | 2 | 22% | Constant |
| *Eustrephus latifolius* | 1 | 100% | 2 | 15% | Positive diagnostic |
| *Galium migrans* | 1 | 100% | 2 | 0% | Positive diagnostic |
| *Galium propinquum* | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Geitonoplesium cymosum* | 1 | 50% | 2 | 9% | Constant |
| *Geranium homeanum* | 3 | 50% | 2 | 2% | Positive diagnostic |
| *Juncus usitatus* | 1 | 50% | 1 | 3% | Positive diagnostic |
| *Melaleuca styphelioides* | 3 | 50% | 1 | 2% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 50% | 2 | 36% | Constant |
| *Myrsine variabilis* | 1 | 50% | 1 | 8% | Constant |
| *Notelaea longifolia* | 2 | 100% | 1 | 21% | Positive diagnostic |
| *Oplismenus aemulus* | 2 | 100% | 2 | 10% | Positive diagnostic |
| *Oplismenus imbecillis* | 2 | 100% | 2 | 13% | Positive diagnostic |
| *Plectranthus parviflorus* | 2 | 100% | 2 | 3% | Positive diagnostic |
| *Pseuderanthemum variabile* | 1 | 50% | 2 | 12% | Constant |
| *Pteris tremula* | 1 | 50% | 1 | 1% | Positive diagnostic |
| *Sigesbeckia orientalis* subsp. *orientalis* | 2 | 100% | 2 | 2% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 50% | 2 | 33% | Constant |
| *Solanum prinophyllum* | 2 | 50% | 1 | 5% | Constant |
| *Solanum pungetium* | 1 | 50% | 2 | 0% | Positive diagnostic |
| *Tylophora barbata* | 1 | 50% | 2 | 5% | Constant |
| *Wahlenbergia gracilis* | 2 | 50% | 1 | 8% | Constant |

*The Native Vegetation of the Sydney Metropolitan Area*

# COASTAL DUNE LITTORAL RAINFOREST                      S_RF06

## Description

A closed canopy dominated by tuckeroo (*Cupaniopsis anacardioides*) and a sandy substrate helps differentiate this littoral rainforest from others found in the Sydney area. This community forms a low closed canopy of rainforest trees with an occasional emergent eucalypt, casuarina, banksia or paperbark. It is situated on recent sand deposits, typically in swales or depressions on low-lying sheltered hind dunes less than 10 metres in elevation. Many tree species are shared with other littoral rainforest communities, including lilly pilly (*Acmena smithii*) and cheese tree (*Glochidion ferdinandi*). In the Sydney region the threatened species magenta lilly pilly (*Syzygium paniculatum*) has been recorded amongst the small tree layer.

Only small, isolated stands of this rainforest occur in the Sydney area on the Kurnell Peninsula and Bundeena. At Towra Point the understorey is threatened by encroaching lantana which defines parts of the reserve previously subject to clearing. The lantana can smother the understorey, inhibiting the development of the ferns and vines that are otherwise present in less-disturbed sites. Outside of the Sydney area the community extends north along the Central Coast where it occurs in Wyrrabalong and Wamberal nature reserves (NPWS 2000c). While similar habitats are found south of Sydney, tuckeroo is not present (NPWS 2002c) and the sand littoral rainforests there are considered to form part of the Temperate Littoral Rainforest community of Tozer et al. (2010).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 15 m | 70% | *Cupaniopsis anacardioides, Syzygium paniculatum, Streblus brunonianus* |
| Small Trees | 4 m | 10% | *Acmena smithii, Breynia oblongifolia, Pittosporum undulatum, Glochidion ferdinandi, Notelaea longifolia, Syzygium paniculatum* |
| Ground Covers | 0.4 m | 50% | *Pellaea falcata, Pteridium esculentum, Viola hederacea, Adiantum aethiopicum* |
| Vines & Climbers | N/A | N/A | *Cayratia clematidea, Cissus antarctica, Geitonoplesium cymosum, Hibbertia scandens, Maclura cochinchinensis, Marsdenia rostrata* |

*Compiled from one site with structural data recorded.

## Threats

Invasive weeds such as lantana (*Lantana camara*) and bitou bush (*Chrysanthemoides monilifera* subsp. *monilifera*) are prolific in disturbed landscapes that adjoin the remaining stands in the Sydney area.

## Conservation Status

Coastal Dune Littoral Rainforest is a component of Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act. It is also a component of Littoral Rainforest and Coastal Vine Thickets of Eastern Australia, a Critically Endangered Ecological Community under the EPBC Act.

It is represented in Towra Point NR and Royal NP.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 17.9 +0.2 hectares<br>74% of extant area | 144 hectares<br>75-80% of extant area |
| Total reserved | 19.1 +0.2 hectares<br>79% of extant area | Not available |
| Total non-reserved | 5.0 +<.1 hectares | Not available |
| Total extant | 24.1 hectares | 185 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate its regional extent.



## Example Locations

o   Charlotte Breen Memorial Park, Kurnell

o   Towra Point NR

## Species Richness

| Number of sites | 4 |
|---|---|
| Total native species | 68 |
| Average no. native species per site | 28.5 ±10.3 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

Closely related to other mesic forests (S_WSF03) found on sand dunes into which it grades in more exposed situations.

## Accuracy

Sampling density is moderate. Map unit boundaries are based on the interpretation of digital imagery, sample sites, topographic position and field traverse. Small areas of the community may be overlooked in very disturbed situations where regeneration of pioneer species may obscure image patterns.

*The Native Vegetation of the Sydney Metropolitan Area*

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acmena smithii* | 3 | 75% | 2 | 6% | Positive diagnostic |
| *Adiantum aethiopicum* | 2 | 25% | 2 | 7% | Uninformative |
| *Banksia integrifolia* | 2 | 75% | 2 | 9% | Positive diagnostic |
| *Baumea juncea* | 2 | 25% | 2 | 4% | Uninformative |
| *Breynia oblongifolia* | 1 | 100% | 1 | 17% | Positive diagnostic |
| *Carex appressa* | 2 | 25% | 2 | 1% | Positive diagnostic |
| *Cassytha pubescens* | 1 | 25% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 1 | 75% | 2 | 7% | Positive diagnostic |
| *Cayratia clematidea* | 2 | 100% | 2 | 4% | Positive diagnostic |
| *Cissus antarctica* | 2 | 75% | 2 | 2% | Positive diagnostic |
| *Cissus hypoglauca* | 1 | 25% | 2 | 8% | Uninformative |
| *Clematis glycinoides* | 2 | 25% | 2 | 6% | Uninformative |
| *Clerodendrum tomentosum* | 2 | 50% | 1 | 5% | Positive diagnostic |
| *Commelina cyanea* | 1 | 75% | 2 | 9% | Positive diagnostic |
| *Cupaniopsis anacardioides* | 3 | 75% | 2 | 2% | Positive diagnostic |
| *Cyperus imbecillis* | 2 | 25% | 1 | 0% | Positive diagnostic |
| *Diospyros australis* | 3 | 25% | 2 | 1% | Positive diagnostic |
| *Echinopogon ovatus* | 2 | 25% | 2 | 6% | Uninformative |
| *Einadia nutans* | 1 | 25% | 1 | 1% | Positive diagnostic |
| *Elaeodendron australe* | 3 | 25% | 1 | 1% | Positive diagnostic |
| *Entolasia marginata* | 2 | 25% | 2 | 22% | Uninformative |
| *Euchiton gymnocephalus* | 1 | 25% | 2 | 0% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 50% | 2 | 15% | Constant |
| *Ficus coronata* | 2 | 25% | 2 | 1% | Uninformative |
| *Ficus rubiginosa* | 4 | 50% | 1 | 4% | Positive diagnostic |
| *Geitonoplesium cymosum* | 2 | 100% | 2 | 9% | Positive diagnostic |
| *Geranium solanderi* | 1 | 25% | 2 | 1% | Positive diagnostic |
| *Glochidion ferdinandi* | 4 | 50% | 1 | 13% | Constant |
| *Glycine clandestina* | 1 | 25% | 2 | 18% | Uninformative |
| *Hibbertia scandens* | 2 | 75% | 2 | 7% | Positive diagnostic |
| *Hydrocotyle acutiloba* | 2 | 25% | 2 | 1% | Positive diagnostic |
| *Hypolepis muelleri* | 2 | 25% | 2 | 5% | Uninformative |
| *Imperata cylindrica* var. *major* | 1 | 25% | 2 | 20% | Uninformative |
| *Juncus usitatus* | 1 | 25% | 1 | 3% | Uninformative |
| *Kennedia rubicunda* | 1 | 25% | 1 | 9% | Uninformative |
| *Lepidosperma concavum* | 1 | 25% | 2 | 4% | Uninformative |
| *Leptospermum laevigatum* | 3 | 25% | 2 | 5% | Uninformative |
| *Livistona australis* | 1 | 50% | 2 | 10% | Constant |
| *Lomandra longifolia* | 3 | 50% | 2 | 47% | Constant |
| *Maclura cochinchinensis* | 2 | 50% | 2 | 1% | Positive diagnostic |
| *Marsdenia rostrata* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Myrsine variabilis* | 1 | 25% | 1 | 8% | Uninformative |
| *Notelaea longifolia* | 1 | 75% | 1 | 21% | Constant |
| *Omalanthus nutans* | 1 | 25% | 1 | 9% | Uninformative |
| *Oplismenus aemulus* | 2 | 25% | 2 | 10% | Uninformative |
| *Oplismenus imbecillis* | 2 | 25% | 2 | 13% | Uninformative |
| *Parsonsia straminea* | 2 | 25% | 1 | 5% | Uninformative |
| *Pellaea falcata* | 2 | 75% | 2 | 2% | Positive diagnostic |
| *Phyllanthus gunnii* | 1 | 25% | 2 | 1% | Uninformative |
| *Pittosporum revolutum* | 2 | 75% | 1 | 9% | Positive diagnostic |
| *Pittosporum undulatum* | 2 | 50% | 2 | 25% | Constant |
| *Plectranthus parviflorus* | 1 | 25% | 2 | 3% | Uninformative |
| *Poa affinis* | 1 | 25% | 2 | 11% | Uninformative |
| *Pyrrosia rupestris* | 1 | 25% | 2 | 2% | Uninformative |
| *Rhagodia candolleana* subsp. *candolleana* | 3 | 25% | 2 | 0% | Positive diagnostic |
| *Sarcopetalum harveyanum* | 2 | 50% | 1 | 4% | Positive diagnostic |
| *Senecio bipinnatisectus* | 3 | 25% | 2 | 0% | Positive diagnostic |
| *Senecio minimus* | 1 | 25% | 1 | 0% | Positive diagnostic |
| *Solanum americanum* | 1 | 25% | 1 | 1% | Positive diagnostic |
| *Solanum stelligerum* | 1 | 25% | 1 | 0% | Positive diagnostic |
| *Stephania japonica* | 2 | 75% | 1 | 6% | Positive diagnostic |
| *Streblus brunonianus* | 3 | 25% | 0 | 0% | Positive diagnostic |
| *Syzygium oleosum* | 1 | 25% | 1 | 0% | Positive diagnostic |
| *Syzygium paniculatum* | 3 | 50% | 1 | 0% | Positive diagnostic |
| *Viola hederacea* | 2 | 75% | 2 | 6% | Positive diagnostic |
| *Wahlenbergia gracilis* | 2 | 25% | 1 | 8% | Uninformative |

# COASTAL ESCARPMENT LITTORAL RAINFOREST S_RF07

## Description

Coastal Escarpment Littoral Rainforest is found on protected escarpment slopes and gullies along the New South Wales coast. It prefers clay soils that derive either from shale layers in sandstone bedrock or from down-slope enrichment from shale capping above. Unlike other rainforests in the Sydney area it can occur some distance from the sea in protected situations at the foot slopes of major scarps or in deep, protected harbour gullies. Inland sites are all exposed to maritime influences arising from low-lying harbour-side positions or from strong sea breezes that blow across the coastal plain.

Depending on the degree of exposure the rainforest canopy may be tall or wind-sheared and at some sites may have a sparse cover of emergent eucalypts. The floristic composition of this rainforest reflects both littoral and warm temperate influences. Lilly pilly (*Acmena smithii*), cabbage tree palm (*Livistona australis*), sweet pittosporum (*Pittosporum undulatum*), scentless rosewood (*Synoum glandulosum*) and cheese tree (*Glochidion ferdinandi*) are the most frequently recorded trees although a wide variety of other rainforest species are encountered less consistently. Coachwood (*Ceratopetalum apetalum*), a tree species commonly recorded in sandstone warm temperate rainforests, is infrequently recorded here. The ground is a cover of ferns, broken only by fallen trees and rock outcrops. A diversity of vines and climbers are present between the upper canopy and the forest floor. The community is found up to four kilometres from the coastline but only where mean annual rainfall exceeds 1200 millimetres and elevation is less than 140 metres above sea level. The community is present on sheltered slopes of the lower Hacking River, the Sydney eastern suburbs escarpment, the Warringah escarpment and Pittwater peninsula. It occurs between Newcastle and Batemans Bay in the Sydney Basin Bioregion.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Emergent | 30 m ±7<br>25-35 | 5% ±0<br>5-5 | *Angophora costata, Syncarpia glomulifera* |
| Trees | 19 m ±5<br>10-25 | 64% ±23<br>15-85 | *Acmena smithii, Livistona australis* |
| Small Trees | 6 m ±3<br>2-13.0 | 18% ±18<br>3-60 | *Eupomatia laurina, Livistona australis, Pittosporum undulatum, Synoum glandulosum, Breynia oblongifolia, Glochidion ferdinandi, Homalanthus populifolius, Notelaea longifolia* |
| Ground Covers | 1.0 m ±0.6<br>0.2-2.0 | 22% ±15<br>5-50 | *Calochlaena dubia, Dianella caerulea, Oplismenus imbecillis, Pseuderanthemum variable, Doodia aspera, Blechnum cartilagineum, Adiantum aethiopicum, Adiantum hispidulum* |
| Vines & Climbers | N/A | N/A | *Cissus hypoglauca, Eustrephus latifolius, Smilax glyciphylla, Morinda jasminoides, Smilax australis* |

*Compiled from 9 sites with structural data recorded.

## Threats

A number of weed species are found within sample sites defining this community. The maritime habitat makes it vulnerable to invasion by bitou bush (*Chrysanthemoides monilifera* subsp. *monilifera*). However other weed species such as small-leaved privet (*Ligustrum sinense*) and wandering Jew (*Tradescantia fluminensis*) are prolific at some sites, particularly within dense urban sub-catchments.

## Conservation Status

Coastal Escarpment Littoral Rainforest is a component of Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act. It is also a component of Littoral Rainforest and Coastal Vine Thickets of Eastern Australia, a Critically Endangered Ecological Community under the EPBC Act.

This vegetation community is represented in Royal NP, Sydney Harbour NP and Ku-ring-gai Chase NP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 30.5 +<.1 hectares  48% of extant area | Not available |
| Total reserved | 48.6 +0 hectares  76% of extant area | Not available |
| Total non-reserved | 15.3 +<.1 hectares | Not available |
| Total extant | 63.9 hectares | Not available |



## Example Locations

o  Epworth Park, Pittwater local government area (LGA)

o  Fisher Bay reserve, Clontarf

## Species Richness

| Number of sites | 29 |
|---|---|
| Total native species | 157 |
| Average no. native species per site | 30.6 ±5.7 |

## Variations and Dynamics

Eucalypt emergents may occur in escarpment gullies with a closed to open sub-canopy of rainforest trees. A prominent stand of cabbage tree palms may also be present and form a palm jungle.

## Relationship to Other Communities

This community shares many species with littoral rainforests found on exposed headlands (S_RF08). It grades into sheltered sandstone forests (S_DSF06, S_WSF02, S_WSF11) as sites become more exposed.

## Accuracy

Sampling density is high. Map unit boundaries were delineated using interpretation of digital imagery identifying rainforest-dominated vegetation with less than 10 per cent eucalypt cover. Differentiation between other littoral rainforest units was based on substrates other than sand mass, distances from the open ocean greater 500 metres and elevations less than 40 metres above sea level.

# Species

A 0.04 hectare site located in this map unit is expected to contain at least 14 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 24 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia implexa* | 1 | 10% | 1 | 5% | Uninformative |
| *Acmena smithii* | 3 | 76% | 2 | 5% | Positive diagnostic |
| *Adiantum aethiopicum* | 2 | 62% | 2 | 6% | Positive diagnostic |
| *Adiantum hispidulum* | 2 | 34% | 1 | 1% | Positive diagnostic |
| *Allocasuarina torulosa* | 2 | 21% | 2 | 10% | Uninformative |
| *Asplenium australasicum* | 1 | 31% | 1 | 1% | Positive diagnostic |
| *Backhousia myrtifolia* | 3 | 10% | 2 | 2% | Uninformative |
| *Banksia integrifolia* | 1 | 17% | 2 | 9% | Uninformative |
| *Blechnum cartilagineum* | 2 | 45% | 2 | 6% | Positive diagnostic |
| *Breynia oblongifolia* | 1 | 69% | 1 | 16% | Positive diagnostic |
| *Callicoma serratifolia* | 2 | 10% | 2 | 5% | Uninformative |
| *Calochlaena dubia* | 3 | 83% | 2 | 16% | Positive diagnostic |
| *Cayratia clematidea* | 2 | 10% | 2 | 4% | Uninformative |
| *Christella dentata* | 2 | 14% | 1 | 1% | Uninformative |
| *Cissus hypoglauca* | 2 | 69% | 2 | 7% | Positive diagnostic |
| *Clerodendrum tomentosum* | 1 | 24% | 1 | 5% | Positive diagnostic |
| *Commelina cyanea* | 2 | 28% | 2 | 8% | Positive diagnostic |
| *Corymbia maculata* | 3 | 24% | 3 | 2% | Positive diagnostic |
| *Cryptocarya microneura* | 1 | 10% | 1 | 1% | Uninformative |
| *Cyathea australis* | 1 | 38% | 1 | 2% | Positive diagnostic |
| *Doodia aspera* | 3 | 38% | 2 | 3% | Positive diagnostic |
| *Doodia caudata* | 2 | 17% | 1 | 1% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 38% | 1 | 20% | Constant |
| *Endiandra sieberi* | 1 | 14% | 1 | 1% | Uninformative |
| *Entolasia marginata* | 2 | 21% | 2 | 22% | Uninformative |
| *Eucalyptus paniculata* | 3 | 14% | 2 | 4% | Uninformative |
| *Eupomatia laurina* | 2 | 38% | 2 | 1% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 83% | 2 | 14% | Positive diagnostic |
| *Ficus coronata* | 3 | 24% | 2 | 1% | Positive diagnostic |
| *Ficus rubiginosa* | 1 | 14% | 1 | 4% | Uninformative |
| *Geitonoplesium cymosum* | 2 | 38% | 2 | 9% | Positive diagnostic |
| *Glochidion ferdinandi* | 2 | 55% | 1 | 13% | Positive diagnostic |
| *Glycine clandestina* | 1 | 10% | 2 | 18% | Uninformative |
| *Gymnostachys anceps* | 1 | 45% | 2 | 2% | Positive diagnostic |
| *Hibbertia dentata* | 2 | 21% | 2 | 8% | Uninformative |
| *Hydrocotyle peduncularis* | 1 | 14% | 2 | 6% | Uninformative |
| *Hypolepis muelleri* | 2 | 21% | 2 | 5% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 1 | 10% | 2 | 20% | Uninformative |
| *Lepidosperma elatius* | 2 | 10% | 2 | 1% | Uninformative |
| *Livistona australis* | 3 | 69% | 2 | 10% | Positive diagnostic |
| *Macrozamia communis* | 1 | 41% | 2 | 4% | Positive diagnostic |
| *Marsdenia rostrata* | 2 | 14% | 1 | 1% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 52% | 2 | 35% | Constant |
| *Morinda jasminoides* | 2 | 62% | 2 | 6% | Positive diagnostic |
| *Myrsine howittiana* | 2 | 10% | 2 | 0% | Uninformative |
| *Myrsine variabilis* | 1 | 28% | 1 | 8% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 79% | 1 | 20% | Positive diagnostic |
| *Omalanthus nutans* | 1 | 59% | 1 | 8% | Positive diagnostic |
| *Oplismenus aemulus* | 1 | 10% | 2 | 10% | Uninformative |
| *Oplismenus imbecillis* | 2 | 76% | 2 | 12% | Positive diagnostic |
| *Pandorea pandorana* | 1 | 69% | 2 | 16% | Positive diagnostic |
| *Passiflora herbertiana* subsp. *herbertiana* | 1 | 17% | 1 | 1% | Uninformative |
| *Pittosporum revolutum* | 1 | 48% | 1 | 8% | Positive diagnostic |
| *Pittosporum undulatum* | 3 | 93% | 2 | 24% | Positive diagnostic |
| *Poa affinis* | 2 | 31% | 2 | 11% | Positive diagnostic |
| *Polyscias sambucifolia* | 1 | 14% | 1 | 15% | Uninformative |
| *Pseuderanthemum variabile* | 2 | 66% | 2 | 12% | Positive diagnostic |
| *Pteris tremula* | 2 | 10% | 1 | 1% | Uninformative |
| *Sarcopetalum harveyanum* | 1 | 38% | 1 | 4% | Positive diagnostic |
| *Schelhammera undulata* | 2 | 38% | 2 | 3% | Positive diagnostic |
| *Smilax australis* | 2 | 41% | 2 | 3% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 83% | 2 | 32% | Positive diagnostic |
| *Stephania japonica* | 2 | 28% | 1 | 6% | Positive diagnostic |
| *Syncarpia glomulifera* | 3 | 31% | 3 | 13% | Uninformative |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 62% | 2 | 5% | Positive diagnostic |
| *Trochocarpa laurina* | 1 | 14% | 1 | 1% | Uninformative |
| *Tylophora barbata* | 2 | 10% | 2 | 5% | Uninformative |
| *Viola hederacea* | 2 | 38% | 2 | 6% | Positive diagnostic |
| *Wilkiea huegeliana* | 2 | 38% | 2 | 2% | Positive diagnostic |
| *Zieria smithii* | 1 | 14% | 1 | 5% | Uninformative |

# COASTAL HEADLAND LITTORAL THICKET <span style="float:right">S_RF08</span>

## Description

This littoral rainforest assemblage is exposed to buffeting salt-laden winds that sculpt a dense close-cropped thicket of rainforest trees. It is situated on shale-influenced soils found on sheltered headlands and scarps that face the open ocean. Typically there is a low, tightly-packed canopy of lilly pilly (*Acmena smithii*), red olive plum (*Elaeodendron australe* var. *australe*) and guioa (*Guioa semiglauca).* These trees may sit below a stunted emergent layer of banksias or eucalypts. Some sites include a low sprawling fig (such as *Ficus rubiginosa*) or a stand of cabbage tree palms (*Livistona australis*). Underneath the low canopy a tangle of vines, twisted tree trunks and gnarled limbs inhibit the development of a shrub layer. Instead an open cover of herbs and ferns are found scattered amongst the litter layer.

This rainforest community has a naturally restricted distribution in New South Wales. In the Sydney Basin Bioregion it occurs between Newcastle and Batemans Bay. Few examples occur in the Sydney area as most headlands are formed by outcropping Hawkesbury sandstone with soils too impoverished to support this community. Nevertheless, several fine stands are present in Royal NP and further north onto the Pittwater peninsula. All are less than 500 metres from the open ocean and are found at elevations up to 160 metres above sea level.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 15 m ±9<br>8-35 | 46% ±35<br>5-90 | *Acmena smithii, Elaeodendron australe, Eucalyptus botryoides, Ficus rubiginosa, Livistona australis, Scolopia braunii* |
| Small Trees | 8 m ±5<br>2-15 | 21% ± 25<br>5-65 | *Guioa semiglauca, Pittosporum undulatum, Diospyros australis, Myrsine variabilis, Clerodendrum tomentosum, Eupomatia laurina, Livistona australis, Synoum glandulosum* |
| Ground Covers | 1.1 m ±0.6<br>0.1-2.0 | 23% ±14<br>5-40 | *Oplismenus imbecillis, Asplenium flabellifolium, Doodia aspera, Gymnostachys anceps, Pellaea falcata, Pseuderanthemum variable, Viola hederacea, Dichondra repens, Gahnia melanocarpa* |
| Vines & Climbers | N/A | N/A | *Geitonoplesium cymosum, Cissus antarctica, Eustrephus latifolius, Pandorea pandorana, Smilax australis, Sarcopetalum harveyanum* |

*Compiled from 6 sites with structural data recorded.

## Threats

Historical coastal development has led to the depletion of littoral rainforests in New South Wales. While stands are still threatened by clearing in some areas, the invasion of weeds, inappropriate fire regimes and heavy recreational pressures are the most persistent threats.

## Conservation Status

This map unit is a component of Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act. It is also a component of Littoral Rainforest and Coastal Vine Thickets of Eastern Australia, a Critically Endangered Ecological Community under the EPBC Act.

This vegetation community is represented in Royal NP.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 520-670 hectares |
| Estimated percentage cleared | Not available | 10-30% |
| Total NPWS reserves | 127 +<.1 hectares<br>96% of extant area | 360 hectares<br>75-80% of extant area<br>50-65% of pre-clearing area |
| Total reserved | 129 +0 hectares<br>98% of extant area | Not available |
| Total non-reserved | 3.0 +0.4 hectares | Not available |
| Total extant | 132 hectares | 470 hectares |



Map unit
Study area
Extant vegetation

## Example Locations

o   Palm Jungle, Burning Palms walk, Royal NP

o   Betty Morrison Reserve, Newport

## Species Richness

| | |
|---|---|
| Number of sites | 10 |
| Total native species | 128 |
| Average no. native species per site | 33.1 ±6.9 |

## Variations and Dynamics

Stands may include an emergent layer of eucalypts or coast banksia (*Banksia integrifolia*). Sheltered headland gully stands are less sheared by winds and are able to reach greater heights.

## Relationship to Other Communities

The community is related to other littoral rainforest found on clay loams (S_RF07). It also shares many species with taller wet sclerophyll forests (S_WSF04, S_WSF05) and rainforests (S_RF01, S_RF03) that occur on similar substrates found along the Hacking River and Illawarra escarpment. The former occur as exposure increases while the latter as distance from the coast increases.

## Accuracy

Sampling density is moderate. Map accuracy for this community is considered to be high due to the ease of identification of rainforest-dominated vegetation located on headlands and foreshores.

A 0.04 hectare site located in this map unit is expected to contain at least 13 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 26 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia floribunda* | 1 | 10% | 2 | 4% | Uninformative |
| *Acacia longifolia* | 1 | 10% | 2 | 21% | Uninformative |
| *Acacia maidenii* | 1 | 10% | 1 | 1% | Uninformative |
| *Acacia mearnsii* | 1 | 10% | 1 | 1% | Uninformative |
| *Acmena smithii* | 3 | 90% | 2 | 5% | Positive diagnostic |
| *Acronychia oblongifolia* | 1 | 10% | 2 | 0% | Uninformative |
| *Adiantum aethiopicum* | 2 | 50% | 2 | 7% | Positive diagnostic |
| *Adiantum silvaticum* | 1 | 10% | 0 | 0% | Uninformative |
| *Allocasuarina torulosa* | 1 | 20% | 2 | 10% | Uninformative |
| *Asplenium australasicum* | 1 | 20% | 1 | 2% | Positive diagnostic |
| *Asplenium flabellifolium* | 2 | 40% | 1 | 4% | Positive diagnostic |
| *Banksia integrifolia* | 2 | 40% | 2 | 9% | Constant |
| *Baumea juncea* | 1 | 10% | 2 | 4% | Uninformative |
| *Billardiera scandens* | 1 | 10% | 1 | 37% | Uninformative |
| *Blechnum cartilagineum* | 2 | 40% | 2 | 6% | Positive diagnostic |
| *Breynia oblongifolia* | 1 | 20% | 1 | 17% | Uninformative |
| *Callicoma serratifolia* | 2 | 10% | 2 | 5% | Uninformative |
| *Callistemon rigidus* | 2 | 10% | 2 | 0% | Uninformative |
| *Calochlaena dubia* | 1 | 30% | 2 | 16% | Uninformative |
| *Carex appressa* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Carex longebrachiata* | 2 | 40% | 1 | 0% | Positive diagnostic |
| *Cassytha glabella* | 2 | 20% | 2 | 14% | Uninformative |
| *Casuarina glauca* | 4 | 10% | 2 | 7% | Uninformative |
| *Cayratia clematidea* | 2 | 20% | 2 | 4% | Uninformative |
| *Centella asiatica* | 1 | 10% | 2 | 6% | Uninformative |
| *Christella dentata* | 2 | 20% | 1 | 1% | Positive diagnostic |
| *Cissus antarctica* | 2 | 60% | 2 | 2% | Positive diagnostic |
| *Cissus hypoglauca* | 2 | 40% | 2 | 8% | Positive diagnostic |
| *Claoxylon australe* | 2 | 10% | 1 | 1% | Uninformative |
| *Clematis aristata* | 2 | 30% | 1 | 7% | Uninformative |
| *Clerodendrum tomentosum* | 1 | 30% | 1 | 5% | Uninformative |
| *Commelina cyanea* | 1 | 30% | 2 | 9% | Uninformative |
| *Cryptocarya glaucescens* | 1 | 10% | 2 | 1% | Uninformative |
| *Cyathea australis* | 1 | 10% | 1 | 2% | Uninformative |
| *Desmodium varians* | 2 | 10% | 2 | 9% | Uninformative |
| *Dichondra repens* | 2 | 30% | 2 | 14% | Uninformative |
| *Digitaria parviflora* | 1 | 10% | 2 | 5% | Uninformative |
| *Diospyros australis* | 2 | 30% | 2 | 1% | Positive diagnostic |
| *Dodonaea triquetra* | 1 | 10% | 2 | 23% | Uninformative |
| *Doodia aspera* | 2 | 50% | 2 | 3% | Positive diagnostic |
| *Doodia caudata* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Doryphora sassafras* | 2 | 10% | 3 | 1% | Uninformative |
| *Elaeocarpus reticulatus* | 2 | 10% | 1 | 20% | Uninformative |
| *Elaeodendron australe* | 1 | 50% | 2 | 1% | Positive diagnostic |
| *Endiandra sieberi* | 1 | 10% | 1 | 1% | Uninformative |
| *Entolasia marginata* | 1 | 20% | 2 | 22% | Uninformative |
| *Eucalyptus botryoides* | 3 | 50% | 3 | 5% | Positive diagnostic |
| *Eucalyptus punctata* | 3 | 10% | 2 | 11% | Uninformative |
| *Eupomatia laurina* | 1 | 50% | 2 | 1% | Positive diagnostic |
| *Euroschinus falcatus* var. *falcatus* | 4 | 10% | 1 | 0% | Uninformative |
| *Eustrephus latifolius* | 1 | 90% | 2 | 15% | Positive diagnostic |
| *Ficinia nodosa* | 2 | 10% | 2 | 2% | Uninformative |
| *Ficus coronata* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Ficus rubiginosa* | 1 | 30% | 1 | 4% | Positive diagnostic |
| *Ficus superba* var. *henneana* | 3 | 10% | 0 | 0% | Uninformative |
| *Gahnia aspera* | 2 | 20% | 1 | 3% | Uninformative |
| *Gahnia melanocarpa* | 2 | 70% | 2 | 3% | Positive diagnostic |
| *Galium propinquum* | 2 | 10% | 2 | 2% | Uninformative |
| *Geijera salicifolia* | 1 | 10% | 0 | 0% | Uninformative |
| *Geitonoplesium cymosum* | 2 | 80% | 2 | 9% | Positive diagnostic |
| *Geranium solanderi* | 2 | 10% | 2 | 1% | Uninformative |
| *Glochidion ferdinandi* | 2 | 50% | 1 | 13% | Positive diagnostic |
| *Goodenia bellidifolia* subsp. *bellidifolia* | 1 | 10% | 1 | 5% | Uninformative |
| *Guioa semiglauca* | 3 | 40% | 1 | 1% | Positive diagnostic |
| *Gymnostachys anceps* | 2 | 30% | 2 | 3% | Positive diagnostic |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 1 | 10% | 1 | 6% | Uninformative |
| *Hibbertia scandens* | 1 | 30% | 2 | 7% | Uninformative |
| *Hydrocotyle acutiloba* | 1 | 10% | 2 | 1% | Uninformative |
| *Hydrocotyle geraniifolia* | 1 | 10% | 1 | 0% | Uninformative |
| *Hydrocotyle laxiflora* | 2 | 20% | 2 | 3% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Hypolepis muelleri* | 2 | 10% | 2 | 5% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 20% | 2 | 20% | Uninformative |
| *Kennedia rubicunda* | 1 | 10% | 1 | 9% | Uninformative |
| *Kunzea ambigua* | 1 | 10% | 2 | 15% | Uninformative |
| *Lastreopsis acuminata* | 2 | 10% | 2 | 0% | Uninformative |
| *Livistona australis* | 3 | 70% | 2 | 10% | Positive diagnostic |
| *Macrozamia communis* | 1 | 10% | 1 | 4% | Uninformative |
| *Marsdenia rostrata* | 1 | 50% | 1 | 1% | Positive diagnostic |
| *Marsdenia suaveolens* | 1 | 10% | 1 | 3% | Uninformative |
| *Melaleuca hypericifolia* | 1 | 10% | 2 | 1% | Uninformative |
| *Morinda jasminoides* | 2 | 50% | 2 | 7% | Positive diagnostic |
| *Myrsine howittiana* | 3 | 20% | 2 | 0% | Positive diagnostic |
| *Myrsine variabilis* | 2 | 60% | 1 | 8% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 50% | 1 | 21% | Constant |
| *Notelaea venosa* | 2 | 10% | 1 | 1% | Uninformative |
| *Omalanthus nutans* | 1 | 30% | 1 | 9% | Uninformative |
| *Oplismenus imbecillis* | 2 | 100% | 2 | 12% | Positive diagnostic |
| *Oxalis perennans* | 1 | 10% | 2 | 7% | Uninformative |
| *Pandorea pandorana* | 1 | 50% | 2 | 16% | Constant |
| *Pellaea falcata* | 2 | 40% | 1 | 2% | Positive diagnostic |
| *Peperomia blanda* var. *floribunda* | 1 | 10% | 2 | 0% | Uninformative |
| *Peperomia tetraphylla* | 1 | 10% | 2 | 0% | Uninformative |
| *Pittosporum multiflorum* | 1 | 10% | 2 | 1% | Uninformative |
| *Pittosporum revolutum* | 2 | 10% | 1 | 9% | Uninformative |
| *Pittosporum undulatum* | 3 | 80% | 2 | 25% | Positive diagnostic |
| *Plantago debilis* | 2 | 10% | 2 | 2% | Uninformative |
| *Platylobium formosum* | 1 | 10% | 2 | 8% | Uninformative |
| *Plectranthus parviflorus* | 1 | 10% | 2 | 3% | Uninformative |
| *Poa affinis* | 1 | 10% | 2 | 11% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 2 | 10% | 2 | 6% | Uninformative |
| *Pouteria australis* | 1 | 10% | 1 | 0% | Uninformative |
| *Pratia purpurascens* | 1 | 20% | 2 | 18% | Uninformative |
| *Pseuderanthemum variabile* | 2 | 30% | 2 | 12% | Uninformative |
| *Pteris tremula* | 1 | 10% | 1 | 1% | Uninformative |
| *Pyrrosia rupestris* | 2 | 20% | 2 | 2% | Positive diagnostic |
| *Rubus parvifolius* | 2 | 10% | 2 | 1% | Uninformative |
| *Sarcopetalum harveyanum* | 2 | 60% | 1 | 4% | Positive diagnostic |
| *Schelhammera undulata* | 2 | 20% | 2 | 3% | Uninformative |
| *Scolopia braunii* | 2 | 20% | 1 | 0% | Positive diagnostic |
| *Senna odorata* | 2 | 10% | 1 | 0% | Uninformative |
| *Sigesbeckia orientalis* subsp. *orientalis* | 2 | 10% | 2 | 3% | Uninformative |
| *Smilax australis* | 1 | 60% | 2 | 3% | Positive diagnostic |
| *Smilax glyciphylla* | 1 | 50% | 2 | 33% | Constant |
| *Solanum stelligerum* | 1 | 10% | 1 | 0% | Uninformative |
| *Stephania japonica* | 2 | 40% | 1 | 6% | Positive diagnostic |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 40% | 2 | 5% | Positive diagnostic |
| *Trema tomentosa* var. *aspera* | 3 | 10% | 1 | 2% | Uninformative |
| *Tristaniopsis collina* | 2 | 10% | 2 | 1% | Uninformative |
| *Tylophora barbata* | 2 | 10% | 2 | 5% | Uninformative |
| *Viola hederacea* | 2 | 60% | 2 | 6% | Positive diagnostic |
| *Wahlenbergia gracilis* | 1 | 10% | 1 | 8% | Uninformative |
| *Wilkiea huegeliana* | 3 | 30% | 2 | 2% | Positive diagnostic |
| *Zieria smithii* | 1 | 10% | 1 | 6% | Uninformative |

# WET SCLEROPHYLL FORESTS

| | |
|---|---|
| Shrubby Subformation | |
| Blue Gum High Forest | S_WSF01 |
| Coastal Enriched Sandstone Moist Forest | S_WSF02 |
| Coastal Sand Littoral Forest | S_WSF03 |
| Illawarra Escarpment Bangalay-Banksia Forest | S_WSF04 |
| Illawarra Escarpment Blackbutt Forest | S_WSF05 |
| Illawarra Escarpment Blue Gum Wet Forest | S_WSF32 |
| Central Coast Escarpment Moist Forest | S_WSF33 |
| Coastal Diatreme Forest | S_WSF35 |
| Coastal Flats Tall Moist Forest | S_WSF36 |
| Grassy Subformation | |
| Coastal Shale-Sandstone Forest | S_WSF06 |
| O'Hares Creek Shale Forest | S_WSF07 |
| Sydney Foreshores Shale Forest | S_WSF08 |
| Sydney Turpentine-Ironbark Forest | S_WSF09 |
| Pittwater Spotted Gum Forest | S_WSF11 |
| Central Coast Escarpment Dry Forest | S_WSF34 |

# BLUE GUM HIGH FOREST

## S_WSF01

**Statewide Class**
North Coast Wet Sclerophyll Forests

NSW Plant Community Type:
1237: Sydney Blue Gum-Blackbutt-Smooth-barked Apple Moist Shrubby Open Forest on Shale Ridges of the Hornsby Plateau, Sydney Basin

Biometric Number(s):
HN596; ME001



## Description

Blue Gum High Forest (Benson and Howell 1990) is a tall wet sclerophyll forest found on fertile shale soils in the high rainfall districts of Sydney's north shore. It is dominated by Sydney blue gum (*Eucalyptus saligna*), blackbutt (*Eucalyptus pilularis*) and turpentine (*Syncarpia glomulifera*) with a number of other eucalypts occurring patchily. A sparse to open cover of small trees is found at most sites and includes a variety of sclerophyllous and mesophyllous species. The ground layer is variable in both composition and cover. It may be ferny, grassy or herbaceous depending on topographic situation and disturbance history. At some sites vines and climbers are prolific.

Blue Gum High Forest is found on a range of shale or shale-influenced substrates in areas receiving between 900 and 1300 millimetres of mean annual rainfall. This includes elevated gullies, ridgelines, crests and slopes underlain by Wianamatta shales as well as small gully heads where downslope movement of shale soil lies above sandstone bedrock. In these latter situations sandstone outcrops may be present, although occupying only a minor component of the site. Typically the community occurs at altitudes above 117 metres above sea level although it is known to occur as low as 30 metres and as high as 185 metres. It is most common across the ridgelines between Castle Hill and St Ives with small areas occurring in Ryde, Lane Cove and Willoughby where it is found at lower elevations.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 32 m ±8 <br> 20-55 | 33% ±12 <br> 8-50 | *Eucalyptus saligna, Eucalyptus pilularis, Eucalyptus paniculata, Syncarpia glomulifera, Angophora costata* |
| Small Trees | 13 m ±7 <br> 2-30 | 24% ±18 <br> 2-60 | *Pittosporum undulatum, Syncarpia glomulifera, Elaeocarpus reticulatus, Acacia implexa.* |
| Shrubs | 4.3 m ±3.2 <br> 1.5-15.0 | 17% ±18 <br> 2-80 | *Polyscias sambucifolia, Pittosporum undulatum, Pittosporum revolutum, Breynia oblongifolia, Leucopogon juniperinus, Ozothamnus diosmifolius, Notelaea longifolia, Clerodendrum tomentosum, Maytenus silvestris, Trema tomentosa* |
| Ground Covers | 1.1 m ±0.8 <br> 0.3-5.0 | 52% ±31 <br> 2-95 | *Entolasia marginata, Pseuderanthemum variabile, Oplismenus aemulus, Lomandra longifolia, Microlaena stipoides, Dianella caerulea, Dichondra repens, Poa affinis, Oplismenus imbecillis, Sigesbeckia orientalis, Adiantum aethiopicum, Pratia purpurascens* |
| Vines & Climbers | N/A | N/A | *Eustrephus latifolius, Pandorea pandorana, Clematis glycinoides, Tylophora barbata, Cayratia clematidea, Glycine microphylla* |

*Compiled from 29 sites with structural data recorded.

*The Native Vegetation of the Sydney Metropolitan Area*

## Threats

Threats are high. Small-scale clearing associated with residential subdivision, road upgrading, extension and maintenance of service easements etc. pose a threat of ongoing decline in the extent of the community.

## Conservation Status

Blue Gum High Forest in the Sydney Basin Bioregion is listed as a Critically Endangered Ecological Community under the NSW TSC Act. Blue Gum High Forest of the Sydney Basin Bioregion is also listed as a Critically Endangered Ecological Community under the Commonwealth EPBC Act. Different location inclusions/exclusions and condition thresholds apply under the State and Commonwealth determinations.

This vegetation community is represented in Dalrymple-Hay NR.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | >1800 hectares |
| Estimated percentage cleared | Not available | >90% |
| Total NPWS reserves | 10.8 +<.1 hectares<br>3% of extant area | 20 hectares<br>10% of extant area<br><2% of pre-clearing area |
| Total reserved | 112 +18.4 hectares<br>36% of extant area | Not available |
| Total non-reserved | 197 +312 hectares | Not available |
| Total extant | 309 hectares | 180 hectares |

*The modeling in Tozer et al. (2010) underestimates the regional extent of this community.



## Example Locations

o   Dalrymple-Hay NR, St Ives, Ku-ring-gai LGA

o   Darvall Park, Ryde

o   Cumberland State Forest, West Pennant Hills

## Species Richness

| | |
|---|---|
| Number of sites | 35 |
| Total native species | 215 |
| Average no. native species per site | 42.6 ±8.2 |

## Variations and Dynamics

Variation in the floristic composition of this map unit can be expected with changes in topographic position, elevation, depth of shale soil, distance from sandstone bedrock and disturbance (Ku-ring-gai Council 2011, Tozer 2003). Some of these topographic variations have been delineated separately or may be identified from local studies (Ku-ring-gai Council 2011).

## Relationship to Other Communities

Floristically the community is closely related to S_WSF09 which together represent a unique tall eucalypt forest assemblage in the greater Sydney region. It grades into S_WSF09 as mean annual rainfall falls below 1000 millimetres per annum at which point the degree of sheltering determines the presence of Blue Gum High Forest. It will also grade toward S_WSF02 where the depth of the shale decreases near or on the sandstone boundary.

## Accuracy

Sampling density is high. Map unit boundaries were based on the interpretation of digital imagery, sample sites and selected field traverses.

A 0.04 hectare site located in this map unit is expected to contain at least 22 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 34 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia decurrens* | 2 | 20% | 2 | 5% | Positive diagnostic |
| *Acacia falcata* | 2 | 11% | 1 | 3% | Uninformative |
| *Acacia floribunda* | 1 | 29% | 2 | 3% | Positive diagnostic |
| *Acacia implexa* | 1 | 34% | 1 | 4% | Positive diagnostic |
| *Acacia parramattensis* | 1 | 40% | 1 | 4% | Positive diagnostic |
| *Acmena smithii* | 1 | 14% | 2 | 6% | Uninformative |
| *Adiantum aethiopicum* | 2 | 51% | 2 | 6% | Positive diagnostic |
| *Allocasuarina torulosa* | 1 | 29% | 2 | 10% | Positive diagnostic |
| *Alphitonia excelsa* | 2 | 14% | 1 | 1% | Uninformative |
| *Angophora floribunda* | 2 | 11% | 2 | 4% | Uninformative |
| *Billardiera scandens* | 1 | 14% | 1 | 37% | Uninformative |
| *Blechnum cartilagineum* | 3 | 20% | 2 | 6% | Uninformative |
| *Breynia oblongifolia* | 2 | 60% | 1 | 16% | Positive diagnostic |
| *Brunoniella australis* | 1 | 17% | 2 | 7% | Uninformative |
| *Bursaria spinosa* | 1 | 14% | 2 | 12% | Uninformative |
| *Callistemon salignus* | 1 | 11% | 1 | 0% | Uninformative |
| *Calochlaena dubia* | 2 | 31% | 2 | 16% | Uninformative |
| *Cayratia clematidea* | 2 | 54% | 2 | 4% | Positive diagnostic |
| *Centella asiatica* | 2 | 34% | 2 | 5% | Positive diagnostic |
| *Cissus antarctica* | 3 | 11% | 2 | 2% | Uninformative |
| *Cissus hypoglauca* | 1 | 11% | 2 | 8% | Uninformative |
| *Clematis aristata* | 2 | 29% | 1 | 7% | Positive diagnostic |
| *Clematis glycinoides* | 2 | 60% | 1 | 5% | Positive diagnostic |
| *Clerodendrum tomentosum* | 1 | 49% | 1 | 5% | Positive diagnostic |
| *Commelina cyanea* | 2 | 29% | 2 | 8% | Positive diagnostic |
| *Cyperus gracilis* | 2 | 14% | 2 | 1% | Uninformative |
| *Cyperus laevis* | 2 | 11% | 2 | 1% | Uninformative |
| *Desmodium rhytidophyllum* | 1 | 14% | 1 | 2% | Uninformative |
| *Desmodium varians* | 1 | 37% | 2 | 8% | Positive diagnostic |
| *Dianella longifolia* | 2 | 11% | 2 | 5% | Uninformative |
| *Dichelachne micrantha* | 1 | 11% | 2 | 9% | Uninformative |
| *Dichondra repens* | 2 | 71% | 2 | 13% | Positive diagnostic |
| *Digitaria parviflora* | 2 | 26% | 2 | 5% | Positive diagnostic |
| *Dodonaea triquetra* | 1 | 17% | 2 | 23% | Uninformative |
| *Doodia aspera* | 2 | 26% | 2 | 3% | Positive diagnostic |
| *Echinopogon caespitosus* | 2 | 34% | 2 | 10% | Positive diagnostic |
| *Echinopogon ovatus* | 2 | 46% | 2 | 5% | Positive diagnostic |
| *Einadia hastata* | 2 | 17% | 1 | 4% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 43% | 1 | 20% | Positive diagnostic |
| *Entolasia marginata* | 2 | 86% | 2 | 21% | Positive diagnostic |
| *Eragrostis leptostachya* | 1 | 11% | 2 | 4% | Uninformative |
| *Eucalyptus paniculata* | 2 | 43% | 2 | 3% | Positive diagnostic |
| *Eucalyptus pilularis* | 3 | 57% | 3 | 13% | Positive diagnostic |
| *Eucalyptus resinifera* subsp. *resinifera* | 1 | 11% | 1 | 5% | Uninformative |
| *Eucalyptus saligna* | 3 | 94% | 2 | 2% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 86% | 2 | 14% | Positive diagnostic |
| *Exocarpos cupressiformis* | 2 | 11% | 1 | 4% | Uninformative |
| *Galium propinquum* | 2 | 11% | 2 | 2% | Uninformative |
| *Geitonoplesium cymosum* | 1 | 20% | 2 | 9% | Uninformative |
| *Geranium homeanum* | 2 | 37% | 2 | 1% | Positive diagnostic |
| *Glochidion ferdinandi* | 2 | 23% | 1 | 13% | Uninformative |
| *Glycine clandestina* | 1 | 37% | 2 | 18% | Constant |
| *Glycine microphylla* | 2 | 51% | 2 | 8% | Positive diagnostic |
| *Glycine tabacina* | 2 | 34% | 2 | 8% | Positive diagnostic |
| *Gonocarpus tetragynus* | 1 | 14% | 2 | 8% | Uninformative |
| *Hardenbergia violacea* | 1 | 29% | 1 | 16% | Uninformative |
| *Hibbertia aspera* | 2 | 17% | 2 | 11% | Uninformative |
| *Hibbertia dentata* | 2 | 20% | 2 | 8% | Uninformative |
| *Hydrocotyle peduncularis* | 2 | 31% | 2 | 6% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 37% | 2 | 20% | Constant |
| *Indigofera australis* | 1 | 14% | 2 | 2% | Uninformative |
| *Kennedia rubicunda* | 1 | 40% | 1 | 8% | Positive diagnostic |
| *Leucopogon juniperinus* | 2 | 54% | 2 | 10% | Positive diagnostic |
| *Lomandra filiformis* | 1 | 14% | 2 | 23% | Uninformative |
| *Lomandra longifolia* | 2 | 77% | 2 | 46% | Positive diagnostic |
| *Maytenus silvestris* | 1 | 46% | 1 | 2% | Positive diagnostic |
| *Melia azedarach* | 1 | 29% | 1 | 1% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Microlaena stipoides* var. *stipoides* | 2 | 80% | 2 | 35% | Positive diagnostic |
| *Morinda jasminoides* | 3 | 23% | 2 | 6% | Positive diagnostic |
| *Myrsine variabilis* | 2 | 17% | 1 | 8% | Uninformative |
| *Notelaea longifolia* | 1 | 43% | 1 | 21% | Positive diagnostic |
| *Omalanthus nutans* | 1 | 31% | 1 | 9% | Positive diagnostic |
| *Oplismenus aemulus* | 2 | 80% | 2 | 9% | Positive diagnostic |
| *Oplismenus imbecillis* | 2 | 51% | 2 | 12% | Positive diagnostic |
| *Oxalis exilis* | 2 | 11% | 1 | 3% | Uninformative |
| *Oxalis perennans* | 1 | 43% | 2 | 6% | Positive diagnostic |
| *Ozothamnus diosmifolius* | 1 | 54% | 1 | 11% | Positive diagnostic |
| *Pandorea pandorana* | 2 | 80% | 1 | 15% | Positive diagnostic |
| *Passiflora herbertiana* subsp. *herbertiana* | 2 | 17% | 1 | 1% | Uninformative |
| *Persoonia linearis* | 1 | 14% | 1 | 20% | Uninformative |
| *Pittosporum revolutum* | 2 | 57% | 1 | 8% | Positive diagnostic |
| *Pittosporum undulatum* | 2 | 80% | 2 | 24% | Positive diagnostic |
| *Plantago debilis* | 1 | 11% | 2 | 2% | Uninformative |
| *Platylobium formosum* | 2 | 26% | 2 | 8% | Positive diagnostic |
| *Plectranthus parviflorus* | 2 | 23% | 2 | 3% | Positive diagnostic |
| *Poa affinis* | 2 | 69% | 2 | 10% | Positive diagnostic |
| *Polyscias sambucifolia* | 2 | 74% | 1 | 14% | Positive diagnostic |
| *Poranthera microphylla* | 1 | 17% | 2 | 7% | Uninformative |
| *Pratia purpurascens* | 2 | 57% | 2 | 17% | Positive diagnostic |
| *Pseuderanthemum variabile* | 2 | 77% | 2 | 11% | Positive diagnostic |
| *Pteridium esculentum* | 2 | 37% | 2 | 40% | Constant |
| *Rubus parvifolius* | 2 | 31% | 2 | 1% | Positive diagnostic |
| *Rumex brownii* | 1 | 17% | 1 | 1% | Uninformative |
| *Sarcopetalum harveyanum* | 1 | 29% | 1 | 4% | Positive diagnostic |
| *Senecio hispidulus* | 2 | 11% | 1 | 2% | Uninformative |
| *Sigesbeckia orientalis* subsp. *orientalis* | 2 | 60% | 1 | 2% | Positive diagnostic |
| *Smilax glyciphylla* | 1 | 20% | 2 | 33% | Uninformative |
| *Solanum prinophyllum* | 1 | 37% | 2 | 5% | Positive diagnostic |
| *Stephania japonica* | 1 | 20% | 1 | 6% | Positive diagnostic |
| *Syncarpia glomulifera* | 3 | 37% | 3 | 13% | Positive diagnostic |
| *Themeda australis* | 2 | 14% | 2 | 23% | Uninformative |
| *Trema tomentosa* var. *aspera* | 2 | 40% | 1 | 2% | Positive diagnostic |
| *Tylophora barbata* | 2 | 63% | 2 | 4% | Positive diagnostic |
| *Veronica plebeia* | 1 | 37% | 1 | 7% | Positive diagnostic |
| *Wahlenbergia gracilis* | 2 | 11% | 1 | 8% | Uninformative |
| *Zieria smithii* | 2 | 17% | 1 | 5% | Uninformative |

# COASTAL ENRICHED SANDSTONE MOIST FOREST

## S_WSF02

**Statewide Class**    North Coast Wet Sclerophyll Forests

NSW Plant Community Type:     1841
Biometric Number(s):     ME59
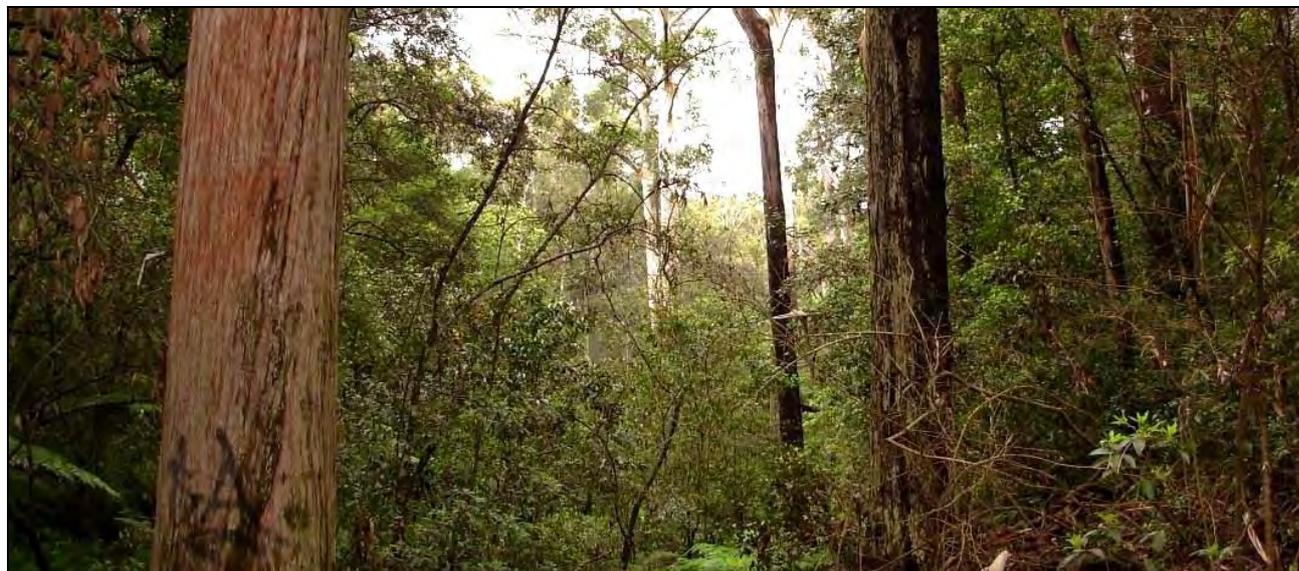


## Description

Coastal Enriched Sandstone Moist Forest is a tall open eucalypt forest with a distinctive mesic shrub and small tree layer. The canopy may be dominated by various combinations of eucalypts although smooth-barked apple (*Angophora costata*) is invariably present. On the north shore and inner harbours turpentine (*Syncarpia glomulifera*), blackbutt (*Eucalyptus pilularis*) and Sydney blue gum (*Eucalyptus saligna*) are dominant trees while on the Warringah and Pittwater escarpments bangalay (*Eucalyptus botryoides*) and mahoganies (*Eucalyptus umbra/scias*) are more prevalent. Elsewhere, Sydney peppermint (*Eucalyptus piperita*) may dominate. A tall stand of forest oak (*Allocasuarina torulosa*) is often present below the eucalypt canopy. Tall small trees tend to be rainforest plants such as coachwood (*Ceratopetalum apetalum)*, blueberry ash (*Elaeocarpus reticulatus)* and occasionally cabbage tree palms (*Livistona australis*). The forest floor is covered by a sparse to dense cover of ferns and twiners.

The distribution of this forest is widespread though patchy across the Sydney area. Typically it is situated in sandstone gullies and sheltered slopes enriched by clay material. This material is sourced from shale bands in the sandstone bedrock associated with Narrabeen sandstone on the Pittwater escarpment or Hawkesbury sandstone in the Lane Cove River valley. At other places the material is sourced from shale caps situated on ridgelines above the creek. Outcropping rocks and benches are common. It occurs at elevations between 10 and 120 metres above sea level and mean annual rainfall of 850-1250 millimetres per annum. A small disjunct location occurs in a shale-enriched gully near Campbelltown.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 25 m ±6<br>15-35 | 34% ±15<br>10-65 | *Angophora costata, Syncarpia glomulifera, Eucalyptus piperita, Eucalyptus pilularis, Eucalyptus saligna, Eucalyptus botryoides* |
| Small Trees | 10 m ±5<br>4-20 | 30% ±21<br>2-80 | *Elaeocarpus reticulatus, Pittosporum undulatum, Ceratopetalum apetalum, Allocasuarina torulosa, Glochidion ferdinandi* |
| Shrubs | 4.1 m ±2.9<br>1.0-10.0 | 25% ±18<br>3-80 | *Notelaea longifolia, Pittosporum undulatum, Dodonaea triquetra, Leucopogon lanceolatus* var. *lanceolatus, Polyscias sambucifolia, Pittosporum revolutum, Breynia oblongifolia, Myrsine variabilis* |
| Ground Covers | 1.3 m ±0.7<br>0.3-3.0 | 28% ±20<br>5-75 | *Dianella caerulea, Lomandra longifolia, Calochlaena dubia, Entolasia stricta, Pteridium esculentum, Poa affinis, Pseuderanthemum variabile, Lepidosperma laterale, Microlaena stipoides* var. *stipoides, Entolasia marginata, Gonocarpus teucrioides,* |
| Vines & Climbers | N/A | N/A | *Smilax glyciphylla, Pandorea pandorana, Eustrephus latifolius, Hibbertia dentata, Billardiera scandens, Cissus hypoglauca* |

*Compiled from 25 sites with structural data recorded.

## Threats

It is unlikely that extensive areas of this community have been lost to clearing as it persists in environments unsuitable for urban or agricultural development. However, the threats from weed infestation, particularly from lantana (*Lantana camara*) are high given prevailing moisture and soil enrichment. Frequent fire may present localised threats.

## Conservation Status

The study area encompasses the majority of the distribution of the community in the region. The community is present in Lane Cove, Ku-ring-gai Chase, Royal and Sydney Harbour national parks.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 337 +1.8 hectares<br>31% of extant area | Not available |
| Total reserved | 741 +4.7 hectares<br>68% of extant area | Not available |
| Total non-reserved | 343 +47.5 hectares | Not available |
| Total extant | 1084 hectares | Not available |



| | |
|---|---|
| Map unit | (yellow) |
| Study area | (red outline) |
| Extant vegetation | (green) |
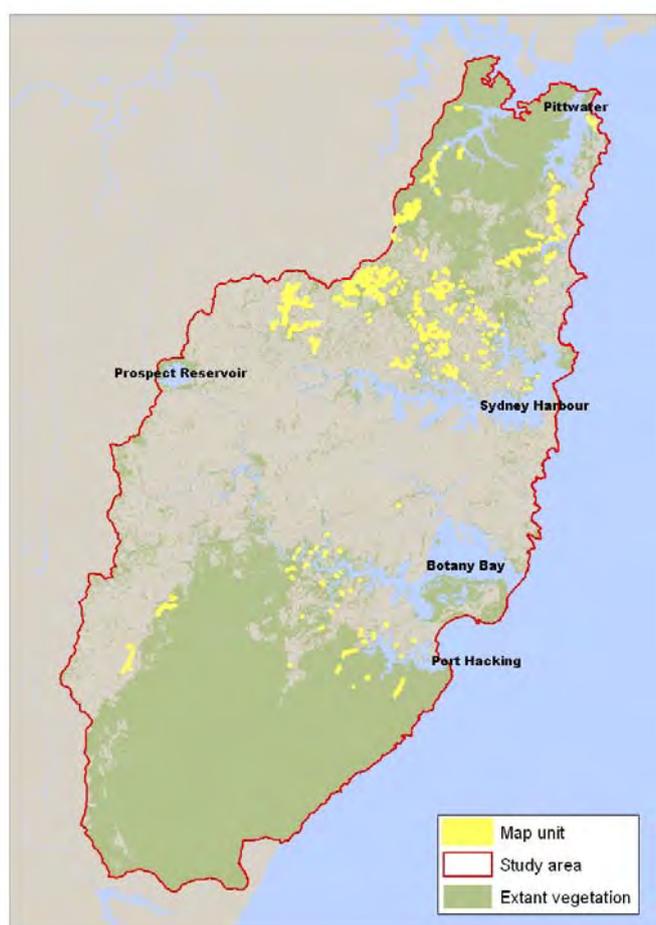
## Example Locations

o    Pennant Hills Park, Beecroft, Hornsby LGA

o    Excelsior Park, North Rocks, Baulkham Hills LGA

o    Warriewood escarpment, Pittwater LGA

o    Myrtle Creek, Minto, Campbelltown LGA

## Species Richness

| | |
|---|---|
| Number of sites | 81 |
| Total native species | 436 |
| Average no. native species per site | 41.5 ±9 |

## Variations and Dynamics

Structural and floristic variations occur across the Sydney area. Variations in dominant eucalypt species are to be expected depending on location. Variations in the composition of some mesic species also occur as a result of variation in annual rainfall. For example *Livistona australis* is more common in low elevation coastal habitats while *Backhousia myrtifolia* occurs in lower rainfall zones. In protected sites the forest tends to be taller, while at sites exposed to ocean breezes the canopy is lower.

## Relationship to Other Communities

This forest shares many species with other wet sclerophyll forests found on Narrabeen and Hawkesbury sandstones including S_DSF06, S_WSF05 and S_WSF04. The forest grades into rainforests in more protected situations (S_RF07, S_RF02). Importantly it may also grade into shale wet forests such as S_WSF09 or S_WSF01, which are both listed under the NSW TSC Act.

## Accuracy

Sampling density is high. Map unit boundaries were determined on the interpretation of eucalypt forests with a moist understorey found on sandstone. The mapping may misclassify some areas that include a stronger shale influence in the composition of the understorey. These may be representative of the Sydney Turpentine Ironbark Forest Endangered Ecological Community.

A 0.04 hectare site located in this map unit is expected to contain at least 17 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 33 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| Acacia linifolia | 2 | 12% | 2 | 20% | Uninformative |
| Acacia terminalis | 1 | 12% | 1 | 20% | Uninformative |
| Acacia ulicifolia | 2 | 21% | 1 | 26% | Uninformative |
| Acmena smithii | 1 | 19% | 2 | 5% | Positive diagnostic |
| Acrotriche divaricata | 2 | 15% | 1 | 2% | Positive diagnostic |
| Adiantum aethiopicum | 2 | 25% | 2 | 6% | Positive diagnostic |
| Allocasuarina littoralis | 2 | 16% | 2 | 27% | Uninformative |
| Allocasuarina torulosa | 3 | 58% | 2 | 8% | Positive diagnostic |
| Angophora costata | 3 | 73% | 3 | 36% | Positive diagnostic |
| Asplenium flabellifolium | 2 | 15% | 1 | 3% | Positive diagnostic |
| Asterolasia correifolia | 2 | 7% | 2 | 0% | Positive diagnostic |
| Astrotricha floccosa | 2 | 16% | 2 | 2% | Positive diagnostic |
| Astrotricha latifolia | 2 | 9% | 1 | 1% | Positive diagnostic |
| Backhousia myrtifolia | 4 | 9% | 2 | 2% | Positive diagnostic |
| Banksia integrifolia | 1 | 12% | 2 | 9% | Uninformative |
| Banksia serrata | 1 | 16% | 2 | 34% | Uninformative |
| Banksia spinulosa | 1 | 12% | 2 | 27% | Uninformative |
| Billardiera scandens | 1 | 48% | 1 | 36% | Constant |
| Blechnum ambiguum | 1 | 7% | 1 | 0% | Positive diagnostic |
| Blechnum cartilagineum | 2 | 44% | 2 | 5% | Positive diagnostic |
| Breynia oblongifolia | 1 | 42% | 1 | 16% | Positive diagnostic |
| Callicoma serratifolia | 2 | 25% | 2 | 4% | Positive diagnostic |
| Calochlaena dubia | 3 | 77% | 2 | 14% | Positive diagnostic |
| Cassytha pubescens | 2 | 26% | 2 | 27% | Uninformative |
| Ceratopetalum apetalum | 2 | 31% | 3 | 4% | Positive diagnostic |
| Ceratopetalum gummiferum | 2 | 44% | 2 | 16% | Positive diagnostic |
| Cissus hypoglauca | 2 | 42% | 2 | 7% | Positive diagnostic |
| Clematis aristata | 1 | 16% | 1 | 7% | Uninformative |
| Clematis glycinoides | 1 | 19% | 2 | 6% | Positive diagnostic |
| Clerodendrum tomentosum | 1 | 22% | 1 | 5% | Positive diagnostic |
| Coronidium elatum | 2 | 10% | 1 | 1% | Positive diagnostic |
| Correa reflexa | 2 | 20% | 1 | 4% | Positive diagnostic |
| Dianella caerulea | 2 | 93% | 2 | 43% | Positive diagnostic |
| Dichondra repens | 2 | 12% | 2 | 14% | Uninformative |
| Dodonaea triquetra | 2 | 40% | 2 | 22% | Positive diagnostic |
| Elaeocarpus reticulatus | 2 | 67% | 1 | 19% | Positive diagnostic |
| Endiandra sieberi | 1 | 14% | 1 | 1% | Positive diagnostic |
| Entolasia marginata | 2 | 23% | 2 | 22% | Uninformative |
| Entolasia stricta | 2 | 77% | 2 | 58% | Positive diagnostic |
| Eucalyptus botryoides | 2 | 14% | 3 | 5% | Positive diagnostic |
| Eucalyptus pilularis | 3 | 41% | 3 | 13% | Positive diagnostic |
| Eucalyptus piperita | 3 | 35% | 3 | 19% | Positive diagnostic |
| Eucalyptus punctata | 3 | 12% | 2 | 11% | Uninformative |
| Eustrephus latifolius | 2 | 59% | 2 | 14% | Positive diagnostic |
| Galium binifolium | 2 | 9% | 1 | 2% | Positive diagnostic |
| Geitonoplesium cymosum | 2 | 15% | 2 | 9% | Uninformative |
| Glochidion ferdinandi | 1 | 26% | 2 | 13% | Positive diagnostic |
| Glycine clandestina | 2 | 22% | 2 | 18% | Uninformative |
| Gonocarpus teucrioides | 2 | 35% | 2 | 23% | Uninformative |
| Grevillea linearifolia | 2 | 16% | 2 | 7% | Uninformative |
| Hardenbergia violacea | 2 | 15% | 1 | 16% | Uninformative |
| Hibbertia dentata | 2 | 48% | 2 | 7% | Positive diagnostic |
| Hibbertia scandens | 1 | 12% | 2 | 7% | Uninformative |
| Imperata cylindrica var. major | 2 | 32% | 2 | 20% | Uninformative |
| Kennedia rubicunda | 1 | 27% | 1 | 8% | Positive diagnostic |
| Lasiopetalum ferrugineum | 2 | 11% | 2 | 11% | Uninformative |
| Lepidosperma elatius | 1 | 6% | 2 | 1% | Positive diagnostic |
| Lepidosperma laterale | 2 | 51% | 2 | 42% | Constant |
| Leptospermum polygalifolium | 1 | 21% | 2 | 14% | Uninformative |
| Leucopogon juniperinus | 1 | 12% | 2 | 10% | Uninformative |
| Leucopogon lanceolatus | 1 | 52% | 1 | 7% | Positive diagnostic |
| Livistona australis | 2 | 35% | 2 | 9% | Positive diagnostic |
| Lomandra filiformis | 1 | 20% | 2 | 23% | Uninformative |
| Lomandra longifolia | 2 | 91% | 2 | 45% | Positive diagnostic |
| Lomatia silaifolia | 1 | 21% | 1 | 28% | Uninformative |
| Marsdenia suaveolens | 1 | 15% | 1 | 3% | Positive diagnostic |
| Maytenus silvestris | 1 | 14% | 1 | 2% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Microlaena stipoides* var. *stipoides* | 2 | 42% | 2 | 35% | Constant |
| *Morinda jasminoides* | 2 | 28% | 2 | 6% | Positive diagnostic |
| *Myrsine variabilis* | 2 | 48% | 1 | 7% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 65% | 1 | 20% | Positive diagnostic |
| *Omalanthus nutans* | 2 | 14% | 1 | 9% | Uninformative |
| *Opercularia aspera* | 2 | 20% | 1 | 7% | Positive diagnostic |
| *Oplismenus aemulus* | 2 | 20% | 2 | 9% | Uninformative |
| *Oplismenus imbecillis* | 2 | 30% | 2 | 12% | Positive diagnostic |
| *Ozothamnus diosmifolius* | 1 | 16% | 1 | 11% | Uninformative |
| *Pandorea pandorana* | 2 | 60% | 2 | 15% | Positive diagnostic |
| *Parsonsia straminea* | 1 | 11% | 1 | 4% | Uninformative |
| *Patersonia glabrata* | 1 | 11% | 2 | 16% | Uninformative |
| *Persoonia levis* | 1 | 12% | 1 | 34% | Uninformative |
| *Persoonia linearis* | 1 | 41% | 1 | 19% | Positive diagnostic |
| *Persoonia pinifolia* | 1 | 12% | 1 | 21% | Uninformative |
| *Phyllanthus hirtellus* | 1 | 16% | 2 | 28% | Uninformative |
| *Pittosporum revolutum* | 2 | 33% | 1 | 8% | Positive diagnostic |
| *Pittosporum undulatum* | 2 | 51% | 2 | 24% | Positive diagnostic |
| *Platylobium formosum* | 2 | 23% | 2 | 8% | Positive diagnostic |
| *Platysace lanceolata* | 2 | 23% | 2 | 8% | Positive diagnostic |
| *Poa affinis* | 2 | 43% | 2 | 10% | Positive diagnostic |
| *Podocarpus spinulosus* | 2 | 10% | 2 | 2% | Positive diagnostic |
| *Polyscias sambucifolia* | 1 | 27% | 1 | 14% | Uninformative |
| *Pomax umbellata* | 2 | 19% | 2 | 15% | Uninformative |
| *Poranthera microphylla* | 2 | 14% | 2 | 7% | Uninformative |
| *Pratia purpurascens* | 1 | 19% | 2 | 18% | Uninformative |
| *Pseuderanthemum variabile* | 2 | 43% | 2 | 11% | Positive diagnostic |
| *Pteridium esculentum* | 2 | 70% | 2 | 39% | Positive diagnostic |
| *Pultenaea daphnoides* | 1 | 19% | 2 | 8% | Positive diagnostic |
| *Pultenaea flexilis* | 2 | 25% | 2 | 5% | Positive diagnostic |
| *Pyrrosia rupestris* | 2 | 7% | 2 | 1% | Positive diagnostic |
| *Sarcopetalum harveyanum* | 1 | 15% | 1 | 4% | Positive diagnostic |
| *Schizomeria ovata* | 3 | 7% | 1 | 1% | Positive diagnostic |
| *Schoenus melanostachys* | 1 | 12% | 2 | 6% | Uninformative |
| *Smilax australis* | 2 | 11% | 1 | 3% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 81% | 2 | 31% | Positive diagnostic |
| *Stylidium laricifolium* | 2 | 7% | 1 | 1% | Positive diagnostic |
| *Stylidium productum* | 2 | 11% | 2 | 5% | Uninformative |
| *Syncarpia glomulifera* | 3 | 52% | 2 | 12% | Positive diagnostic |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 30% | 2 | 5% | Positive diagnostic |
| *Todea barbara* | 1 | 11% | 2 | 1% | Positive diagnostic |
| *Trema tomentosa* var. *aspera* | 1 | 10% | 1 | 2% | Positive diagnostic |
| *Tristaniopsis collina* | 2 | 10% | 2 | 1% | Positive diagnostic |
| *Trochocarpa laurina* | 1 | 7% | 1 | 1% | Positive diagnostic |
| *Tylophora barbata* | 1 | 17% | 2 | 4% | Positive diagnostic |
| *Xanthorrhoea arborea* | 2 | 31% | 2 | 11% | Positive diagnostic |
| *Xanthosia pilosa* | 1 | 23% | 2 | 20% | Uninformative |
| *Zieria pilosa* | 2 | 15% | 2 | 5% | Positive diagnostic |
| *Zieria smithii* | 1 | 23% | 1 | 5% | Positive diagnostic |

# COASTAL SAND LITTORAL FOREST

**Statewide Class** North Coast Wet Sclerophyll Forests

NSW Plant Community Type: 1536: Bangalay-Smooth-barked Apple-Swamp Mahogany Low Open Forest of Southern Sydney, Sydney Basin Bioregion

Biometric Number(s): HU750; ME056



## Description

Coastal Sand Littoral Forest comprises a forest and woodland community with a prominent component of littoral rainforest species amongst the shrub and small tree layer. An open cover of tuckeroo (*Cupaniopsis anacardioides*) and other waxy-leaved species occur below a canopy of banksia, casuarina and/or eucalypt trees. A high diversity of vines are found across multiple layers of the vegetation. The woody vine cockspur thorn (*Maclura cochinchinensis*), identifiable by its long spikes, is a useful diagnostic species for the community. Habitat and disturbance are both very influential in the structure and composition of the community at any given location. It is restricted to coastal sand deposits receiving greater than 1050 millimeters of mean annual rainfall. The most extensive areas remain on the older low-lying (c. 1.5-10 metres above sea level) transgressive barrier dunes along the northern side of the Kurnell Peninsula. On the drier siliceous sands the forest forms a eucalypt-dominated forest comprising bangalay (*Eucalyptus botryoides*) and/or swamp mahogany (*Eucalyptus robusta*) with a grassy and ferny ground cover. On the humic podsols associated with poorly drained areas eucalypts are less prominent and instead tall coast banksia (*Banksia integrifolia*) and swamp oak (*Casuarina glauca*) dominate above a ground cover of sedges thriving amongst the waterlogged soils. Above 10 metres above sea level this community is increasingly restricted to sheltered situations. Eucalypts may once have consistently dominated, however today lower-growing banksia scrubs are more common. Similar forests occur on the sand deposits on the New South Wales Central Coast.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 15 m ±4<br>9-20 | 29% ±17<br>3-60 | *Banksia integrifolia, Eucalyptus robusta, Eucalyptus botryoides, Casuarina glauca* |
| Small Trees | 6 m ±3<br>3-10 | 24% ±18<br>5-60 | *Cupaniopsis anacardioides, Banksia integrifolia, Pittosporum undulatum, Glochidion ferdinandi, Casuarina glauca, Leptospermum laevigatum* |
| Shrubs | 3.1 m ±1.4<br>1.5-5.0 | 20% ±23<br>5-60 | *Breynia oblongifolia, Monotoca elliptica, Notelaea longifolia, Imperata cylindrical* var. *major, Clerodendrum tomentosum* |
| Ground Covers | 0.8 m ±0.6<br>0.2-2.0 | 43% ±18<br>15-80 | *Lomandra longifolia, Pteridium esculentum, Commelina cyanea, Oplismenus imbecillis* |
| Vines & Climbers | N/A | N/A | *Geitonoplesium cymosum, Stephania japonica, Maclura cochinchinensis, Hibbertia scandens, Eustrephus latifolius* |

*Compiled from 9 sites with structural data recorded.

## Threats

Widespread and intensive disturbance arising from sand mining and industrial and urban development has resulted in extensive loss of this community. In many instances the original topography of the landscape has irreversibly changed with the loss and migration of sand dunes. Extant areas are often in dynamic stages of succession and heavily cloaked in invasive weeds such as lantana (*Lantana camara*) and bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*).

## Conservation Status

Coastal Sand Littoral Forest is a component of Kurnell Dune Forest in the Sutherland Shire and the City of Rockdale, an Endangered Ecological Community under the NSW TSC Act. A significant proportion of the remaining area occurs within Towra Point NR.

|  | **Within Study Area** | **Within Sydney Basin** |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 44.4 +9.7 hectares 52% of extant area | Not available |
| Total reserved | 47.4 +9.7 hectares 55% of extant area | Not available |
| Total non-reserved | 38.5 +4.6 hectares | Not available |
| Total extant | 85.9 hectares | Not available |



## Example Locations

o Central ridge of Towra Point NR, Kurnell (permission required for access)

o Charlotte Breen Memorial Park, Kurnell (highly disturbed example)

## Species Richness

| | |
|---|---|
| Number of sites | 20 |
| Total native species | 103 |
| Average no. native species per site | 23.1 ±4.4 |

## Variations and Dynamics

Variations are present across the distribution of this community. Eucalypt-dominated forests are prominent on low-lying sand flats while taller dunes tend to be mixed scrubs of banksia and tea-tree. Poorly drained sites on flats support a high proportion of swamp oak.

## Relationship to Other Communities

This community shares many species with Coastal Dune Littoral Rainforest (S_RF06) and Coastal Sand Tea-tree-Banksia Scrub (S_HL02). The community grades toward swamp forests (S_FoW04, S_FoW03) on poorly drained low-lying areas. On higher dunes in more exposed situations the forest will grade into S_DSF21 or S_DSF02.

## Accuracy

Sampling density is high. Map unit boundaries are drawn from the interpretation of digital imagery to identify mesic-influenced vegetation on coastal sand deposits. Disturbance patterns visible on aerial photography may mask the presence of this community in some instances.

A 0.04 hectare site located in this map unit is expected to contain at least 11 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 17 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 1 | 50% | 2 | 21% | Positive diagnostic |
| *Acacia maidenii* | 1 | 15% | 1 | 1% | Uninformative |
| *Acacia melanoxylon* | 2 | 10% | 1 | 0% | Uninformative |
| *Acmena smithii* | 2 | 20% | 2 | 6% | Uninformative |
| *Acronychia oblongifolia* | 2 | 10% | 1 | 0% | Uninformative |
| *Allocasuarina littoralis* | 1 | 15% | 2 | 27% | Uninformative |
| *Banksia integrifolia* | 2 | 100% | 2 | 9% | Positive diagnostic |
| *Banksia serrata* | 2 | 15% | 2 | 33% | Uninformative |
| *Baumea juncea* | 2 | 35% | 2 | 4% | Positive diagnostic |
| *Breynia oblongifolia* | 2 | 90% | 1 | 16% | Positive diagnostic |
| *Cassytha pubescens* | 1 | 10% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 2 | 55% | 2 | 6% | Positive diagnostic |
| *Cayratia clematidea* | 2 | 40% | 2 | 4% | Positive diagnostic |
| *Cissus antarctica* | 2 | 10% | 2 | 2% | Uninformative |
| *Clematis aristata* | 1 | 15% | 1 | 7% | Uninformative |
| *Clematis glycinoides* | 2 | 35% | 2 | 6% | Positive diagnostic |
| *Clerodendrum tomentosum* | 1 | 30% | 1 | 5% | Positive diagnostic |
| *Commelina cyanea* | 2 | 55% | 2 | 8% | Positive diagnostic |
| *Cupaniopsis anacardioides* | 2 | 90% | 1 | 1% | Positive diagnostic |
| *Desmodium varians* | 2 | 15% | 2 | 8% | Uninformative |
| *Dianella revoluta* | 1 | 15% | 2 | 17% | Uninformative |
| *Dichondra repens* | 2 | 15% | 2 | 14% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 10% | 1 | 21% | Uninformative |
| *Entolasia marginata* | 1 | 20% | 2 | 22% | Uninformative |
| *Eucalyptus botryoides* | 2 | 25% | 3 | 5% | Positive diagnostic |
| *Eucalyptus robusta* | 4 | 30% | 3 | 1% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 45% | 2 | 15% | Positive diagnostic |
| *Ficus rubiginosa* | 1 | 10% | 1 | 4% | Uninformative |
| *Geitonoplesium cymosum* | 3 | 90% | 2 | 8% | Positive diagnostic |
| *Glochidion ferdinandi* | 2 | 70% | 1 | 13% | Positive diagnostic |
| *Glycine clandestina* | 2 | 10% | 2 | 18% | Uninformative |
| *Hibbertia scandens* | 2 | 45% | 2 | 6% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 55% | 2 | 20% | Positive diagnostic |
| *Ipomoea brasiliensis* | 2 | 15% | 0 | 0% | Uninformative |
| *Leptospermum laevigatum* | 3 | 30% | 2 | 5% | Positive diagnostic |
| *Leucopogon parviflorus* | 2 | 15% | 1 | 1% | Uninformative |
| *Lomandra longifolia* | 2 | 70% | 2 | 46% | Constant |
| *Maclura cochinchinensis* | 2 | 55% | 2 | 0% | Positive diagnostic |
| *Macrozamia spiralis* | 2 | 10% | 1 | 1% | Uninformative |
| *Marsdenia rostrata* | 1 | 15% | 1 | 1% | Uninformative |
| *Melaleuca nodosa* | 3 | 10% | 2 | 5% | Uninformative |
| *Monotoca elliptica* | 1 | 70% | 2 | 6% | Positive diagnostic |
| *Myoporum acuminatum* | 1 | 10% | 2 | 0% | Uninformative |
| *Myrsine variabilis* | 1 | 30% | 1 | 8% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 70% | 1 | 21% | Positive diagnostic |
| *Omalanthus nutans* | 2 | 40% | 1 | 9% | Positive diagnostic |
| *Oplismenus aemulus* | 2 | 10% | 2 | 10% | Uninformative |
| *Oplismenus imbecillis* | 2 | 55% | 2 | 12% | Positive diagnostic |
| *Parsonsia straminea* | 2 | 35% | 1 | 4% | Positive diagnostic |
| *Pellaea falcata* | 2 | 10% | 1 | 2% | Uninformative |
| *Pimelea linifolia* | 1 | 10% | 2 | 27% | Uninformative |
| *Pittosporum revolutum* | 2 | 40% | 1 | 9% | Positive diagnostic |
| *Pittosporum undulatum* | 2 | 55% | 2 | 25% | Positive diagnostic |
| *Poa affinis* | 2 | 15% | 2 | 11% | Uninformative |
| *Pteridium esculentum* | 2 | 75% | 2 | 40% | Positive diagnostic |
| *Rhagodia candolleana* subsp. *candolleana* | 2 | 10% | 2 | 0% | Uninformative |
| *Sarcopetalum harveyanum* | 3 | 10% | 1 | 4% | Uninformative |
| *Schoenus melanostachys* | 2 | 10% | 2 | 6% | Uninformative |
| *Smilax glyciphylla* | 2 | 15% | 2 | 33% | Uninformative |
| *Spinifex sericeus* | 2 | 10% | 2 | 1% | Uninformative |
| *Stephania japonica* | 2 | 55% | 1 | 5% | Positive diagnostic |
| *Tetragonia tetragonioides* | 2 | 20% | 2 | 2% | Positive diagnostic |

# ILLAWARRA ESCARPMENT BANGALAY-BANKSIA FOREST        S_WSF04

Statewide Class                     North Coast Wet Sclerophyll Forests
NSW Plant Community Type:           694: Blackbutt-Turpentine-Bangalay Moist Open Forest on Sheltered Slopes and
                                    Gullies, Southern Sydney Basin
Biometric Number(s):                ME030; SR516



## Description

Illawarra Escarpment Bangalay-Banksia Forest (NPWS 2002c) represents a structural variant of the tall Illawarra escarpment forests described in regional vegetation classifications covering the Illawarra and southern Sydney area. South from Garie in Royal NP, the coastal escarpment reveals the underlying Narrabeen claystones beneath the Hawkesbury sandstone plateau. The escarpment here is exposed to the open ocean and the full force of the prevailing southerly winds. A stunted sometimes gnarled open forest occurs on these clayey soils. Low-growing bangalay (*Eucalyptus botryoides*) and coast banksia (*Banksia integrifolia*) mix with turpentine (*Syncarpia glomulifera*) and smooth-barked apple (*Angophora costata*). The latter appears to decrease in frequency as the influence of the sandstone talus from the eroding clifflines diminishes. The understorey retains a moist open shrub and small tree layer that closely resembles the taller forests found along the Hacking River and Illawarra escarpment. This mix of rainforest species is retained by a combination of the fertile soils and very high mean annual rainfall. Most locations are close to the open ocean extending from sea level to the top of the escarpment at elevations around 250 metres above sea level. The community extends southward along the escarpment to Austinmer (NPWS 2002c). The community can be considered to form part of the broader forest community Illawarra Gully Wet Forest (Tozer et al. 2010).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 12 m ±7<br>5-27 | 56% ±15<br>35-80 | *Banksia integrifolia, Eucalyptus botryoides, Angophora costata, Syncarpia glomulifera* |
| Shrubs | 3.6 m ±1.9<br>2.0-7.0 | 25% ±13<br>5-40 | *Breynia oblongifolia, Acmena smithii, Livistona australis, Myrsine variabilis, Leptospermum laevigatum, Pittosporum undulatum* |
| Ground Covers | 1.1 m ±0.4<br>0.8-2.0 | 64% ±32<br>15-95 | *Lomandra longifolia, Pteridium esculentum, Oplismenus imbecillis, Commelina cyanea, Dichondra repens, Imperata cylindrica* var. *major, Pseuderanthemum variable, Adiantum aethiopicum, Poa labillardierei, Viola hederacea, Entolasia marginata, Gahnia melanocarpa, Plectranthus parviflorus* |
| Vines & Climbers | N/A | N/A | *Hibbertia scandens, Glycine clandestina, Eustrephus latifolius, Geitonoplesium cymosum, Kennedia rubicunda, Hibbertia dentata, Stephania japonica* var. *discolour, Tylophora barbata* |

*Compiled from 8 sites with structural data recorded.

## Threats

Within the Sydney area the primary distribution of this community is within the boundaries of Royal NP. Small areas were cleared for shacks during the Depression in the 1930s. Local weed infestations persist around these areas of human habitation. Trampling and grazing by feral deer imposes local impacts, particularly where remnants remain close to open grassy areas. Outside of the study area around 40 per cent of the remaining stands are heavily disturbed (NPWS 2002c).

## Conservation Status

Much of the extant area within the study area is conserved within Royal NP.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 10,140-14,200 hectares |
| Estimated percentage cleared | Not available | 30-50 % |
| Total NPWS reserves | 231 +6.3 hectares<br>91% of extant area | 1900 hectares<br>25-30% of extant area<br>5-20% of pre-clearing area |
| Total reserved | 231 +6.3 hectares<br>91% of extant area | Not available |
| Total non-reserved | 24.0 +6.8 hectares | Not available |
| Total extant | 255 hectares | 7100 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o   Werrong Track, Royal NP

## Species Richness

| Number of sites | 7 |
|---|---|
| Total native species | 136 |
| Average no. native species per site | 41.4 ±5.4 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

As exposure to strong winds and open environments decreases this forest becomes taller before grading into Illawarra Escarpment Blackbutt Forest (S_WSF05). More protected situations develop Coastal Headland Littoral Thicket (S_RF08).

This community forms a component of the coastal moist forests and rainforests in the study area. Together with Illawarra Escarpment Blackbutt Forest (S_WSF05) this assemblage describes the Illawarra Gully Wet Forests of Tozer et al. (2010).

## Accuracy

Sampling density is moderate. Mapping boundaries are based on the interpretation of mixed eucalypt and banksia cover of lower height situated on exposed ocean facing slopes on Narrabeen shales and sandstone

A 0.04 hectare site located in this map unit is expected to contain at least 16 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 33 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia binervata* | 1 | 14% | 2 | 2% | Uninformative |
| *Acacia implexa* | 2 | 29% | 1 | 5% | Uninformative |
| *Acacia longifolia* | 3 | 14% | 2 | 21% | Uninformative |
| *Acacia maidenii* | 3 | 14% | 1 | 1% | Uninformative |
| *Acacia melanoxylon* | 1 | 29% | 1 | 0% | Positive diagnostic |
| *Acmena smithii* | 2 | 29% | 2 | 6% | Uninformative |
| *Acronychia oblongifolia* | 1 | 14% | 2 | 0% | Uninformative |
| *Adiantum aethiopicum* | 2 | 14% | 2 | 7% | Uninformative |
| *Adiantum formosum* | 2 | 14% | 2 | 1% | Uninformative |
| *Adiantum hispidulum* | 1 | 14% | 1 | 1% | Uninformative |
| *Allocasuarina distyla* | 1 | 14% | 2 | 11% | Uninformative |
| *Arthropodium milleflorum* | 1 | 14% | 2 | 3% | Uninformative |
| *Asplenium flabellifolium* | 2 | 14% | 1 | 4% | Uninformative |
| *Austrodanthonia racemosa* | 1 | 14% | 2 | 2% | Uninformative |
| *Banksia integrifolia* | 3 | 57% | 1 | 9% | Positive diagnostic |
| *Billardiera scandens* | 1 | 14% | 1 | 37% | Uninformative |
| *Blechnum cartilagineum* | 2 | 14% | 2 | 7% | Uninformative |
| *Brachyscome angustifolia* | 1 | 14% | 2 | 1% | Uninformative |
| *Breynia oblongifolia* | 2 | 71% | 1 | 17% | Positive diagnostic |
| *Calochlaena dubia* | 3 | 14% | 2 | 16% | Uninformative |
| *Carex appressa* | 1 | 14% | 2 | 1% | Uninformative |
| *Cassytha glabella* | 1 | 14% | 2 | 14% | Uninformative |
| *Cayratia clematidea* | 1 | 43% | 2 | 4% | Positive diagnostic |
| *Centella asiatica* | 2 | 29% | 2 | 6% | Uninformative |
| *Cheilanthes sieberi* subsp. *sieberi* | 2 | 14% | 2 | 13% | Uninformative |
| *Chorizandra cymbaria* | 2 | 14% | 2 | 1% | Uninformative |
| *Cissus antarctica* | 1 | 14% | 2 | 2% | Uninformative |
| *Cissus hypoglauca* | 1 | 14% | 2 | 8% | Uninformative |
| *Claoxylon australe* | 1 | 14% | 1 | 1% | Uninformative |
| *Clematis aristata* | 2 | 29% | 1 | 7% | Uninformative |
| *Clematis glycinoides* | 2 | 29% | 2 | 6% | Uninformative |
| *Clerodendrum tomentosum* | 1 | 43% | 1 | 5% | Positive diagnostic |
| *Commelina cyanea* | 2 | 100% | 2 | 8% | Positive diagnostic |
| *Coronidium scorpioides* | 3 | 29% | 1 | 2% | Positive diagnostic |
| *Cryptocarya microneura* | 1 | 14% | 1 | 1% | Uninformative |
| *Cyperus gracilis* | 2 | 14% | 2 | 1% | Uninformative |
| *Desmodium rhytidophyllum* | 1 | 14% | 1 | 2% | Uninformative |
| *Desmodium varians* | 2 | 43% | 2 | 8% | Constant |
| *Dichelachne rara* | 1 | 14% | 2 | 1% | Uninformative |
| *Dichondra repens* | 2 | 71% | 2 | 14% | Positive diagnostic |
| *Diospyros australis* | 2 | 29% | 2 | 1% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 14% | 2 | 23% | Uninformative |
| *Doodia aspera* | 2 | 29% | 2 | 3% | Positive diagnostic |
| *Echinopogon caespitosus* | 1 | 14% | 2 | 11% | Uninformative |
| *Echinopogon ovatus* | 1 | 57% | 2 | 6% | Positive diagnostic |
| *Einadia hastata* | 2 | 29% | 1 | 4% | Uninformative |
| *Elaeodendron australe* | 2 | 14% | 1 | 1% | Uninformative |
| *Entolasia marginata* | 2 | 43% | 2 | 22% | Constant |
| *Entolasia stricta* | 2 | 71% | 2 | 59% | Constant |
| *Eucalyptus botryoides* | 3 | 100% | 3 | 5% | Positive diagnostic |
| *Eucalyptus paniculata* | 1 | 14% | 2 | 4% | Uninformative |
| *Eucalyptus pilularis* | 4 | 14% | 3 | 14% | Uninformative |
| *Eucalyptus piperita* | 1 | 14% | 3 | 20% | Uninformative |
| *Eustrephus latifolius* | 2 | 86% | 2 | 15% | Positive diagnostic |
| *Ficus rubiginosa* | 1 | 14% | 1 | 4% | Uninformative |
| *Gahnia erythrocarpa* | 1 | 14% | 1 | 2% | Uninformative |
| *Gahnia melanocarpa* | 2 | 29% | 2 | 3% | Positive diagnostic |
| *Gahnia sieberiana* | 2 | 29% | 2 | 7% | Uninformative |
| *Galium binifolium* | 2 | 14% | 1 | 2% | Uninformative |
| *Galium liratum* | 2 | 14% | 0 | 0% | Uninformative |
| *Galium propinquum* | 1 | 14% | 2 | 2% | Uninformative |
| *Geitonoplesium cymosum* | 2 | 71% | 2 | 9% | Positive diagnostic |
| *Geranium homeanum* | 1 | 14% | 2 | 2% | Uninformative |
| *Geranium solanderi* | 2 | 57% | 1 | 1% | Positive diagnostic |
| *Glycine clandestina* | 2 | 100% | 2 | 18% | Positive diagnostic |
| *Glycine tabacina* | 2 | 14% | 2 | 8% | Uninformative |
| *Gonocarpus tetragynus* | 2 | 14% | 2 | 8% | Uninformative |

*The Native Vegetation of the Sydney Metropolitan Area*

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Goodenia ovata* | 2 | 14% | 1 | 2% | Uninformative |
| *Guioa semiglauca* | 1 | 14% | 1 | 1% | Uninformative |
| *Gymnostachys anceps* | 1 | 14% | 2 | 3% | Uninformative |
| *Hedycarya angustifolia* | 2 | 29% | 1 | 0% | Positive diagnostic |
| *Hibbertia dentata* | 2 | 43% | 2 | 8% | Constant |
| *Hibbertia scandens* | 2 | 100% | 2 | 6% | Positive diagnostic |
| *Hydrocotyle acutiloba* | 2 | 29% | 2 | 1% | Positive diagnostic |
| *Hydrocotyle laxiflora* | 2 | 14% | 2 | 3% | Uninformative |
| *Hydrocotyle tripartita* | 2 | 14% | 1 | 0% | Uninformative |
| *Imperata cylindrica* var. *major* | 3 | 71% | 2 | 20% | Positive diagnostic |
| *Indigofera australis* | 3 | 57% | 2 | 2% | Positive diagnostic |
| *Kennedia rubicunda* | 2 | 43% | 1 | 9% | Constant |
| *Leptospermum laevigatum* | 2 | 29% | 2 | 5% | Uninformative |
| *Leucopogon juniperinus* | 2 | 29% | 2 | 10% | Uninformative |
| *Leucopogon lanceolatus* | 3 | 29% | 1 | 8% | Uninformative |
| *Livistona australis* | 2 | 57% | 2 | 10% | Positive diagnostic |
| *Lomandra glauca* | 1 | 14% | 2 | 16% | Uninformative |
| *Lomandra longifolia* | 2 | 100% | 2 | 47% | Positive diagnostic |
| *Melaleuca hypericifolia* | 2 | 14% | 2 | 1% | Uninformative |
| *Myrsine variabilis* | 3 | 14% | 1 | 8% | Uninformative |
| *Notelaea longifolia* | 2 | 43% | 1 | 21% | Constant |
| *Notelaea venosa* | 1 | 14% | 1 | 1% | Uninformative |
| *Notodanthonia longifolia* | 2 | 14% | 1 | 1% | Uninformative |
| *Oplismenus aemulus* | 2 | 29% | 2 | 10% | Uninformative |
| *Oplismenus imbecillis* | 2 | 71% | 2 | 12% | Positive diagnostic |
| *Oxalis chnoodes* | 2 | 14% | 2 | 1% | Uninformative |
| *Oxalis perennans* | 2 | 14% | 2 | 7% | Uninformative |
| *Ozothamnus diosmifolius* | 1 | 29% | 1 | 12% | Uninformative |
| *Paspalum distichum* | 1 | 14% | 2 | 0% | Uninformative |
| *Pelargonium inodorum* | 1 | 14% | 1 | 1% | Uninformative |
| *Pellaea falcata* | 1 | 43% | 2 | 2% | Positive diagnostic |
| *Persoonia linearis* | 3 | 29% | 1 | 20% | Uninformative |
| *Pimelea ligustrina* | 1 | 14% | 1 | 0% | Uninformative |
| *Pittosporum multiflorum* | 2 | 14% | 2 | 1% | Uninformative |
| *Pittosporum revolutum* | 1 | 14% | 1 | 9% | Uninformative |
| *Plantago debilis* | 2 | 29% | 2 | 2% | Positive diagnostic |
| *Plectranthus parviflorus* | 2 | 71% | 2 | 3% | Positive diagnostic |
| *Poa affinis* | 3 | 14% | 2 | 11% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 4 | 29% | 2 | 6% | Uninformative |
| *Poa poiformis* var. *poiformis* | 2 | 14% | 2 | 0% | Uninformative |
| *Polyscias sambucifolia* | 1 | 14% | 1 | 15% | Uninformative |
| *Pseuderanthemum variabile* | 2 | 71% | 2 | 12% | Positive diagnostic |
| *Pteridium esculentum* | 2 | 86% | 2 | 40% | Constant |
| *Pyrrosia rupestris* | 1 | 14% | 2 | 2% | Uninformative |
| *Rubus moluccanus* | 2 | 14% | 1 | 0% | Uninformative |
| *Rubus parvifolius* | 2 | 29% | 2 | 1% | Positive diagnostic |
| *Rumex brownii* | 1 | 43% | 1 | 1% | Positive diagnostic |
| *Sarcopetalum harveyanum* | 2 | 14% | 1 | 4% | Uninformative |
| *Senecio lautus* | 1 | 14% | 1 | 1% | Uninformative |
| *Senecio linearifolius* | 2 | 29% | 1 | 0% | Positive diagnostic |
| *Sigesbeckia orientalis* subsp. *orientalis* | 1 | 14% | 2 | 3% | Uninformative |
| *Smilax australis* | 1 | 29% | 2 | 4% | Uninformative |
| *Solanum aviculare* | 1 | 14% | 1 | 0% | Uninformative |
| *Solanum prinophyllum* | 2 | 43% | 1 | 5% | Positive diagnostic |
| *Sporobolus elongatus* | 2 | 14% | 2 | 1% | Uninformative |
| *Stephania japonica* | 2 | 71% | 1 | 6% | Positive diagnostic |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 14% | 2 | 5% | Uninformative |
| *Themeda australis* | 3 | 14% | 2 | 23% | Uninformative |
| *Tricoryne simplex* | 2 | 14% | 1 | 2% | Uninformative |
| *Tristaniopsis laurina* | 3 | 14% | 2 | 3% | Uninformative |
| *Tylophora barbata* | 2 | 86% | 2 | 4% | Positive diagnostic |
| *Urtica incisa* | 2 | 57% | 1 | 0% | Positive diagnostic |
| *Veronica plebeia* | 2 | 43% | 1 | 7% | Positive diagnostic |
| *Viola betonicifolia* subsp. *betonicifolia* | 1 | 14% | 2 | 0% | Uninformative |
| *Viola hederacea* | 2 | 43% | 2 | 6% | Positive diagnostic |
| *Xerochrysum bracteatum* | 2 | 14% | 2 | 0% | Uninformative |

# ILLAWARRA ESCARPMENT BLACKBUTT FOREST

# S_WSF05

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**North Coast Wet Sclerophyll Forests**
694: Blackbutt-Turpentine-Bangalay Moist Open Forest on Sheltered Slopes and Gullies, Southern Sydney Basin
ME030; SR516
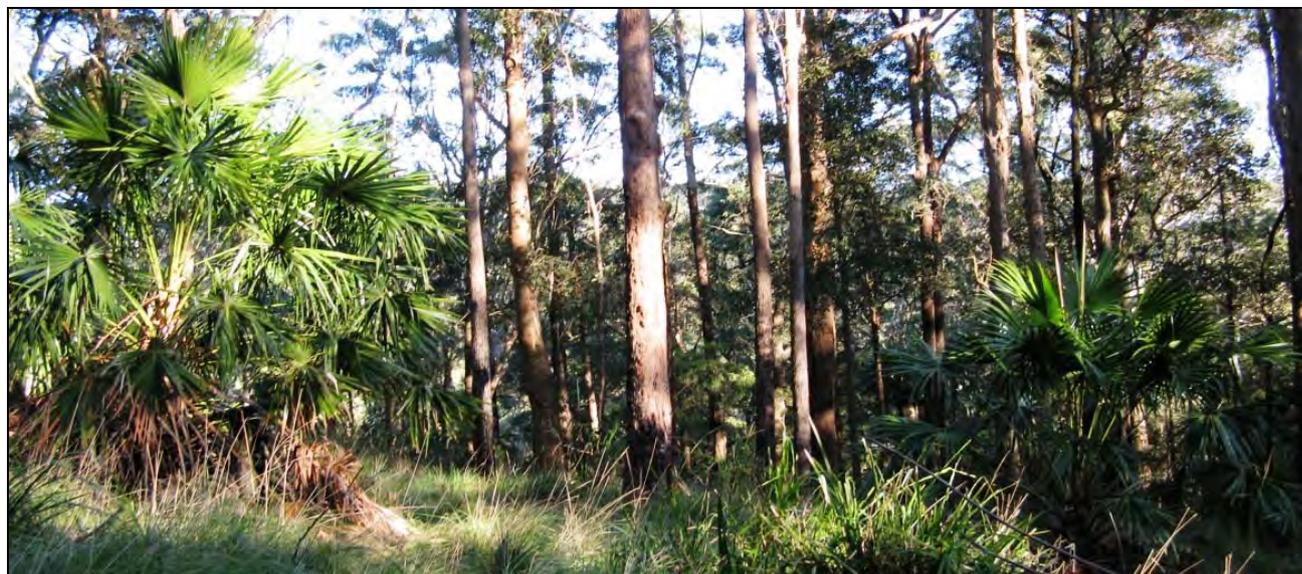


## Description

Illawarra Escarpment Blackbutt Forest is a tall coastal eucalypt forest with a moist open understorey found south of Audley in the Hacking River valley. The canopy is dominated by blackbutt (*Eucalyptus pilularis*) and turpentine (*Syncarpia glomulifera*), with grey ironbark (*Eucalyptus paniculata*) occurring less frequently. An open cover of palms and mesic trees and shrubs is typical above a ground cover of ferns, grasses, rushes and climbers. It is restricted to deep red-brown-coloured clay soils derived from the layer of Narrabeen shale that is exposed along the northern Illawarra escarpment and in the Hacking River gorges. The distribution of the community is strongly associated with high rainfall (areas that receive more than 1200 millimetres of mean annual rainfall), sheltered aspects and elevations less than 200 meters above sea level. South of the study area the community extends along the escarpment foothills and coastal lowlands as far as Batemans Bay (Tozer et al. 2010).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 30 m ±9 <br> 14-40 | 41% ±11 <br> 30-55 | *Syncarpia glomulifera, Eucalyptus paniculata* subsp. *paniculata, Eucalyptus pilularis, Eucalyptus botryoides* |
| Small Trees | 11 m ±2 <br> 8-15 | 30% ±22 <br> 5-60 | *Livistona australis, Synoum glandulosum, Acacia maidenii* |
| Shrubs | 3.1 m ±1.2 <br> 1.5-4.0 | 16% ±9 <br> 10-30 | *Myrsine variabilis, Clerodendrum tomentosum, Notelaea longifolia, Breynia oblongifolia, Goodenia ovata, Persoonia linearis* |
| Ground Covers | 2.2 m ±3.7 <br> 0.3-12.0 | 42%±35 <br> 5.5-95 | *Lomandra longifolia, Pseuderanthemum variable, Pteridium esculentum, Doodia aspera, Oplismenus imbecillis, Calochlaena dubia, Entolasia stricta, Desmodium varians, Gymnostachys anceps, Gahnia melanocarpa, Imperata cylindrica* var. *major, Adiantum aethiopicum, Blechnum cartilagineum, Entolasia marginata, Viola hederacea* |
| Vines & Climbers | N/A | N/A | *Hibbertia dentata, Tylophora barbata, Eustrephus latifolius, Hibbertia scandens, Smilax australis, Clematis aristata, Geitonoplesium cymosum, Glycine clandestina, Stephania japonica* var. *discolour, Kennedia rubicunda, Cissus hypoglauca* |

*Compiled from 7 sites with structural data recorded.

## Threats

Within the study area the primary distribution occurs within the boundaries of Royal NP. Unlike areas immediately south along the northern Illawarra escarpment, the forest has escaped repeated logging and clearing associated with coal mining and urban development. Weeds such as lantana (*Lantana camara*) infest areas where the canopy has been opened following disturbance. Incursions of other weeds such as Crofton weed (*Ageratina adenophora*) extend into gully systems from urban development in the headwaters of the Hacking catchment.

## Conservation Status

Extensive areas are conserved within Royal NP. Elsewhere however, clearing has removed more than a third of its original range and a small proportion of its overall distribution is protected in formal reservation.

This vegetation community is represented in Royal NP and Garawarra State Conservation Area (SCA).

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 10,140-14,200 hectares |
| Estimated percentage cleared | Not available | 30-50 % |
| Total NPWS reserves | 1031 +0.3 hectares<br>70% of extant area | 1900 hectares<br>25-30% of extant area<br>5-20% of pre-clearing area |
| Total reserved | 1031 +0.3 hectares<br>70% of extant area | Not available |
| Total non-reserved | 441 +13.5 hectares | Not available |
| Total extant | 1472 hectares | 7100 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.



Map legend:
- Map unit
- Study area
- Extant vegetation
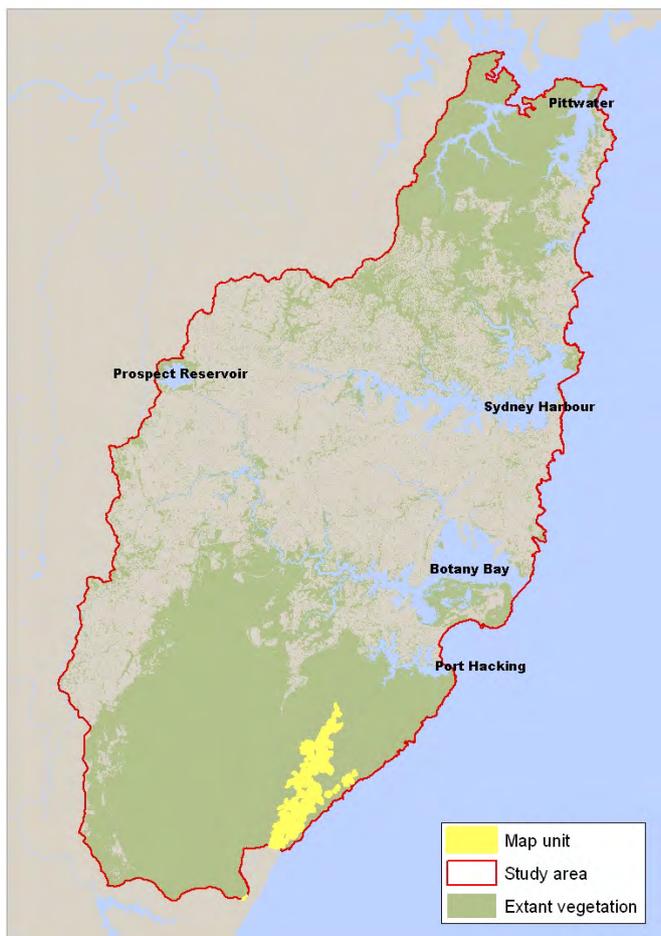
## Example Locations

o   Lady Carrington Drive, Royal NP

## Species Richness

| Number of sites | 22 |
|---|---|
| Total native species | 220 |
| Average no. native species per site | 43.6 ±10.1 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

This community forms part of the coastal moist forests and rainforests in the Sydney metropolitan area. It is floristically very similar to S_WSF04, a community that shares the underlying habitat and species assemblage but is situated on very exposed slopes that directly face the open ocean. The forest grades into rainforest (S_RF03) in protected situations.

## Accuracy

Sampling density is moderate. Mapping boundaries are based on the interpretation of tall blackbutt, turpentine and bangalay forests found on Narrabeen sandstone and within the rainfall and elevational domains of the community.

A 0.04 hectare site located in this map unit is expected to contain at least 18 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 35 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia binervata* | 2 | 36% | 2 | 2% | Positive diagnostic |
| *Acacia floribunda* | 3 | 36% | 1 | 3% | Positive diagnostic |
| *Acacia implexa* | 1 | 14% | 1 | 5% | Uninformative |
| *Acacia irrorata* | 2 | 41% | 1 | 2% | Positive diagnostic |
| *Acacia maidenii* | 1 | 23% | 1 | 1% | Positive diagnostic |
| *Acmena smithii* | 2 | 14% | 2 | 6% | Uninformative |
| *Adiantum aethiopicum* | 2 | 27% | 2 | 7% | Positive diagnostic |
| *Adiantum formosum* | 3 | 14% | 2 | 1% | Uninformative |
| *Allocasuarina torulosa* | 3 | 18% | 2 | 10% | Uninformative |
| *Angophora costata* | 2 | 41% | 3 | 37% | Constant |
| *Asplenium flabellifolium* | 2 | 14% | 1 | 4% | Uninformative |
| *Banksia serrata* | 1 | 14% | 2 | 33% | Uninformative |
| *Billardiera scandens* | 1 | 50% | 1 | 37% | Constant |
| *Blechnum cartilagineum* | 2 | 23% | 2 | 6% | Uninformative |
| *Breynia oblongifolia* | 1 | 45% | 1 | 16% | Positive diagnostic |
| *Calochlaena dubia* | 2 | 36% | 2 | 16% | Constant |
| *Cayratia clematidea* | 2 | 14% | 2 | 4% | Uninformative |
| *Centella asiatica* | 1 | 14% | 2 | 6% | Uninformative |
| *Cissus hypoglauca* | 2 | 36% | 2 | 8% | Positive diagnostic |
| *Clematis aristata* | 2 | 59% | 1 | 6% | Positive diagnostic |
| *Clerodendrum tomentosum* | 1 | 45% | 1 | 5% | Positive diagnostic |
| *Commelina cyanea* | 1 | 14% | 2 | 9% | Uninformative |
| *Coronidium elatum* | 2 | 18% | 1 | 1% | Uninformative |
| *Desmodium rhytidophyllum* | 1 | 14% | 1 | 2% | Uninformative |
| *Desmodium varians* | 2 | 45% | 2 | 8% | Positive diagnostic |
| *Dianella caerulea* | 2 | 82% | 2 | 44% | Positive diagnostic |
| *Dichondra repens* | 2 | 55% | 2 | 14% | Positive diagnostic |
| *Diospyros australis* | 1 | 23% | 2 | 1% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 14% | 2 | 23% | Uninformative |
| *Doodia aspera* | 2 | 50% | 2 | 3% | Positive diagnostic |
| *Doryanthes excelsa* | 2 | 14% | 2 | 9% | Uninformative |
| *Echinopogon caespitosus* | 1 | 14% | 2 | 11% | Uninformative |
| *Echinopogon ovatus* | 1 | 23% | 2 | 6% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 27% | 1 | 20% | Uninformative |
| *Entolasia marginata* | 2 | 45% | 2 | 22% | Constant |
| *Entolasia stricta* | 2 | 55% | 2 | 59% | Constant |
| *Eucalyptus paniculata* | 2 | 59% | 2 | 3% | Positive diagnostic |
| *Eucalyptus pilularis* | 3 | 59% | 3 | 13% | Positive diagnostic |
| *Eucalyptus saligna* | 3 | 27% | 3 | 3% | Positive diagnostic |
| *Eustrephus latifolius* | 1 | 68% | 2 | 15% | Positive diagnostic |
| *Gahnia melanocarpa* | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Galium propinquum* | 1 | 14% | 2 | 2% | Uninformative |
| *Geitonoplesium cymosum* | 1 | 50% | 2 | 9% | Positive diagnostic |
| *Geranium solanderi* | 1 | 23% | 2 | 1% | Positive diagnostic |
| *Glycine clandestina* | 2 | 59% | 2 | 17% | Positive diagnostic |
| *Glycine microphylla* | 2 | 23% | 2 | 9% | Uninformative |
| *Gonocarpus teucrioides* | 1 | 27% | 2 | 23% | Uninformative |
| *Goodenia ovata* | 2 | 41% | 1 | 2% | Positive diagnostic |
| *Guioa semiglauca* | 1 | 18% | 2 | 1% | Uninformative |
| *Gymnostachys anceps* | 1 | 32% | 2 | 3% | Positive diagnostic |
| *Hibbertia dentata* | 2 | 73% | 2 | 7% | Positive diagnostic |
| *Hibbertia scandens* | 2 | 73% | 2 | 6% | Positive diagnostic |
| *Hydrocotyle acutiloba* | 2 | 36% | 2 | 1% | Positive diagnostic |
| *Hydrocotyle peduncularis* | 2 | 18% | 2 | 6% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 64% | 2 | 20% | Positive diagnostic |
| *Indigofera australis* | 2 | 27% | 2 | 2% | Positive diagnostic |
| *Kennedia rubicunda* | 2 | 45% | 1 | 9% | Positive diagnostic |
| *Lagenophora stipitata* | 1 | 27% | 2 | 3% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 45% | 2 | 42% | Constant |
| *Leucopogon lanceolatus* | 1 | 36% | 1 | 8% | Positive diagnostic |
| *Livistona australis* | 2 | 77% | 2 | 10% | Positive diagnostic |
| *Lomandra longifolia* | 3 | 95% | 2 | 46% | Positive diagnostic |
| *Macrozamia communis* | 2 | 14% | 1 | 4% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 45% | 2 | 36% | Constant |
| *Morinda jasminoides* | 1 | 18% | 2 | 7% | Uninformative |
| *Myrsine variabilis* | 1 | 50% | 1 | 8% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 64% | 1 | 21% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Notelaea venosa* | 2 | 14% | 1 | 1% | Uninformative |
| *Oplismenus aemulus* | 2 | 14% | 2 | 10% | Uninformative |
| *Oplismenus imbecillis* | 2 | 64% | 2 | 12% | Positive diagnostic |
| *Oxalis chnoodes* | 2 | 18% | 1 | 1% | Uninformative |
| *Ozothamnus diosmifolius* | 2 | 18% | 1 | 11% | Uninformative |
| *Pandorea pandorana* | 1 | 23% | 2 | 16% | Uninformative |
| *Passiflora herbertiana* subsp. *herbertiana* | 1 | 18% | 1 | 1% | Uninformative |
| *Pelargonium inodorum* | 2 | 14% | 1 | 1% | Uninformative |
| *Pellaea falcata* | 2 | 18% | 2 | 2% | Uninformative |
| *Persoonia linearis* | 1 | 59% | 1 | 19% | Positive diagnostic |
| *Phyllanthus gunnii* | 1 | 14% | 2 | 1% | Uninformative |
| *Pittosporum revolutum* | 1 | 23% | 1 | 9% | Uninformative |
| *Plantago debilis* | 2 | 18% | 2 | 2% | Uninformative |
| *Plectranthus parviflorus* | 2 | 18% | 2 | 3% | Uninformative |
| *Poa affinis* | 4 | 18% | 2 | 11% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 4 | 27% | 2 | 6% | Positive diagnostic |
| *Polyscias sambucifolia* | 1 | 14% | 1 | 15% | Uninformative |
| *Poranthera microphylla* | 1 | 27% | 2 | 7% | Positive diagnostic |
| *Pratia purpurascens* | 1 | 41% | 2 | 17% | Constant |
| *Pseuderanthemum variabile* | 2 | 82% | 2 | 12% | Positive diagnostic |
| *Psychotria loniceroides* | 1 | 14% | 1 | 0% | Uninformative |
| *Pteridium esculentum* | 2 | 86% | 2 | 40% | Positive diagnostic |
| *Pultenaea blakelyi* | 2 | 18% | 2 | 0% | Uninformative |
| *Pultenaea daphnoides* | 1 | 14% | 2 | 8% | Uninformative |
| *Pultenaea flexilis* | 1 | 14% | 2 | 6% | Uninformative |
| *Rhodamnia rubescens* | 1 | 18% | 2 | 0% | Uninformative |
| *Rubus parvifolius* | 2 | 14% | 2 | 1% | Uninformative |
| *Rubus rosifolius* | 2 | 14% | 2 | 0% | Uninformative |
| *Sarcopetalum harveyanum* | 1 | 41% | 1 | 4% | Positive diagnostic |
| *Schelhammera undulata* | 2 | 27% | 2 | 3% | Positive diagnostic |
| *Sigesbeckia orientalis* subsp. *orientalis* | 2 | 14% | 2 | 2% | Uninformative |
| *Smilax australis* | 2 | 50% | 1 | 3% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 18% | 2 | 33% | Uninformative |
| *Solanum prinophyllum* | 1 | 14% | 1 | 5% | Uninformative |
| *Stephania japonica* | 2 | 27% | 1 | 6% | Positive diagnostic |
| *Syncarpia glomulifera* | 3 | 91% | 3 | 12% | Positive diagnostic |
| *Synoum glandulosum* subsp. *glandulosum* | 1 | 23% | 2 | 5% | Positive diagnostic |
| *Tylophora barbata* | 2 | 73% | 2 | 4% | Positive diagnostic |
| *Veronica plebeia* | 1 | 14% | 1 | 7% | Uninformative |
| *Viola hederacea* | 2 | 55% | 2 | 6% | Positive diagnostic |
| *Wahlenbergia gracilis* | 1 | 27% | 1 | 8% | Uninformative |
| *Zieria smithii* | 1 | 14% | 1 | 5% | Uninformative |

# ILLAWARRA ESCARPMENT BLUE GUM WET FOREST
# S_WSF32

Statewide Class
NSW Plant Community Type:

Biometric Number(s):

North Coast Wet Sclerophyll Forests
1245: Sydney Blue Gum x Bangalay-Lilly Pilly Moist Forest in Gullies and on Sheltered Slopes, Southern Sydney Basin Bioregion
HN597; ME044; SR652



## Description

Illawarra Escarpment Blue Gum Wet Forest is a very tall eucalypt forest marked by multiple layers of rainforest trees, palms and shrubs. The canopy is dominated by the hybrid Sydney blue gum (*Eucalyptus botryoides <--> saligna*) and/or bangalay (*Eucalyptus botryoides*). Co-dominant species may include coastal grey box (*Eucalyptus quadrangulata*), turpentine (*Syncarpia glomulifera*) and blackbutt (*Eucalyptus pilularis*). A complex warm temperate rainforest sub-canopy attains heights of 20 metres or more and features sassafrass (*Doryphora sassafras*), laurels (*Cryptocarya* spp.), red cedar (*Toona ciliata*) and tall cabbage tree palm (*Livistona australis*). Smaller rainforest trees and shrubs include lilly pilly (*Acmena smithii*), bastard rosewood (*Synoum glandulosum*) and mock olive (*Notelaea venosa*). A sparse cover of vegetation occupies the forest floor with ferns and settlers twine (*Gymnostachys anceps*) frequently recorded.

This forest is associated with high rainfall (greater than 1400 millimetres) and deep chocolate clay soils on escarpment benches, alluvial flats and protected gullies of the Illawarra escarpment (NPWS 2002). The Hacking River valley is the northern limit of the community. It extends southwards along the escarpment to Nowra (Tozer et al. 2010) where it is distributed between 60 and 300 metres above sea level on Narrabeen group sediments or on Illawarra Coal Measures.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 32.2 m 25-45 | 34% 20-45 | *Eucalyptus botryoides <--> saligna, Eucalyptus quadrangulata, Eucalyptus pilularis, Syncarpia glomulifera* |
| Small Trees | 16.3 m 1 2-20 | 40% 10-70 | *Acmena smithii, Livistona australis, Cryptocarya glaucescens, Eupomatia laurina, Doryphora sassafras, Cryptocarya microneura, Claoxylon australe, Toona australis* |
| Shrubs | 2.4 m 1-6 | 30.8% 20-65 | *Notelaea venosa, Clerodendrum tomentosum, Synoum glandulosum Ficus coronata, Omalanthus populifolius* |
| Ground Covers | 0.7 m 0.1-1.5 | 25.2% 5-50 | *Adiantum formosum, Pseuderanthemum variabile, Calochlaena dubia, Gymnostachys anceps* |
| Vines & Climbers | N/A | N/A | *Marsdenia rostrata, Celastrus subspicata, Eustrephus latifolius, Pandorea pandorana, Geitonoplesium cymosum* |

*Compiled from 2 sites with structural data recorded. Standard deviation not calculated.

## Threats

Across the range of the community the impacts of past timber harvesting operations and coal mining are made evident by the even age stands of eucalypts, overgrown trails and dense infestations of lantana (*Lanatana camara*). The latter suggests that the canopy has been opened at some point allowing the rapid penetration of this invasive species into the forest. Within the study area these impacts are visible around the Otford valley area and some portions of the Hacking River valley flats. Increased fire frequency in Royal NP and surrounds increases the probability that fire will penetrate this wet sclerophyll forest boundary and damage or inhibit fire intolerant plants.

## Conservation Status

The forest is represented in Royal NP, Illawarra Escarpment SCA and Cambewarra Range NR.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Est. 38,000 hectares |
| Estimated percentage cleared | Not available | 43% |
| Total NPWS reserves | 130 +<.1 hectares 57% of extant area | 4500 hectares 20% of extant area |
| Total reserved | 130 +0 hectares 57% of extant area | Not available |
| Total non-reserved | 97.0 +10.6 hectares | Not available |
| Total extant | 227 hectares | 21,500 hectares |



## Example Locations

o   Lady Wakehurst Drive, Royal NP

o   Lloyd Place, Otford

## Species Richness

| Number of sites | 2 |
|---|---|
| Total native species | 60 |
| Average no. native species per site | 40.5 ±3.5 |

## Variations and Dynamics

The appearance of *Eucalyptus botryoides* <--> *saligna* varies across the range of the community. Near the coast the hybrid carries an entire rough-barked cover over the trunk, whereas elsewhere stands are typified by only a partial rough-barked stocking. *Eucalyptus quadrangulata* appears in the canopy along a distinctive shale layer of the Narrabeen group sediments at around 80 metres above sea level in the Hacking River valley.

Stands are often heavily modified by lantana infestation where urban, mining and agricultural landuse occupy the landscape.

## Relationship to Other Communities

This community grades into well developed tall rainforest (S_RF01) on sites that are protected by southerly aspects or incised gullies. With increasing exposure the forest loses the layers of rainforest sub-canopy as it grades into an open forest dominated by blackbutt (S_WSF05).

## Accuracy

Sampling density is low in the study area, although moderate in the adjoining Illawarra region (2002c). Map boundaries were determined using sample sites, field traverse and tall wet sclerophyll forest found on lower slopes, flats and sheltered slopes in the Hacking River valley.

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| Acacia implexa | 1 | 50% | 1 | 5% | Constant |
| Acacia irrorata | 1 | 50% | 1 | 3% | Positive diagnostic |
| Acmena smithii | 3 | 100% | 2 | 6% | Positive diagnostic |
| Adiantum formosum | 3 | 100% | 2 | 1% | Positive diagnostic |
| Alectryon subcinereus | 1 | 50% | 1 | 1% | Positive diagnostic |
| Blechnum cartilagineum | 3 | 100% | 2 | 7% | Positive diagnostic |
| Breynia oblongifolia | 2 | 50% | 1 | 17% | Constant |
| Calochlaena dubia | 3 | 100% | 2 | 16% | Positive diagnostic |
| Carex appressa | 2 | 50% | 2 | 1% | Positive diagnostic |
| Cissus hypoglauca | 1 | 50% | 2 | 8% | Constant |
| Claoxylon australe | 2 | 50% | 1 | 1% | Positive diagnostic |
| Clerodendrum tomentosum | 3 | 100% | 1 | 5% | Positive diagnostic |
| Cryptocarya glaucescens | 2 | 50% | 2 | 1% | Positive diagnostic |
| Cryptocarya microneura | 3 | 50% | 1 | 1% | Positive diagnostic |
| Cyathea australis | 1 | 50% | 1 | 2% | Positive diagnostic |
| Dichondra repens | 2 | 50% | 2 | 14% | Constant |
| Diospyros australis | 3 | 100% | 2 | 1% | Positive diagnostic |
| Doodia aspera | 2 | 50% | 2 | 3% | Positive diagnostic |
| Doryphora sassafras | 2 | 50% | 3 | 1% | Positive diagnostic |
| Elaeodendron australe | 1 | 50% | 2 | 1% | Positive diagnostic |
| Entolasia marginata | 2 | 50% | 2 | 22% | Constant |
| Eucalyptus botryoides | 1 | 50% | 3 | 5% | Constant |
| Eucalyptus botryoides <--> saligna | 3 | 100% | 3 | 0% | Positive diagnostic |
| Eucalyptus pilularis | 3 | 50% | 3 | 14% | Constant |
| Eupomatia laurina | 1 | 50% | 2 | 2% | Positive diagnostic |
| Eustrephus latifolius | 2 | 100% | 2 | 15% | Positive diagnostic |
| Gahnia aspera | 2 | 50% | 1 | 3% | Positive diagnostic |
| Gahnia melanocarpa | 2 | 50% | 2 | 3% | Positive diagnostic |
| Geitonoplesium cymosum | 2 | 100% | 2 | 9% | Positive diagnostic |
| Gymnostachys anceps | 2 | 100% | 2 | 3% | Positive diagnostic |
| Hibbertia dentata | 1 | 50% | 2 | 8% | Constant |
| Hibbertia scandens | 1 | 50% | 2 | 7% | Constant |
| Hydrocotyle laxiflora | 2 | 50% | 2 | 3% | Positive diagnostic |
| Hypolepis muelleri | 3 | 50% | 2 | 5% | Constant |
| Livistona australis | 3 | 100% | 2 | 10% | Positive diagnostic |
| Marsdenia rostrata | 1 | 50% | 1 | 1% | Positive diagnostic |
| Morinda jasminoides | 1 | 50% | 2 | 7% | Constant |
| Myrsine variabilis | 1 | 50% | 1 | 8% | Constant |
| Notelaea venosa | 2 | 50% | 1 | 1% | Positive diagnostic |
| Oplismenus imbecillis | 2 | 100% | 2 | 13% | Positive diagnostic |
| Oxalis chnoodes | 2 | 100% | 2 | 1% | Positive diagnostic |
| Pandorea pandorana | 2 | 100% | 2 | 16% | Positive diagnostic |
| Parsonsia straminea | 2 | 100% | 1 | 5% | Positive diagnostic |
| Pellaea falcata | 2 | 50% | 2 | 2% | Positive diagnostic |
| Pittosporum multiflorum | 2 | 50% | 2 | 1% | Positive diagnostic |
| Poa labillardierei var. labillardierei | 2 | 50% | 2 | 6% | Constant |
| Polystichum australiense | 3 | 50% | 2 | 0% | Positive diagnostic |
| Pratia purpurascens | 1 | 50% | 2 | 18% | Constant |
| Pseuderanthemum variabile | 2 | 100% | 2 | 12% | Positive diagnostic |
| Psychotria loniceroides | 1 | 50% | 1 | 0% | Positive diagnostic |
| Rhodamnia rubescens | 1 | 50% | 1 | 0% | Positive diagnostic |
| Sarcopetalum harveyanum | 1 | 100% | 1 | 4% | Positive diagnostic |
| Smilax australis | 2 | 100% | 1 | 4% | Positive diagnostic |
| Stephania japonica | 2 | 100% | 1 | 6% | Positive diagnostic |
| Syncarpia glomulifera | 3 | 100% | 3 | 13% | Positive diagnostic |
| Tylophora barbata | 2 | 100% | 2 | 5% | Positive diagnostic |
| Viola hederacea | 2 | 50% | 2 | 6% | Constant |
| Wilkiea huegeliana | 2 | 50% | 2 | 2% | Positive diagnostic |
| Zieria smithii | 2 | 50% | 1 | 5% | Constant |

# CENTRAL COAST ESCARPMENT MOIST FOREST <span style="float:right">S_WSF33</span>

**Statewide Class**
NSW Plant Community Type:

**Northern Hinterland Wet Sclerophyll Forests**
1565: Turpentine-Rough-barked Apple-Forest Oak Moist Shrubby Tall Open Forest
of the Central Coast

Biometric Number(s):

HU779; ME86



## Description

Central Coast Escarpment Moist Forest occurs on sheltered foreshore slopes above the Hawkesbury River and its adjoining tributaries. It is a tall open eucalypt forest with an open to moderately dense cover of mesic shrubs, occasional palms and a prominent grass and fern ground cover. Turpentine (*Syncarpia glomulifera*) and/or rough-barked apple (*Angophora floribunda*) may occur in either the upper or middle tree layers and as result are the most commonly recorded trees. However individual stands are more often characterised by tall grey ironbark (*Eucalyptus paniculata*), mahoganies (including *Eucalyptus umbra*) or bangalay (*Eucalyptus botryoides*). Forest oak (*Allocasuarina torulosa*) is invariably recorded above a midstratum of soft-leaved shrubs, small trees and palms including cabbage tree palm (*Livistona australis*), scentless rosewood (*Synoum glandulosum)* and *Astrotricha floccosa,* typical of coastal forests*.*

This community is common on mid to lower south-facing slopes below 100 metres in elevation on Narrabeen sediments. It receives between 1150 and 1300 millimetres of mean annual rainfall. It has been cleared from many of the lower escarpment slopes on the Pittwater peninsula. The forest is more extensively distributed on the northern side of the Hawkesbury River and is widespread on slopes beneath the Hawkesbury sandstone plateaus of Dharug and Brisbane Water national parks and on upper slopes of the Gosford and Watagan ranges (NPWS 2000, Sommerville et al. 2009).

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 26 m ±4.1<br>12-30 | 35% ±13.1<br>25-40 | *Angophora floribunda, Eucalyptus paniculata subsp. paniculata, Syncarpia glomulifera, Eucalyptus botryoides, Eucalyptus umbra, Eucalyptus piperita* |
| Small Trees | 7.8 m ±2.5<br>3-15 | 14% ±11.1<br>5-35 | *Allocasuarina torulosa, Synoum glandulosum, Livistona australis, Banksia integrifolia, Acmena smithii, Tristaniopsis laurina, Backhousia myrtifolia* |
| Shrubs | 4.3 m ±2.4<br>1-12 | 20% ±16.8<br>5-50 | *Livistona australis, Myrsine variabilis, Astrotricha floccosa, Dodonaea triquetra, Bursaria spinosa, Acacia floribunda, Acacia longissima, Pultenaea flexilis, Trema tomentosa* var. *aspera* |
| Ground Covers | 0.6 m ±0.3<br>0-1.5 | 50% ±20<br>20-85 | *Calochlaena dubia, Pteridium esculentum, Blechnum cartilagineum, Dianella caerulea, Lomandra longifolia, Schelhammera undulata, Lepidosperma laterale, Gymnostachys anceps* |
| Vines & Climbers | N/A | N/A | *Billardiera scandens, Cassytha pubescens, Cissus hypoglauca, Clematis aristata, Geitonoplesium cymosum, Hibbertia dentata* |

*Compiled from 8 sites with structural data recorded.

## Threats

Within the Sydney metropolitan area clearing for urban development is likely to have reduced the original extent in the Pittwater LGA. Associated impacts with such development, including weed incursions, are visible using aerial photography and ground survey. Increased fire frequency arising from hazard reduction burning is also likely to alter the composition of the shrub and ground cover to promote fire-tolerant species.

## Conservation Status

This community is represented within Ku-ring-gai Chase, Dharug, Brisbane Waters and Popran national parks.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 216 +0.2 hectares<br>77% of extant area | Est. 520 hectares |
| Total reserved | 234 +0.4 hectares<br>84% of extant area | Not available |
| Total non-reserved | 45.0 +37.8 hectares | Not available |
| Total extant | 279 hectares | Est. 3500 hectares |



Map unit
Study area
Extant vegetation

## Example Locations

o   Church Point escarpment, Pittwater LGA

o   Resolute Beach, Pittwater

o   Apple Tree Bay, Cowan Water

## Species Richness

| Number of sites | 11 |
|---|---|
| Total native species | 141 |
| Average no. native species per site | 42.1 ±6.6 |

## Variations and Dynamics

Upper Narrabeen escarpment slopes support some Hawkesbury sandstone colluvium with the area marked by large sandstone boulders. Here, Sydney peppermint (*Eucalyptus piperita*), smooth-barked apple (*Angophora costata*) and red bloodwood (*Corymbia gummifera*) can be found amongst the canopy. Grey ironbark and bangalay are less prevalent in the Cowan creek catchment. Conversely some stands close to the foreshore include coast banksia (*Banksia integrifolia*) with a scrubby dense layer of small rainforest trees.

## Relationship to Other Communities

This community shares floristic affinities with other forests found on Narrabeen sediments in the Sydney basin. Forests of the northern Illawarra (S_WSF05, S_WSF04) share some canopy and mesic shrub species. However, deeper gorges in the Hacking River valley expose rich Narrabeen shale seams that appear to remain submerged by the drowned Hawkesbury River valley. In addition, mean annual rainfall levels exceed that in the Pittwater by several hundred millimetres. In the Pittwater area, however, this community grades into the conspicuous stands of spotted gum (S_WSF11) south of Towlers Bay in western Pittwater. The forest transitions into Central Coast Escarpment Dry Forest (S_WSF34) on dry north and west facing escarpment slopes.

## Accuracy

Sampling density is moderate. Map boundaries were based on environmental parameters determined by systematic floristic sample sites and on the interpretation of tall eucalypt forest on Narrabeen substrates. Discrimination of Hawkesbury and Narrabeen substrates was marked by field traverse and inferred by the presence of one or more of the following: grey ironbark, bangalay, rough-barked apple, cabbage tree palm or distinct mesic sub-canopy.

A 0.04 hectare site located in this map unit is expected to contain at least 18 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 34 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia floribunda* | 2 | 36% | 1 | 3% | Positive diagnostic |
| *Acacia longissima* | 2 | 36% | 1 | 2% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 27% | 1 | 25% | Uninformative |
| *Acmena smithii* | 4 | 18% | 2 | 6% | Uninformative |
| *Adiantum aethiopicum* | 2 | 27% | 2 | 7% | Uninformative |
| *Allocasuarina torulosa* | 3 | 91% | 2 | 10% | Positive diagnostic |
| *Angophora floribunda* | 3 | 55% | 2 | 4% | Positive diagnostic |
| *Astrotricha floccosa* | 2 | 91% | 2 | 2% | Positive diagnostic |
| *Banksia integrifolia* | 1 | 27% | 2 | 9% | Uninformative |
| *Billardiera scandens* | 1 | 64% | 1 | 37% | Constant |
| *Blechnum cartilagineum* | 1 | 27% | 2 | 7% | Uninformative |
| *Breynia oblongifolia* | 1 | 45% | 1 | 17% | Constant |
| *Calochlaena dubia* | 2 | 64% | 2 | 16% | Positive diagnostic |
| *Cayratia clematidea* | 2 | 18% | 2 | 4% | Uninformative |
| *Cissus hypoglauca* | 2 | 64% | 2 | 8% | Positive diagnostic |
| *Clematis aristata* | 1 | 18% | 1 | 7% | Uninformative |
| *Clerodendrum tomentosum* | 2 | 18% | 1 | 5% | Uninformative |
| *Desmodium varians* | 2 | 27% | 2 | 8% | Uninformative |
| *Dianella caerulea* | 2 | 91% | 2 | 45% | Positive diagnostic |
| *Dichondra repens* | 1 | 27% | 2 | 14% | Uninformative |
| *Dioscorea transversa* | 2 | 18% | 2 | 0% | Uninformative |
| *Entolasia marginata* | 2 | 27% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 64% | 2 | 59% | Constant |
| *Eucalyptus botryoides* | 3 | 36% | 3 | 5% | Positive diagnostic |
| *Eucalyptus paniculata* | 3 | 45% | 2 | 4% | Positive diagnostic |
| *Eucalyptus piperita* | 3 | 36% | 3 | 20% | Constant |
| *Eucalyptus punctata* | 1 | 27% | 2 | 11% | Uninformative |
| *Eucalyptus umbra* | 3 | 36% | 2 | 3% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 100% | 2 | 15% | Positive diagnostic |
| *Gahnia melanocarpa* | 2 | 55% | 2 | 3% | Positive diagnostic |
| *Galium binifolium* | 1 | 27% | 1 | 2% | Positive diagnostic |
| *Geitonoplesium cymosum* | 1 | 82% | 2 | 9% | Positive diagnostic |
| *Glycine clandestina* | 2 | 45% | 2 | 18% | Constant |
| *Glycine tabacina* | 2 | 36% | 2 | 8% | Positive diagnostic |
| *Goodenia ovata* | 2 | 36% | 1 | 2% | Positive diagnostic |
| *Gymnostachys anceps* | 2 | 45% | 2 | 3% | Positive diagnostic |
| *Hardenbergia violacea* | 2 | 27% | 1 | 16% | Uninformative |
| *Hibbertia dentata* | 2 | 73% | 2 | 8% | Positive diagnostic |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 1 | 27% | 1 | 6% | Uninformative |
| *Hydrocotyle laxiflora* | 2 | 73% | 2 | 2% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 64% | 2 | 20% | Positive diagnostic |
| *Lepidosperma elatius* | 2 | 27% | 2 | 1% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 73% | 2 | 42% | Constant |
| *Livistona australis* | 2 | 91% | 2 | 10% | Positive diagnostic |
| *Lomandra confertifolia* | 2 | 18% | 2 | 5% | Uninformative |
| *Lomandra filiformis* | 2 | 18% | 2 | 23% | Uninformative |
| *Lomandra gracilis* | 2 | 18% | 2 | 10% | Uninformative |
| *Lomandra longifolia* | 2 | 82% | 2 | 47% | Constant |
| *Macrozamia communis* | 3 | 27% | 1 | 4% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 64% | 2 | 36% | Constant |
| *Myrsine variabilis* | 2 | 36% | 1 | 8% | Constant |
| *Notelaea longifolia* | 1 | 64% | 1 | 21% | Positive diagnostic |
| *Opercularia hispida* | 1 | 18% | 2 | 1% | Uninformative |
| *Oplismenus imbecillis* | 2 | 82% | 2 | 12% | Positive diagnostic |
| *Oxalis exilis* | 2 | 18% | 1 | 3% | Uninformative |
| *Oxalis perennans* | 1 | 18% | 2 | 7% | Uninformative |
| *Pandorea pandorana* | 2 | 82% | 2 | 16% | Positive diagnostic |
| *Panicum simile* | 3 | 36% | 2 | 10% | Constant |
| *Passiflora herbertiana* subsp. *herbertiana* | 1 | 18% | 1 | 1% | Uninformative |
| *Persoonia linearis* | 1 | 64% | 1 | 19% | Positive diagnostic |
| *Phyllanthus hirtellus* | 2 | 18% | 2 | 27% | Uninformative |
| *Pittosporum undulatum* | 1 | 18% | 2 | 25% | Uninformative |
| *Platylobium formosum* | 2 | 18% | 2 | 8% | Uninformative |
| *Poa affinis* | 2 | 27% | 2 | 11% | Uninformative |
| *Podolobium ilicifolium* | 2 | 27% | 2 | 1% | Positive diagnostic |
| *Pomax umbellata* | 2 | 18% | 2 | 15% | Uninformative |
| *Pratia purpurascens* | 2 | 64% | 2 | 17% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Prostanthera denticulata* | 1 | 18% | 2 | 1% | Uninformative |
| *Pseuderanthemum variabile* | 2 | 100% | 2 | 12% | Positive diagnostic |
| *Pteridium esculentum* | 3 | 100% | 2 | 40% | Positive diagnostic |
| *Pultenaea daphnoides* | 2 | 18% | 2 | 8% | Uninformative |
| *Pultenaea flexilis* | 2 | 18% | 2 | 6% | Uninformative |
| *Schelhammera undulata* | 2 | 82% | 2 | 3% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 45% | 2 | 33% | Constant |
| *Syncarpia glomulifera* | 3 | 64% | 3 | 13% | Positive diagnostic |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 91% | 2 | 5% | Positive diagnostic |
| *Themeda australis* | 2 | 36% | 2 | 23% | Constant |
| *Trema tomentosa* var. *aspera* | 1 | 36% | 1 | 2% | Positive diagnostic |
| *Viola banksii* | 2 | 18% | 2 | 0% | Uninformative |
| *Viola hederacea* | 2 | 55% | 2 | 6% | Positive diagnostic |
| *Xanthorrhoea arborea* | 1 | 45% | 2 | 11% | Positive diagnostic |
| *Xanthorrhoea macronema* | 2 | 18% | 2 | 1% | Uninformative |

# COASTAL DIATREME FOREST                                                    S_WSF35

**Statewide Class**
NSW Plant Community Type:

**Northern Hinterland Wet Sclerophyll Forests**
1565: Turpentine-Rough-barked Apple-Forest Oak Moist Shrubby Tall Open Forest of the Central Coast

Biometric Number(s):

HU779; ME83



## Description

Coastal Diatreme Forest is a tall moist forest occurring on isolated volcanic landforms associated with the northern Sydney coastal plateaus. These landforms are either diatremes or dykes. Diatremes are small crater-like depressions that mix volcanic material and sandstone. The largest occurs at Campbells Crater near Cowan. Dykes, such as that at West Head, are less distinctive as they were formed by the oozing of magma through weak joints in the sandstone and have been exposed through erosion. Both landforms feature clay-rich soils that support tall wet sclerophyll forests. The canopy includes rough-barked apple (*Angophora floribunda*) with grey ironbark (*Eucalyptus paniculata*) and turpentine (*Syncarpia glomulifera*) found on the more exposed position at West Head and blue-leaved stringybark (*Eucalyptus agglomerata*) dominating the sheltered Campbells Crater. The understorey is characterised by a mixture of mesic and dry shrub species including cabbage tree palm (*Livistona australis*) and scentless rosewood (*Synoum glandulosum*). Ground cover typically includes a combination of herb, fern and grass species along with a diverse combination of small vines.

The assemblage of flora found on the diatremes is not markedly different from the shrub/grass wet sclerophyll forests found on clay soils of the northern coastal Sydney region. The landform on which it occurs is however unique and limited in extent and is the rationale for the identification of this map unit. This tall forest is found at elevations less than 100 metres above sea level. These isolated patches receive a coastal rainfall pattern that generally exceeds 1150 millimetres per annum. Outside of the study area other diatremes are found in Muougamarra and Brisbane Waters reserves and on Mangrove Mountain. All have been modified by human development, with the latter mostly cleared for quarries or agriculture.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 25.2 m ±4.3 18-30 | 34% ±17.1 5-75 | *Eucalyptus paniculata, Angophora floribunda, Eucalyptus umbra, Angophora costata,  Syncarpia glomulifera, Eucalyptus agglomerata, Eucalyptus scias, Eucalyptus punctata* |
| Small Trees | 16.3 m ±1.8 1 2-20 | 40% ±42.4 10-70 | *Allocasuarina torulosa, Livistona australis, Toona ciliata* |
| Shrubs | 3.4 m ±1.9 1-6 | 16% ±16.8 1-6 | *Astrotricha floccosa, Xanthorrhoea arborea, Macrozamia communis, Astrotricha floccosa, Pultenaea flexilis, Acacia longissima, Macrozamia communis, Synoum glandulosum* subsp. *glandulosum* |
| Ground Covers | 0.7 m ±0.4 0.4-0.1 | 39.2% ±27.8 0.1-1.5 | *Blechnum cartilagineum, Calochlaena dubia, Desmodium rhytidophyllum, Dianella caerulea, Entolasia stricta, Gymnostachys anceps, Hydrocotyle laxiflora, Imperata cylindrica* var. *major* |
| Vines & Climbers | N/A | N/A | *Cissus hypoglauca, Pandorea pandorana, Clematis aristata, Geitonoplesium cymosum, Hardenbergia violacea, Hibbertia dentata* |

*Compiled from 4 sites from the Sydney region with structural data recorded.

## Threats

Within the study area the richer volcanic soils were preferentially targetted for agriculture during early settlement. This resulted in clearing and intensive grazing and evidence of these impacts remaining today. At Campbells Crater in Ku-ring-gai Chase NP weeds are found on the sheltered slopes and the narrow drainage line is smothered in vines that cloak the remnant rainforest. Elsewhere some diatremes have been quarried for blue metal to provide an aggregate for the building industry. Recreational pressures persist at West Head where the exposed dyke is situated near major vantage points and picnic areas.

## Conservation Status

This community is represented in Ku-ring-gai Chase NP, Brisbane Waters NP and Muogamarra NR.

|  | Within Study Area | Within Sydney Basin |
| --- | --- | --- |
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 53.2 +1.0 hectares 100% of extant area | Est. 60 hectares |
| Total reserved | 53.2 +1.0 hectares 100% of extant area | Not available |
| Total non-reserved | <.1 +<.1 hectares | Not available |
| Total extant | 53.2 hectares | Est. 70 hectares |



## Example Locations

o    West Head, Ku-ring-gai Chase NP

o    Campbells Crater, Ku-ring-gai Chase NP

## Species Richness

| Number of sites | 1 |
| --- | --- |
| Total native species | 40 |
| Average no. native species per site | 40 ±0.0 |

## Variations and Dynamics

Variation in the dominant eucalypt species occurs between these volcanic landforms. Drier sites such as Campbells Crater carry blue-leaved stringybark. Variations also occur within diatremes in response to soil moisture availability and shelter. Cabbage tree palm (*Livistona australis*) can form a closed sub-canopy in very protected sites such as West Head gullies. At Campbells Crater there are isolated red cedar (*Toona ciliata*) in heavily disturbed gully lines that drain the depression.

## Relationship to Other Communities

This community may alternatively be considered a variant of Central Coast Escarpment Moist Forest (S_WSF33) which occurs on the sheltered foreshore slopes of western Pittwater and the lower Hawkesbury River escarpments. Floristically they share many species, including eucalypts, small rainforest trees, shrubs and grassy and herbaceous ground covers.

## Accuracy

Sample density is low. Map boundaries were determined by the delineation of tall forest on diatremes on the sandstone plateau.

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia floribunda* | 2 | 100% | 1 | 4% | Positive diagnostic |
| *Allocasuarina torulosa* | 3 | 100% | 2 | 10% | Positive diagnostic |
| *Angophora costata* | 3 | 100% | 3 | 37% | Positive diagnostic |
| *Angophora floribunda* | 4 | 100% | 2 | 4% | Positive diagnostic |
| *Astrotricha floccosa* | 1 | 100% | 2 | 3% | Positive diagnostic |
| *Calochlaena dubia* | 3 | 100% | 2 | 16% | Positive diagnostic |
| *Commersonia fraseri* | 2 | 100% | 2 | 0% | Positive diagnostic |
| *Dianella caerulea* | 2 | 100% | 2 | 45% | Positive diagnostic |
| *Entolasia marginata* | 2 | 100% | 2 | 22% | Positive diagnostic |
| *Entolasia stricta* | 2 | 100% | 2 | 59% | Positive diagnostic |
| *Eucalyptus agglomerata* | 3 | 100% | 2 | 1% | Positive diagnostic |
| *Eucalyptus piperita* | 2 | 100% | 3 | 20% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 100% | 2 | 15% | Positive diagnostic |
| *Galium binifolium* | 2 | 100% | 1 | 2% | Positive diagnostic |
| *Glycine clandestina* | 2 | 100% | 2 | 18% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 100% | 2 | 23% | Positive diagnostic |
| *Goodenia heterophylla* | 2 | 100% | 1 | 4% | Positive diagnostic |
| *Hardenbergia violacea* | 1 | 100% | 1 | 16% | Positive diagnostic |
| *Hydrocotyle peduncularis* | 2 | 100% | 2 | 6% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 100% | 2 | 20% | Positive diagnostic |
| *Livistona australis* | 2 | 100% | 2 | 10% | Positive diagnostic |
| *Lobelia dentata* | 1 | 100% | 1 | 0% | Positive diagnostic |
| *Lomandra brevis* | 1 | 100% | 1 | 1% | Positive diagnostic |
| *Lomandra gracilis* | 1 | 100% | 2 | 10% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 100% | 2 | 24% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 4 | 100% | 2 | 36% | Positive diagnostic |
| *Oplismenus aemulus* | 2 | 100% | 2 | 10% | Positive diagnostic |
| *Pandorea pandorana* | 1 | 100% | 2 | 16% | Positive diagnostic |
| *Persoonia linearis* | 1 | 100% | 1 | 20% | Positive diagnostic |
| *Pseuderanthemum variabile* | 3 | 100% | 2 | 12% | Positive diagnostic |
| *Pteridium esculentum* | 4 | 100% | 2 | 40% | Positive diagnostic |
| *Pultenaea flexilis* | 2 | 100% | 2 | 6% | Positive diagnostic |
| *Schelhammera undulata* | 1 | 100% | 2 | 3% | Positive diagnostic |
| *Senecio linearifolius* | 2 | 100% | 2 | 0% | Positive diagnostic |
| *Solanum prinophyllum* | 2 | 100% | 1 | 5% | Positive diagnostic |
| *Synoum glandulosum* subsp. *glandulosum* | 1 | 100% | 2 | 5% | Positive diagnostic |
| *Trema tomentosa* var. *aspera* | 2 | 100% | 1 | 2% | Positive diagnostic |
| *Xanthorrhoea arborea* | 2 | 100% | 2 | 12% | Positive diagnostic |
| *Xanthosia tridentata* | 2 | 100% | 2 | 21% | Positive diagnostic |
| *Zieria pilosa* | 2 | 100% | 2 | 6% | Positive diagnostic |
| *Acacia floribunda* | 2 | 100% | 1 | 4% | Positive diagnostic |
| *Allocasuarina torulosa* | 3 | 100% | 2 | 10% | Positive diagnostic |
| *Angophora costata* | 3 | 100% | 3 | 37% | Positive diagnostic |
| *Angophora floribunda* | 4 | 100% | 2 | 4% | Positive diagnostic |
| *Astrotricha floccosa* | 1 | 100% | 2 | 3% | Positive diagnostic |
| *Calochlaena dubia* | 3 | 100% | 2 | 16% | Positive diagnostic |
| *Commersonia fraseri* | 2 | 100% | 2 | 0% | Positive diagnostic |
| *Dianella caerulea* | 2 | 100% | 2 | 45% | Positive diagnostic |
| *Entolasia marginata* | 2 | 100% | 2 | 22% | Positive diagnostic |
| *Entolasia stricta* | 2 | 100% | 2 | 59% | Positive diagnostic |
| *Eucalyptus agglomerata* | 3 | 100% | 2 | 1% | Positive diagnostic |
| *Eucalyptus piperita* | 2 | 100% | 3 | 20% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 100% | 2 | 15% | Positive diagnostic |
| *Galium binifolium* | 2 | 100% | 1 | 2% | Positive diagnostic |
| *Glycine clandestina* | 2 | 100% | 2 | 18% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 100% | 2 | 23% | Positive diagnostic |
| *Goodenia heterophylla* | 2 | 100% | 1 | 4% | Positive diagnostic |
| *Hardenbergia violacea* | 1 | 100% | 1 | 16% | Positive diagnostic |
| *Hydrocotyle peduncularis* | 2 | 100% | 2 | 6% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 100% | 2 | 20% | Positive diagnostic |
| *Livistona australis* | 2 | 100% | 2 | 10% | Positive diagnostic |
| *Lobelia dentata* | 1 | 100% | 1 | 0% | Positive diagnostic |
| *Lomandra brevis* | 1 | 100% | 1 | 1% | Positive diagnostic |
| *Lomandra gracilis* | 1 | 100% | 2 | 10% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 100% | 2 | 24% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 4 | 100% | 2 | 36% | Positive diagnostic |
| *Oplismenus aemulus* | 2 | 100% | 2 | 10% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Pandorea pandorana* | 1 | 100% | 2 | 16% | Positive diagnostic |
| *Persoonia linearis* | 1 | 100% | 1 | 20% | Positive diagnostic |
| *Pseuderanthemum variabile* | 3 | 100% | 2 | 12% | Positive diagnostic |
| *Pteridium esculentum* | 4 | 100% | 2 | 40% | Positive diagnostic |
| *Pultenaea flexilis* | 2 | 100% | 2 | 6% | Positive diagnostic |
| *Schelhammera undulata* | 1 | 100% | 2 | 3% | Positive diagnostic |
| *Senecio linearifolius* | 2 | 100% | 2 | 0% | Positive diagnostic |
| *Solanum prinophyllum* | 2 | 100% | 1 | 5% | Positive diagnostic |
| *Synoum glandulosum* subsp. *glandulosum* | 1 | 100% | 2 | 5% | Positive diagnostic |
| *Trema tomentosa* var. *aspera* | 2 | 100% | 1 | 2% | Positive diagnostic |
| *Xanthorrhoea arborea* | 2 | 100% | 2 | 12% | Positive diagnostic |
| *Xanthosia tridentata* | 2 | 100% | 2 | 21% | Positive diagnostic |
| *Zieria pilosa* | 2 | 100% | 2 | 6% | Positive diagnostic |

# COASTAL FLATS TALL MOIST FOREST

## S_WSF36

| | |
|---|---|
| **Statewide Class** | **North Coast Wet Sclerophyll Forests** |
| NSW Plant Community Type: | 1522: Lilly Pilly-Sandpaper Fig-Prickly-leaved Tea-tree Warm Temperate Rainforest of the Central Coast and Lower Hunter Valley |
| Biometric Number(s): | HU736; ME63 |



## Description

Coastal Flats Tall Moist Forest is a tall eucalypt community with layers of small rainforest trees and mesic shrubs that is found on coastal flats and adjoining toe slopes. The canopy may include several closely related eucalypts – bangalay (*Eucalyptus botryoides*), sydney blue gum (*Eucalyptus saligna*) or intergrades between the two. Other associated species include turpentine (*Syncarpia glomulifera*), rough-barked apple (*Angophora floribunda*) and blackbutt (*Eucalyptus pilularis*). Rainforest trees such as cheese tree (*Glochidion ferdinandii*), lilly pilly (*Acmena smithii*) and sandpaper fig (*Ficus coronata*) may form an open to closed cover with grey myrtle (*Backhousia myrtifolia*) and cabbage tree palm (*Livistona australis*). Poorly drained sites include stands of paperbark (*Melaleuca* spp.). The ground cover is typical of coastal flats where combinations of moisture-loving ferns, sedges and grasses are common.

This tall forest receives more than 1150 millimetres of mean annual rainfall and is situated on elevations less than 40 metres above sea level. The alluvial soils on which it grows are sourced from Narrabeen sediments and are clay rich. In the Sydney area alluvial soils have been heavily cleared with the best examples remaining in the lower Hacking River valley. Stands in the Lane Cove River valley and South Creek in Cromer are severely disturbed. Outside the Sydney area it is found along the larger coastal river systems north to Newcastle (NPWS 2000c).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 27.2 m ±4.3 15-35 | 21.6% ±6.1 10-42 | *Eucalyptus botryoides, Eucalyptus saligna, Eucalyptus pilularis, Angophora floribunda, Syncarpia glomulifera, Angophora costata* |
| Small Trees | 14.3 m ±1.8 6-25 | 65% ±17.4 30-70 | *Acmena smithii, Glochidion ferdinandii, Livistona australis, Backhousia myrtifolia, Melaleuca linariifolia, Melaleuca styphelioides* |
| Shrubs | 3.4 m ±1.9 1-4 | 17.5% ±10.6 7-30 | *Eupomatia laurina, Clerodendrum tomentosum, Acacia irrorata, Ficus coronata, Notelaea longifolia, Synoum glandulosum* subsp. *glandulosum, Pittosporum undulatum, Pittosporum revolutum* |
| Ground Covers | 0.7 m ±0.4 0.01-1 | 42.5% ±31.6 6-65 | *Blechnum cartilagineum, Calochlaena dubia, Gahnia melanocarpa, Hypolepis muelleri, Microlaena stipoides* var. *stipoides, Entolasia marginata, Hydrocotyle peduncularis, Carex* spp., *Oplismenus imbecillis* |
| Vines & Climbers | N/A | N/A | *Cissus hypoglauca, Morinda jasminoides, Clematis aristata, Geitonoplesium cymosum, Stephania japonica, Hibbertia dentata* |

*Modified from NPWS (2002c)

## Threats

Alluvial forests have been heavily cleared and modified across coastal New South Wales (Keith and Scott 2005). This has left remnants degraded by weed infestation and fragmentation and modified by altered drainage patterns. Urban development continues to directly threaten remnants through clearing or by downstream impacts (NSW Scientific Committee 2005). Few examples of this forest are free of any evidence of disturbance, with many in dense urban parts of Sydney characterised by a remnant canopy, exotic shrub layers and dense ground cover of native and exotic grasses and herbs.

## Conservation Status

This forest is represented in Royal NP and Lane Cove River NP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 25383 |
| Estimated percentage cleared | Not available | 82% |
| Total NPWS reserves | 42.6 +5.9 hectares<br>86% of extant area | Est. 100 hectares<br><0.1% of preclearing area<br><0.1% of extant area |
| Total reserved | 47.3 +5.9 hectares<br>96% of extant area | Not available |
| Total non-reserved | 2.2 +<.1 hectares | Not available |
| Total extant | 49.5 hectares | Est. 70 hectares |



Map unit
Study area
Extant vegetation

## Example Locations

o   Lady Carrington Drive, Royal NP

o   Jamieson Park, Warringah LGA

## Species Richness

| Number of sites | 11 |
|---|---|
| Total native species | 137 |
| Average no. native species per site | 35.0 ±9.8 |

## Variations and Dynamics

On narrow creeks the forest may include trees more typical of surrounding slopes and rises such as smooth-barked apple (*Angophora costata*), Sydney peppermint (*Eucalyptus piperita*) and red mahogany (*Eucalyptus resinifera*). Sites with poor drainage will include a higher cover of paperbark species and feature some swampy ground covers such as *Gahnia clarkei.*

## Relationship to Other Communities

This community marks a gradient between swamp sclerophyll forests, riverflat eucalypt forests and wet sclerophyll forests situated on freely draining substrates. For example Coastal Flats Swamp Mahogany Forest (S_FoW02) may occur on the same floodplain as this forest though at elevations less than six metres above sea level (while this community will range between five and 40 metres above sea level). Other swamp sclerophyll forests (Riverflat Paperbark Swamp Forest (S_FoW05)) are more commonly associated with perched alluviums, drier climates and sandy alluvial material. Similar forests occur on sandy alluviums at Deep Creek near Narrabeen lagoon (Coastal Alluvial Bangalay Forest, S_FoW01) although the understorey comprises a greater proportion of sclerophyllous shrubs and a sparse cover of rainforest trees.

## Accuracy

Sampling density is high but is unevenly distributed owing to the disturbance level of forests outside of the Hacking River valley. These tall forests and the landscapes on which they occur are readily interpreted from aerial photography and it is therefore expected to be accurately mapped.

A 0.04 hectare site located in this map unit is expected to contain at least 13 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 28 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia floribunda* | 2 | 18% | 1 | 4% | Uninformative |
| *Acacia irrorata* | 2 | 45% | 1 | 3% | Positive diagnostic |
| *Acmena smithii* | 2 | 64% | 2 | 5% | Positive diagnostic |
| *Adiantum aethiopicum* | 2 | 18% | 2 | 7% | Uninformative |
| *Adiantum hispidulum* | 2 | 18% | 1 | 1% | Uninformative |
| *Alphitonia excelsa* | 1 | 27% | 1 | 1% | Positive diagnostic |
| *Aphanopetalum resinosum* | 2 | 27% | 2 | 0% | Positive diagnostic |
| *Backhousia myrtifolia* | 2 | 27% | 2 | 2% | Positive diagnostic |
| *Billardiera scandens* | 2 | 18% | 1 | 37% | Uninformative |
| *Blechnum cartilagineum* | 2 | 64% | 2 | 6% | Positive diagnostic |
| *Breynia oblongifolia* | 2 | 18% | 1 | 17% | Uninformative |
| *Callicoma serratifolia* | 2 | 18% | 2 | 5% | Uninformative |
| *Calochlaena dubia* | 3 | 73% | 2 | 16% | Positive diagnostic |
| *Carex appressa* | 2 | 18% | 2 | 1% | Uninformative |
| *Carex brunnea* | 3 | 27% | 3 | 0% | Positive diagnostic |
| *Casuarina glauca* | 2 | 18% | 2 | 7% | Uninformative |
| *Cayratia clematidea* | 1 | 55% | 2 | 4% | Positive diagnostic |
| *Ceratopetalum apetalum* | 2 | 27% | 2 | 5% | Uninformative |
| *Cissus antarctica* | 2 | 18% | 2 | 2% | Uninformative |
| *Cissus hypoglauca* | 2 | 64% | 2 | 8% | Positive diagnostic |
| *Claoxylon australe* | 1 | 18% | 1 | 1% | Uninformative |
| *Clematis aristata* | 1 | 36% | 1 | 7% | Positive diagnostic |
| *Clerodendrum tomentosum* | 2 | 55% | 1 | 5% | Positive diagnostic |
| *Commelina cyanea* | 2 | 18% | 2 | 9% | Uninformative |
| *Cyathea australis* | 2 | 18% | 1 | 2% | Uninformative |
| *Doodia aspera* | 2 | 18% | 2 | 3% | Uninformative |
| *Duboisia myoporoides* | 2 | 27% | 1 | 1% | Positive diagnostic |
| *Elaeocarpus reticulatus* | 1 | 27% | 1 | 20% | Uninformative |
| *Entolasia marginata* | 2 | 45% | 2 | 22% | Constant |
| *Eucalyptus botryoides* | 3 | 36% | 3 | 5% | Positive diagnostic |
| *Eucalyptus pilularis* | 3 | 18% | 3 | 14% | Uninformative |
| *Eupomatia laurina* | 2 | 45% | 2 | 1% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 36% | 2 | 15% | Constant |
| *Ficus coronata* | 2 | 64% | 2 | 1% | Positive diagnostic |
| *Ficus rubiginosa* | 1 | 27% | 1 | 4% | Positive diagnostic |
| *Gahnia aspera* | 2 | 18% | 1 | 3% | Uninformative |
| *Gahnia melanocarpa* | 2 | 45% | 2 | 3% | Positive diagnostic |
| *Gahnia sieberiana* | 3 | 18% | 2 | 7% | Uninformative |
| *Geitonoplesium cymosum* | 2 | 82% | 2 | 9% | Positive diagnostic |
| *Glochidion ferdinandi* | 3 | 64% | 1 | 13% | Positive diagnostic |
| *Gymnostachys anceps* | 2 | 18% | 2 | 3% | Uninformative |
| *Hibbertia dentata* | 2 | 45% | 2 | 8% | Positive diagnostic |
| *Hibbertia scandens* | 2 | 18% | 2 | 7% | Uninformative |
| *Hydrocotyle laxiflora* | 2 | 27% | 2 | 3% | Positive diagnostic |
| *Hydrocotyle peduncularis* | 2 | 36% | 2 | 6% | Positive diagnostic |
| *Hypolepis muelleri* | 3 | 73% | 2 | 5% | Positive diagnostic |
| *Livistona australis* | 3 | 91% | 2 | 10% | Positive diagnostic |
| *Lomandra longifolia* | 2 | 73% | 2 | 47% | Constant |
| *Lomatia myricoides* | 2 | 18% | 2 | 3% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 36% | 2 | 36% | Constant |
| *Morinda jasminoides* | 2 | 91% | 2 | 6% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 64% | 1 | 21% | Positive diagnostic |
| *Notelaea venosa* | 1 | 18% | 1 | 1% | Uninformative |
| *Omalanthus nutans* | 2 | 18% | 1 | 9% | Uninformative |
| *Oplismenus imbecillis* | 2 | 73% | 2 | 12% | Positive diagnostic |
| *Oxalis exilis* | 2 | 18% | 1 | 3% | Uninformative |
| *Pandorea pandorana* | 1 | 27% | 2 | 16% | Uninformative |
| *Parsonsia straminea* | 1 | 27% | 1 | 5% | Uninformative |
| *Pittosporum revolutum* | 2 | 36% | 1 | 9% | Constant |
| *Pittosporum undulatum* | 1 | 36% | 2 | 25% | Constant |
| *Poa affinis* | 2 | 27% | 2 | 11% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 2 | 18% | 2 | 6% | Uninformative |
| *Pratia purpurascens* | 1 | 27% | 2 | 18% | Uninformative |
| *Pseuderanthemum variabile* | 2 | 36% | 2 | 12% | Constant |
| *Pteridium esculentum* | 2 | 45% | 2 | 40% | Constant |
| *Sarcopetalum harveyanum* | 2 | 55% | 1 | 4% | Positive diagnostic |
| *Schizomeria ovata* | 3 | 18% | 1 | 1% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Smilax australis* | 2 | 55% | 1 | 3% | Positive diagnostic |
| *Smilax glyciphylla* | 1 | 45% | 2 | 33% | Constant |
| *Stellaria flaccida* | 1 | 18% | 2 | 0% | Uninformative |
| *Stenocarpus salignus* | 2 | 18% | 2 | 1% | Uninformative |
| *Stephania japonica* | 2 | 73% | 1 | 6% | Positive diagnostic |
| *Syncarpia glomulifera* | 3 | 36% | 3 | 13% | Constant |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 64% | 2 | 5% | Positive diagnostic |
| *Syzygium oleosum* | 1 | 27% | 1 | 0% | Positive diagnostic |
| *Trema tomentosa* var. *aspera* | 1 | 27% | 1 | 2% | Positive diagnostic |
| *Viola hederacea* | 3 | 55% | 2 | 6% | Positive diagnostic |
| *Wilkiea huegeliana* | 1 | 27% | 2 | 2% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|

# COASTAL SHALE-SANDSTONE FOREST

# S_WSF06

**Statewide Class**

**Northern Hinterland Wet Sclerophyll Forests**

NSW Plant Community Type:

1085: Red Bloodwood-Smooth-barked Apple Shrubby Forest on Shale or Ironstone of Coastal Plateaux, Sydney Basin

Biometric Number(s):

HN567; ME039; SR597



## Description

Coastal Shale-Sandstone Forest is often a tall open eucalypt forest with a sparse layer of dry sclerophyllous shrubs and a grassy ground cover. It occurs on clay-influenced soils associated with residual shale or lateritic capping, shale bands in the sandstone bedrock or downslope shale wash on exposed sandstone slopes. The eucalypts that occur consistently are tall red bloodwood (*Corymbia gummifera*) and smooth-barked apple (*Angophora costata*), but it is the local abundance of blackbutt (*Eucalyptus pilularis*), turpentine (*Syncarpia glomulifera*) and mahogany (*Eucalyptus resinifera, E. umbra*) that make the forest distinctive from the surrounding sandstone woodlands. A tall sparse layer of casuarinas (*Allocasuarina littoralis)* is found above an open layer of dry shrubs including banksias, wattles, hakeas and geebungs. A diverse combination of grasses, rushes and herbs provide a continuous ground cover. In some areas the forest may form a low open woodland comprising smooth-barked apple, brown stringybark (*Eucalyptus capitellata*) and scribbly gum (*Eucalyptus racemosa*) amongst other species. A thin layer of clay soil is sufficient to retain the grassy ground covers that help to distinguish the community. Some stands of this forest have been described as a variant of Duffys Forest Ecological Community (Smith and Smith 2000), an Endangered Ecological Community under the NSW TSC Act. Coastal Shale-Sandstone Forest is found in areas that receive an average of more than 900 millimeteres of rainfall per annum and are between two and 372 metres above sea level.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 24 m ±6 <br> 15-35 | 37% ±18 <br> 5-75 | *Angophora costata, Corymbia gummifera, Eucalyptus pilularis, Syncarpia glomulifera, Eucalyptus resinifera* |
| Small Trees | 9 m ±6 <br> 1-20 | 20% ±17 <br> 3-70 | *Pittosporum undulatum, Allocasuarina littoralis* |
| Shrubs | 3.9 m ±2.9 <br> 1.5-15.0 | 25% ±16 <br> 5-65 | *Lomatia silaifolia, Acacia linifolia, Banksia spinulosa Hakea sericea, Persoonia levis, Polyscias sambucifolia, Bossiaea obcordata, Dodonaea triquetra, Leptospermum trinervium, Goodenia hederacea, Lomandra multiflora* |
| Ground Covers | 0.9 m ±0.4 <br> 0.4-2.0 | 34% ±26 <br> 4-80 | *Entolasia stricta, Dianella caerulea, Phyllanthus hirtellus, Lomandra obliqua, Lepidosperma laterale, Pteridium esculentum, Lomandra longifolia, Austrostipa pubescens, Imperata cylindrica* var. *major, Microlaena stipoides* var. *stipoides, Themeda australis, Brunoniella pumilio* |
| Vines & Climbers | N/A | N/A | *Billardiera scandens, Cassytha pubescens, Smilax glyciphylla* |

*Compiled from 23 sites with structural data recorded.

## Threats

Clearing of shale soils on undulating topography has been extensive in the Sydney area. The first wave occurred for agriculture followed by urbanisation. Remnant stands of this forest are often small and surrounded by high density urban land use. Frequent fire, weeds and rubbish dumping are persistent threats.

## Conservation Status

Some stands of the forest are described as a variant of the Duffys Forest Ecological Community in the Sydney Basin Bioregion (Smith and Smith 2000), an Endangered Ecological Community under the TSC Act. However, the species list in the determination for that Endangered Ecological Community (EEC) does not encompass characteristic species that occur in this community. Therefore Coastal Shale-Sandstone Forest is considered not to be a component of that EEC.This community is represented in Royal, Garigal and Lane Cove national parks.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 3715-5200 hectares |
| Estimated percentage cleared | Not available | 30-50% |
| Total NPWS reserves | 158 +10.2 hectares<br>39% of extant area | 1600 hectares<br>60% of extant area<br>30-50% of pre-clearing area |
| Total reserved | 247 +21.0 hectares<br>61% of extant area | Not available |
| Total non-reserved | 156 +193 hectares | Not available |
| Total extant | 403 hectares | 2600 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o   Davidson High School, Davidson

o   Loftus, Royal NP

o   Lake Parramatta Reserve, North Parramatta

## Species Richness

| | |
|---|---|
| Number of sites | 60 |
| Total native species | 367 |
| Average no. native species per site | 47.6 ±9.1 |

## Variations and Dynamics

Several floristic and structural variations are recognised. The community varies between a tall open forest and woodland depending on the depth of shale-derived soil and proximity to sandstone bedrock. Composition of the canopy will vary with this gradation, with blackbutt and grasses such as *Themeda australis* more prevalent in tall forests and scribbly gums and sclerophyllous shrubs such as *Banksia spinulosa* more prevalent near the sandstone boundary.

## Relationship to Other Communities

Floristically this forest is related to other shale enriched sandstone communities such as S_DSF04 which occurs in similar coastal locations. S_DSF04 has a higher proportion of sclerophyll shrubs and a lower cover of grasses. Ironstone woodlands (S_DSF14) are occasionally recorded nearby. Other communities which are found on shale enriched soils occupy areas of lower rainfall in the western parts of the study area. This includes S_DSF17, S_DSF18 and S_GW04.

## Accuracy

Sampling density is high. Map unit boundaries relied on the interpretation of topographic position and shale-sandstone soils inferred from published mapping.. Open woodland forms with shale ground covers may be underestimated.

A 0.04 hectare site located in this map unit is expected to contain at least 20 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 39 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia brownii* | 1 | 10% | 1 | 1% | Uninformative |
| *Acacia linifolia* | 2 | 72% | 2 | 19% | Positive diagnostic |
| *Acacia longifolia* | 1 | 23% | 2 | 21% | Uninformative |
| *Acacia myrtifolia* | 2 | 50% | 2 | 11% | Positive diagnostic |
| *Acacia suaveolens* | 1 | 18% | 1 | 28% | Uninformative |
| *Acacia ulicifolia* | 1 | 28% | 1 | 25% | Uninformative |
| *Allocasuarina littoralis* | 2 | 48% | 2 | 26% | Positive diagnostic |
| *Allocasuarina torulosa* | 2 | 15% | 2 | 10% | Uninformative |
| *Angophora costata* | 3 | 83% | 3 | 36% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 22% | 2 | 14% | Uninformative |
| *Aristida vagans* | 2 | 42% | 2 | 14% | Positive diagnostic |
| *Austrodanthonia tenuior* | 1 | 12% | 2 | 4% | Uninformative |
| *Austrostipa pubescens* | 2 | 57% | 2 | 19% | Positive diagnostic |
| *Banksia marginata* | 2 | 10% | 2 | 10% | Uninformative |
| *Banksia serrata* | 2 | 17% | 2 | 33% | Uninformative |
| *Banksia spinulosa* | 2 | 70% | 2 | 25% | Positive diagnostic |
| *Billardiera scandens* | 2 | 80% | 1 | 36% | Positive diagnostic |
| *Bossiaea obcordata* | 2 | 43% | 2 | 6% | Positive diagnostic |
| *Brunoniella pumilio* | 2 | 53% | 1 | 6% | Positive diagnostic |
| *Bursaria spinosa* | 1 | 13% | 2 | 12% | Uninformative |
| *Cassytha glabella* | 1 | 15% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 40% | 2 | 27% | Constant |
| *Caustis flexuosa* | 2 | 12% | 2 | 18% | Uninformative |
| *Ceratopetalum gummiferum* | 1 | 22% | 2 | 17% | Uninformative |
| *Clematis aristata* | 2 | 10% | 1 | 7% | Uninformative |
| *Comesperma ericinum* | 1 | 12% | 1 | 2% | Positive diagnostic |
| *Corymbia gummifera* | 3 | 77% | 2 | 40% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 43% | 2 | 26% | Constant |
| *Dampiera stricta* | 1 | 15% | 2 | 24% | Uninformative |
| *Daviesia ulicifolia* | 1 | 15% | 2 | 3% | Positive diagnostic |
| *Dianella caerulea* | 2 | 82% | 2 | 44% | Positive diagnostic |
| *Dianella revoluta* | 1 | 40% | 2 | 16% | Positive diagnostic |
| *Dichelachne micrantha* | 1 | 17% | 2 | 9% | Uninformative |
| *Dillwynia retorta* | 2 | 18% | 2 | 26% | Uninformative |
| *Dodonaea triquetra* | 2 | 40% | 2 | 22% | Positive diagnostic |
| *Doryanthes excelsa* | 2 | 10% | 2 | 9% | Uninformative |
| *Echinopogon caespitosus* | 1 | 25% | 2 | 10% | Positive diagnostic |
| *Elaeocarpus reticulatus* | 1 | 30% | 1 | 20% | Uninformative |
| *Entolasia marginata* | 2 | 23% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 3 | 95% | 2 | 58% | Positive diagnostic |
| *Epacris pulchella* | 1 | 40% | 2 | 15% | Positive diagnostic |
| *Eragrostis brownii* | 2 | 10% | 2 | 7% | Uninformative |
| *Eucalyptus capitellata* | 3 | 10% | 3 | 2% | Uninformative |
| *Eucalyptus globoidea* | 3 | 33% | 2 | 3% | Positive diagnostic |
| *Eucalyptus haemastoma* | 2 | 13% | 2 | 12% | Uninformative |
| *Eucalyptus pilularis* | 3 | 32% | 3 | 13% | Positive diagnostic |
| *Eucalyptus piperita* | 2 | 12% | 3 | 20% | Uninformative |
| *Eucalyptus resinifera* subsp. *resinifera* | 2 | 38% | 1 | 4% | Positive diagnostic |
| *Eucalyptus sieberi* | 3 | 10% | 2 | 9% | Uninformative |
| *Glochidion ferdinandi* | 1 | 20% | 2 | 13% | Uninformative |
| *Glycine clandestina* | 2 | 57% | 2 | 17% | Positive diagnostic |
| *Glycine microphylla* | 2 | 17% | 2 | 9% | Uninformative |
| *Gonocarpus tetragynus* | 2 | 12% | 2 | 8% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 32% | 2 | 23% | Uninformative |
| *Goodenia bellidifolia* subsp. *bellidifolia* | 1 | 12% | 1 | 4% | Uninformative |
| *Goodenia hederacea* | 2 | 42% | 1 | 10% | Positive diagnostic |
| *Goodenia heterophylla* | 1 | 17% | 1 | 3% | Positive diagnostic |
| *Grevillea linearifolia* | 3 | 17% | 2 | 7% | Uninformative |
| *Grevillea sericea* | 2 | 32% | 2 | 15% | Positive diagnostic |
| *Hakea dactyloides* | 1 | 17% | 2 | 24% | Uninformative |
| *Hakea sericea* | 2 | 60% | 2 | 20% | Positive diagnostic |
| *Hardenbergia violacea* | 1 | 25% | 1 | 16% | Uninformative |
| *Hibbertia aspera* | 1 | 35% | 2 | 10% | Positive diagnostic |
| *Hibbertia bracteata* | 1 | 15% | 2 | 5% | Uninformative |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 1 | 18% | 1 | 5% | Positive diagnostic |
| *Hovea linearis* | 2 | 18% | 1 | 11% | Uninformative |
| *Hybanthus monopetalus* | 1 | 12% | 1 | 2% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Hypericum gramineum* | 2 | 10% | 2 | 3% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 58% | 2 | 19% | Positive diagnostic |
| *Joycea pallida* | 2 | 15% | 2 | 1% | Positive diagnostic |
| *Kennedia rubicunda* | 2 | 13% | 1 | 9% | Uninformative |
| *Kunzea ambigua* | 2 | 13% | 2 | 15% | Uninformative |
| *Lagenophora stipitata* | 2 | 15% | 2 | 3% | Positive diagnostic |
| *Lambertia formosa* | 2 | 22% | 2 | 26% | Uninformative |
| *Lasiopetalum ferrugineum* | 2 | 37% | 2 | 11% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 77% | 2 | 41% | Positive diagnostic |
| *Leptospermum polygalifolium* | 1 | 20% | 2 | 14% | Uninformative |
| *Leucopogon juniperinus* | 2 | 32% | 2 | 10% | Positive diagnostic |
| *Leucopogon lanceolatus* | 1 | 10% | 1 | 8% | Uninformative |
| *Lindsaea linearis* | 1 | 30% | 2 | 16% | Uninformative |
| *Lindsaea microphylla* | 1 | 30% | 1 | 7% | Positive diagnostic |
| *Lissanthe strigosa* | 2 | 18% | 2 | 8% | Uninformative |
| *Lomandra cylindrica* | 2 | 13% | 2 | 10% | Uninformative |
| *Lomandra filiformis* | 1 | 32% | 2 | 22% | Uninformative |
| *Lomandra glauca* | 1 | 13% | 2 | 16% | Uninformative |
| *Lomandra gracilis* | 1 | 20% | 2 | 10% | Uninformative |
| *Lomandra longifolia* | 2 | 47% | 2 | 47% | Constant |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 68% | 2 | 23% | Positive diagnostic |
| *Lomandra obliqua* | 2 | 73% | 2 | 31% | Positive diagnostic |
| *Lomatia silaifolia* | 2 | 68% | 1 | 26% | Positive diagnostic |
| *Micrantheum ericoides* | 2 | 45% | 2 | 16% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 72% | 2 | 35% | Positive diagnostic |
| *Monotoca scoparia* | 1 | 10% | 1 | 16% | Uninformative |
| *Notelaea longifolia* | 1 | 13% | 1 | 21% | Uninformative |
| *Olearia microphylla* | 1 | 12% | 1 | 3% | Positive diagnostic |
| *Omalanthus nutans* | 1 | 12% | 1 | 9% | Uninformative |
| *Opercularia diphylla* | 1 | 15% | 2 | 8% | Uninformative |
| *Opercularia varia* | 1 | 15% | 1 | 1% | Positive diagnostic |
| *Ozothamnus diosmifolius* | 1 | 25% | 1 | 11% | Positive diagnostic |
| *Panicum simile* | 2 | 28% | 2 | 9% | Positive diagnostic |
| *Patersonia glabrata* | 1 | 37% | 2 | 16% | Positive diagnostic |
| *Patersonia sericea* | 2 | 15% | 1 | 15% | Uninformative |
| *Persoonia laurina* | 2 | 25% | 1 | 2% | Positive diagnostic |
| *Persoonia levis* | 1 | 65% | 1 | 32% | Positive diagnostic |
| *Persoonia linearis* | 1 | 23% | 1 | 20% | Uninformative |
| *Persoonia pinifolia* | 1 | 18% | 2 | 21% | Uninformative |
| *Petrophile pulchella* | 1 | 15% | 2 | 16% | Uninformative |
| *Phyllanthus hirtellus* | 2 | 58% | 2 | 27% | Positive diagnostic |
| *Pimelea curviflora* | 2 | 10% | 1 | 0% | Uninformative |
| *Pimelea linifolia* | 2 | 10% | 2 | 27% | Uninformative |
| *Pittosporum undulatum* | 2 | 52% | 2 | 24% | Positive diagnostic |
| *Platylobium formosum* | 2 | 33% | 2 | 7% | Positive diagnostic |
| *Platysace linearifolia* | 2 | 18% | 2 | 30% | Uninformative |
| *Polyscias sambucifolia* | 1 | 45% | 1 | 14% | Positive diagnostic |
| *Pomax umbellata* | 1 | 18% | 2 | 15% | Uninformative |
| *Pratia purpurascens* | 2 | 42% | 2 | 17% | Positive diagnostic |
| *Prostanthera denticulata* | 2 | 13% | 2 | 1% | Positive diagnostic |
| *Pseuderanthemum variabile* | 1 | 10% | 2 | 13% | Uninformative |
| *Pteridium esculentum* | 2 | 57% | 2 | 40% | Constant |
| *Pultenaea daphnoides* | 2 | 17% | 2 | 8% | Uninformative |
| *Pultenaea hispidula* | 2 | 23% | 1 | 1% | Positive diagnostic |
| *Pultenaea linophylla* | 2 | 12% | 1 | 3% | Uninformative |
| *Pultenaea tuberculata* | 1 | 27% | 2 | 16% | Uninformative |
| *Pultenaea villosa* | 2 | 10% | 2 | 2% | Uninformative |
| *Smilax glyciphylla* | 2 | 40% | 2 | 33% | Constant |
| *Syncarpia glomulifera* | 3 | 38% | 3 | 12% | Positive diagnostic |
| *Tetrarrhena juncea* | 2 | 17% | 2 | 4% | Positive diagnostic |
| *Themeda australis* | 2 | 60% | 2 | 22% | Positive diagnostic |
| *Xanthorrhoea media* | 2 | 30% | 2 | 19% | Uninformative |
| *Xanthosia pilosa* | 1 | 10% | 2 | 21% | Uninformative |
| *Xanthosia tridentata* | 2 | 43% | 2 | 21% | Positive diagnostic |
| *Xylomelum pyriforme* | 2 | 10% | 1 | 7% | Uninformative |

# O'HARES CREEK SHALE FOREST

## S_WSF07

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Northern Hinterland Wet Sclerophyll Forests**
1253: Sydney Peppermint-White Stringybark-Smooth-barked Apple Forest on Shale Outcrops, Sydney Basin Bioregion
HN644; ME87
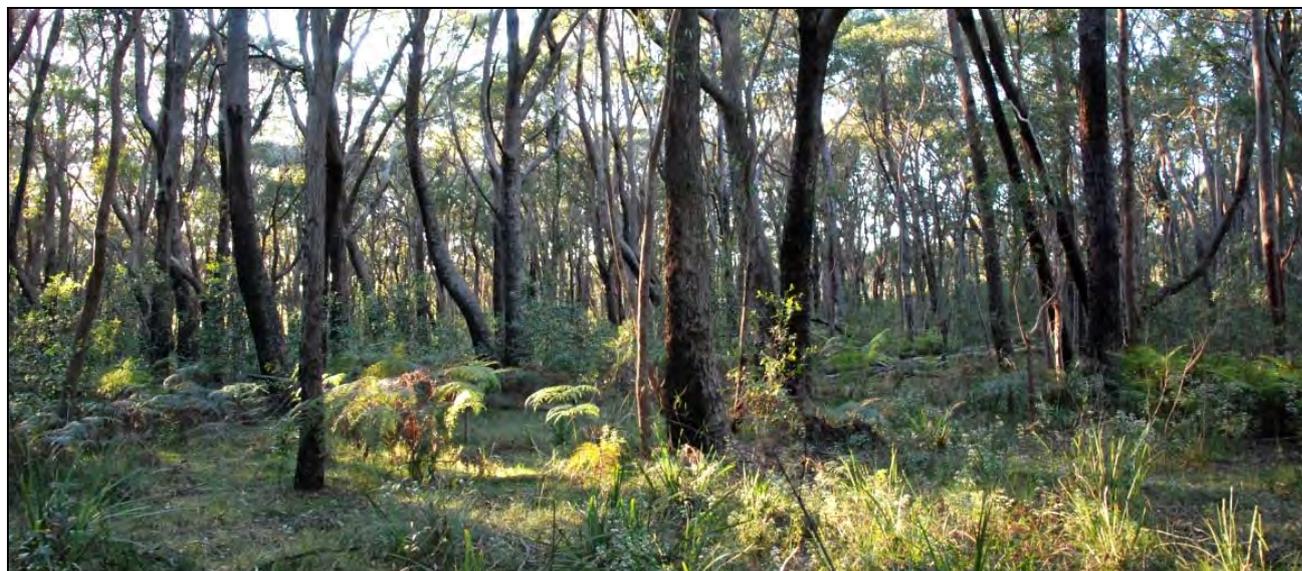


## Description

O'Hares Creek Shale Forest is dominated by tall Sydney peppermint (*Eucalyptus piperita*), white stringybark (*Eucalyptus globoidea*) and smooth-barked apple (*Angophora costata*). It is an open forest with a sparse tall shrub and small tree layer that may comprise a number of wattle species including two-veined hickory (*Acacia binervata*). Smaller shrubs are similarly sparse with banksias, peas and geebungs commonly recorded. The ground cover however is very dense and often marked by an impressive cushion of ferns, lilies and rushes. Some sites include clumps of the conspicuous Gymea lily (*Doryanthes excelsa*).

This forest community is associated with the reddish brown clay soils that form flat to gently sloping residual capping above sandstone bedrock around Darkes Forest on the Woronora Plateau. The community is naturally restricted in extent occurring between Cataract catchment and Appin Road to Helensburgh. It persists within a narrow mean annual rainfall band of 950 to 1100 millimetres and between elevations of 350 and 450 meters above sea level.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 25 m ±9.1 | 33% ± 14.9 | *Eucalyptus globoidea, Eucalyptus piperita, Angophora costata, Corymbia gummifera* |
| Small Trees | 9.7 m ±3.3 | 25% ± 24.4 | *Acacia longifolia, Acacia binervata* |
| Shrubs | 3.3 m ±1.5 | 20%±5 | *Leucopogon lanceolatus* var. *lanceolatus, Persoonia linearis, Lomatia silaifolia, Banksia spinulosa* subsp. *spinulosa, Goodenia heterophylla, Hibbertia aspera* subsp. *aspera, Hibbertia empetrifolia* |
| Ground Covers | 1 m | 70%±20 | *Dianella caerulea, Lomandra longifolia, Pteridium esculentum, Calochlaena dubia, Blechnum cartilagineum, Entolasia stricta, Lagenophora stipitata, Viola hederacea, Imperata cylindrica* var. *major, Doryanthes excelsa, Microlaena stipoides* var. *stipoides, Pratia purpurascens, Entolasia marginate, Phyllanthus hirtellus, Poranthera microphylla, Brunoniella pumilio, Gonocarpus teucrioides, Helichrysum elatum* |
| Vines & Climbers | N/A | N/A | *Glycine clandestina, Billardiera scandens, Clematis aristata, Kennedia rubicunda, Eustrephus latifolius, Smilax glyciphylla, Hibbertia scandens* |

*Compiled from 2 sites with structural data recorded.

## Threats

The largest patches of shale capping supporting this forest have largely been cleared for agriculture, most notably at Darkes Forest and Helensburgh. Clay quarry operations have excavated a number of smaller patches while the Appin Road dissects a once significant area. Timber cutting is likely to have once targeted the tall straight trees found on these sites (Keith 1994).

## Conservation Status

O'Hares Creek Shale Forest Communiy is listed as an Endangered Ecological Community under the TSC Act. It is recorded from Dharawal NR.

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 3715-5200 hectares |
| Estimated percentage cleared | Not available | 30-50% |
| Total NPWS reserves | 22.9 +0.4 hectares 12% of extant area | 1600 hectares 60% of extant area 30-50% of pre-clearing area |
| Total reserved | 134 +19.5 hectares 69% of extant area | Not available |
| Total non-reserved | 61.0 +11.0 hectares | Not available |
| Total extant | 195 hectares | 2600 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o   Darkes Forest Road, Darkes Forest.

o   Fire Trail 9E in Dharawal NR.

## Species Richness

| | |
|---|---|
| Number of sites | 14 |
| Total native species | 167 |
| Average no. native species per site | 40.3 ±6 |

## Variations and Dynamics

Individual patches vary in the thickness of the underlying shale soil. This results in a forest that can exhibit greater or lesser degrees of sandstone influence in the density and diversity of the shrub layer. Keith (1994) also contends that easterly patches are typified by a more mesic understorey than those in the west.

## Relationship to Other Communities

This community is floristically similar to other communities that occur on residual shale soils on the coastal sandstone plateau of the Sydney basin. There are many species shared with S_DSF13 and also with mesic shale-influenced forests S_WSF02 and S_WSF05.

Spatially the community grades into surrounding sandstone and ironstone vegetation communities associated with the broad sandstone plateau. This includes S_DSF05 and S_DSF14.

## Accuracy

The community has a moderate sampling intensity across the range of the mapped distribution.

A 0.04 hectare site located in this map unit is expected to contain at least 15 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 32 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia binervata* | 2 | 43% | 2 | 2% | Positive diagnostic |
| *Acacia binervia* | 3 | 36% | 2 | 1% | Positive diagnostic |
| *Acacia linifolia* | 3 | 14% | 2 | 20% | Uninformative |
| *Acacia longifolia* | 2 | 71% | 2 | 21% | Positive diagnostic |
| *Acacia myrtifolia* | 2 | 21% | 2 | 12% | Uninformative |
| *Acacia obtusifolia* | 2 | 14% | 2 | 2% | Uninformative |
| *Allocasuarina littoralis* | 1 | 21% | 2 | 27% | Uninformative |
| *Amperea xiphoclada* | 2 | 14% | 1 | 6% | Uninformative |
| *Angophora costata* | 4 | 64% | 3 | 37% | Constant |
| *Aristida vagans* | 2 | 14% | 2 | 14% | Uninformative |
| *Austrostipa pubescens* | 2 | 29% | 2 | 20% | Uninformative |
| *Banksia spinulosa* | 2 | 57% | 2 | 26% | Constant |
| *Billardiera scandens* | 2 | 71% | 1 | 37% | Constant |
| *Blechnum cartilagineum* | 2 | 71% | 2 | 6% | Positive diagnostic |
| *Brunoniella australis* | 3 | 14% | 2 | 7% | Uninformative |
| *Brunoniella pumilio* | 2 | 43% | 2 | 7% | Positive diagnostic |
| *Calochlaena dubia* | 3 | 86% | 2 | 16% | Positive diagnostic |
| *Cassytha pubescens* | 2 | 14% | 2 | 27% | Uninformative |
| *Clematis aristata* | 2 | 64% | 1 | 7% | Positive diagnostic |
| *Clematis glycinoides* | 2 | 14% | 2 | 6% | Uninformative |
| *Comesperma volubile* | 2 | 21% | 1 | 1% | Positive diagnostic |
| *Coronidium elatum* | 2 | 36% | 1 | 1% | Positive diagnostic |
| *Corymbia gummifera* | 3 | 50% | 2 | 41% | Constant |
| *Dampiera purpurea* | 2 | 29% | 1 | 4% | Positive diagnostic |
| *Dampiera stricta* | 2 | 14% | 2 | 23% | Uninformative |
| *Desmodium varians* | 2 | 29% | 2 | 8% | Uninformative |
| *Dianella caerulea* | 2 | 100% | 2 | 44% | Positive diagnostic |
| *Dianella revoluta* | 1 | 14% | 2 | 17% | Uninformative |
| *Dichelachne rara* | 2 | 29% | 1 | 1% | Positive diagnostic |
| *Doryanthes excelsa* | 3 | 57% | 2 | 9% | Positive diagnostic |
| *Drosera peltata* | 1 | 14% | 1 | 3% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 14% | 1 | 20% | Uninformative |
| *Entolasia marginata* | 2 | 43% | 2 | 22% | Constant |
| *Entolasia stricta* | 2 | 79% | 2 | 59% | Constant |
| *Eucalyptus globoidea* | 3 | 86% | 2 | 3% | Positive diagnostic |
| *Eucalyptus oblonga* | 4 | 14% | 2 | 7% | Uninformative |
| *Eucalyptus piperita* | 3 | 93% | 3 | 19% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 50% | 2 | 15% | Positive diagnostic |
| *Gahnia clarkei* | 2 | 14% | 2 | 4% | Uninformative |
| *Gahnia sieberiana* | 2 | 14% | 2 | 7% | Uninformative |
| *Galium propinquum* | 2 | 21% | 2 | 2% | Positive diagnostic |
| *Glycine clandestina* | 2 | 79% | 2 | 17% | Positive diagnostic |
| *Gompholobium latifolium* | 2 | 21% | 1 | 4% | Uninformative |
| *Gompholobium virgatum* | 2 | 14% | 2 | 0% | Uninformative |
| *Gonocarpus tetragynus* | 2 | 29% | 2 | 8% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 43% | 2 | 23% | Constant |
| *Goodenia bellidifolia* subsp. *bellidifolia* | 2 | 14% | 1 | 5% | Uninformative |
| *Goodenia heterophylla* | 2 | 50% | 1 | 3% | Positive diagnostic |
| *Hakea gibbosa* | 2 | 14% | 2 | 7% | Uninformative |
| *Hardenbergia violacea* | 2 | 14% | 1 | 16% | Uninformative |
| *Hibbertia aspera* | 2 | 43% | 2 | 10% | Positive diagnostic |
| *Hibbertia dentata* | 3 | 29% | 2 | 8% | Uninformative |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 2 | 43% | 1 | 6% | Positive diagnostic |
| *Hibbertia scandens* | 2 | 36% | 2 | 7% | Positive diagnostic |
| *Hydrocotyle acutiloba* | 3 | 14% | 2 | 1% | Uninformative |
| *Hydrocotyle peduncularis* | 2 | 29% | 2 | 6% | Positive diagnostic |
| *Hypericum gramineum* | 2 | 14% | 2 | 3% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 71% | 2 | 20% | Positive diagnostic |
| *Kennedia rubicunda* | 2 | 57% | 1 | 9% | Positive diagnostic |
| *Lagenophora stipitata* | 2 | 71% | 1 | 3% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 43% | 2 | 42% | Constant |
| *Leptomeria acida* | 1 | 14% | 1 | 6% | Uninformative |
| *Leptospermum polygalifolium* | 2 | 21% | 2 | 14% | Uninformative |
| *Leucopogon lanceolatus* | 2 | 71% | 1 | 8% | Positive diagnostic |
| *Lindsaea linearis* | 2 | 21% | 2 | 16% | Uninformative |
| *Lindsaea microphylla* | 2 | 14% | 1 | 8% | Uninformative |
| *Lomandra gracilis* | 1 | 14% | 2 | 10% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lomandra longifolia* | 2 | 100% | 2 | 46% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 21% | 2 | 24% | Uninformative |
| *Lomandra obliqua* | 2 | 14% | 2 | 32% | Uninformative |
| *Lomatia silaifolia* | 2 | 64% | 1 | 27% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 50% | 2 | 36% | Constant |
| *Opercularia aspera* | 2 | 14% | 1 | 8% | Uninformative |
| *Opercularia diphylla* | 2 | 29% | 2 | 8% | Uninformative |
| *Oplismenus imbecillis* | 3 | 14% | 2 | 13% | Uninformative |
| *Oxalis perennans* | 1 | 29% | 2 | 7% | Uninformative |
| *Ozothamnus diosmifolius* | 1 | 21% | 1 | 11% | Uninformative |
| *Patersonia glabrata* | 2 | 29% | 2 | 16% | Uninformative |
| *Persoonia linearis* | 2 | 71% | 1 | 19% | Positive diagnostic |
| *Persoonia pinifolia* | 2 | 14% | 1 | 21% | Uninformative |
| *Phyllanthus hirtellus* | 2 | 43% | 2 | 27% | Constant |
| *Poranthera microphylla* | 2 | 43% | 2 | 7% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 50% | 2 | 18% | Constant |
| *Pteridium esculentum* | 3 | 100% | 2 | 40% | Positive diagnostic |
| *Pultenaea daphnoides* | 2 | 29% | 2 | 8% | Uninformative |
| *Pultenaea hispidula* | 2 | 14% | 2 | 1% | Uninformative |
| *Pultenaea linophylla* | 1 | 36% | 1 | 3% | Positive diagnostic |
| *Pultenaea retusa* | 2 | 21% | 1 | 2% | Positive diagnostic |
| *Schoenus melanostachys* | 2 | 14% | 2 | 6% | Uninformative |
| *Smilax glyciphylla* | 2 | 50% | 2 | 33% | Constant |
| *Telopea speciosissima* | 1 | 14% | 1 | 3% | Uninformative |
| *Tetraria capillaris* | 2 | 14% | 1 | 1% | Uninformative |
| *Tetrarrhena turfosa* | 2 | 21% | 2 | 1% | Positive diagnostic |
| *Themeda australis* | 2 | 21% | 2 | 23% | Uninformative |
| *Tylophora barbata* | 2 | 14% | 2 | 5% | Uninformative |
| *Viola betonicifolia* subsp. *betonicifolia* | 2 | 14% | 1 | 0% | Uninformative |
| *Viola hederacea* | 2 | 71% | 2 | 6% | Positive diagnostic |

# SYDNEY FORESHORES SHALE FOREST

**Statewide Class**
NSW Plant Community Type:
Biometric Number(s):

**Northern Hinterland Wet Sclerophyll Forests**
1847
ME62



## Description

Sydney Foreshores Shale Forest is found on localised patches of shale-enriched sandstone which occur on crests and slopes of minor sandstone scarps adjoining the coastal waterways of Sydney. It is a tall open eucalypt forest with a sparse shrub layer and a dense cover of graminoids (grasses, rushes and sedges). The canopy generally includes grey gum (*Eucalyptus punctata*) and smooth-barked apple (*Angophora costata*) while forest red gum (*Eucalyptus tereticornis*) may dominate locally. Often the shrub and small tree layer is only a sparse cover of wattles or casuarinas. In contrast the ground cover is characterised by dense clumps of spiny-headed mat-rush (*Lomandra longifolia*) above a low cover of other grasses and herbs.

Sydney Foreshores Shale Forest is restricted to the Sydney region where it occurs at elevations between six and 20 metres above sea level and where mean annual rainfall exceeds 1100 millimetres. Patches are small and discontinuous, often surrounded by sandstone forests and woodlands.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 28 m ±3 <br> 25-30 | 31% ±11 <br> 20-45 | *Angophora costata, Eucalyptus punctata, Eucalyptus tereticornis* |
| Small Trees | 5 m ±2 <br> 4-7 | 18% ±13 <br> 10-40 | *Allocasuarina littoralis, Acacia mearnsii, Kunzea ambigua, Notelaea longifolia, Breynia oblongifolia, Duboisia myoporoides, Myrsine variabilis* |
| Ground Covers | 1.0 m ±0.4 <br> 0.3-1.5 | 47% ±19 <br> 20-70 | *Aristida vagans, Dichondra repens, Entolasia stricta, Leucopogon juniperinus, Microlaena stipoides* var. *stipoides, Pratia purpurascens, Gahnia aspera, Lepidosperma laterale, Lomandra longifolia, Oplismenus imbecillis, Poranthera microphylla, Veronica plebeia, Digitaria parviflora, Eragrostis brownii, Hydrocotyle laxiflora, Imperata cylindrica* var. *major, Oplismenus aemulus, Oxalis perennans, Echinopogon ovatus, Entolasia marginata, Lomandra filiformis, Setaria distans, Viola hederacea* |
| Vines & Climbers | N/A | N/A | *Glycine microphylla, Geitonoplesium cymosum, Billardiera scandens, Hibbertia scandens* |

*Compiled from 5 sites with structural data recorded.

## Threats

Threats are moderate. The extent of past clearing is difficult to determine as this forest is associated with shale lenses and caps that are not discernable from available soil or geology mapping. However this naturally rare forest is likely to have been cleared for waterside urban development in the lower reaches of the Parramatta, Georges and Hacking rivers. Given their proximity to the urban interface remnants are exposed to weed infestation and recreational pressures.

## Conservation Status

This vegetation community is represented in Royal NP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 172 +2.4 hectares<br>95% of extant area | Not available |
| Total reserved | 174 +2.4 hectares<br>96% of extant area | Not available |
| Total non-reserved | 8.0 +7.4 hectares | Not available |
| Total extant | 182 hectares | Not available |



## Example Locations

o    Oyster Cove Reserve, Waverton, North Sydney LGA

o    Carruthers Bay, Port Hacking, Royal NP, Sutherland LGA

## Species Richness

| Number of sites | 8 |
|---|---|
| Total native species | 173 |
| Average no. native species per site | 44.1 ±11.7 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

Sydney Foreshores Shale Forest is closely related to other shale forests found within the higher rainfall zones of the Sydney area. Many of the herbs, grasses and rushes found amongst the dense ground cover are shared with Sydney Turpentine-Ironbark Forest (S_WSF09). However, the characteristic tree species of that community are not recorded in this forest.

The community often grades into the surrounding foreshore sandstone woodland and forest complexes.

## Accuracy

Sampling density is moderate. Map unit boundaries are based on field traverse and refined from existing mapping (Keith and Tozer unpublished, Allen et al. 2007).

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| Acacia irrorata | 4 | 13% | 1 | 3% | Uninformative |
| Acacia longifolia | 2 | 13% | 2 | 21% | Uninformative |
| Acacia maidenii | 1 | 25% | 1 | 1% | Positive diagnostic |
| Acacia mearnsii | 2 | 38% | 1 | 0% | Positive diagnostic |
| Acacia melanoxylon | 1 | 13% | 1 | 0% | Uninformative |
| Acmena smithii | 4 | 25% | 2 | 6% | Uninformative |
| Adiantum aethiopicum | 2 | 13% | 2 | 7% | Uninformative |
| Allocasuarina littoralis | 1 | 63% | 2 | 27% | Constant |
| Angophora costata | 2 | 50% | 3 | 37% | Constant |
| Anisopogon avenaceus | 1 | 13% | 2 | 14% | Uninformative |
| Aristida vagans | 2 | 63% | 2 | 14% | Positive diagnostic |
| Asplenium australasicum | 3 | 13% | 1 | 2% | Uninformative |
| Asplenium flabellifolium | 2 | 25% | 1 | 4% | Uninformative |
| Astroloma humifusum | 2 | 13% | 1 | 3% | Uninformative |
| Austrodanthonia monticola | 1 | 13% | 2 | 0% | Uninformative |
| Austrodanthonia racemosa | 1 | 13% | 2 | 2% | Uninformative |
| Austrostipa pubescens | 2 | 13% | 2 | 20% | Uninformative |
| Backhousia myrtifolia | 2 | 13% | 2 | 2% | Uninformative |
| Banksia integrifolia | 2 | 25% | 2 | 9% | Uninformative |
| Billardiera scandens | 1 | 75% | 1 | 37% | Constant |
| Blechnum cartilagineum | 2 | 25% | 2 | 7% | Uninformative |
| Blechnum nudum | 2 | 13% | 1 | 0% | Uninformative |
| Breynia oblongifolia | 1 | 50% | 1 | 17% | Constant |
| Brunoniella australis | 2 | 13% | 2 | 7% | Uninformative |
| Calochlaena dubia | 2 | 25% | 2 | 16% | Uninformative |
| Carex breviculmis | 1 | 13% | 2 | 1% | Uninformative |
| Cassytha glabella | 1 | 13% | 2 | 14% | Uninformative |
| Cassytha pubescens | 2 | 50% | 2 | 27% | Constant |
| Cayratia clematidea | 1 | 13% | 2 | 4% | Uninformative |
| Cenchrus caliculatus | 1 | 13% | 0 | 0% | Uninformative |
| Centella asiatica | 2 | 13% | 2 | 6% | Uninformative |
| Chrysocephalum apiculatum | 1 | 13% | 2 | 1% | Uninformative |
| Cissus hypoglauca | 2 | 38% | 2 | 8% | Constant |
| Clematis aristata | 1 | 50% | 1 | 7% | Positive diagnostic |
| Clerodendrum tomentosum | 1 | 38% | 1 | 5% | Positive diagnostic |
| Commelina cyanea | 1 | 13% | 2 | 9% | Uninformative |
| Convolvulus erubescens | 2 | 13% | 2 | 1% | Uninformative |
| Coronidium elatum | 1 | 13% | 2 | 1% | Uninformative |
| Coronidium scorpioides | 2 | 13% | 1 | 2% | Uninformative |
| Crassula sieberiana | 1 | 25% | 1 | 1% | Positive diagnostic |
| Cymbopogon refractus | 1 | 13% | 2 | 4% | Uninformative |
| Davallia solida var. pyxidata | 2 | 25% | 1 | 0% | Positive diagnostic |
| Daviesia acicularis | 1 | 13% | 1 | 0% | Uninformative |
| Desmodium rhytidophyllum | 1 | 13% | 1 | 2% | Uninformative |
| Desmodium varians | 1 | 25% | 2 | 8% | Uninformative |
| Dianella caerulea | 2 | 63% | 2 | 45% | Constant |
| Dichondra repens | 2 | 63% | 2 | 14% | Positive diagnostic |
| Digitaria parviflora | 1 | 38% | 2 | 5% | Positive diagnostic |
| Dodonaea triquetra | 2 | 13% | 2 | 23% | Uninformative |
| Doodia aspera | 2 | 25% | 2 | 3% | Uninformative |
| Doryanthes excelsa | 1 | 13% | 2 | 9% | Uninformative |
| Duboisia myoporoides | 2 | 25% | 1 | 1% | Positive diagnostic |
| Echinopogon caespitosus | 1 | 38% | 2 | 11% | Constant |
| Echinopogon ovatus | 2 | 25% | 2 | 6% | Uninformative |
| Elaeocarpus reticulatus | 1 | 13% | 1 | 20% | Uninformative |
| Endiandra sieberi | 1 | 13% | 1 | 1% | Uninformative |
| Entolasia marginata | 3 | 25% | 2 | 22% | Uninformative |
| Entolasia stricta | 2 | 88% | 2 | 59% | Constant |
| Epacris pulchella | 2 | 13% | 2 | 16% | Uninformative |
| Eragrostis brownii | 1 | 38% | 2 | 7% | Constant |
| Eucalyptus botryoides | 2 | 25% | 3 | 5% | Uninformative |
| Eucalyptus haemastoma | 2 | 13% | 2 | 12% | Uninformative |
| Eucalyptus pilularis | 1 | 13% | 3 | 14% | Uninformative |
| Eucalyptus punctata | 4 | 38% | 2 | 11% | Constant |
| Eucalyptus tereticornis | 4 | 25% | 2 | 5% | Uninformative |
| Euchiton gymnocephalus | 2 | 13% | 1 | 0% | Uninformative |
| Eupomatia laurina | 2 | 25% | 2 | 2% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Eustrephus latifolius* | 1 | 38% | 2 | 15% | Constant |
| *Ficus obliqua* | 1 | 13% | 3 | 0% | Uninformative |
| *Ficus rubiginosa* | 3 | 25% | 1 | 4% | Uninformative |
| *Gahnia aspera* | 2 | 50% | 1 | 3% | Positive diagnostic |
| *Gahnia clarkei* | 1 | 13% | 2 | 4% | Uninformative |
| *Gahnia melanocarpa* | 1 | 25% | 2 | 3% | Uninformative |
| *Gahnia sieberiana* | 2 | 25% | 2 | 7% | Uninformative |
| *Geitonoplesium cymosum* | 1 | 88% | 2 | 9% | Positive diagnostic |
| *Geranium homeanum* | 2 | 13% | 2 | 2% | Uninformative |
| *Glochidion ferdinandi* | 1 | 13% | 2 | 13% | Uninformative |
| *Glycine clandestina* | 1 | 13% | 2 | 18% | Uninformative |
| *Glycine microphylla* | 2 | 63% | 2 | 9% | Positive diagnostic |
| *Goodenia hederacea* | 2 | 13% | 1 | 10% | Uninformative |
| *Guioa semiglauca* | 1 | 13% | 1 | 1% | Uninformative |
| *Gymnostachys anceps* | 1 | 13% | 2 | 3% | Uninformative |
| *Haemodorum planifolium* | 1 | 13% | 1 | 3% | Uninformative |
| *Hakea sericea* | 1 | 38% | 2 | 21% | Constant |
| *Hedycarya angustifolia* | 1 | 13% | 1 | 0% | Uninformative |
| *Hibbertia dentata* | 1 | 25% | 2 | 8% | Uninformative |
| *Hibbertia scandens* | 2 | 25% | 2 | 7% | Uninformative |
| *Hydrocotyle acutiloba* | 1 | 13% | 2 | 1% | Uninformative |
| *Hydrocotyle geraniifolia* | 1 | 13% | 1 | 0% | Uninformative |
| *Hydrocotyle laxiflora* | 2 | 38% | 2 | 3% | Positive diagnostic |
| *Hydrocotyle peduncularis* | 2 | 13% | 2 | 6% | Uninformative |
| *Hydrocotyle tripartita* | 1 | 13% | 1 | 0% | Uninformative |
| *Hypericum gramineum* | 2 | 13% | 2 | 3% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 50% | 2 | 20% | Constant |
| *Kennedia rubicunda* | 1 | 25% | 1 | 9% | Uninformative |
| *Korthalsella rubra* | 1 | 13% | 0 | 0% | Uninformative |
| *Kunzea ambigua* | 2 | 50% | 2 | 15% | Constant |
| *Lagenophora stipitata* | 2 | 25% | 2 | 3% | Uninformative |
| *Laxmannia gracilis* | 1 | 13% | 1 | 5% | Uninformative |
| *Legnephora moorei* | 1 | 13% | 1 | 0% | Uninformative |
| *Lepidosperma laterale* | 2 | 75% | 2 | 42% | Constant |
| *Leptomeria acida* | 1 | 13% | 1 | 6% | Uninformative |
| *Leptospermum polygalifolium* | 2 | 25% | 2 | 14% | Uninformative |
| *Leucopogon juniperinus* | 2 | 75% | 2 | 10% | Positive diagnostic |
| *Leucopogon lanceolatus* | 1 | 25% | 1 | 8% | Uninformative |
| *Livistona australis* | 2 | 13% | 2 | 10% | Uninformative |
| *Lobelia andrewsii* | 2 | 13% | 1 | 1% | Uninformative |
| *Lomandra filiformis* | 1 | 38% | 2 | 22% | Constant |
| *Lomandra gracilis* | 2 | 13% | 2 | 10% | Uninformative |
| *Lomandra longifolia* | 4 | 88% | 2 | 47% | Constant |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 13% | 2 | 24% | Uninformative |
| *Lomandra obliqua* | 1 | 25% | 2 | 32% | Uninformative |
| *Lomatia silaifolia* | 2 | 13% | 1 | 27% | Uninformative |
| *Micrantheum ericoides* | 1 | 13% | 2 | 17% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 3 | 63% | 2 | 36% | Constant |
| *Myrsine howittiana* | 1 | 13% | 2 | 0% | Uninformative |
| *Myrsine variabilis* | 1 | 63% | 1 | 8% | Positive diagnostic |
| *Nematolepis squamea* subsp. *squamea* | 1 | 13% | 1 | 0% | Uninformative |
| *Notelaea longifolia* | 2 | 75% | 1 | 21% | Positive diagnostic |
| *Notelaea venosa* | 1 | 13% | 1 | 1% | Uninformative |
| *Notodanthonia longifolia* | 2 | 13% | 1 | 1% | Uninformative |
| *Opercularia aspera* | 2 | 13% | 1 | 8% | Uninformative |
| *Oplismenus aemulus* | 1 | 38% | 2 | 10% | Constant |
| *Oplismenus imbecillis* | 2 | 75% | 2 | 12% | Positive diagnostic |
| *Oxalis chnoodes* | 1 | 13% | 2 | 1% | Uninformative |
| *Oxalis perennans* | 2 | 38% | 2 | 7% | Constant |
| *Ozothamnus diosmifolius* | 2 | 13% | 1 | 12% | Uninformative |
| *Pandorea pandorana* | 1 | 38% | 2 | 16% | Constant |
| *Panicum simile* | 2 | 13% | 2 | 10% | Uninformative |
| *Paspalidium distans* | 3 | 25% | 2 | 7% | Uninformative |
| *Patersonia glabrata* | 1 | 13% | 2 | 16% | Uninformative |
| *Patersonia sericea* | 1 | 13% | 1 | 15% | Uninformative |
| *Peperomia tetraphylla* | 1 | 13% | 2 | 0% | Uninformative |
| *Persoonia lanceolata* | 1 | 13% | 1 | 11% | Uninformative |
| *Persoonia linearis* | 2 | 13% | 1 | 20% | Uninformative |
| *Persoonia pinifolia* | 2 | 13% | 1 | 21% | Uninformative |
| *Phyllanthus hirtellus* | 1 | 38% | 2 | 27% | Constant |
| *Pittosporum revolutum* | 1 | 13% | 1 | 9% | Uninformative |
| *Pittosporum undulatum* | 1 | 38% | 2 | 25% | Constant |
| *Plantago debilis* | 1 | 13% | 2 | 2% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Platycerium bifurcatum* | 2 | 13% | 1 | 1% | Uninformative |
| *Platysace linearifolia* | 1 | 13% | 2 | 30% | Uninformative |
| *Plectranthus parviflorus* | 2 | 25% | 2 | 3% | Uninformative |
| *Poa affinis* | 1 | 25% | 2 | 11% | Uninformative |
| *Polymeria calycina* | 1 | 13% | 1 | 2% | Uninformative |
| *Polyscias sambucifolia* | 1 | 13% | 1 | 15% | Uninformative |
| *Pomax umbellata* | 1 | 25% | 2 | 15% | Uninformative |
| *Poranthera microphylla* | 2 | 63% | 2 | 7% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 75% | 2 | 18% | Positive diagnostic |
| *Prostanthera incisa* | 2 | 13% | 2 | 0% | Uninformative |
| *Pseuderanthemum variabile* | 1 | 38% | 2 | 12% | Constant |
| *Pultenaea flexilis* | 1 | 13% | 2 | 6% | Uninformative |
| *Pyrrosia rupestris* | 3 | 25% | 2 | 2% | Positive diagnostic |
| *Sarcopetalum harveyanum* | 1 | 25% | 1 | 4% | Uninformative |
| *Smilax australis* | 2 | 25% | 2 | 4% | Uninformative |
| *Smilax glyciphylla* | 2 | 25% | 2 | 33% | Uninformative |
| *Stephania japonica* | 1 | 13% | 1 | 6% | Uninformative |
| *Stylidium graminifolium* | 1 | 13% | 2 | 5% | Uninformative |
| *Syncarpia glomulifera* | 2 | 13% | 3 | 13% | Uninformative |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 38% | 2 | 5% | Positive diagnostic |
| *Themeda australis* | 1 | 38% | 2 | 23% | Constant |
| *Thysanotus tuberosus* | 2 | 13% | 1 | 2% | Uninformative |
| *Todea barbara* | 2 | 13% | 1 | 2% | Uninformative |
| *Tristaniopsis collina* | 2 | 13% | 2 | 1% | Uninformative |
| *Tristaniopsis laurina* | 2 | 13% | 2 | 3% | Uninformative |
| *Tylophora barbata* | 2 | 25% | 2 | 5% | Uninformative |
| *Veronica plebeia* | 2 | 50% | 1 | 7% | Positive diagnostic |
| *Viola hederacea* | 2 | 25% | 2 | 6% | Uninformative |
| *Wahlenbergia gracilis* | 1 | 13% | 1 | 8% | Uninformative |
| *Wilkiea huegeliana* | 2 | 13% | 2 | 2% | Uninformative |
| *Xanthosia tridentata* | 1 | 13% | 2 | 22% | Uninformative |
| *Zieria smithii* | 1 | 13% | 1 | 6% | Uninformative |

# SYDNEY TURPENTINE-IRONBARK FOREST

**Statewide Class**
NSW Plant Community Type:
Biometric Number(s):

**Northern Hinterland Wet Sclerophyll Forests**
1281: Turpentine-Grey Ironbark Open Forest on Shale in the Sydney Basin
HN604; ME041



## Description

Sydney Turpentine-Ironbark Forest (Benson and Howell 1990) is a tall open forest found on shale and shale-enriched sandstone soils on the coast and hinterland of Sydney. It has been extensively cleared but was once widely distributed between Sutherland and the Hornsby plateau with outlying examples found on shale-rich deposits at Campbelltown, Menai, Kurrajong and Heathcote. The primary distribution of this forest is in areas receiving between 900 and 1250 millimetres of mean annual rainfall at elevations between 10 and 180 metres above sea level.

The forest is characterised by open midstrata of mesic and sclerophyllous shrubs and small trees with a grassy ground cover. The composition of the canopy is variable depending on location and substrate. Typically it is recognised by a canopy dominated by turpentine (*Syncarpia glomulifera*), red mahogany (*Eucalyptus resinifera*) and various ironbarks of which *Eucalyptus paniculata* is most often recorded. On the north shore these forests are found on shale-enriched sheltered sandstone slopes where ironbarks are less common and blackbutt (*Eucalyptus pilularis*) is prevalent. In the western suburbs drier forms of this forest are found at Concord, Bankstown and Auburn although remnants are small and highly disturbed. This map unit is referable to a community of the same name in Tozer et al. 2010 and includes some sites previously identified as Sydney Turpentine Ironbark Margin Forest in NPWS (2002b) and Tozer (2003).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 23 m ±6 <br> 15-35 | 35% ±20 <br> 5-85 | *Syncarpia glomulifera, Angophora costata, Eucalyptus pilularis, Eucalyptus resinifera, Eucalyptus paniculata* subsp. *paniculata, Eucalyptus fibrosa, Eucalyptus crebra* |
| Small Trees | 9 m ±6 <br> 1-25 | 23% ±20 <br> 5-80 | *Pittosporum undulatum, Syncarpia glomulifera* |
| Shrubs | 2.9 m ±1.9 <br> 1.0-10.0 | 16% ±13 <br> 1-60 | *Pittosporum undulatum, Leucopogon juniperinus, Polyscias sambucifolia, Breynia oblongifolia, Ozothamnus diosmifolius, Notelaea longifolia, Hibbertia aspera* subsp. *aspera, Dodonaea triquetra, Pittosporum revolutum, Bursaria spinosa* |
| Ground Covers | 0.8 m ±0.4 <br> 0.3-2.0 | 50% ±26 <br> 5-90 | *Microlaena stipoides* var. *stipoides, Dianella caerulea, Pratia purpurascens, Entolasia marginata, Entolasia stricta, Lepidosperma laterale, Lomandra longifolia, Echinopogon caespitosus* var. *caespitosus, Dichondra repens, Lomandra multiflora, Themeda australis, Aristida vagans, Pseuderanthemum variabile* |
| Vines & Climbers | N/A | N/A | *Pandorea pandorana, Billardiera scandens, Glycine microphylla, Eustrephus latifolius, Glycine clandestina* |

*Compiled from 39 sites with structural data recorded.

## Threats

The NSW Scientific Committee (1998b) considers that remnants are small and scattered. Identified threats include: clearing, physical damage from recreational activities, rubbish dumping, grazing, mowing and weed invasion.

## Conservation Status

Sydney Turpentine-Ironbark Forest is listed as an Endangered Ecological Community under the NSW TSC Act. Turpentine-Ironbark Forest in the Sydney Basin Bioregion is also listed as a Critically Endangered Ecological Community under the Commonwealth EPBC Act. Different location inclusions/exclusions and condition thresholds apply under the State and Commonwealth determinations.This community is represented in Wallumatta NR.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | >23,000 hectares |
| Estimated percentage cleared | Not available | <90% |
| Total NPWS reserves | 30.5 +1.8 hectares<br>7% of extant area | 250 hectares<br>10% of extant area<br><2% of pre-clearing area |
| Total reserved | 203 +18.1 hectares<br>44% of extant area | Not available |
| Total non-reserved | 255 +471 hectares | Not available |
| Total extant | 458 hectares | 2300 hectares |



Map unit
Study area
Extant vegetation
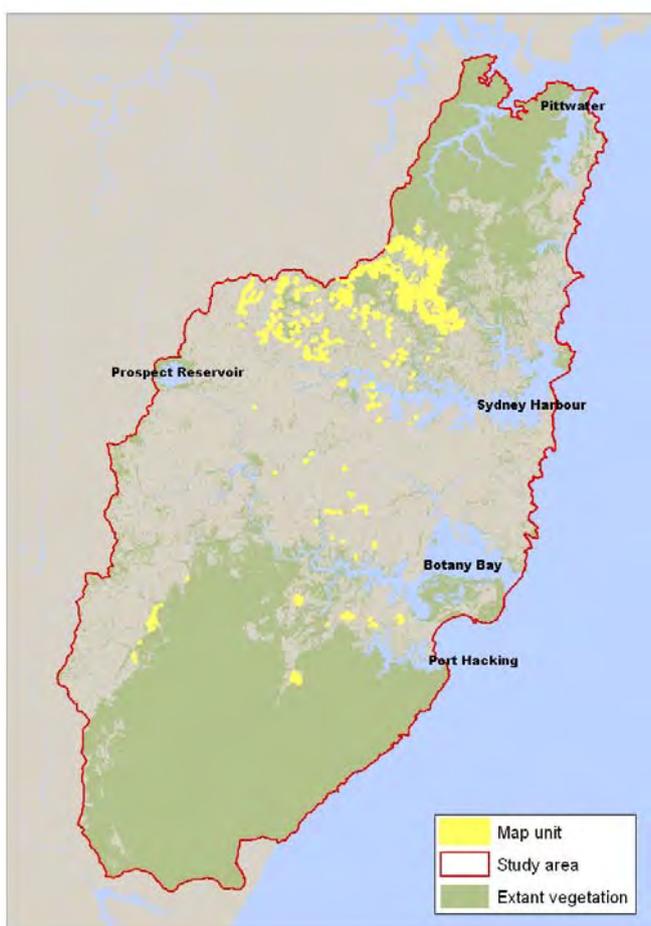
## Example Locations

o   Sheldon Forest, Gordon, Ku-ring-gai LGA

o   Menai Park, Menai, Sutherland LGA

o   Beecroft Park, Cheltenham, Hornsby LGA

o   Sesquicentennial Park, Heathcote, Sutherland LGA

## Species Richness

| | |
|---|---|
| Number of sites | 58 |
| Total native species | 309 |
| Average no. native species per site | 43.1 ±9.6 |

## Variations and Dynamics

Several variations in habitat occur throughout the Sydney area. While shale-capped ridges and crests across the lower north shore once carried extensive areas of this forest, today many examples persist near the shale-sandstone interface and transition toward sandstone gully forests. Other variations include sites at Menai and The Crest at Bankstown on shales with forest red gum (*Eucalyptus tereticornis*), at Heathcote with bangalay (*Eucalyptus botryoides*) and at Concord and Auburn where broad-leaved ironbark (*Eucalyptus fibrosa*) and grey gum (*Eucalyptus punctata*) are recorded.

## Relationship to Other Communities

Sydney Turpentine Ironbark Forest shares many species with Blue Gum High Forest (S_WSF01). Together the communities are a unique feature of higher rainfall fertile shales of the Sydney region. As rainfall increases on shale soils of greater depth it will grade into Blue Gum High Forest (S_WSF01). The transition zone appears around the lower elevations in Ryde and Castle Hill where rainfall quickly rises from around 1000 millimetres per annum with increases in altitude. Sites situated on or near sandstone gullies may grade quickly onto S_WSF02 or S_DSF04.

## Accuracy

Sampling density is high. Map unit boundaries were based on the interpretation of soils, topographic position and dominant canopy species from digital imagery. This was supported by field traverse, although care is still required in the interpretation of the unit where it occurs near the shale-sandstone interface.

A 0.04 hectare site located in this map unit is expected to contain at least 20 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 35 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia decurrens* | 1 | 10% | 2 | 5% | Uninformative |
| *Acacia falcata* | 1 | 22% | 1 | 3% | Positive diagnostic |
| *Acacia floribunda* | 1 | 16% | 2 | 3% | Positive diagnostic |
| *Acacia implexa* | 1 | 16% | 1 | 4% | Positive diagnostic |
| *Acacia linifolia* | 1 | 19% | 2 | 20% | Uninformative |
| *Acacia longifolia* | 1 | 28% | 2 | 21% | Uninformative |
| *Acacia parramattensis* | 2 | 22% | 1 | 4% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 17% | 1 | 26% | Uninformative |
| *Adiantum aethiopicum* | 2 | 17% | 2 | 7% | Uninformative |
| *Allocasuarina littoralis* | 2 | 16% | 2 | 27% | Uninformative |
| *Allocasuarina torulosa* | 1 | 29% | 2 | 9% | Positive diagnostic |
| *Angophora costata* | 2 | 55% | 3 | 36% | Constant |
| *Angophora floribunda* | 3 | 21% | 2 | 4% | Positive diagnostic |
| *Aristida vagans* | 2 | 47% | 2 | 14% | Positive diagnostic |
| *Austrodanthonia racemosa* | 2 | 10% | 2 | 2% | Uninformative |
| *Austrodanthonia tenuior* | 2 | 14% | 2 | 4% | Positive diagnostic |
| *Austrostipa pubescens* | 2 | 14% | 2 | 20% | Uninformative |
| *Austrostipa rudis* | 2 | 17% | 2 | 1% | Positive diagnostic |
| *Billardiera scandens* | 1 | 43% | 1 | 37% | Constant |
| *Breynia oblongifolia* | 2 | 59% | 1 | 16% | Positive diagnostic |
| *Bursaria spinosa* | 2 | 41% | 2 | 11% | Positive diagnostic |
| *Calochlaena dubia* | 2 | 10% | 2 | 17% | Uninformative |
| *Cassytha pubescens* | 1 | 10% | 2 | 28% | Uninformative |
| *Centella asiatica* | 2 | 22% | 2 | 5% | Positive diagnostic |
| *Cheilanthes sieberi* subsp. *sieberi* | 2 | 40% | 2 | 12% | Positive diagnostic |
| *Clematis aristata* | 2 | 17% | 1 | 7% | Uninformative |
| *Clematis glycinoides* | 2 | 34% | 2 | 5% | Positive diagnostic |
| *Clerodendrum tomentosum* | 2 | 14% | 1 | 5% | Uninformative |
| *Commelina cyanea* | 1 | 19% | 2 | 8% | Uninformative |
| *Correa reflexa* | 2 | 17% | 1 | 4% | Positive diagnostic |
| *Cymbopogon refractus* | 2 | 19% | 2 | 3% | Positive diagnostic |
| *Daviesia ulicifolia* | 1 | 12% | 2 | 3% | Positive diagnostic |
| *Desmodium varians* | 1 | 21% | 2 | 8% | Positive diagnostic |
| *Dianella caerulea* | 2 | 84% | 2 | 44% | Positive diagnostic |
| *Dianella longifolia* | 1 | 10% | 2 | 5% | Uninformative |
| *Dianella revoluta* | 1 | 22% | 2 | 17% | Uninformative |
| *Dichelachne micrantha* | 2 | 22% | 2 | 9% | Positive diagnostic |
| *Dichondra repens* | 2 | 55% | 2 | 13% | Positive diagnostic |
| *Digitaria parviflora* | 2 | 22% | 2 | 5% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 47% | 2 | 22% | Positive diagnostic |
| *Echinopogon caespitosus* | 2 | 50% | 2 | 10% | Positive diagnostic |
| *Echinopogon ovatus* | 1 | 19% | 2 | 5% | Positive diagnostic |
| *Einadia hastata* | 2 | 21% | 1 | 3% | Positive diagnostic |
| *Elaeocarpus reticulatus* | 2 | 22% | 1 | 20% | Uninformative |
| *Entolasia marginata* | 2 | 78% | 2 | 21% | Positive diagnostic |
| *Entolasia stricta* | 2 | 66% | 2 | 59% | Constant |
| *Eragrostis leptostachya* | 2 | 22% | 2 | 4% | Positive diagnostic |
| *Eucalyptus globoidea* | 2 | 16% | 3 | 4% | Positive diagnostic |
| *Eucalyptus paniculata* | 3 | 33% | 2 | 3% | Positive diagnostic |
| *Eucalyptus pilularis* | 2 | 53% | 3 | 13% | Positive diagnostic |
| *Eucalyptus punctata* | 1 | 16% | 2 | 11% | Uninformative |
| *Eucalyptus resinifera* subsp. *resinifera* | 1 | 43% | 2 | 4% | Positive diagnostic |
| *Eucalyptus saligna* | 1 | 14% | 3 | 3% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 47% | 2 | 14% | Positive diagnostic |
| *Exocarpos cupressiformis* | 1 | 21% | 1 | 4% | Positive diagnostic |
| *Gahnia aspera* | 1 | 12% | 2 | 3% | Positive diagnostic |
| *Glochidion ferdinandi* | 1 | 22% | 2 | 13% | Uninformative |
| *Glycine clandestina* | 2 | 48% | 2 | 17% | Positive diagnostic |
| *Glycine microphylla* | 1 | 57% | 2 | 8% | Positive diagnostic |
| *Glycine tabacina* | 2 | 24% | 2 | 8% | Positive diagnostic |
| *Gonocarpus tetragynus* | 1 | 17% | 2 | 8% | Uninformative |
| *Goodenia hederacea* | 1 | 10% | 1 | 10% | Uninformative |
| *Hakea sericea* | 1 | 12% | 2 | 22% | Uninformative |
| *Hardenbergia violacea* | 1 | 41% | 1 | 15% | Positive diagnostic |
| *Hibbertia aspera* | 2 | 50% | 2 | 10% | Positive diagnostic |
| *Hibbertia dentata* | 1 | 14% | 2 | 8% | Uninformative |
| *Hydrocotyle peduncularis* | 2 | 24% | 2 | 5% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Imperata cylindrica* var. *major* | 2 | 43% | 2 | 20% | Positive diagnostic |
| *Kennedia rubicunda* | 2 | 17% | 1 | 9% | Uninformative |
| *Kunzea ambigua* | 1 | 24% | 2 | 14% | Uninformative |
| *Lepidosperma laterale* | 2 | 60% | 2 | 42% | Constant |
| *Leucopogon juniperinus* | 2 | 76% | 1 | 9% | Positive diagnostic |
| *Lomandra filiformis* | 1 | 33% | 2 | 22% | Uninformative |
| *Lomandra longifolia* | 2 | 72% | 2 | 46% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 40% | 2 | 23% | Constant |
| *Lomandra obliqua* | 1 | 31% | 2 | 32% | Uninformative |
| *Lomatia silaifolia* | 1 | 16% | 1 | 28% | Uninformative |
| *Maytenus silvestris* | 1 | 21% | 1 | 2% | Positive diagnostic |
| *Melia azedarach* | 1 | 10% | 1 | 1% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 3 | 83% | 2 | 34% | Positive diagnostic |
| *Myrsine variabilis* | 2 | 21% | 1 | 8% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 53% | 1 | 20% | Positive diagnostic |
| *Omalanthus nutans* | 1 | 22% | 1 | 9% | Positive diagnostic |
| *Oplismenus aemulus* | 2 | 43% | 2 | 9% | Positive diagnostic |
| *Oplismenus imbecillis* | 2 | 36% | 2 | 12% | Positive diagnostic |
| *Oxalis exilis* | 2 | 16% | 1 | 3% | Positive diagnostic |
| *Oxalis perennans* | 2 | 22% | 2 | 7% | Positive diagnostic |
| *Ozothamnus diosmifolius* | 2 | 60% | 1 | 10% | Positive diagnostic |
| *Pandorea pandorana* | 2 | 62% | 2 | 15% | Positive diagnostic |
| *Panicum simile* | 1 | 17% | 2 | 10% | Uninformative |
| *Parsonsia straminea* | 1 | 12% | 1 | 4% | Uninformative |
| *Persoonia linearis* | 1 | 33% | 1 | 19% | Uninformative |
| *Phyllanthus hirtellus* | 1 | 22% | 2 | 28% | Uninformative |
| *Pimelea linifolia* | 2 | 22% | 2 | 27% | Uninformative |
| *Pittosporum revolutum* | 2 | 43% | 1 | 8% | Positive diagnostic |
| *Pittosporum undulatum* | 2 | 86% | 2 | 23% | Positive diagnostic |
| *Platylobium formosum* | 1 | 33% | 2 | 8% | Positive diagnostic |
| *Poa affinis* | 2 | 40% | 2 | 10% | Positive diagnostic |
| *Polyscias sambucifolia* | 2 | 71% | 1 | 13% | Positive diagnostic |
| *Pomax umbellata* | 1 | 22% | 2 | 15% | Uninformative |
| *Poranthera microphylla* | 1 | 26% | 2 | 7% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 67% | 2 | 16% | Positive diagnostic |
| *Pseuderanthemum variabile* | 2 | 62% | 2 | 11% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 19% | 2 | 33% | Uninformative |
| *Solanum prinophyllum* | 2 | 12% | 1 | 5% | Uninformative |
| *Syncarpia glomulifera* | 3 | 78% | 2 | 11% | Positive diagnostic |
| *Themeda australis* | 2 | 45% | 2 | 22% | Positive diagnostic |
| *Tylophora barbata* | 2 | 17% | 2 | 4% | Positive diagnostic |
| *Veronica plebeia* | 1 | 45% | 1 | 6% | Positive diagnostic |
| *Zieria smithii* | 2 | 22% | 1 | 5% | Positive diagnostic |

# PITTWATER SPOTTED GUM FOREST

## S_WSF11

| Statewide Class | Southern Lowland Wet Sclerophyll Forests |
|---|---|
| NSW Plant Community Type: | 1214: Spotted Gum-Grey Ironbark Open Forest in the Pittwater Area, Sydney Basin |
| Biometric Number(s): | HN642 |
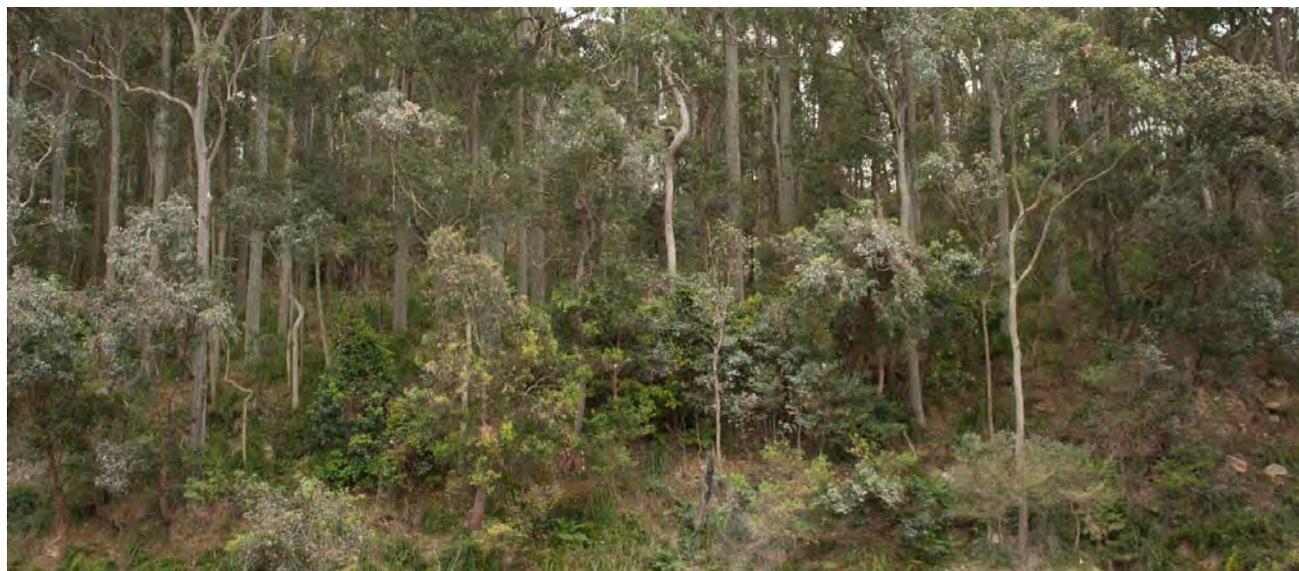


## Description

Stands of spotted gum (*Corymbia maculata*) mark this distinctive forest on the foreshores and escarpments of the Pittwater peninsula. These trees form a tall open forest that may also include grey ironbark (*Eucalyptus paniculata*) and broad-leaved white mahogany (*Eucalyptus umbra*). At the lower heights of the eucalypt stratum it is common to find an open cover of forest oak (*Allocasuarina torulosa*). The midstorey usually comprises a mixed layer of mesic and dry shrub species and occasional palms. Shrub species include blueberry ash (*Elaeocarpus reticulatus*), scentless rosewood (*Synoum glandulosum* subsp. *glandulosum*), narrow-leaved geebung (*Persoonia linearis*) and mountain holly (*Podolobium ilicifolium*). Like many spotted gum forests along coastal New South Wales burrawang (*Macrozamia communis*) can assume a prominent component of the ground layer above a scatter of grasses, ferns and small vines. At times the ground layer appears very grassy, with an abundance of blady grass (*Imperata cylindrica* var. *major*) notable where there is a history of frequent fire.

Pittwater Spotted Gum Forest has recently been subject to review by Bell and Stables (2012). These authors concluded that this forest has a close association with Narrabeen sediments exposed on rises, escarpments and footslopes throughout northern Pittwater LGA and Wagstaff peninsula in the Gosford LGA. The forest spans a number of aspects and topographic positions but is rarely found above 100 metres above sea level. It receives between 1150 and 1300 millimetres of mean annual rainfall. It is estimated that 75 per cent of its pre-European distribution has been cleared in the Pittwater and Gosford urban areas (Bell and Stables 2012) with some remaining stands impacted by the encroachment of urban weeds.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 24.8 m ±3.9 <br> 22-30 | 35% | *Corymbia maculata, Eucalyptus paniculata, Eucalyptus umbra, Corymbia gummifera, Eucalyptus botryoides* |
| Small Trees | 9 m ±5 <br> 8-12 | 27.5% ±24.7 <br> 10-45 | *Allocasuarina torulosa, Elaeocarpus reticulatus, Glochidion ferdinandii* |
| Shrubs | 1.8 m ±1.4 <br> 0.5-3.5 | 15% | *Podolobium ilicifolium, Macrozamia communis, Notelaea longifolia, Synoum glandulosum* subsp. *glandulosum* |
| Ground Covers | 0.5 m ±21.2 <br> 0.1-1 | 50% ±21 <br> 35-60 | *Billardiera scandens, Dianella caerulea, Entolasia stricta, Lomandra longifolia, Xanthorrhoea macronema, Microlaena stipoides* var. *stipoides, Schelhammera undulata, Themeda australis* |
| Vines & Climbers | N/A | N/A | *Eustrephus latifolius, Pandorea pandorana, Cassytha pubescens, Cissus hypoglauca, Geitonoplesium cymosum, Lomandra filiformis* |

*Compiled from 2 sites with structural data recorded.

## Threats

Pittwater Spotted Gum is threatened by clearing for urban development, urban run off, rubbish dumping, garden refuse, weed invasion, and inappropriate fire regimes (Bangalay Ecological and Bushfire and Eastcoast Flora Survey 2011, NSW Scientific Committee 2011).

## Conservation Status

This community forms a component of Pittwater and Wagstaff Spotted Gum Forest in the Sydney Basin Bioregion, listed as an Endangered Ecological Community under the TSC Act. This community is represented in Ku-ring-gai Chase NP.

|  | **Within Study Area** | **Within Sydney Basin** |
|---|---|---|
| Estimate of pre-clearing area | Not available | 954 hectares |
| Estimated percentage cleared | Not available | 76% |
| Total NPWS reserves | 18.9 +1.7 hectares<br>15% of extant area | Not available |
| Total reserved | 66.6 +6.0 hectares<br>54% of extant area | Not available |
| Total non-reserved | 57.4 +250 hectares | Not available |
| Total extant | 124 hectares | 275 hectares |



## Example Locations

o   Woody Point, Ku-ring-gai Chase NP

o   Scotland Island, Pittwater LGA

o   Angophora Reserve, Avalon

## Species Richness

| Number of sites | 22 |
|---|---|
| Total native species | 216 |
| Average no. native species per site | 50.9 ±9.1 |

## Variations and Dynamics

Characteristics in the understorey can vary with topographic position and proximity to urban infrastructure. Open grassy examples dominated by blady grass are found on more gentle gradients adjoining urban boundaries. Sheltered aspects carry a higher cover of mesic shrubs and palms and this is pronounced toward gully systems that support rainforests (S_RF07 and S_RF03).

## Relationship to Other Communities

Floristically this unit is related to Central Coast Escarpment Dry Forest (S_WSF34) and Central Coast Escarpment Moist Forest (S_WSF33) which both occur on the Narrabeen sediments in the Pittwater area. The latter occupies sheltered sites and the former appears to associate with the youngest of the Narrabeen layers near the base of the overlying Hawkesbury sandstone. At low elevations along the escarpments that face the open sea this spotted gum community grades into littoral rainforest (S_RF07) on south-facing aspects and gullylines.

## Accuracy

Sampling density is high. Spotted gum provides a strong crown signature on digital imagery and its extent is therefore expected to be accurately defined in the mapping.

A 0.04 hectare site located in this map unit is expected to contain at least 25 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 42 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia implexa* | 1 | 41% | 1 | 4% | Positive diagnostic |
| *Acacia longissima* | 1 | 32% | 2 | 2% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 32% | 1 | 25% | Uninformative |
| *Acmena smithii* | 2 | 14% | 2 | 6% | Uninformative |
| *Acrotriche divaricata* | 2 | 27% | 1 | 2% | Positive diagnostic |
| *Adiantum aethiopicum* | 2 | 32% | 2 | 7% | Positive diagnostic |
| *Allocasuarina littoralis* | 2 | 18% | 2 | 27% | Uninformative |
| *Allocasuarina torulosa* | 3 | 77% | 2 | 9% | Positive diagnostic |
| *Arthropodium milleflorum* | 1 | 14% | 2 | 3% | Uninformative |
| *Banksia integrifolia* | 1 | 18% | 2 | 9% | Uninformative |
| *Billardiera scandens* | 2 | 50% | 1 | 37% | Constant |
| *Brachyscome angustifolia* | 2 | 14% | 2 | 1% | Uninformative |
| *Breynia oblongifolia* | 1 | 68% | 1 | 16% | Positive diagnostic |
| *Caesia parviflora* | 1 | 41% | 1 | 3% | Positive diagnostic |
| *Calochlaena dubia* | 1 | 41% | 2 | 16% | Constant |
| *Cassytha glabella* | 1 | 23% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 27% | 2 | 27% | Uninformative |
| *Cayratia clematidea* | 1 | 18% | 2 | 4% | Uninformative |
| *Cissus hypoglauca* | 1 | 41% | 2 | 8% | Positive diagnostic |
| *Clematis aristata* | 1 | 32% | 1 | 7% | Positive diagnostic |
| *Clerodendrum tomentosum* | 1 | 23% | 1 | 5% | Positive diagnostic |
| *Commelina cyanea* | 2 | 23% | 2 | 8% | Uninformative |
| *Corymbia gummifera* | 2 | 41% | 2 | 41% | Constant |
| *Corymbia maculata* | 4 | 95% | 3 | 1% | Positive diagnostic |
| *Cryptocarya microneura* | 1 | 23% | 1 | 1% | Positive diagnostic |
| *Cymbopogon refractus* | 2 | 18% | 2 | 4% | Uninformative |
| *Desmodium rhytidophyllum* | 1 | 27% | 1 | 2% | Positive diagnostic |
| *Desmodium varians* | 1 | 32% | 2 | 8% | Positive diagnostic |
| *Dianella caerulea* | 2 | 100% | 2 | 44% | Positive diagnostic |
| *Dianella revoluta* | 1 | 14% | 2 | 17% | Uninformative |
| *Dichelachne micrantha* | 1 | 14% | 2 | 9% | Uninformative |
| *Dichondra repens* | 2 | 18% | 2 | 14% | Uninformative |
| *Digitaria parviflora* | 1 | 45% | 2 | 5% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 18% | 2 | 23% | Uninformative |
| *Doodia aspera* | 2 | 14% | 2 | 3% | Uninformative |
| *Echinopogon caespitosus* | 1 | 14% | 2 | 11% | Uninformative |
| *Elaeocarpus reticulatus* | 2 | 91% | 1 | 20% | Positive diagnostic |
| *Endiandra sieberi* | 1 | 14% | 1 | 1% | Uninformative |
| *Entolasia marginata* | 2 | 73% | 2 | 22% | Positive diagnostic |
| *Entolasia stricta* | 2 | 77% | 2 | 59% | Constant |
| *Eucalyptus botryoides* | 1 | 14% | 3 | 5% | Uninformative |
| *Eucalyptus paniculata* | 2 | 55% | 2 | 4% | Positive diagnostic |
| *Eucalyptus punctata* | 2 | 18% | 2 | 11% | Uninformative |
| *Eucalyptus umbra* | 3 | 23% | 2 | 3% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 95% | 2 | 14% | Positive diagnostic |
| *Exocarpos cupressiformis* | 1 | 23% | 1 | 4% | Positive diagnostic |
| *Geitonoplesium cymosum* | 2 | 82% | 2 | 8% | Positive diagnostic |
| *Glochidion ferdinandi* | 1 | 50% | 2 | 13% | Positive diagnostic |
| *Glycine clandestina* | 2 | 50% | 2 | 18% | Positive diagnostic |
| *Glycine tabacina* | 1 | 14% | 2 | 8% | Uninformative |
| *Goodenia heterophylla* | 2 | 27% | 1 | 3% | Positive diagnostic |
| *Goodenia ovata* | 2 | 18% | 2 | 2% | Uninformative |
| *Gymnostachys anceps* | 2 | 14% | 2 | 3% | Uninformative |
| *Hardenbergia violacea* | 1 | 64% | 1 | 15% | Positive diagnostic |
| *Hibbertia dentata* | 2 | 36% | 2 | 8% | Positive diagnostic |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 1 | 32% | 1 | 5% | Positive diagnostic |
| *Hydrocotyle laxiflora* | 2 | 23% | 2 | 2% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 59% | 2 | 20% | Positive diagnostic |
| *Jacksonia scoparia* | 1 | 14% | 2 | 2% | Uninformative |
| *Kennedia rubicunda* | 2 | 23% | 1 | 9% | Uninformative |
| *Lagenophora stipitata* | 2 | 18% | 2 | 3% | Uninformative |
| *Leucopogon juniperinus* | 1 | 27% | 2 | 10% | Uninformative |
| *Livistona australis* | 1 | 64% | 2 | 10% | Positive diagnostic |
| *Lomandra confertifolia* | 2 | 14% | 2 | 5% | Uninformative |
| *Lomandra filiformis* | 1 | 32% | 2 | 22% | Uninformative |
| *Lomandra glauca* | 1 | 14% | 2 | 16% | Uninformative |
| *Lomandra gracilis* | 2 | 14% | 2 | 10% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lomandra longifolia* | 2 | 100% | 2 | 46% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 64% | 2 | 23% | Positive diagnostic |
| *Lomandra obliqua* | 2 | 14% | 2 | 32% | Uninformative |
| *Macrozamia communis* | 2 | 77% | 1 | 4% | Positive diagnostic |
| *Marsdenia rostrata* | 1 | 18% | 1 | 1% | Uninformative |
| *Maytenus silvestris* | 1 | 18% | 1 | 3% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 64% | 2 | 35% | Constant |
| *Morinda jasminoides* | 2 | 41% | 2 | 6% | Positive diagnostic |
| *Myrsine variabilis* | 1 | 59% | 1 | 8% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 91% | 1 | 21% | Positive diagnostic |
| *Opercularia aspera* | 1 | 32% | 1 | 8% | Positive diagnostic |
| *Oplismenus aemulus* | 2 | 23% | 2 | 10% | Uninformative |
| *Oplismenus imbecillis* | 2 | 64% | 2 | 12% | Positive diagnostic |
| *Oxalis perennans* | 1 | 23% | 2 | 7% | Uninformative |
| *Pandorea pandorana* | 2 | 95% | 2 | 16% | Positive diagnostic |
| *Panicum simile* | 1 | 50% | 2 | 9% | Positive diagnostic |
| *Paspalidium distans* | 2 | 18% | 2 | 7% | Uninformative |
| *Passiflora herbertiana* subsp. *herbertiana* | 1 | 18% | 1 | 1% | Uninformative |
| *Persoonia levis* | 1 | 18% | 1 | 33% | Uninformative |
| *Persoonia linearis* | 1 | 64% | 1 | 19% | Positive diagnostic |
| *Phyllanthus hirtellus* | 2 | 23% | 2 | 27% | Uninformative |
| *Pimelea ligustrina* | 1 | 14% | 1 | 0% | Uninformative |
| *Pittosporum revolutum* | 2 | 41% | 1 | 8% | Positive diagnostic |
| *Pittosporum undulatum* | 2 | 73% | 2 | 24% | Positive diagnostic |
| *Platylobium formosum* | 2 | 41% | 2 | 8% | Positive diagnostic |
| *Poa affinis* | 2 | 41% | 2 | 11% | Positive diagnostic |
| *Podolobium ilicifolium* | 2 | 50% | 2 | 1% | Positive diagnostic |
| *Polyscias sambucifolia* | 2 | 41% | 1 | 15% | Positive diagnostic |
| *Pomax umbellata* | 1 | 55% | 2 | 14% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 77% | 2 | 17% | Positive diagnostic |
| *Prostanthera denticulata* | 1 | 14% | 2 | 1% | Uninformative |
| *Pseuderanthemum variabile* | 2 | 73% | 2 | 12% | Positive diagnostic |
| *Pteridium esculentum* | 2 | 68% | 2 | 40% | Constant |
| *Pultenaea flexilis* | 2 | 23% | 2 | 6% | Uninformative |
| *Sarcopetalum harveyanum* | 1 | 27% | 1 | 4% | Positive diagnostic |
| *Schelhammera undulata* | 2 | 59% | 2 | 3% | Positive diagnostic |
| *Smilax australis* | 2 | 18% | 2 | 4% | Uninformative |
| *Smilax glyciphylla* | 2 | 68% | 2 | 32% | Positive diagnostic |
| *Solanum prinophyllum* | 1 | 23% | 1 | 5% | Positive diagnostic |
| *Stephania japonica* | 1 | 27% | 1 | 6% | Positive diagnostic |
| *Syncarpia glomulifera* | 2 | 18% | 3 | 13% | Uninformative |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 14% | 2 | 5% | Uninformative |
| *Themeda australis* | 2 | 77% | 2 | 22% | Positive diagnostic |
| *Trochocarpa laurina* | 2 | 18% | 1 | 1% | Uninformative |
| *Tylophora barbata* | 1 | 36% | 2 | 4% | Positive diagnostic |
| *Viola hederacea* | 2 | 23% | 2 | 6% | Uninformative |
| *Wilkiea huegeliana* | 2 | 27% | 2 | 2% | Positive diagnostic |
| *Xanthorrhoea arborea* | 2 | 27% | 2 | 11% | Uninformative |
| *Xanthorrhoea macronema* | 2 | 32% | 2 | 0% | Positive diagnostic |
| *Zieria smithii* | 2 | 27% | 1 | 5% | Positive diagnostic |

# CENTRAL COAST ESCARPMENT DRY FOREST

## S_WSF34

**Statewide Class**

NSW Plant Community Type:

Biometric Number(s):

**Northern Hinterland Wet Sclerophyll Forests**

1557: Rough-barked Apple-Forest Oak-Grey Gum Grassy Woodland on Sandstone Ranges of the Sydney Basin

HU771; ME88



## Description

Central Coast Escarpment Dry Forest is a moderately tall open forest that occurs on dry, exposed foreshore slopes that overlook the lower Hawkesbury River. Rough-barked apple (*Angophora floribunda*) is frequently recorded amongst the canopy, often with a prominent cover of forest oak (*Allocasuarina torulosa*). Other eucalypt species are less common with grey ironbark (*Eucalyptus paniculata*) or turpentine (*Syncarpia glomulifera*) occurring on finer clay soils and mahoganies (incl. *Eucalyptus umbra*) and red bloodwood (*Corymbia gummifera*) observed on upper slope colluvial Hawkesbury sediments. Shrubs are sparsely scattered and comprise wattles, peas, grass trees and *Astrotricha floccosa*. The ground layer is typified by a moderate cover of grasses and herbs. Kangaroo grass (*Themeda australis*) and wire grass (*Entolasia stricta*) are very common. In some areas, such as West Head, the forest is characterised by a very dense layer of casuarinas (*Allocasuarina torulosa* and/or *Allocasuarina littoralis*) with emergent or remnant eucalypts. This is most prevalent around the military emplacements that offer primary vantage points to the mouth of the Hawkesbury River, which suggests these patterns are disturbance related. Here the ground cover can be very sparse and instead covered in a continuous layer of casuarina needles.

The forest is restricted to northerly and westerly aspects on Narrabeen sediments generally at elevations less than 100 metres above sea level. It has a restricted distribution in the study area although elsewhere it is found on the exposed foreshore escarpments of Muogamarra and Marramarra reserves and occasionally on the exposed northern side of the Hawkesbury River. The forest lies within a mean annual rainfall band of 1000 and 1230 millimetres.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 24 m ±6<br>15-35 | 37% ±18<br>5-75 | *Angophora floribunda, Eucalyptus paniculata, Eucalyptus umbra, Syncarpia glomulifera, Angophora costata, Corymbia gummifera* |
| Small Trees | 9 m ±6<br>1-20 | 20% ±17<br>3-70 | *Allocasuarina torulosa, Allocasuarina littoralis* |
| Shrubs | 3.9 m ±2.9<br>1.5-15.0 | 25% ±16<br>5-65 | *Xanthorrhoea arborea, Astrotricha floccosa, Acacia ulicifolia, Hibbertia empetrifolia* subsp. *empetrifolia* |
| Ground Covers | 0.9 m ±0.4<br>0.4-2.0 | 34% ±26<br>4-80 | *Themeda australis, Lomandra confertifolia, Lomandra multiflora* subsp. *multiflora, Entolasia stricta, Panicum simile, Platysace linearifolia, Pomax umbellata* |
| Vines & Climbers | N/A | N/A | |

*Compiled from 4 sites with structural data recorded.

## Threats

Within the study area this community is distant from intense urban development and therefore less impacted by associated threats. Nonetheless, disturbance appears to arise from altered fire regimes, weed invasion and recreational pressures at major vantage and river access point. Local impacts are visible at West Head near former military fortifications.

## Conservation Status

This community is represented in Ku-ring-gai Chase, Dharug, Marramarra and Muogomarra reserves.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 224 +1.9 hectares 88% of extant area | Est. 1200 hectares |
| Total reserved | 235 +3.8 hectares 92% of extant area | Not available |
| Total non-reserved | 20.0 +6.0 hectares | Not available |
| Total extant | 255 hectares | Est. 3500 hectares |



Map unit
Study area
Extant vegetation

## Example Locations

o   West Head, Ku-ring-gai Chase NP

o   Jamieson Park, Warringah LGA

## Species Richness

| Number of sites | 17 |
|---|---|
| Total native species | 208 |
| Average no. native species per site | 41.4 ±13.4 |

## Variations and Dynamics

Casuarina scrubs dominated by *Allocasuarina torulosa* and/or *Allocasuarina littoralis* are found amongst disturbed areas such as those adjoining military emplacements at West Head in Ku-ring-gai Chase NP. Sites here comprise fewer species than is typical for undisturbed locations. Casuarinas are allelopathic, that is, they can inhibit plant growth particularly when they occur in great abundance.

Other variations appear to arise from the proximity of the overlying Hawkesbury sandstone. Downslope movement of sandy soil and boulders introduces some species more typical of less fertile substrates including smooth-barked apple (*Angophora costata*), *Xanthorrhoea arborea* and *Banksia spinulosa*.

## Relationship to Other Communities

The forest grades into Central Coast Escarpment Moist Forest (S_WSF33) on sheltered aspects and gullies. Increased frequency and abundance of mesic shrubs and small trees such as cabbage tree palm (*Livistona australis*) and scentless rosewood (*Synoum glandulosum*) present a more complex midstorey layer. Other forests found on the escarpment foreshores of the Hawkesbury River are associated with less fertile Hawkesbury sandstone sediments (Hawkesbury River Escarpment Dry Forest, S_DSF69) which are characterised by a diverse sclerophyllous shrub layer and a less pronounced cover of grasses. A gentle gradation between communities occurs particularly where there is a narrow interface between Narrabeen and Hawkesbury materials on lower escarpment slopes.

## Accuracy

Sampling intensity is moderate. Mapping relied on the environmental domains of site data and the interpretation of Narrabeen series substrates. Discrimination of Hawkesbury and Narrabeen substrates was marked by field traverse and inferred by the presence of one or more of the following species: grey ironbark, bangalay, rough-barked apple or dense stands of casuarina.

*The Native Vegetation of the Sydney Metropolitan Area*

A 0.04 hectare site located in this map unit is expected to contain at least 10 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 33 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| Acacia linifolia | 1 | 24% | 2 | 20% | Uninformative |
| Acacia longifolia | 1 | 29% | 2 | 21% | Uninformative |
| Acacia myrtifolia | 2 | 12% | 2 | 12% | Uninformative |
| Acacia suaveolens | 1 | 29% | 1 | 28% | Uninformative |
| Acacia terminalis | 2 | 18% | 1 | 20% | Uninformative |
| Acacia ulicifolia | 1 | 35% | 1 | 25% | Constant |
| Actinotus helianthi | 2 | 12% | 1 | 8% | Uninformative |
| Allocasuarina littoralis | 2 | 53% | 2 | 27% | Constant |
| Allocasuarina torulosa | 3 | 76% | 2 | 9% | Positive diagnostic |
| Angophora costata | 3 | 47% | 3 | 37% | Constant |
| Angophora floribunda | 3 | 29% | 2 | 4% | Positive diagnostic |
| Anisopogon avenaceus | 2 | 12% | 2 | 14% | Uninformative |
| Aristida vagans | 2 | 12% | 2 | 14% | Uninformative |
| Astrotricha floccosa | 2 | 29% | 2 | 2% | Positive diagnostic |
| Banksia integrifolia | 1 | 24% | 2 | 9% | Uninformative |
| Billardiera scandens | 1 | 65% | 1 | 37% | Constant |
| Breynia oblongifolia | 1 | 35% | 1 | 17% | Constant |
| Bursaria spinosa | 1 | 18% | 2 | 12% | Uninformative |
| Calochlaena dubia | 1 | 29% | 2 | 16% | Uninformative |
| Cassinia denticulata | 3 | 12% | 1 | 1% | Uninformative |
| Cassytha glabella | 2 | 12% | 2 | 14% | Uninformative |
| Cayratia clematidea | 1 | 12% | 2 | 4% | Uninformative |
| Cheilanthes sieberi subsp. sieberi | 1 | 12% | 2 | 13% | Uninformative |
| Cissus hypoglauca | 3 | 12% | 2 | 8% | Uninformative |
| Clematis aristata | 1 | 24% | 1 | 7% | Uninformative |
| Clerodendrum tomentosum | 2 | 18% | 1 | 5% | Uninformative |
| Commelina cyanea | 2 | 12% | 2 | 9% | Uninformative |
| Correa reflexa | 1 | 12% | 1 | 5% | Uninformative |
| Crassula sieberiana | 1 | 12% | 1 | 1% | Uninformative |
| Cyathochaeta diandra | 2 | 18% | 2 | 26% | Uninformative |
| Cymbopogon refractus | 2 | 18% | 2 | 4% | Uninformative |
| Desmodium rhytidophyllum | 2 | 12% | 1 | 2% | Uninformative |
| Deyeuxia quadriseta | 2 | 12% | 2 | 0% | Uninformative |
| Dianella caerulea | 2 | 94% | 2 | 44% | Positive diagnostic |
| Dianella revoluta | 2 | 12% | 2 | 17% | Uninformative |
| Digitaria parviflora | 2 | 53% | 2 | 5% | Positive diagnostic |
| Dodonaea triquetra | 1 | 41% | 2 | 23% | Constant |
| Echinopogon caespitosus | 2 | 12% | 2 | 11% | Uninformative |
| Elaeocarpus reticulatus | 1 | 24% | 1 | 20% | Uninformative |
| Entolasia marginata | 2 | 47% | 2 | 22% | Constant |
| Entolasia stricta | 2 | 82% | 2 | 59% | Constant |
| Eucalyptus botryoides | 1 | 47% | 3 | 5% | Positive diagnostic |
| Eucalyptus piperita | 1 | 29% | 3 | 20% | Uninformative |
| Eucalyptus punctata | 1 | 18% | 2 | 11% | Uninformative |
| Eucalyptus umbra | 1 | 24% | 2 | 3% | Positive diagnostic |
| Eustrephus latifolius | 1 | 65% | 2 | 15% | Positive diagnostic |
| Ficus rubiginosa | 2 | 12% | 1 | 4% | Uninformative |
| Gahnia clarkei | 1 | 24% | 2 | 4% | Positive diagnostic |
| Gahnia melanocarpa | 3 | 12% | 2 | 3% | Uninformative |
| Geitonoplesium cymosum | 2 | 29% | 2 | 9% | Uninformative |
| Glochidion ferdinandi | 1 | 47% | 2 | 13% | Positive diagnostic |
| Glycine clandestina | 2 | 71% | 2 | 17% | Positive diagnostic |
| Glycine tabacina | 1 | 12% | 2 | 8% | Uninformative |
| Gompholobium latifolium | 4 | 12% | 1 | 4% | Uninformative |
| Gonocarpus teucrioides | 3 | 24% | 2 | 23% | Uninformative |
| Goodenia heterophylla | 2 | 12% | 1 | 4% | Uninformative |
| Grevillea sericea | 1 | 12% | 2 | 15% | Uninformative |
| Haemodorum planifolium | 1 | 12% | 1 | 3% | Uninformative |
| Hakea dactyloides | 1 | 12% | 2 | 24% | Uninformative |
| Hardenbergia violacea | 2 | 24% | 1 | 16% | Uninformative |
| Hibbertia dentata | 2 | 47% | 2 | 8% | Positive diagnostic |
| Hibbertia empetrifolia subsp. empetrifolia | 2 | 35% | 1 | 6% | Positive diagnostic |
| Hydrocotyle peduncularis | 2 | 41% | 2 | 6% | Positive diagnostic |
| Hypolepis muelleri | 2 | 12% | 2 | 5% | Uninformative |
| Imperata cylindrica var. major | 2 | 59% | 2 | 20% | Positive diagnostic |
| Kennedia rubicunda | 2 | 53% | 1 | 9% | Positive diagnostic |
| Lasiopetalum ferrugineum | 2 | 12% | 2 | 11% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lepidosperma laterale* | 2 | 65% | 2 | 42% | Constant |
| *Leptospermum polygalifolium* | 1 | 12% | 2 | 14% | Uninformative |
| *Leucopogon juniperinus* | 1 | 12% | 2 | 10% | Uninformative |
| *Leucopogon lanceolatus* | 1 | 12% | 1 | 8% | Uninformative |
| *Livistona australis* | 1 | 35% | 2 | 10% | Positive diagnostic |
| *Lomandra confertifolia* | 2 | 24% | 2 | 5% | Positive diagnostic |
| *Lomandra filiformis* | 2 | 12% | 2 | 23% | Uninformative |
| *Lomandra glauca* | 3 | 12% | 2 | 16% | Uninformative |
| *Lomandra gracilis* | 1 | 24% | 2 | 10% | Uninformative |
| *Lomandra longifolia* | 2 | 65% | 2 | 47% | Constant |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 41% | 2 | 24% | Constant |
| *Lomandra obliqua* | 1 | 18% | 2 | 32% | Uninformative |
| *Macrozamia communis* | 2 | 29% | 1 | 4% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 35% | 2 | 36% | Constant |
| *Mitrasacme polymorpha* | 2 | 12% | 2 | 6% | Uninformative |
| *Myrsine variabilis* | 1 | 41% | 1 | 8% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 65% | 1 | 21% | Positive diagnostic |
| *Omalanthus nutans* | 1 | 29% | 1 | 9% | Uninformative |
| *Opercularia aspera* | 2 | 35% | 1 | 8% | Positive diagnostic |
| *Oplismenus imbecillis* | 2 | 24% | 2 | 13% | Uninformative |
| *Oxalis exilis* | 1 | 12% | 1 | 3% | Uninformative |
| *Pandorea pandorana* | 2 | 35% | 2 | 16% | Constant |
| *Panicum simile* | 2 | 41% | 2 | 10% | Positive diagnostic |
| *Persoonia levis* | 1 | 29% | 1 | 33% | Uninformative |
| *Persoonia linearis* | 1 | 41% | 1 | 19% | Constant |
| *Phyllanthus hirtellus* | 1 | 41% | 2 | 27% | Constant |
| *Pittosporum revolutum* | 1 | 24% | 1 | 9% | Uninformative |
| *Pittosporum undulatum* | 2 | 18% | 2 | 25% | Uninformative |
| *Platysace lanceolata* | 2 | 65% | 2 | 8% | Positive diagnostic |
| *Plectranthus parviflorus* | 1 | 18% | 2 | 3% | Uninformative |
| *Poa affinis* | 2 | 29% | 2 | 11% | Uninformative |
| *Podocarpus spinulosus* | 1 | 12% | 2 | 2% | Uninformative |
| *Polyscias sambucifolia* | 1 | 59% | 1 | 15% | Positive diagnostic |
| *Pomax umbellata* | 2 | 59% | 2 | 14% | Positive diagnostic |
| *Poranthera microphylla* | 2 | 24% | 2 | 7% | Uninformative |
| *Pratia purpurascens* | 2 | 53% | 2 | 17% | Positive diagnostic |
| *Prostanthera denticulata* | 2 | 29% | 2 | 1% | Positive diagnostic |
| *Pseuderanthemum variabile* | 2 | 35% | 2 | 12% | Constant |
| *Pteridium esculentum* | 2 | 82% | 2 | 40% | Positive diagnostic |
| *Pultenaea daphnoides* | 2 | 12% | 2 | 8% | Uninformative |
| *Pultenaea flexilis* | 3 | 12% | 2 | 6% | Uninformative |
| *Sarcopetalum harveyanum* | 1 | 35% | 1 | 4% | Positive diagnostic |
| *Schelhammera undulata* | 2 | 12% | 2 | 3% | Uninformative |
| *Senna odorata* | 2 | 12% | 1 | 0% | Uninformative |
| *Smilax glyciphylla* | 2 | 47% | 2 | 33% | Constant |
| *Stephania japonica* | 1 | 24% | 1 | 6% | Uninformative |
| *Syncarpia glomulifera* | 1 | 12% | 3 | 13% | Uninformative |
| *Synoum glandulosum* subsp. *glandulosum* | 1 | 18% | 2 | 5% | Uninformative |
| *Themeda australis* | 2 | 65% | 2 | 23% | Positive diagnostic |
| *Xanthorrhoea arborea* | 2 | 65% | 2 | 11% | Positive diagnostic |
| *Xanthorrhoea media* | 1 | 29% | 2 | 20% | Uninformative |
| *Xanthosia pilosa* | 1 | 29% | 2 | 20% | Uninformative |
| *Xanthosia tridentata* | 1 | 12% | 2 | 22% | Uninformative |
| *Zieria smithii* | 2 | 12% | 1 | 5% | Uninformative |

| | |
|---|---|
| Cumberland Moist Shale Woodland | S_GW01 |
| Cumberland Shale Hills Woodland | S_GW02 |
| Cumberland Shale Plains Woodland | S_GW03 |
| Cumberland Shale-Sandstone Ironbark Forest | S_GW04 |

# CUMBERLAND MOIST SHALE WOODLAND

# S_GW01

Statewide Class
NSW Plant Community Type:

Biometric Number(s):

Coastal Valley Grassy Woodlands
830: Forest Red Gum-Grey Box Shrubby Woodland on Shale of the Cumberland
Plain, Sydney Basin
HN524; ME017



## Description

Cumberland Moist Shale Woodland (NPWS 2002b, Tozer 2003) occurs on protected aspects on steeper shale hills and rises of the southern half of the Cumberland Plain. It differs from the grassy woodlands found in western Sydney by the prevalence of waxy-leaved shrubs and small trees in the understorey and a ground cover of herbs, fleshy twiners and grasses. Some of these species, such as hairy clerodendrum (*Clerodendrum tomentosum*) and slender grape (*Cayratia clematidea*), are hints of the Hinterland Dry Rainforest (S_RF05), a community that occasionally occurs in more protected situations nearby. Across its range in western Sydney the canopy is mostly dominated by forest red gum (*Eucalyptus tereticornis*) and grey box (*Eucalyptus moluccana*). However, there is a distinct band of spotted gum (*Corymbia maculata*) that appears along the sheltered slopes between Cecil Hills and Prospect Reservoir.

This unit occurs on the Cumberland Plain Wianamatta shale at elevations between 50 and 300 metres above sea level and where mean annual rainfall level reaches between 800 and 900 millimetres (Tozer et al. 2010). Much of this habitat has been extensively cleared, with remaining stands commonly choked by dense thickets of African olive (*Olea europaea* subsp. *cuspidata*). This reduces species diversity and in chronic situations it may be difficult to correctly diagnose the community due to low numbers of native species. Regional analysis suggests there are affinities between this community and sheltered forests found on the hinterland of the Hunter Valley. Further exploratory work is required.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 26 m ±5<br>20-30 | 13% ±6<br>5-20 | *Corymbia maculata, Eucalyptus moluccana, Eucalyptus eugenioides, Eucalyptus tereticornis* |
| Small Trees | 8 m ±5<br>3-15 | 18% ±5<br>10-20 | *Bursaria spinosa, Acacia implexa* |
| Shrubs | 3.5 m ±0.7<br>3.0-4.0 | 18% ±18<br>5-30 | *Bursaria spinosa, Breynia oblongifolia, Einadia hastata, Clerodendrum tomentosum* |
| Ground Covers | 0.5 m ±0.4<br>0.2-1.0 | 21% ±11<br>5-30 | *Dichondra repens, Microlaena stipoides* var. *stipoides, Solanum prinophyllum, Cyperus enervis, Desmodium varians, Echinopogon ovatus, Oplismenus aemulus, Oplismenus imbecillis, Oxalis exilis, Pseuderanthemum variabile, Scleria mackaviensis* |
| Vines & Climbers | N/A | N/A | *Glycine microphylla, Cayratia clematidea* |

*Compiled from 4 sites with structural data recorded.

## Threats

Threats are severe. Past clearing has diminished a large proportion of the original cover and remnants are disturbed and fragmented. Threats of clearing for urban development persist within the Sydney metropolitan area. The invasion of remnant stands by the exotic African olive (*Olea europaea* subsp. *cuspidata*) is extensive on the boundary of the study area. Other continuing threats described by the NSW Scientific Committee (2002c) include illegal dumping, fragmentation and clearing for recreational development.

## Conservation Status

Cumberland Moist Shale Woodland is a component of Moist Shale Woodland in the Sydney Basin Bioregion which is listed as an Endangered Ecological Community under the TSC Act. It is also a component of Western Sydney Dry Rainforest and Moist Woodland on Shale, and Endangered Ecological Community under the EPBC Act.

This vegetation community is represented in Western Sydney Regional Park (RP).

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | Est. 9000-10,000 hectares |
| Estimated percentage cleared | Not available | 55-60% |
| Total NPWS reserves | <.1 +<.1 hectares<br>0% of extant area | 740 hectares<br>13% of extant area<br>8% of pre-clearing area |
| Total reserved | 76.4 +0.4 hectares<br>93% of extant area | Not available |
| Total non-reserved | 5.8 +0.3 hectares | Not available |
| Total extant | 82.2 hectares | Est. 5500 hectares |

*As this woodland is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o   Calmsley Hill City Farm,, Abbotsbury

## Species Richness

| | |
|---|---|
| Number of sites | 4 |
| Total native species | 58 |
| Average no. native species per site | 28.8 ±5.7 |

## Variations and Dynamics

Within the study area this community is often dominated by spotted gum within Fairfield LGA. Elsewhere the species is absent and the community is more commonly dominated by red gum and grey box.

## Relationship to Other Communities

Many species are shared with Hinterland Dry Rainforest (S_RF05) which is situated proximate to this community in sites with greater shelter. As the topography becomes more exposed Cumberland Moist Shale Woodland grades into one of the drier grassy Cumberland Plain woodland units (S_GW02, S_GW03).

## Accuracy

Sampling density is moderate. Mapping was based on the pre-1750 vegetation map of Tozer et al. (2010). Map unit boundaries were defined from the interpretation of digital imagery to identify candidate sheltered forests using topographic position, canopy species signatures and understorey characteristics. Low sampling density and highly disturbed vegetation patterns are likely to result in an underestimate of the community in the study area.

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia implexa* | 1 | 50% | 1 | 5% | Positive diagnostic |
| *Aristida ramosa* | 2 | 25% | 2 | 4% | Uninformative |
| *Austrodanthonia racemosa* | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Austrodanthonia setacea* | 2 | 25% | 2 | 0% | Positive diagnostic |
| *Bothriochloa macra* | 1 | 25% | 1 | 1% | Positive diagnostic |
| *Breynia oblongifolia* | 1 | 75% | 1 | 17% | Positive diagnostic |
| *Brunoniella australis* | 2 | 25% | 2 | 7% | Uninformative |
| *Brunoniella pumilio* | 2 | 50% | 2 | 7% | Constant |
| *Bursaria spinosa* | 2 | 100% | 2 | 11% | Positive diagnostic |
| *Cayratia clematidea* | 2 | 75% | 2 | 4% | Positive diagnostic |
| *Cheilanthes sieberi* subsp. *sieberi* | 2 | 25% | 2 | 13% | Uninformative |
| *Clematis glycinoides* | 1 | 25% | 2 | 6% | Uninformative |
| *Clerodendrum tomentosum* | 1 | 25% | 1 | 5% | Uninformative |
| *Corymbia maculata* | 3 | 100% | 3 | 2% | Positive diagnostic |
| *Cymbonotus lawsonianus* | 1 | 25% | 1 | 0% | Positive diagnostic |
| *Cyperus enervis* | 2 | 75% | 1 | 0% | Positive diagnostic |
| *Desmodium brachypodum* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Desmodium varians* | 2 | 75% | 2 | 8% | Positive diagnostic |
| *Dianella longifolia* | 1 | 25% | 2 | 5% | Uninformative |
| *Dichondra repens* | 2 | 100% | 2 | 14% | Positive diagnostic |
| *Digitaria diffusa* | 2 | 25% | 2 | 0% | Positive diagnostic |
| *Echinopogon caespitosus* | 1 | 25% | 2 | 11% | Uninformative |
| *Echinopogon ovatus* | 1 | 75% | 2 | 6% | Positive diagnostic |
| *Einadia hastata* | 2 | 50% | 1 | 4% | Positive diagnostic |
| *Einadia polygonoides* | 2 | 50% | 2 | 0% | Positive diagnostic |
| *Eragrostis leptostachya* | 2 | 50% | 2 | 4% | Positive diagnostic |
| *Eucalyptus eugenioides* | 3 | 50% | 1 | 2% | Positive diagnostic |
| *Eucalyptus moluccana* | 3 | 75% | 3 | 4% | Positive diagnostic |
| *Eucalyptus tereticornis* | 3 | 50% | 2 | 5% | Positive diagnostic |
| *Euchiton sphaericus* | 1 | 25% | 1 | 3% | Uninformative |
| *Galium migrans* | 2 | 50% | 2 | 0% | Positive diagnostic |
| *Galium propinquum* | 3 | 25% | 2 | 2% | Uninformative |
| *Geranium homeanum* | 2 | 25% | 2 | 2% | Uninformative |
| *Glycine clandestina* | 2 | 100% | 2 | 18% | Positive diagnostic |
| *Glycine microphylla* | 1 | 25% | 2 | 9% | Uninformative |
| *Hypericum gramineum* | 1 | 25% | 2 | 3% | Uninformative |
| *Hypoxis hygrometrica* | 1 | 25% | 2 | 2% | Uninformative |
| *Juncus usitatus* | 1 | 25% | 1 | 3% | Uninformative |
| *Lagenophora stipitata* | 2 | 25% | 2 | 4% | Uninformative |
| *Lomandra filiformis* | 2 | 50% | 2 | 22% | Constant |
| *Microlaena stipoides* var. *stipoides* | 2 | 100% | 2 | 36% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 25% | 1 | 21% | Uninformative |
| *Opercularia aspera* | 1 | 25% | 1 | 8% | Uninformative |
| *Oplismenus aemulus* | 1 | 75% | 2 | 10% | Positive diagnostic |
| *Oplismenus imbecillis* | 2 | 75% | 2 | 13% | Positive diagnostic |
| *Oxalis exilis* | 2 | 75% | 1 | 3% | Positive diagnostic |
| *Oxalis perennans* | 2 | 25% | 2 | 7% | Uninformative |
| *Paspalidium distans* | 3 | 25% | 2 | 7% | Uninformative |
| *Plantago debilis* | 1 | 25% | 2 | 2% | Uninformative |
| *Poa sieberiana* | 1 | 50% | 2 | 1% | Positive diagnostic |
| *Portulaca oleracea* | 1 | 50% | 1 | 0% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 50% | 2 | 18% | Constant |
| *Pseuderanthemum variabile* | 1 | 75% | 2 | 12% | Positive diagnostic |
| *Scleria mackaviensis* | 2 | 75% | 2 | 0% | Positive diagnostic |
| *Sigesbeckia orientalis* subsp. *orientalis* | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Solanum prinophyllum* | 2 | 100% | 1 | 5% | Positive diagnostic |
| *Veronica plebeia* | 2 | 50% | 1 | 7% | Constant |
| *Wahlenbergia gracilis* | 2 | 50% | 1 | 8% | Constant |

# CUMBERLAND SHALE HILLS WOODLAND
# S_GW02

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Coastal Valley Grassy Woodlands**
850: Grey Box-Forest Red Gum Grassy Woodland on Shale of the Southern Cumberland Plain, Sydney Basin
HN529; ME019



## Description

Cumberland Shale Hills Woodland is one of two widespread grassy woodland communities which together are recognised as Cumberland Plain Woodland n the Sydney Basin Bioregion, a Critically Endangered Ecological Community. It is an open woodland of grey box (*Eucalyptus moluccana*) and forest red gum (*Eucalyptus tereticornis*) with narrow-leaved ironbark (*Eucalyptus crebra*) also common. Hickory wattle (*Acacia implexa*) occurs amongst the small tree layer, often amongst regrowth stands. This species is one of the more distinctive floristic attributes that helps distinguish between the two components of the EEC. Other features are similar in that the two woodland units are characterised by an open shrub layer and a grassy ground cover. Fire history can have an important influence on the abundance of shrubs (Watson et al. 2009), with density of blackthorn (*Bursaria spinosa*) increasing with time since fire.

The community occupies higher elevations associated with the hills and rises south from Prospect. It is most extensive in Campbelltown and Liverpool local government areas. It extends beyond the study area west across the Razorback range and once dominated the southern half of the Cumberland Plain. It is restricted to mean annual rainfall of between 750 and 900 millimetres and elevations between 50 and 350 metres above sea level (Tozer et al. 2010).

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 24 m ±6 <br> 13-35 | 17% ±8 <br> 5-30 | *Eucalyptus moluccana, Eucalyptus tereticornis, Eucalyptus crebra* |
| Small Trees | 8 m ±3 <br> 3-14 | 8% ±5 <br> 2-15 | *Acacia implexa* |
| Shrubs | 3.4 m ±1.0 <br> 2.0-5.0 | 19% ±12 <br> 10-40 | *Bursaria spinosa* |
| Ground Covers | 1.0 m ±0.0 <br> 1.0-1.0 | 63% ±15 <br> 40-80 | *Brunoniella australis, Dichondra repens, Microlaena stipoides* var. *stipoides, Aristida ramosa, Asperula conferta, Cyperus gracilis, Oxalis perennans, Carex inversa, Cheilanthes sieberi* subsp. *sieberi, Desmodium varians, Arthropodium milleflorum, Dichelachne micrantha, Echinopogon ovatus, Sida corrugata, Sporobolus creber, Bothriochloa macra, Cheilanthes distans, Chloris truncata, Eragrostis leptostachya, Galium propinquum, Solanum pungetium, Themeda australis, Cymbopogon refractus, Einadia polygonoides, Einadia trigonos, Poa labillardierei, Veronica plebeia* |
| Vines & Climbers | N/A | N/A | *Glycine clandestina, Glycine tabacina, Hardenbergia violacea* |

*Compiled from 9 sites with structural data recorded.

## Threats

Past clearing for agriculture has removed extensive stands of this woodland resulting in permanent loss and fragmentation. Remnants are threatened by continued urban and industrial expansion. Invasion by African olive (*Olea europaea* subsp. *cuspidata*) is a significant threat; dense stands of this weed occupy large areas formerly occupied by the community (Cuneo 2008). The NSW Scientific Committee (1997) also considers grazing, inappropriate fire regimes, and artificial enrichment from water runoff as significant threats to the community.

## Conservation Status

Cumberland Shale Hills Woodland is a component of Cumberland Plain Woodland in the Sydney Basin Bioregion which is listed as a Critically Endangered Ecological Community under the NSW TSC Act. It is also listed as a Critically Endangered Ecological Community under the EPBC Act as a component of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest. This vegetation community is represented in Prospect NR, Western Sydney RP and Leacock RP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 17,600-44,000 hectares |
| Estimated percentage cleared | Not available | 75-90% |
| Total NPWS reserves | 0.3 +<.1 hectares<br>0.1% of extant area | 210 hectares<br>5% of extant area<br><2% of pre-clearing area |
| Total reserved | 57.0 +0 hectares<br>23% of extant area | Not available |
| Total non-reserved | 193 +59.8 hectares | Not available |
| Total extant | 250 hectares | 4400 hectares |



## Example Locations

o   The Australian Botanic Garden, Mount Annan

o   Prospect NR, Prospect

## Species Richness

| Number of sites | 6 |
|---|---|
| Total native species | 82 |
| Average no. native species per site | 34.0 ±9.2 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

There are subtle floristic differences with Cumberland Shale Plains Woodland (S_GW03) with which it grades at lower elevations and near the northern limit around Prospect Reservoir. NPWS (2002b) indicates that elevation and landscape position separate the distribution boundaries of the two communities. Spatially it grades into moist shale forests (S_GW01) on lower protected slopes that follow the major ridgelines between Cecil Hills and Hoxton Park. It grades into shale transition forests (S_GW04) near the interface with the sandstone plateaus (Tozer 2003).

## Accuracy

Sampling density within the study area is moderate however additional samples exist in areas immediately adjoining. Mapping was based on the pre-1750 mapping of Tozer et al. (2010). Map unit boundaries were defined from the interpretation of digital imagery which defined both S_GW03 and S_GW02. No attempt was made to separate this unit from S_GW03 as there are no features of the community which can be reliably distinguished using the interpretation of imagery. Units were later separated using predicted distributions of Tozer et al. (2010).

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia baileyana* | 1 | 17% | 1 | 0% | Uninformative |
| *Acacia implexa* | 2 | 100% | 1 | 4% | Positive diagnostic |
| *Acacia parramattensis* | 1 | 17% | 1 | 5% | Uninformative |
| *Ajuga australis* | 2 | 17% | 1 | 1% | Uninformative |
| *Aristida ramosa* | 3 | 83% | 2 | 3% | Positive diagnostic |
| *Aristida vagans* | 3 | 33% | 2 | 14% | Uninformative |
| *Arthropodium milleflorum* | 1 | 50% | 2 | 3% | Positive diagnostic |
| *Asperula conferta* | 2 | 83% | 2 | 1% | Positive diagnostic |
| *Austrodanthonia racemosa* | 2 | 17% | 2 | 2% | Uninformative |
| *Austrodanthonia tenuior* | 3 | 17% | 2 | 4% | Uninformative |
| *Bothriochloa macra* | 1 | 67% | 1 | 1% | Positive diagnostic |
| *Brunoniella australis* | 2 | 100% | 2 | 6% | Positive diagnostic |
| *Brunoniella pumilio* | 2 | 17% | 2 | 7% | Uninformative |
| *Bursaria spinosa* | 3 | 83% | 2 | 11% | Positive diagnostic |
| *Carex inversa* | 2 | 83% | 1 | 2% | Positive diagnostic |
| *Cheilanthes distans* | 2 | 67% | 1 | 1% | Positive diagnostic |
| *Cheilanthes sieberi* subsp. *sieberi* | 2 | 67% | 2 | 12% | Positive diagnostic |
| *Chloris truncata* | 2 | 67% | 2 | 0% | Positive diagnostic |
| *Chloris ventricosa* | 3 | 17% | 2 | 1% | Uninformative |
| *Clematis glycinoides* | 2 | 33% | 2 | 6% | Uninformative |
| *Convolvulus erubescens* | 2 | 17% | 2 | 1% | Uninformative |
| *Crassula sieberiana* | 2 | 17% | 1 | 1% | Uninformative |
| *Cymbonotus lawsonianus* | 2 | 17% | 1 | 0% | Uninformative |
| *Cymbopogon refractus* | 2 | 33% | 2 | 4% | Positive diagnostic |
| *Cyperus fulvus* | 1 | 17% | 0 | 0% | Uninformative |
| *Cyperus gracilis* | 2 | 83% | 2 | 1% | Positive diagnostic |
| *Desmodium brachypodum* | 2 | 67% | 1 | 1% | Positive diagnostic |
| *Desmodium varians* | 2 | 50% | 2 | 8% | Positive diagnostic |
| *Dianella longifolia* | 1 | 17% | 2 | 5% | Uninformative |
| *Dichelachne micrantha* | 2 | 50% | 2 | 9% | Positive diagnostic |
| *Dichelachne parva* | 2 | 17% | 2 | 1% | Uninformative |
| *Dichondra repens* | 2 | 100% | 2 | 14% | Positive diagnostic |
| *Dodonaea viscosa* | 2 | 17% | 1 | 1% | Uninformative |
| *Echinopogon ovatus* | 2 | 67% | 2 | 6% | Positive diagnostic |
| *Einadia hastata* | 2 | 17% | 1 | 4% | Uninformative |
| *Einadia nutans* | 1 | 83% | 1 | 1% | Positive diagnostic |
| *Einadia trigonos* | 2 | 33% | 2 | 1% | Positive diagnostic |
| *Elymus scaber* | 1 | 33% | 1 | 0% | Positive diagnostic |
| *Eragrostis leptostachya* | 2 | 17% | 2 | 4% | Uninformative |
| *Eremophila debilis* | 1 | 17% | 2 | 1% | Uninformative |
| *Eriochloa pseudoacrotricha* | 1 | 17% | 1 | 0% | Uninformative |
| *Eucalyptus crebra* | 3 | 67% | 2 | 3% | Positive diagnostic |
| *Eucalyptus moluccana* | 3 | 67% | 3 | 4% | Positive diagnostic |
| *Eucalyptus tereticornis* | 3 | 67% | 2 | 5% | Positive diagnostic |
| *Euchiton involucratus* | 2 | 17% | 2 | 0% | Uninformative |
| *Fimbristylis dichotoma* | 2 | 33% | 1 | 1% | Positive diagnostic |
| *Galium propinquum* | 2 | 67% | 1 | 2% | Positive diagnostic |
| *Geranium homeanum* | 2 | 17% | 2 | 2% | Uninformative |
| *Geranium solanderi* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Glycine clandestina* | 2 | 50% | 2 | 18% | Constant |
| *Glycine microphylla* | 2 | 17% | 2 | 9% | Uninformative |
| *Glycine tabacina* | 2 | 50% | 2 | 8% | Positive diagnostic |
| *Hardenbergia violacea* | 1 | 50% | 1 | 16% | Constant |
| *Hypericum gramineum* | 2 | 33% | 2 | 3% | Positive diagnostic |
| *Hypoxis hygrometrica* | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Lachnagrostis filiformis* | 1 | 33% | 1 | 2% | Positive diagnostic |
| *Lomandra confertifolia* | 1 | 17% | 2 | 5% | Uninformative |
| *Mentha satureioides* | 2 | 33% | 2 | 0% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 100% | 2 | 36% | Positive diagnostic |
| *Oplismenus imbecillis* | 2 | 17% | 2 | 13% | Uninformative |
| *Oxalis perennans* | 2 | 83% | 2 | 7% | Positive diagnostic |
| *Pandorea pandorana* | 1 | 17% | 2 | 16% | Uninformative |
| *Paspalidium distans* | 2 | 33% | 2 | 7% | Uninformative |
| *Pellaea falcata* | 1 | 17% | 2 | 2% | Uninformative |
| *Plectranthus parviflorus* | 1 | 17% | 2 | 3% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 1 | 17% | 2 | 6% | Uninformative |
| *Polygala japonica* | 1 | 17% | 1 | 0% | Uninformative |
| *Poranthera microphylla* | 2 | 33% | 2 | 7% | Uninformative |
| *Scleria mackaviensis* | 2 | 33% | 2 | 0% | Positive diagnostic |
| *Scutellaria humilis* | 2 | 33% | 2 | 0% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Senecio hispidulus* | 2 | 17% | 1 | 2% | Uninformative |
| *Senecio quadridentatus* | 2 | 33% | 1 | 0% | Positive diagnostic |
| *Sida corrugata* | 1 | 67% | 2 | 0% | Positive diagnostic |
| *Solanum pungetium* | 2 | 67% | 1 | 0% | Positive diagnostic |
| *Sporobolus creber* | 1 | 33% | 1 | 1% | Positive diagnostic |
| *Sporobolus elongatus* | 1 | 17% | 2 | 1% | Uninformative |
| *Themeda australis* | 4 | 67% | 2 | 23% | Constant |
| *Tricoryne elatior* | 2 | 33% | 2 | 3% | Positive diagnostic |
| *Veronica plebeia* | 2 | 50% | 1 | 7% | Positive diagnostic |
| *Wahlenbergia communis* | 2 | 33% | 2 | 0% | Positive diagnostic |
| *Wahlenbergia stricta* subsp. *stricta* | 2 | 17% | 2 | 1% | Uninformative |
| *Wurmbea dioica* subsp. *dioica* | 2 | 17% | 2 | 0% | Uninformative |

# CUMBERLAND SHALE PLAINS WOODLAND                    S_GW03

## Description

The gentle topography associated with the shale plains of western Sydney carries an open grassy woodland dominated by grey box (*Eucalyptus moluccana*), forest red gum (*Eucalyptus tereticornis*) and ironbark (*Eucalyptus crebra*/*Eucalyptus fibrosa*). Localised patches of spotted gum (*Corymbia maculata*) may occur in the Fairfield LGA. Cumberland Shale Plains Woodland is the second of the grassy woodlands that comprise the Cumberland Plain Woodland in the Sydney Basin Bioregion Critically Endangered Ecological Community listed under the NSW TSC Act. Like the related community Cumberland Shale Hills Woodland (S_GW02) it is typified by a sparse to moderate cover of shrubs and a high cover of grasses and forbs.

Tozer et al. (2010) define the primary habitat for the community as occurring at elevations less than 150 meters above sea level with some sites occurring at higher elevations where the landscape remains gently inclined. Rainfall is restricted to a narrow band between 750 and 950 millimetres per annum. The community occupies the north-west and west zones of the study area but is widespread elsewhere across the Cumberland Plain.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 20 m ±5 <br> 10-30 | 19% ±10 <br> 1-45 | *Eucalyptus moluccana, Eucalyptus tereticornis, Eucalyptus crebra, Eucalyptus eugenioides, Eucalyptus fibrosa* |
| Small Trees | 7 m ±4 <br> 2-17 | 17% ±14 <br> 1-60 | *Acacia decurrens, Acacia implexa* |
| Shrubs | 3.4 m ±1.6 <br> 1.0-8.0 | 17% ±12 <br> 2-50 | *Bursaria spinosa* |
| Ground Covers | 0.9 m ±0.4 <br> 0.2-2.0 | 51% ±29 <br> 2-95 | *Dichondra repens, Brunoniella australis, Microlaena stipoides* var. *stipoides, Themeda australis, Desmodium varians, Cheilanthes sieberi* subsp. *sieberi, Aristida vagans, Dichelachne micrantha, Lomandra filiformis, Setaria distans, Dianella longifolia, Aristida ramosa, Opercularia diphylla, Eragrostis leptostachya, Lomandra multiflora, Wahlenbergia gracilis, Oxalis perennans, Tricoryne elatior, Euchiton sphaericus, Cymbopogon refractus, Stackhousia viminea, Chloris ventricosa* |
| Vines & Climbers | N/A | N/A | *Glycine tabacina, Glycine clandestina, Glycine microphylla, Hardenbergia violacea* |

*Compiled from 82 sites with structural data recorded.

## Threats

Past clearing for agriculture has removed extensive stands of this woodland resulting in permanent loss and fragmentation. Remnants are threatened by continued urban and industrial expansion. The NSW Scientific Committee (1997) also consider frequent mowing and grazing, inappropriate fire regimes, weed invasion and artificial enrichment from water runoff to impact upon the community.

## Conservation Status

Cumberland Shale Plains Woodland is a component of Cumberland Plain Woodland in the Sydney Basin Bioregion which is listed as a Critically Endangered Ecological Community under the TSC Act. It is also is a component of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest listed as a Critically Endangered Ecological Community under the EPBC Act.

This vegetation community is represented in Prospect NR, Western Sydney RP and Leacock RP.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 13 600-27,200 hectares |
| Estimated percentage cleared | Not available | 75-95% |
| Total NPWS reserves | 275 +10.2 hectares 18% of extant area | 560 hectares 8% of extant area <2% of pre-clearing area |
| Total reserved | 586 +62.7 hectares 39% of extant area | Not available |
| Total non-reserved | 901 +350 hectares | Not available |
| Total extant | 1487 hectares | 6800 hectares |
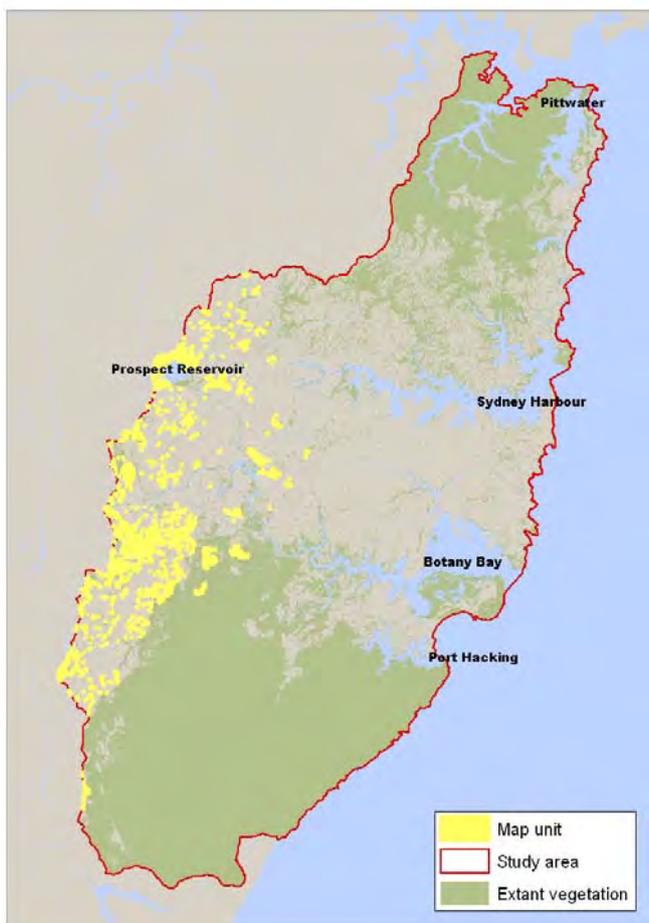


## Example Locations

o   Reserves in Campbelltown LGA

o   Reserves in Parramatta LGA

## Species Richness

| | |
|---|---|
| Number of sites | 85 |
| Total native species | 291 |
| Average no. native species per site | 39.7 ±9.5 |

## Variations and Dynamics

Local variations may occur where either forest red gum or grey box are absent at a site. Sites approaching the shale-sandstone boundary or on thin lateritic soils often include a higher proportion of red ironbark (*Eucalyptus fibrosa*).

## Relationship to Other Communities

There are subtle floristic differences with Cumberland Shale Hills Woodland (S_GW02) with which it grades at higher elevations in Campbelltown, Liverpool and Fairfield local government areas. It grades into shale transition forests (S_GW04) which occur near the interface with the sandstone plateaus (Tozer 2003). It also grades into taller moist shale forests as rainfall increases. The transition to Sydney Turpentine-Ironbark Forest (S_WSF09) and Blue Gum High Forest (S_WSF01) occurs in the north-west of the study area near Castle Hill. In Bankstown, Parramatta and Liverpool it may be proximate to communities found on Tertiary alluvium and shale-gravels (S_DSF01, S_DSF02, S_DSF03).

## Accuracy

Sampling intensity within the study area is high. Map unit boundaries were defined from the interpretation of digital imagery which defined both S_GW03 and S_GW02. No attempt was made to separate this unit from S_GW03 as there are no features of the community which can be reliably distinguished using the interpretation of imagery. Units were later separated using predicted distributions of each community presented in Tozer et al. (2010).

A 0.04 hectare site located in this map unit is expected to contain at least 26 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 32 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| Acacia decurrens | 2 | 36% | 2 | 4% | Positive diagnostic |
| Acacia falcata | 1 | 13% | 1 | 3% | Positive diagnostic |
| Acacia implexa | 2 | 26% | 1 | 4% | Positive diagnostic |
| Acacia parramattensis | 2 | 13% | 1 | 5% | Positive diagnostic |
| Ajuga australis | 1 | 16% | 2 | 0% | Positive diagnostic |
| Aristida ramosa | 2 | 56% | 2 | 1% | Positive diagnostic |
| Aristida vagans | 2 | 65% | 2 | 12% | Positive diagnostic |
| Arthropodium milleflorum | 2 | 36% | 1 | 2% | Positive diagnostic |
| Arthropodium sp. B | 2 | 6% | 1 | 0% | Positive diagnostic |
| Asperula conferta | 2 | 33% | 2 | 0% | Positive diagnostic |
| Astroloma humifusum | 1 | 12% | 1 | 2% | Positive diagnostic |
| Austrodanthonia racemosa | 2 | 38% | 2 | 1% | Positive diagnostic |
| Austrodanthonia tenuior | 2 | 29% | 2 | 3% | Positive diagnostic |
| Austrostipa rudis | 2 | 11% | 2 | 2% | Positive diagnostic |
| Bossiaea prostrata | 1 | 11% | 1 | 2% | Positive diagnostic |
| Bothriochloa decipiens var. decipiens | 2 | 8% | 1 | 0% | Positive diagnostic |
| Bothriochloa macra | 1 | 16% | 1 | 1% | Positive diagnostic |
| Breynia oblongifolia | 2 | 24% | 1 | 16% | Uninformative |
| Brunoniella australis | 2 | 88% | 2 | 4% | Positive diagnostic |
| Bursaria spinosa | 3 | 93% | 2 | 8% | Positive diagnostic |
| Caesia parviflora | 2 | 18% | 1 | 3% | Positive diagnostic |
| Carex inversa | 2 | 21% | 1 | 1% | Positive diagnostic |
| Centella asiatica | 2 | 14% | 2 | 5% | Positive diagnostic |
| Cheilanthes distans | 2 | 11% | 1 | 1% | Positive diagnostic |
| Cheilanthes sieberi subsp. sieberi | 2 | 84% | 2 | 10% | Positive diagnostic |
| Chloris ventricosa | 2 | 33% | 2 | 0% | Positive diagnostic |
| Clematis glycinoides | 2 | 19% | 2 | 6% | Positive diagnostic |
| Corymbia maculata | 3 | 9% | 3 | 2% | Positive diagnostic |
| Cymbopogon refractus | 2 | 40% | 2 | 2% | Positive diagnostic |
| Cyperus gracilis | 2 | 11% | 2 | 1% | Positive diagnostic |
| Daviesia ulicifolia | 2 | 27% | 2 | 2% | Positive diagnostic |
| Desmodium brachypodum | 2 | 15% | 1 | 1% | Positive diagnostic |
| Desmodium rhytidophyllum | 2 | 12% | 1 | 2% | Positive diagnostic |
| Desmodium varians | 2 | 82% | 1 | 6% | Positive diagnostic |
| Dianella longifolia | 2 | 56% | 1 | 3% | Positive diagnostic |
| Dianella revoluta | 2 | 24% | 1 | 17% | Uninformative |
| Dichanthium sericeum subsp. sericeum | 2 | 12% | 0 | 0% | Positive diagnostic |
| Dichelachne micrantha | 2 | 69% | 1 | 7% | Positive diagnostic |
| Dichelachne parva | 1 | 18% | 2 | 0% | Positive diagnostic |
| Dichondra repens | 2 | 92% | 2 | 11% | Positive diagnostic |
| Digitaria ramularis | 2 | 11% | 2 | 2% | Positive diagnostic |
| Dillwynia sieberi | 2 | 25% | 2 | 1% | Positive diagnostic |
| Dodonaea viscosa | 1 | 16% | 2 | 0% | Positive diagnostic |
| Echinopogon caespitosus | 2 | 34% | 1 | 10% | Positive diagnostic |
| Echinopogon ovatus | 2 | 31% | 2 | 5% | Positive diagnostic |
| Einadia hastata | 1 | 25% | 2 | 3% | Positive diagnostic |
| Einadia nutans | 1 | 13% | 1 | 1% | Positive diagnostic |
| Einadia polygonoides | 2 | 9% | 1 | 0% | Positive diagnostic |
| Einadia trigonos | 2 | 16% | 2 | 1% | Positive diagnostic |
| Elymus scaber | 1 | 8% | 1 | 0% | Positive diagnostic |
| Entolasia marginata | 2 | 31% | 2 | 22% | Uninformative |
| Eragrostis brownii | 2 | 20% | 2 | 6% | Positive diagnostic |
| Eragrostis leptostachya | 2 | 53% | 2 | 3% | Positive diagnostic |
| Eremophila debilis | 2 | 29% | 1 | 0% | Positive diagnostic |
| Eriochloa pseudoacrotricha | 2 | 9% | 1 | 0% | Positive diagnostic |
| Eucalyptus crebra | 3 | 14% | 2 | 2% | Positive diagnostic |
| Eucalyptus eugenioides | 2 | 16% | 1 | 1% | Positive diagnostic |
| Eucalyptus fibrosa | 1 | 15% | 3 | 3% | Positive diagnostic |
| Eucalyptus moluccana | 3 | 76% | 3 | 1% | Positive diagnostic |
| Eucalyptus tereticornis | 3 | 71% | 2 | 2% | Positive diagnostic |
| Euchiton sphaericus | 2 | 48% | 1 | 1% | Positive diagnostic |
| Exocarpos cupressiformis | 1 | 20% | 1 | 3% | Positive diagnostic |
| Fimbristylis dichotoma | 2 | 22% | 1 | 1% | Positive diagnostic |
| Galium propinquum | 1 | 8% | 2 | 1% | Positive diagnostic |
| Glycine clandestina | 2 | 49% | 2 | 17% | Positive diagnostic |
| Glycine microphylla | 2 | 41% | 2 | 8% | Positive diagnostic |
| Glycine tabacina | 2 | 67% | 2 | 6% | Positive diagnostic |
| Goodenia hederacea | 2 | 31% | 1 | 10% | Positive diagnostic |
| Hardenbergia violacea | 2 | 40% | 1 | 15% | Positive diagnostic |
| Hydrocotyle peduncularis | 2 | 16% | 2 | 6% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Hypericum gramineum* | 2 | 27% | 1 | 2% | Positive diagnostic |
| *Hypoxis hygrometrica* | 2 | 31% | 1 | 1% | Positive diagnostic |
| *Indigofera australis* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Juncus usitatus* | 1 | 25% | 1 | 2% | Positive diagnostic |
| *Lachnagrostis filiformis* | 1 | 25% | 1 | 1% | Positive diagnostic |
| *Lagenophora gracilis* | 1 | 13% | 2 | 2% | Positive diagnostic |
| *Laxmannia gracilis* | 2 | 14% | 1 | 5% | Positive diagnostic |
| *Leucopogon juniperinus* | 1 | 20% | 2 | 10% | Uninformative |
| *Linum marginale* | 2 | 7% | 1 | 0% | Positive diagnostic |
| *Lomandra filiformis* | 2 | 71% | 2 | 21% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 49% | 2 | 23% | Positive diagnostic |
| *Melaleuca decora* | 2 | 15% | 2 | 3% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 3 | 89% | 2 | 34% | Positive diagnostic |
| *Opercularia diphylla* | 2 | 60% | 2 | 6% | Positive diagnostic |
| *Oplismenus aemulus* | 2 | 14% | 2 | 10% | Uninformative |
| *Oxalis exilis* | 2 | 14% | 1 | 3% | Positive diagnostic |
| *Oxalis perennans* | 2 | 55% | 2 | 5% | Positive diagnostic |
| *Ozothamnus diosmifolius* | 2 | 27% | 1 | 11% | Positive diagnostic |
| *Panicum effusum* | 2 | 24% | 2 | 0% | Positive diagnostic |
| *Panicum simile* | 2 | 25% | 2 | 9% | Positive diagnostic |
| *Paspalidium distans* | 2 | 60% | 2 | 5% | Positive diagnostic |
| *Phyllanthus virgatus* | 2 | 16% | 0 | 0% | Positive diagnostic |
| *Plantago debilis* | 2 | 21% | 2 | 1% | Positive diagnostic |
| *Plantago gaudichaudii* | 2 | 16% | 0 | 0% | Positive diagnostic |
| *Plectranthus parviflorus* | 2 | 22% | 2 | 3% | Positive diagnostic |
| *Poa labillardierei* var. *labillardierei* | 2 | 24% | 2 | 5% | Positive diagnostic |
| *Poa sieberiana* | 2 | 7% | 2 | 1% | Positive diagnostic |
| *Polymeria calycina* | 1 | 12% | 1 | 1% | Positive diagnostic |
| *Poranthera microphylla* | 2 | 31% | 2 | 6% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 34% | 2 | 17% | Positive diagnostic |
| *Pultenaea microphylla* | 1 | 8% | 1 | 0% | Positive diagnostic |
| *Rumex brownii* | 1 | 6% | 1 | 1% | Positive diagnostic |
| *Sarga leiocladum* | 2 | 6% | 0 | 0% | Positive diagnostic |
| *Scaevola albida* | 2 | 6% | 0 | 0% | Positive diagnostic |
| *Schenkia spicata* | 1 | 6% | 1 | 0% | Positive diagnostic |
| *Schoenus apogon* | 2 | 7% | 2 | 1% | Positive diagnostic |
| *Scleria mackaviensis* | 2 | 7% | 2 | 0% | Positive diagnostic |
| *Senecio diaschides* | 1 | 9% | 1 | 0% | Positive diagnostic |
| *Senecio hispidulus* | 1 | 14% | 1 | 2% | Positive diagnostic |
| *Sida corrugata* | 2 | 8% | 1 | 0% | Positive diagnostic |
| *Solanum prinophyllum* | 2 | 34% | 1 | 4% | Positive diagnostic |
| *Sporobolus creber* | 1 | 22% | 1 | 0% | Positive diagnostic |
| *Sporobolus elongatus* | 2 | 18% | 1 | 0% | Positive diagnostic |
| *Stackhousia viminea* | 2 | 40% | 1 | 2% | Positive diagnostic |
| *Themeda australis* | 2 | 81% | 2 | 21% | Positive diagnostic |
| *Tricoryne elatior* | 2 | 49% | 1 | 2% | Positive diagnostic |
| *Vernonia cinerea* var. *cinerea* | 2 | 33% | 1 | 2% | Positive diagnostic |
| *Veronica plebeia* | 2 | 33% | 1 | 6% | Positive diagnostic |
| *Vittadinia cuneata* | 1 | 8% | 0 | 0% | Positive diagnostic |
| *Wahlenbergia gracilis* | 2 | 64% | 1 | 6% | Positive diagnostic |
| *Wahlenbergia stricta* subsp. *stricta* | 2 | 9% | 1 | 1% | Positive diagnostic |
| *Wurmbea dioica* subsp. *dioica* | 2 | 7% | 2 | 0% | Positive diagnostic |
| *Zornia dyctiocarpa* var. *dyctiocarpa* | 1 | 11% | 1 | 0% | Positive diagnostic |

# CUMBERLAND SHALE-SANDSTONE IRONBARK FOREST <span style="float:right">S_GW04</span>

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Coastal Valley Grassy Woodlands**
1395: Narrow-leaved Ironbark-Broad-leaved Ironbark-Grey Gum Open Forest of the Edges of the Cumberland Plain, Sydney Basin
HN556; ME021



## Description

Cumberland Shale-Sandstone Ironbark Forest is found on the fringes of the Cumberland Plain. It is one of a suite of forests that are associated with the subtle intergrade between clay-rich shale soil and the coarse sandy substrates of the sandstone plateau. Within the study area, the forest is restricted to the hinterland where mean annual rainfall is relatively low (800-1000 millimetres) and soils have a distinct clay component. It is most extensively distributed on the western edge of the Woronora Plateau and above the Nepean and Georges rivers between Appin and the Holsworthy defence area. It is a moderately tall eucalypt forest with a mixed understorey of sclerophyll shrubs and grasses (Tozer et al. 2010). Sites invariably have one of two species of ironbark (*Eucalyptus crebra* or *Eucalyptus fibrosa*) present in the canopy along with grey gum (*Eucalyptus punctata*) and red bloodwood (*Corymbia gummifera*). Spotted gum (*Corymbia maculata*) and blackbutt (*Eucalyptus pilularis*) are included amongst the canopy in the Appin and Wedderburn area respectively. A sparse cover of tall casuarinas (*Allocasuarina littoralis/Allocasuarina torulosa*) is common.

The understorey supports a mix of shrubs that are common on shale substrates such as blackthorn (*Bursaria spinosa*) and those more commonly associated with sandstone soils such as geebungs (*Persoonia* spp.). Beneath this diverse mix of shrubs is a high cover of grass and forbs. The grass layer includes a wide range of species, most of which occur more extensively on the Cumberland Plain.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 20 m ±5 <br> 10-30 | 21% ±11 <br> 5-40 | *Eucalyptus punctata, Eucalyptus crebra, Eucalyptus fibrosa, Corymbia gummifera, Corymbia maculata, Eucalyptus pilularis* |
| Small Trees | 7 m ±5 <br> 2-18 | 16% ±15 <br> 1-70 | *Persoonia linearis, Bursaria spinosa, Allocasuarina littoralis* |
| Shrubs | 3.2 m ±1.3 <br> 1.0-6.0 | 22% ±19 <br> 1-70 | *Ozothamnus diosmifolius, Pimelea linifolia, Kunzea ambigua, Leucopogon juniperinus, Bursaria spinosa, Hibbertia aspera, Notelaea longifolia, Olearia microphylla* |
| Ground Covers | 1.1 m ±0.5 <br> 0.3-2.0 | 41% ±24 <br> 5-90 | *Microlaena stipoides* var. *stipoides, Lepidosperma laterale, Lomandra multiflora, Aristida vagans, Cheilanthes sieberi* subsp. *sieberi, Entolasia stricta, Pomax umbellata, Themeda australis, Echinopogon caespitosus* var. *caespitosus, Pratia purpurascens, Austrostipa pubescens, Panicum simile, Dianella revoluta, Poa labillardierei* |
| Vines & Climbers | N/A | N/A | *Billardiera scandens, Glycine clandestina, Hardenbergia violacea* |

*Compiled from 43 sites with structural data recorded.

## Threats

Past clearing has removed extensive areas, particularly where marginal grazing land has been transformed by recent urban subdivision. There are still extensive contiguous stands both in the study area and the margins of the Cumberland Plain. These continue to be threatened by clearing, physical damage from recreational activities, rubbish dumping, grazing, mowing and weed invasion (NSW Scientific Committee 1998a).

## Conservation Status

Cumberland Shale-Sandstone Ironbark Forest is a component of Shale/Sandstone Transition Forest, an Endangered Ecological Community listed under the NSW TSC Act. It is also a component of Shale/Sandstone Transition Forest listed as an Endangered Ecological Community under the Commonwealth EPBC Act.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 24,000-48,000 hectares |
| Estimated percentage cleared | Not available | 60-80% hectares |
| Total NPWS reserves | 7.0 +<.1 hectares<br>0.9% of extant area | 240 hectares<br>3% of extant area<br><2% of pre-clearing area |
| Total reserved | 77.8 +2.8 hectares<br>10% of extant area | Not available |
| Total non-reserved | 711 +172 hectares | Not available |
| Total extant | 789 hectares | 9600 hectares |



Map unit
Study area
Extant vegetation
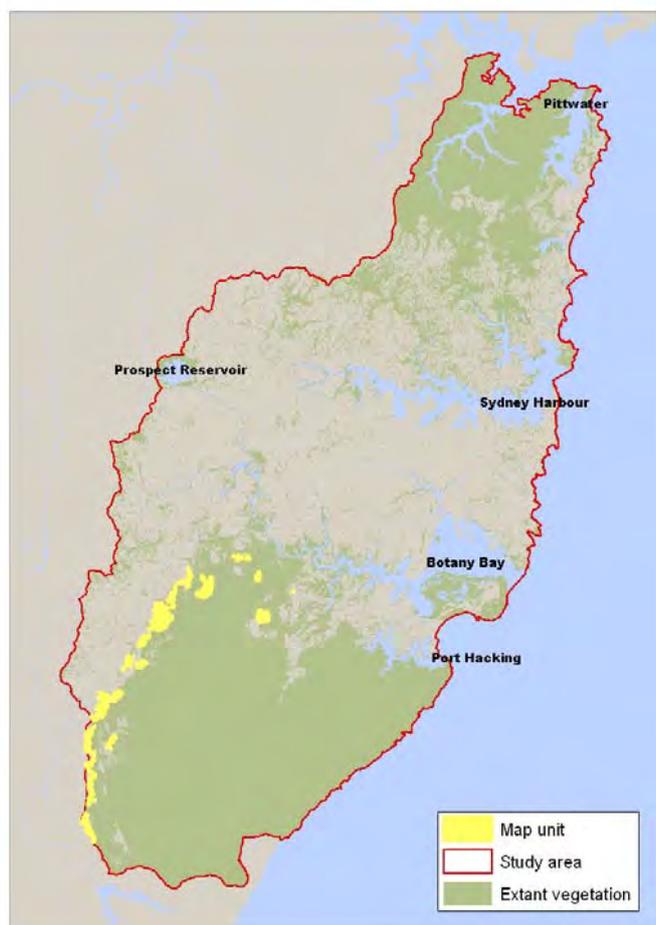
## Example Locations

o   Ingleburn Reserve, Ingleburn

o   East of Smiths Creek, Smiths Creek Reserve, Ruse

## Species Richness

| Number of sites | 40 |
|---|---|
| Total native species | 271 |
| Average no. native species per site | 50.0 ±6.5 |

## Variations and Dynamics

There are several localised canopy variants that fall within this map unit. Typically the overstorey is dominated by one or a combination of ironbarks. In the Appin area spotted gum is locally dominant. Some stands between Wedderburn area and Appin include blackbutt. A high proportion of sites comprising this community occur as part of the gradation between the Cumberland Plain and the Georges River while the remainder are situated on residual shale caps on the Woronora Plateau.

## Relationship to Other Communities

This community is related to other dry scrub-grass ironbark woodlands found on shale-gravel soils of the Cumberland Plain (S_DSF01, S_DSF02). A small number of sites were difficult to allocate to either of these groups consistently, reinforcing the similarity in soil properties and climatic influences. This was particularly the case in the northern Holsworthy area where there is much gradation between these communities.

Spatially the community grades into another transition forest (S_DSF18) in which shale soil has a more subtle influence on the vegetation composition. This gradation may occur quite rapidly as the shale soil layer thins exposing the underlying sandstone bedrock. Where shale substrate deepens it is common that the community will grade into one of the Cumberland Plain woodlands (S_GW02, S_GW03).

## Accuracy

Sampling density in the study area is high. Map boundaries were based on the interpretation of shale sandstone soils using the predicted distribution of unit GW02 in Tozer et al 2010, and sample sites and the distinctive signature of *Eucalyptus fibrosa.*

A 0.04 hectare site located in this map unit is expected to contain at least 27 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 41 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia binervata* | 2 | 25% | 2 | 2% | Positive diagnostic |
| *Acacia decurrens* | 2 | 40% | 1 | 5% | Positive diagnostic |
| *Acacia falcata* | 1 | 23% | 1 | 3% | Positive diagnostic |
| *Acacia floribunda* | 2 | 10% | 1 | 4% | Uninformative |
| *Acacia implexa* | 1 | 23% | 1 | 4% | Positive diagnostic |
| *Acacia longifolia* | 1 | 13% | 2 | 21% | Uninformative |
| *Acacia parramattensis* | 2 | 23% | 1 | 5% | Positive diagnostic |
| *Acacia parvipinnula* | 2 | 13% | 2 | 1% | Uninformative |
| *Acacia terminalis* | 2 | 20% | 1 | 20% | Uninformative |
| *Acacia ulicifolia* | 2 | 23% | 1 | 25% | Uninformative |
| *Allocasuarina littoralis* | 2 | 50% | 2 | 27% | Positive diagnostic |
| *Allocasuarina torulosa* | 1 | 13% | 2 | 10% | Uninformative |
| *Angophora bakeri* | 1 | 23% | 2 | 5% | Positive diagnostic |
| *Angophora floribunda* | 2 | 15% | 2 | 4% | Uninformative |
| *Aristida vagans* | 2 | 90% | 2 | 13% | Positive diagnostic |
| *Arthropodium milleflorum* | 1 | 25% | 2 | 3% | Positive diagnostic |
| *Astroloma humifusum* | 2 | 23% | 1 | 2% | Positive diagnostic |
| *Astroloma pinifolium* | 1 | 10% | 1 | 2% | Uninformative |
| *Austrodanthonia tenuior* | 2 | 10% | 2 | 4% | Uninformative |
| *Austrostipa pubescens* | 2 | 65% | 2 | 19% | Positive diagnostic |
| *Billardiera scandens* | 2 | 78% | 1 | 36% | Positive diagnostic |
| *Bossiaea prostrata* | 2 | 15% | 1 | 2% | Uninformative |
| *Breynia oblongifolia* | 1 | 25% | 1 | 17% | Uninformative |
| *Brunoniella australis* | 2 | 30% | 2 | 6% | Positive diagnostic |
| *Brunoniella pumilio* | 2 | 33% | 2 | 6% | Positive diagnostic |
| *Bursaria spinosa* | 2 | 58% | 2 | 11% | Positive diagnostic |
| *Caesia parviflora* | 1 | 13% | 1 | 4% | Uninformative |
| *Calotis dentex* | 2 | 33% | 2 | 1% | Positive diagnostic |
| *Cassytha glabella* | 2 | 30% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 18% | 2 | 27% | Uninformative |
| *Cheilanthes sieberi* subsp. *sieberi* | 2 | 80% | 2 | 11% | Positive diagnostic |
| *Clematis aristata* | 2 | 20% | 1 | 7% | Uninformative |
| *Clematis glycinoides* | 2 | 18% | 2 | 6% | Uninformative |
| *Corymbia maculata* | 4 | 20% | 3 | 2% | Positive diagnostic |
| *Cymbopogon refractus* | 1 | 13% | 2 | 4% | Uninformative |
| *Dampiera purpurea* | 2 | 10% | 1 | 4% | Uninformative |
| *Desmodium varians* | 1 | 25% | 2 | 8% | Positive diagnostic |
| *Dianella revoluta* | 2 | 73% | 1 | 16% | Positive diagnostic |
| *Dichelachne micrantha* | 2 | 48% | 2 | 9% | Positive diagnostic |
| *Dichondra repens* | 2 | 50% | 2 | 14% | Positive diagnostic |
| *Digitaria parviflora* | 2 | 15% | 2 | 5% | Uninformative |
| *Digitaria ramularis* | 2 | 60% | 1 | 1% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 28% | 2 | 23% | Uninformative |
| *Echinopogon caespitosus* | 2 | 85% | 1 | 9% | Positive diagnostic |
| *Echinopogon ovatus* | 1 | 15% | 2 | 6% | Uninformative |
| *Einadia hastata* | 1 | 13% | 2 | 4% | Uninformative |
| *Entolasia marginata* | 2 | 35% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 88% | 2 | 58% | Positive diagnostic |
| *Eragrostis brownii* | 2 | 23% | 2 | 6% | Positive diagnostic |
| *Eragrostis leptostachya* | 2 | 15% | 2 | 4% | Uninformative |
| *Eucalyptus crebra* | 3 | 60% | 2 | 2% | Positive diagnostic |
| *Eucalyptus fibrosa* | 3 | 43% | 2 | 3% | Positive diagnostic |
| *Eucalyptus globoidea* | 2 | 15% | 3 | 4% | Uninformative |
| *Eucalyptus oblonga* | 2 | 18% | 2 | 7% | Uninformative |
| *Eucalyptus pilularis* | 1 | 15% | 3 | 14% | Uninformative |
| *Eucalyptus punctata* | 3 | 58% | 2 | 10% | Positive diagnostic |
| *Eucalyptus tereticornis* | 1 | 10% | 2 | 5% | Uninformative |
| *Euchiton sphaericus* | 1 | 18% | 1 | 3% | Uninformative |
| *Exocarpos cupressiformis* | 1 | 33% | 1 | 3% | Positive diagnostic |
| *Exocarpos strictus* | 2 | 35% | 2 | 3% | Positive diagnostic |
| *Gahnia aspera* | 1 | 20% | 1 | 3% | Positive diagnostic |
| *Galium binifolium* | 2 | 20% | 1 | 1% | Positive diagnostic |
| *Glycine clandestina* | 2 | 70% | 2 | 17% | Positive diagnostic |
| *Glycine microphylla* | 2 | 30% | 2 | 8% | Positive diagnostic |
| *Glycine tabacina* | 2 | 30% | 2 | 8% | Positive diagnostic |
| *Gonocarpus tetragynus* | 2 | 43% | 2 | 8% | Positive diagnostic |
| *Goodenia hederacea* | 2 | 48% | 1 | 10% | Positive diagnostic |
| *Hakea sericea* | 1 | 13% | 2 | 22% | Uninformative |
| *Hardenbergia violacea* | 1 | 60% | 1 | 15% | Positive diagnostic |
| *Hibbertia aspera* | 2 | 63% | 2 | 10% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Hibbertia diffusa* | 2 | 20% | 2 | 2% | Positive diagnostic |
| *Hovea linearis* | 1 | 13% | 1 | 11% | Uninformative |
| *Hypericum gramineum* | 1 | 10% | 2 | 3% | Uninformative |
| *Hypoxis hygrometrica* | 2 | 15% | 2 | 2% | Uninformative |
| *Imperata cylindrica* var. *major* | 1 | 23% | 2 | 20% | Uninformative |
| *Jacksonia scoparia* | 2 | 35% | 1 | 2% | Positive diagnostic |
| *Kennedia rubicunda* | 2 | 20% | 1 | 9% | Uninformative |
| *Kunzea ambigua* | 2 | 60% | 2 | 14% | Positive diagnostic |
| *Lagenophora gracilis* | 2 | 50% | 1 | 2% | Positive diagnostic |
| *Laxmannia gracilis* | 1 | 40% | 1 | 4% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 98% | 2 | 41% | Positive diagnostic |
| *Leucopogon juniperinus* | 2 | 63% | 2 | 9% | Positive diagnostic |
| *Lissanthe strigosa* | 2 | 28% | 2 | 8% | Positive diagnostic |
| *Lomandra confertifolia* | 2 | 23% | 2 | 4% | Positive diagnostic |
| *Lomandra cylindrica* | 2 | 10% | 2 | 11% | Uninformative |
| *Lomandra filiformis* | 2 | 48% | 2 | 22% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 85% | 1 | 23% | Positive diagnostic |
| *Lomandra obliqua* | 2 | 28% | 2 | 32% | Uninformative |
| *Lomatia silaifolia* | 1 | 10% | 1 | 28% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 90% | 2 | 35% | Positive diagnostic |
| *Myrsine variabilis* | 2 | 25% | 1 | 8% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 43% | 1 | 21% | Positive diagnostic |
| *Notodanthonia longifolia* | 2 | 15% | 1 | 1% | Uninformative |
| *Olearia microphylla* | 1 | 28% | 1 | 2% | Positive diagnostic |
| *Olearia viscidula* | 1 | 15% | 2 | 0% | Uninformative |
| *Opercularia diphylla* | 2 | 55% | 2 | 7% | Positive diagnostic |
| *Oxalis exilis* | 2 | 10% | 1 | 3% | Uninformative |
| *Oxalis perennans* | 2 | 35% | 2 | 7% | Positive diagnostic |
| *Ozothamnus diosmifolius* | 2 | 68% | 1 | 11% | Positive diagnostic |
| *Panicum simile* | 2 | 75% | 2 | 9% | Positive diagnostic |
| *Paspalidium distans* | 2 | 33% | 2 | 7% | Positive diagnostic |
| *Persoonia linearis* | 2 | 90% | 1 | 18% | Positive diagnostic |
| *Persoonia pinifolia* | 2 | 10% | 1 | 21% | Uninformative |
| *Phyllanthus hirtellus* | 2 | 45% | 2 | 27% | Constant |
| *Pimelea linifolia* | 2 | 55% | 2 | 26% | Positive diagnostic |
| *Pittosporum undulatum* | 1 | 13% | 2 | 25% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 2 | 55% | 2 | 5% | Positive diagnostic |
| *Polymeria calycina* | 1 | 10% | 1 | 1% | Uninformative |
| *Polyscias sambucifolia* | 1 | 13% | 1 | 15% | Uninformative |
| *Pomaderris lanigera* | 2 | 18% | 1 | 1% | Uninformative |
| *Pomax umbellata* | 2 | 75% | 2 | 14% | Positive diagnostic |
| *Poranthera microphylla* | 1 | 43% | 2 | 7% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 75% | 2 | 17% | Positive diagnostic |
| *Solanum prinophyllum* | 1 | 50% | 1 | 4% | Positive diagnostic |
| *Stypandra glauca* | 2 | 40% | 1 | 1% | Positive diagnostic |
| *Syncarpia glomulifera* | 2 | 18% | 3 | 13% | Uninformative |
| *Themeda australis* | 2 | 85% | 2 | 22% | Positive diagnostic |
| *Tricoryne elatior* | 2 | 18% | 2 | 3% | Uninformative |
| *Vernonia cinerea* var. *cinerea* | 1 | 28% | 2 | 2% | Positive diagnostic |
| *Veronica plebeia* | 1 | 50% | 1 | 6% | Positive diagnostic |
| *Wahlenbergia gracilis* | 1 | 30% | 1 | 8% | Positive diagnostic |

| | |
|---|---|
| Beach Spinifex Grassland | S_GL01 |
| Coastal Headland Grassland | S_GL02 |

# BEACH SPINIFEX GRASSLAND                                    S_GL01

**Statewide Class**

NSW Plant Community Type:

Biometric Number(s):

**Maritime Grasslands**

1204: Spinifex Beach Strand Grassland, Sydney Basin Bioregion and South East Corner Bioregion

SR640; ME89
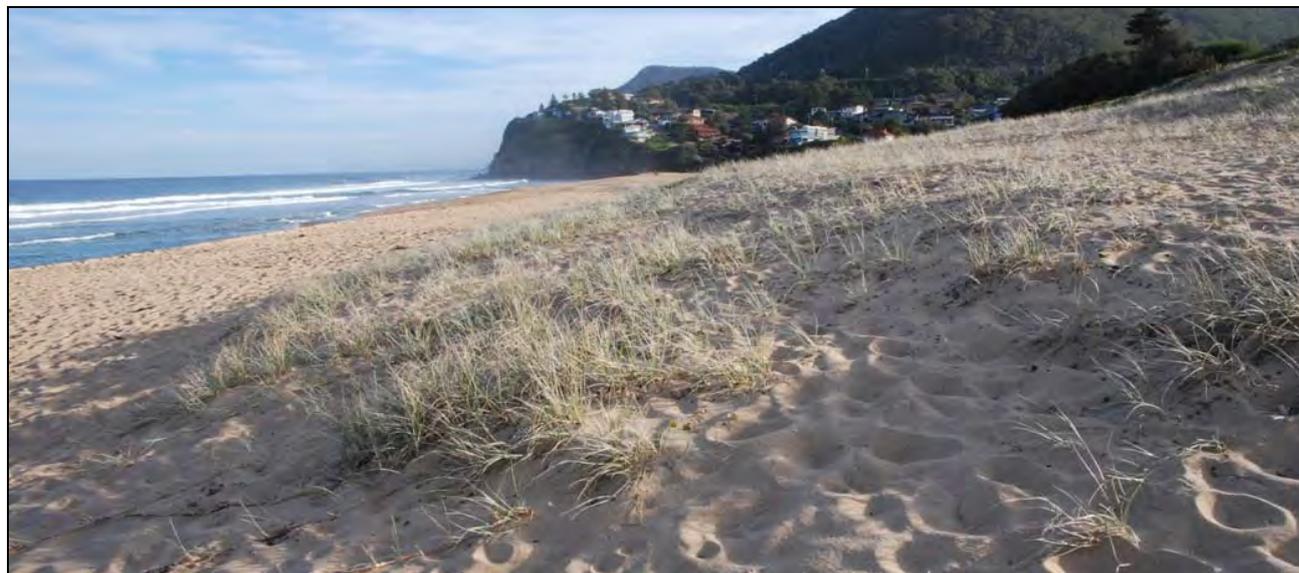


## Description

Fringing the sandy beaches of the coastline and sandy inlets is an open cover of grasses and herbs. These are often temporary communities found growing on mobile sand deposits such as beach foredunes and dune blowouts. The dominant species is the grass hairy spinifex (*Spinifex sericeus*). All are well adapted to disturbance, and the stout rhizomes serve to stabilise the sand against wind and storm erosion (ALS 1978).

Beach Spinifex Grassland is found across beach strands in New South Wales.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Ground Covers | Estimated 0.1-0.3m | Estimated 70% | *Spinifex sericeus* |

*Compiled from 0 sites with structural data recorded. Estimate only.

## Threats

These beach front grasslands are subject to intense recreational pressures in the Sydney area. These pressures include sand removal, trampling and rubbish aggregation. Heavily used beaches and or modified dunal landscapes rarely retain this community.

## Conservation Status

This vegetation community is present in all coastal national parks and reserves.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 6200-8860 hectares |
| Estimated percentage cleared | Not available | 50-65% |
| Total NPWS reserves | 2.5 +<.1 hectares<br>9% of extant area | 1700 hectares<br>55% of extant area<br>25-35% of pre-clearing area |
| Total reserved | 10.5 +0 hectares<br>39% of extant area | Not available |
| Total non-reserved | 16.5 +<.1 hectares | Not available |
| Total extant | 27.0 hectares | 3100 hectares |



## Example Locations

o    Widespread on Sydney beaches

## Species Richness

| Number of sites | 3 |
|---|---|
| Total native species | 4 |
| Average no. native species per site | 2.0 ±1 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

The community grades into Coastal Foredune Wattle Scrub (S_HL05) as distance from the sea increases. Ground cover species are shared with this map unit.

## Accuracy

Sampling intensity is low. Mapped boundaries were interpreted from visible grasslands present on coastal beaches and lake shorelines.

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 1 | 33% | 2 | 21% | Uninformative |
| *Apium prostratum* | 1 | 33% | 2 | 1% | Positive diagnostic |
| *Spinifex sericeus* | 5 | 100% | 2 | 1% | Positive diagnostic |
| *Zoysia macrantha* | 3 | 33% | 3 | 0% | Positive diagnostic |

# COASTAL HEADLAND GRASSLAND <span style="float:right">S_GL02</span>

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Maritime Grasslands**
897: Kangaroo Grass Sod Tussock Grassland of Coastal Areas of the Sydney Basin and South East Corner
HN631; HU674; ME054; HU911; ME028; SR563



## Description

Coastal Headland Grassland occurs on clay soils on exposed headlands, cliff faces and podsolised sand dunes along the coastal zone. It comprises a low-growing continuous cover of kangaroo grass (*Themeda australis*) and tussocks of spiny-headed mat-rush (*Lomandra longifolia*). There may be a wide variety of other grasses and herbs amongst the ground cover depending on previous and current land uses and proximity to the ocean. Isolated clumps of native shrubs may also occur, including coastal wattle (*Acacia longifolia*) and banksia species. In Sydney the disturbance history associated with the location of this community suggest that these grasslands may be derived following the removal of the original cover of heath and shrub species. This includes Bald Hill lookout at Otford and Turimetta Head at north Narabeen.

The community is widespread elsewhere along coastal New South Wales although it occurs in small patch sizes at disjunct locations.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Shrubs | 1.5 m<br>1.5-1.5 | 1%<br>1-1 | *Leucopogon parviflorus, Pimelea linifolia, Senecio lautus, Westringia fruticosa, Astroloma humifusum* |
| Ground Covers | 0.4 m<br>0.4 0.4 | 98%<br>98-98 | *Centella asiatica, Eragrostis brownii, Ficinia nodosa, Poranthera microphylla, Schoenus apogon, Themeda australis, Lomandra longifolia* |
| Vines & Climbers | N/A | N/A | *Glycine tabacina* |

*Compiled from 1 site with structural data recorded.

## Threats

The NSW Scientific Committee (2005f) recognizes that significant areas have been depleted by coastal development. These threats persist although more pervasive issues are likely to be posed by invasion by shrubs, both introduced species such as bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*) and lantana (*Lantana camara*), and native species including coastal wattle (*Acacia longifolia*), coast banksia (*Banksia integrifolia*) and coastal rosemary (*Westringia fruticosa*). Although native shrubs are a feature of the community, invasion and conversion to dense shrubland has occurred at a number of sites in recent years and this may threaten the persistence of grassland elements in the community. Other threats include recreational use (with weed invasion and erosion occurring adjacent to footpaths) and mowing as part of lawn maintenance on coastal council reserves.

## Conservation Status

This map unit forms a component of Themeda Grassland on Seacliffs and Coastal Headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community listed under the NSW TSC Act.

This vegetation community is represented in Kamay Botany Bay, Royal and Ku-ring-gai Chase national parks.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Est. 250 hectares |
| Estimated percentage cleared | Not available | 60% |
| Total NPWS reserves | 116 +<.1 hectares<br>97% of extant area | 35 hectares<br>20-25% of extant area<br>10-20% of pre-clearing area |
| Total reserved | 117 +0 hectares<br>98% of extant area | Not available |
| Total non-reserved | 3.0 +<.1 hectares | Not available |
| Total extant | 120 hectares | Est. 150 hectares |



## Example Locations

o   Bald Hill, Stanwell Tops

o   Long Reef headland, Warringah LGA

o   Cape Banks, Kamay Botany Bay NP, La Perouse

## Species Richness

| | |
|---|---|
| Number of sites | 6 |
| Total native species | 57 |
| Average no. native species per site | 18.8 ±7 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

This community is related to Coastal Headland Clay Heath (S_HL01) on Narrabeen sandstone headlands.

## Accuracy

Sampling density is moderate. Mapped boundaries are based on the interpretation of open grasslands found on coastal headlands. Open scattered shrub layers with continuous grass cover are included. Some cliff face grass cover may be overlooked and small patches in nearby disturbed or exotic grasslands may also be excluded from the mapping.

A 0.04 hectare site located in this map unit is expected to contain at least 6 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 13 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 1 | 83% | 2 | 21% | Positive diagnostic |
| *Acacia myrtifolia* | 1 | 17% | 2 | 12% | Uninformative |
| *Acacia parramattensis* | 1 | 17% | 1 | 5% | Uninformative |
| *Allocasuarina distyla* | 2 | 50% | 2 | 11% | Constant |
| *Aristida warburgii* | 1 | 17% | 1 | 1% | Uninformative |
| *Astroloma humifusum* | 2 | 50% | 1 | 3% | Positive diagnostic |
| *Austrodanthonia tenuior* | 1 | 17% | 2 | 4% | Uninformative |
| *Banksia integrifolia* | 2 | 83% | 2 | 9% | Positive diagnostic |
| *Boronia polygalifolia* | 2 | 17% | 1 | 0% | Uninformative |
| *Bossiaea prostrata* | 2 | 17% | 1 | 2% | Uninformative |
| *Casuarina glauca* | 1 | 17% | 2 | 7% | Uninformative |
| *Centella asiatica* | 2 | 83% | 2 | 6% | Positive diagnostic |
| *Dichelachne micrantha* | 2 | 33% | 2 | 9% | Uninformative |
| *Dichondra repens* | 1 | 17% | 2 | 14% | Uninformative |
| *Digitaria parviflora* | 2 | 33% | 2 | 5% | Uninformative |
| *Eragrostis brownii* | 2 | 83% | 2 | 6% | Positive diagnostic |
| *Euchiton sphaericus* | 1 | 17% | 1 | 3% | Uninformative |
| *Ficinia nodosa* | 2 | 17% | 2 | 2% | Uninformative |
| *Fimbristylis dichotoma* | 1 | 33% | 1 | 1% | Positive diagnostic |
| *Glycine clandestina* | 2 | 50% | 2 | 18% | Constant |
| *Glycine microphylla* | 2 | 17% | 2 | 9% | Uninformative |
| *Glycine tabacina* | 2 | 17% | 2 | 8% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 17% | 2 | 23% | Uninformative |
| *Goodenia ovata* | 1 | 17% | 2 | 2% | Uninformative |
| *Hardenbergia violacea* | 1 | 17% | 1 | 16% | Uninformative |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 2 | 17% | 1 | 6% | Uninformative |
| *Hydrocotyle peduncularis* | 1 | 17% | 2 | 6% | Uninformative |
| *Hypericum gramineum* | 1 | 17% | 2 | 3% | Uninformative |
| *Lasiopetalum ferrugineum* | 1 | 67% | 2 | 11% | Positive diagnostic |
| *Laxmannia gracilis* | 1 | 17% | 1 | 5% | Uninformative |
| *Leptospermum laevigatum* | 1 | 33% | 2 | 5% | Uninformative |
| *Leucopogon parviflorus* | 1 | 17% | 1 | 1% | Uninformative |
| *Lomandra cylindrica* | 1 | 17% | 2 | 11% | Uninformative |
| *Lomandra filiformis* | 2 | 17% | 2 | 23% | Uninformative |
| *Lomandra longifolia* | 3 | 33% | 2 | 46% | Uninformative |
| *Melaleuca hypericifolia* | 1 | 17% | 2 | 1% | Uninformative |
| *Melaleuca nodosa* | 1 | 17% | 2 | 5% | Uninformative |
| *Opercularia hispida* | 1 | 17% | 2 | 1% | Uninformative |
| *Oxalis perennans* | 1 | 83% | 2 | 7% | Positive diagnostic |
| *Paspalidium distans* | 2 | 17% | 2 | 7% | Uninformative |
| *Pimelea linifolia* | 3 | 17% | 2 | 27% | Uninformative |
| *Polymeria calycina* | 2 | 67% | 1 | 1% | Positive diagnostic |
| *Pomaderris mediora* | 1 | 17% | 1 | 0% | Uninformative |
| *Poranthera microphylla* | 2 | 33% | 2 | 7% | Uninformative |
| *Pratia purpurascens* | 1 | 83% | 2 | 18% | Positive diagnostic |
| *Ptilothrix deusta* | 3 | 17% | 2 | 5% | Uninformative |
| *Pultenaea daphnoides* | 1 | 17% | 2 | 8% | Uninformative |
| *Schoenus apogon* | 2 | 17% | 2 | 1% | Uninformative |
| *Senecio lautus* | 2 | 17% | 1 | 1% | Uninformative |
| *Stylidium graminifolium* | 1 | 17% | 2 | 5% | Uninformative |
| *Themeda australis* | 5 | 100% | 2 | 23% | Positive diagnostic |
| *Tricoryne elatior* | 2 | 67% | 2 | 3% | Positive diagnostic |
| *Viola hederacea* | 2 | 17% | 2 | 6% | Uninformative |
| *Westringia fruticosa* | 1 | 33% | 2 | 1% | Positive diagnostic |

# DRY SCLEROPHYLL FORESTS

| | |
|---|---|
| Shrub/Grass Subformation | |
| Castlereagh Ironbark Forest | S_DSF01 |
| Castlereagh Shale-Gravel Transition Forest | S_DSF02 |
| Shrubby Subformation | |
| Coastal Sand Apple-Bloodwood Forest | S_DSF03 |
| Coastal Enriched Sandstone Dry Forest | S_DSF04 |
| Sydney South Exposed Sandstone Woodland | S_DSF05 |
| Coastal Sandstone Foreshores Forest | S_DSF06 |
| Coastal Sandstone Riparian Forest | S_DSF08 |
| Coastal Sandstone Gully Forest | S_DSF09 |
| Hornsby Enriched Sandstone Exposed Woodland | S_DSF10 |
| Sydney North Exposed Sandstone Woodland | S_DSF11 |
| Southern Sydney Sheltered Forest | S_DSF13 |
| Sydney Ironstone Bloodwood-Silvertop Ash Forest | S_DSF14 |
| Sydney Hinterland Exposed Sandstone Woodland | S_DSF15 |
| Sydney Hinterland Apple-Blackbutt Gully Forest | S_DSF17 |
| Sydney Hinterland Grey Gum Ridgetop Forest | S_DSF18 |
| Castlereagh Scribbly Gum Woodland | S_DSF19 |
| Castlereagh Swamp Woodland | S_DSF20 |
| Coastal Sand Bangalay Forest | S_DSF21 |
| Hawkesbury River Escarpment Dry Forest | S_DSF69 |

# CASTLEREAGH IRONBARK FOREST                                                S_DSF01

**Statewide Class**
NSW Plant Community Type:

**Cumberland Dry Sclerophyll Forests**
725: Broad-leaved Ironbark-*Melaleuca decora* Shrubby Open Forest on Clay Soils of the Cumberland Plain, Sydney Basin

Biometric Number(s):                          HN513; ME002



## Description

Castlereagh Ironbark Forest is one of two closely related ironbark shrub-grass forests found in western Sydney that occur on gravelly-clay soils. Map users may experience difficulty distinguishing between this unit and Castlereagh Shale-Gravel Transition Forest (S_DSF02), and as a result it may be easiest to consider them subtle variations of the one floristic assemblage. Castlereagh Ironbark Forest is associated with clay soils derived from Tertiary alluvial deposits (Tozer 2003). The structure ranges from a moderately tall open eucalypt forest or woodland to a low dense thicket of paperbarks with low emergent eucalypts. The latter is prevalent across the catchment of the Cooks River and is recognised in other classifications as Cooks River Clay Plain Scrub (Benson 1992). Benson and Howell (1994a) suggest that these scrubs may arise from human-induced changes to the original forest structure.

Broad-leaved ironbark (*Eucalyptus fibrosa*) is the most commonly recorded eucalypt although at some sites it may be absent. Woollybutt (*Eucalyptus longifolia*) is a regular associate although sites often have a diverse canopy composition which reflects subtle grades between substrates sourced from Tertiary sand, sandstone bedrock, shale and ironstone gravels. For this reason there are localised unusual occurrences of hard-leaved scribbly gum (*Eucalyptus sclerophylla*), smooth-barked apple (*Angophora costata*) and narrow-leaved apple (*Angophora bakeri*), species more typically associated with siliceous soils of sand deposits and the sandstone plateau. A prominent small tree layer of *Melaleuca decora* features above a dense cover of shrubs that include *Melaleuca nodosa,* blackthorn (*Bursaria spinosa*) and peach heath (*Lissanthe strigosa*). The ground layer is a sparse cover of grasses and forbs. These may be very depauperate in locations where dense shrub layers exclude light and suppress plant growth.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 19 m ±6 <br> 7-30 | 22% ± 14 <br> 2-60 | *Eucalyptus fibrosa, Melaleuca decora, Eucalyptus crebra, Eucalyptus tereticornis, Eucalyptus eugenioides, Eucalyptus longifolia* |
| Small Trees | 7 m ±4 <br> 2-12 | 20% ± 22 <br> 1-80 | *Acacia falcata, Acacia decurrens, Melaleuca nodosa* |
| Shrubs | 3.0 m ±1.6 <br> 1.0-6.0 | 26% ±21 <br> 5-65 | *Bursaria spinosa, Hibbertia aspera, Melaleuca nodosa* |
| Ground Covers | 0.8 m ±0.3 <br> 0.3-1.0 | 34% ±22 <br> 4-70 | *Cheilanthes sieberi* subsp. *sieberi, Entolasia stricta, Opercularia diphylla, Aristida vagans, Lepidosperma laterale, Microlaena stipoides* var. *stipoides, Lomandra filiformis, Themeda australis* |
| Vines & Climbers | N/A | N/A | *Glycine clandestina, Glycine microphylla, Hardenbergia violacea* |

*Compiled from 26 sites with structural data recorded.

## Threats

Past clearing has extensively depleted the original extent. Extensive stands of scrub are clearly visible in 1943 aerial photography (Land and Property Information 2013) in the Cooks River catchment. Urban development has severely depleted its former extent, once widespread across Bankstown, Revesby, Villawood, Rookwood and Greenacre. Remnants persist in the study area in small isolated patches surrounded by urban land use. This introduces significant threats arising from weed invasion, rubbish dumping, inappropriate mowing and high frequency fires.

## Conservation Status

Castlereagh Ironbark Forest is a component of Cooks River/Castlereagh Ironbark Forest in the Sydney Basin, an Endangered Ecological Community listed under the NSW TSC Act.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 5500-22,000 hectares |
| Estimated percentage cleared | Not available | 80-95% |
| Total NPWS reserves | <.1 +<.1 hectares<br>0% of extant area | 290 hectares<br>26% of extant area<br><5% of pre-clearing area |
| Total reserved | 28.2 +1.5 hectares<br>20% of extant area | Not available |
| Total non-reserved | 113 +58.1 hectares | Not available |
| Total extant | 141 hectares | 1100 hectares |



| Map unit |
| Study area |
| Extant vegetation |
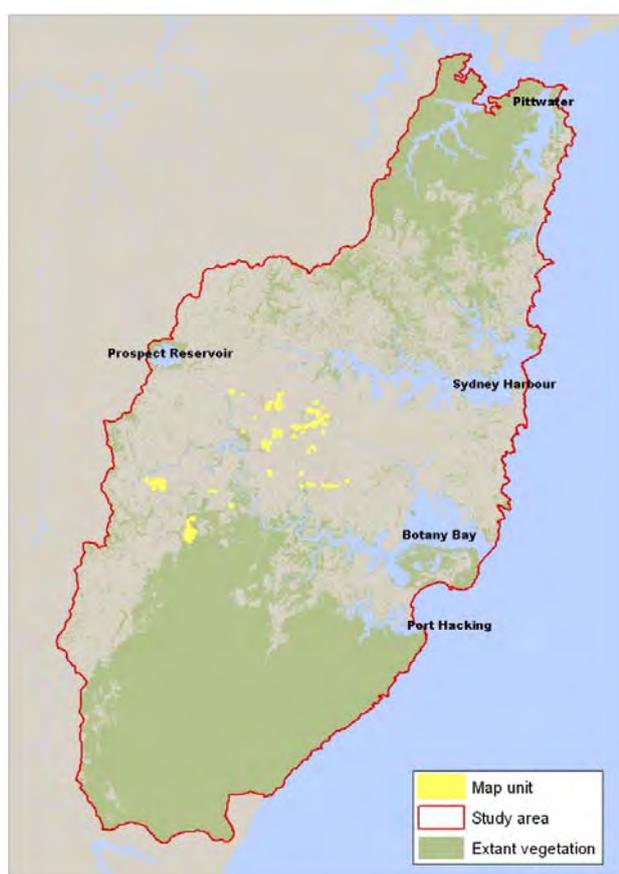
## Example Locations

o   Rookwood Cemetery, Auburn LGA

o   Carysfield Park, Bankstown LGA

o   Voyager Point, Liverpool LGA

## Species Richness

| Number of sites | 26 |
|---|---|
| Total native species | 241 |
| Average no. native species per site | 43.0 ±6.4 |

## Variations and Dynamics

Two structural variations have been identified and mapped. Localities dominated by low paperbark (*Melaleuca* spp.) scrubs are clearly visible from aerial photography. A number of different combinations of eucalypt species were found in the canopy at different stands, and were given unique identifiers during the mapping phase. These tended to reflect the range of habitats from Tertiary sand and clays, shales with sand mantles and sandstone with sand and ironstone mantles.

## Relationship to Other Communities

This map unit shares considerable overlap in species composition and habitat with Castlereagh Shale-Gravel Transition Forest (S_DSF02). Forest red gum and grey box are less common in this unit but they are not, on their own, definitive features that can be used to separate the two communities. Strong floristic affinities are also shared with Cumberland Shale-Sandstone Ironbark Forest (S_GW04), another dry shrub-grass forest found on the margins of the Cumberland Plain. It grades into other forests within relatively short distances as the composition of the underlying soil changes. In sites approaching sandier substrates Castlereagh Scribbly Gum Woodland (S_DSF19) is more common. Greater shale influence in the soil in lower rainfall zones introduces Cumberland Plain woodlands (S_GW02, S_GW03), whereas in higher rainfall zones Sydney Turpentine-Ironbark Forest (S_WSF09) may be prevalent.

## Accuracy

Sampling density in the study area is high. Map boundaries were informed by the interpretation of Tertiary sand and gravel substrates, sample sites and a vegetation structure of forest, low forest and woodland

A 0.04 hectare site located in this map unit is expected to contain at least 20 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 35 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia decurrens* | 2 | 35% | 2 | 5% | Positive diagnostic |
| *Acacia falcata* | 1 | 35% | 1 | 3% | Positive diagnostic |
| *Acacia longifolia* | 1 | 15% | 2 | 21% | Uninformative |
| *Acacia parramattensis* | 2 | 19% | 1 | 5% | Uninformative |
| *Acacia pubescens* | 2 | 38% | 2 | 0% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 12% | 1 | 26% | Uninformative |
| *Angophora bakeri* | 2 | 15% | 2 | 5% | Uninformative |
| *Aristida ramosa* | 1 | 19% | 2 | 3% | Uninformative |
| *Aristida vagans* | 2 | 85% | 2 | 14% | Positive diagnostic |
| *Arthropodium milleflorum* | 1 | 15% | 2 | 3% | Uninformative |
| *Astroloma humifusum* | 2 | 12% | 1 | 3% | Uninformative |
| *Austrodanthonia tenuior* | 2 | 42% | 2 | 4% | Positive diagnostic |
| *Austrostipa pubescens* | 2 | 15% | 2 | 20% | Uninformative |
| *Austrostipa rudis* | 1 | 12% | 2 | 2% | Uninformative |
| *Billardiera scandens* | 2 | 38% | 1 | 37% | Constant |
| *Boronia polygalifolia* | 1 | 12% | 1 | 0% | Uninformative |
| *Bossiaea prostrata* | 2 | 35% | 1 | 2% | Positive diagnostic |
| *Brunoniella australis* | 2 | 35% | 2 | 6% | Positive diagnostic |
| *Brunoniella pumilio* | 2 | 15% | 2 | 7% | Uninformative |
| *Bursaria spinosa* | 2 | 73% | 2 | 11% | Positive diagnostic |
| *Caesia parviflora* | 2 | 12% | 1 | 4% | Uninformative |
| *Calotis cuneifolia* | 2 | 19% | 1 | 0% | Uninformative |
| *Cassinia arcuata* | 1 | 12% | 1 | 0% | Uninformative |
| *Cassytha glabella* | 2 | 23% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 31% | 2 | 27% | Uninformative |
| *Centella asiatica* | 1 | 19% | 2 | 6% | Uninformative |
| *Cheilanthes sieberi* subsp. *sieberi* | 2 | 96% | 2 | 12% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 12% | 2 | 26% | Uninformative |
| *Cymbopogon refractus* | 2 | 19% | 2 | 4% | Uninformative |
| *Daviesia ulicifolia* | 2 | 23% | 2 | 3% | Positive diagnostic |
| *Desmodium varians* | 2 | 23% | 2 | 8% | Uninformative |
| *Dianella longifolia* | 2 | 38% | 2 | 5% | Positive diagnostic |
| *Dianella revoluta* | 2 | 65% | 1 | 16% | Positive diagnostic |
| *Dichelachne micrantha* | 2 | 65% | 2 | 9% | Positive diagnostic |
| *Dichondra repens* | 2 | 50% | 2 | 14% | Positive diagnostic |
| *Dillwynia parvifolia* | 2 | 31% | 2 | 1% | Positive diagnostic |
| *Dillwynia sieberi* | 2 | 23% | 2 | 1% | Positive diagnostic |
| *Echinopogon caespitosus* | 2 | 38% | 2 | 10% | Positive diagnostic |
| *Echinopogon ovatus* | 2 | 31% | 2 | 6% | Positive diagnostic |
| *Einadia hastata* | 2 | 19% | 1 | 4% | Uninformative |
| *Entolasia marginata* | 2 | 15% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 92% | 2 | 58% | Positive diagnostic |
| *Eragrostis brownii* | 2 | 23% | 2 | 7% | Uninformative |
| *Eucalyptus crebra* | 2 | 19% | 2 | 3% | Uninformative |
| *Eucalyptus eugenioides* | 1 | 27% | 1 | 2% | Positive diagnostic |
| *Eucalyptus fibrosa* | 3 | 65% | 2 | 3% | Positive diagnostic |
| *Eucalyptus globoidea* | 2 | 27% | 3 | 4% | Positive diagnostic |
| *Eucalyptus longifolia* | 1 | 27% | 1 | 1% | Positive diagnostic |
| *Eucalyptus tereticornis* | 1 | 15% | 2 | 5% | Uninformative |
| *Euchiton sphaericus* | 1 | 19% | 1 | 3% | Uninformative |
| *Eustrephus latifolius* | 1 | 15% | 2 | 15% | Uninformative |
| *Glycine clandestina* | 2 | 58% | 2 | 17% | Positive diagnostic |
| *Glycine microphylla* | 2 | 46% | 2 | 8% | Positive diagnostic |
| *Glycine tabacina* | 1 | 31% | 2 | 8% | Positive diagnostic |
| *Gonocarpus tetragynus* | 2 | 27% | 2 | 8% | Positive diagnostic |
| *Gonocarpus teucrioides* | 1 | 12% | 2 | 24% | Uninformative |
| *Goodenia hederacea* | 2 | 58% | 1 | 10% | Positive diagnostic |
| *Goodenia paniculata* | 2 | 12% | 2 | 1% | Uninformative |
| *Hardenbergia violacea* | 2 | 35% | 1 | 16% | Uninformative |
| *Hibbertia aspera* | 2 | 65% | 2 | 10% | Positive diagnostic |
| *Hibbertia pedunculata* | 2 | 19% | 2 | 0% | Uninformative |
| *Hydrocotyle peduncularis* | 2 | 15% | 2 | 6% | Uninformative |
| *Hypericum gramineum* | 2 | 27% | 2 | 3% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 15% | 2 | 20% | Uninformative |
| *Jacksonia scoparia* | 2 | 12% | 2 | 2% | Uninformative |
| *Kunzea ambigua* | 2 | 15% | 2 | 15% | Uninformative |
| *Lachnagrostis filiformis* | 1 | 15% | 1 | 2% | Uninformative |
| *Lagenophora gracilis* | 2 | 15% | 2 | 3% | Uninformative |
| *Lagenophora stipitata* | 2 | 15% | 2 | 3% | Uninformative |
| *Lasiopetalum ferrugineum* | 1 | 12% | 2 | 11% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Laxmannia gracilis* | 1 | 42% | 1 | 5% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 81% | 2 | 42% | Positive diagnostic |
| *Leucopogon juniperinus* | 2 | 42% | 2 | 10% | Positive diagnostic |
| *Lissanthe strigosa* | 2 | 58% | 1 | 8% | Positive diagnostic |
| *Lomandra filiformis* | 2 | 73% | 2 | 22% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 65% | 1 | 23% | Positive diagnostic |
| *Macrozamia spiralis* | 2 | 12% | 1 | 1% | Uninformative |
| *Maytenus silvestris* | 2 | 19% | 1 | 3% | Uninformative |
| *Melaleuca decora* | 2 | 62% | 2 | 2% | Positive diagnostic |
| *Melaleuca nodosa* | 4 | 58% | 2 | 5% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 85% | 2 | 35% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 19% | 1 | 21% | Uninformative |
| *Olearia microphylla* | 1 | 42% | 1 | 2% | Positive diagnostic |
| *Opercularia diphylla* | 2 | 77% | 2 | 7% | Positive diagnostic |
| *Oxalis exilis* | 1 | 12% | 1 | 3% | Uninformative |
| *Oxalis perennans* | 2 | 38% | 2 | 7% | Positive diagnostic |
| *Ozothamnus diosmifolius* | 2 | 38% | 1 | 11% | Positive diagnostic |
| *Panicum simile* | 2 | 54% | 2 | 9% | Positive diagnostic |
| *Paspalidium distans* | 2 | 35% | 2 | 7% | Positive diagnostic |
| *Persoonia linearis* | 1 | 12% | 1 | 20% | Uninformative |
| *Phyllanthus hirtellus* | 2 | 12% | 2 | 28% | Uninformative |
| *Pimelea linifolia* | 2 | 27% | 2 | 27% | Uninformative |
| *Pittosporum undulatum* | 2 | 23% | 2 | 25% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 2 | 31% | 2 | 6% | Positive diagnostic |
| *Polymeria calycina* | 1 | 12% | 1 | 2% | Uninformative |
| *Polyscias sambucifolia* | 2 | 27% | 1 | 15% | Uninformative |
| *Pomax umbellata* | 2 | 35% | 2 | 15% | Uninformative |
| *Poranthera microphylla* | 2 | 46% | 1 | 7% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 77% | 2 | 17% | Positive diagnostic |
| *Pultenaea villosa* | 2 | 38% | 2 | 2% | Positive diagnostic |
| *Senecio hispidulus* | 1 | 15% | 1 | 2% | Uninformative |
| *Stackhousia viminea* | 1 | 19% | 1 | 3% | Uninformative |
| *Syncarpia glomulifera* | 2 | 19% | 3 | 13% | Uninformative |
| *Themeda australis* | 3 | 65% | 2 | 23% | Positive diagnostic |
| *Thysanotus tuberosus* | 2 | 15% | 1 | 2% | Uninformative |
| *Tricoryne elatior* | 2 | 12% | 2 | 3% | Uninformative |
| *Vernonia cinerea* var. *cinerea* | 2 | 35% | 1 | 2% | Positive diagnostic |
| *Veronica plebeia* | 1 | 35% | 1 | 7% | Positive diagnostic |
| *Wahlenbergia gracilis* | 2 | 50% | 1 | 7% | Positive diagnostic |
| *Wahlenbergia stricta* subsp. *stricta* | 2 | 12% | 2 | 1% | Uninformative |
| *Wurmbea dioica* subsp. *dioica* | 2 | 15% | 2 | 0% | Uninformative |

# CASTLEREAGH SHALE-GRAVEL TRANSITION FOREST

## S_DSF02

**Statewide Class**

NSW Plant Community Type:

Biometric Number(s):

**Cumberland Dry Sclerophyll Forests**

724: Broad-leaved Ironbark-Grey Box-*Melaleuca decora* Grassy Open Forest on Clay/Gravel Soils of the Cumberland Plain, Sydney Basin

HN512; ME004



## Description

Castlereagh Shale-Gravel Transition Forest (Benson and Howell 1994a, NPWS 2002b, Tozer 2003) is recognised as a community associated with shale-influenced sandy soils that support a component of ironstone gravels. These soils can occur in remarkably different locations. Some are associated with low-lying Tertiary alluvium overlying shale soils (NPWS 2002) in the Bankstown area, whereas others occur on the northern Woronora Plateau where residual shale caps lie above bands of ironstone laterite and sandstone bedrock. The combination of the parent material produces a soil of relatively low fertility compared to the deeper Wianamatta shale soils of the Cumberland Plain. Together with a relatively low mean annual rainfall (800-900 millimetres) these conditions produce an open eucalypt forest with an understorey that may vary between dense shrubs and a low sparse shrub cover with an abundant ground cover of grasses.

Typically the canopy includes broad-leaved ironbark (*Eucalyptus fibrosa*) along with a wide variety of other eucalypts depending on location. The taller paperbark *Melaleuca decora* may be prominent above a lower open shrub layer of blackthorn (*Bursaria spinosa*) and gorse bitter pea (*Daviesia ulicifolia*). The ground cover is a mix of grasses, sedges and herbs. Map users may experience difficulties in distinguishing this map unit from the closely related Castlereagh Ironbark Forest (S_DSF01) on the basis of floristic composition alone. Within the Sydney area the largest stands occur within the Holsworthy defence area, with isolated remnants extending to Prospect and Bankstown.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 19 m ±6 <br> 10-25 | 18% ± 10 <br> 5-35 | *Eucalyptus fibrosa, Eucalyptus moluccana, Eucalyptus tereticornis, Eucalyptus crebra, Eucalyptus globoidea* |
| Small Trees | 8 m ±5 <br> 3-19 | 12% ±9 <br> 3 -30 | *Bursaria spinosa, Melaleuca decora, Acacia falcata, Acacia decurrens* |
| Shrubs | 2.1 m ±1.0 <br> 1.0-4.0 | 22% ±26 <br> 2-80 | *Bursaria spinosa, Daviesia ulicifolia, Lissanthe strigosa* |
| Ground Covers | 0.7 m ±0.3 <br> 0.3-1.0 | 55% ±25 <br> 5-90 | *Themeda australis, Cheilanthes sieberi* subsp. *sieberi, Dianella revoluta, Lomandra multiflora* subsp. *multiflora, Microlaena stipoides* var. *stipoides, Aristida vagans, Entolasia stricta, Lepidosperma laterale, Brunoniella australis, Lomandra filiformis, Dichelachne micrantha, Opercularia diphylla, Panicum simile, Dichondra repens* |
| Vines & Climbers | N/A | N/A | *Glycine tabacina, Glycine clandestina, Hardenbergia violacea* |

*Compiled from 10 sites with structural data recorded.

## Threats

Past clearing has extensively depleted the original extent. Remnants persist in the Sydney metropolitan area in small isolated patches surrounded by urban land use. This introduces significant threats arising from weed invasion, rubbish dumping, inappropriate mowing and high frequency fires.

## Conservation Status

Castlereagh Shale-Gravel Transition Forest is a component of Shale Gravel Transition Forest in the Sydney Basin Bioregion, an Endangered Ecological Community listed under the NSW TSC Act. It also is a component of Cumberland Plain Woodlands and Shale-Gravel Transition Forest listed as a Critically Endangered Ecological Community under the Commonwealth EPBC Act.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 4860-6800 hectares |
| Estimated percentage cleared | Not available | 65-75% |
| Total NPWS reserves | <.1 +<.1 hectares <br> 0% of extant area | 230 hectares <br> 2% of extant area <br> <10% of pre-clearing area |
| Total reserved | 22.6 +0.5 hectares <br> 4% of extant area | Not available |
| Total non-reserved | 585 +87.8 hectares | Not available |
| Total extant | 608 hectares | 1700 hectares |



Map unit
Study area
Extant vegetation
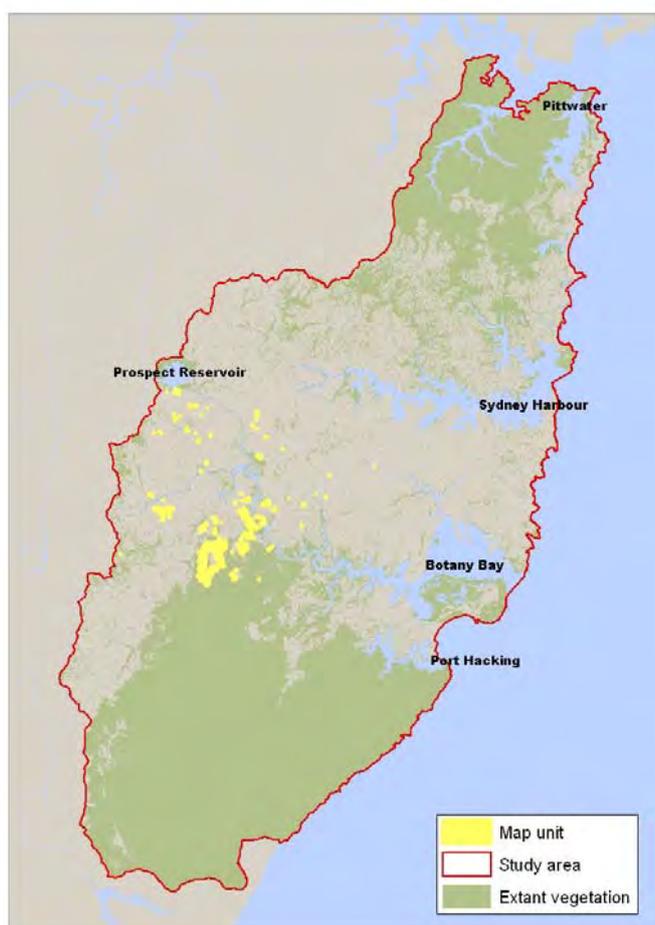
## Example Locations

o   Harris Creek Oval, Holsworthy, Liverpool LGA

o   Mirambeena RP, Bankstown LGA

## Species Richness

| Number of sites | 23 |
|---|---|
| Total native species | 236 |
| Average no. native species per site | 35.8 ±13.1 |

## Variations and Dynamics

Several structural forms are recognised including grassy woodlands supporting dry shrubs and a dense midstratum of paperbarks with emergent eucalypts.

## Relationship to Other Communities

This map unit shares considerable overlap in species composition and habitat with Castlereagh Ironbark Forest (S_DSF01). Forest red gum and grey box are more common in this unit but they are not, on their own, definitive features that can be used to separate the two communities. Strong floristic affinities are also shared with Cumberland Shale-Sandstone Ironbark Forest (S_GW04), another dry shrub-grass forest found on the margins of the Cumberland Plain. In contrast a small number of sites that are currently recognised as Castlereagh Shale-Gravel Transition Forest are, on the basis of this study, more aligned to Cumberland Plain woodlands (S_GW02, S_GW03).

Castlereagh Shale-Gravel Transition Forest will grade into other forests within relatively short distances as the composition of the underlying soil changes. In sites approaching sandier substrates Castlereagh Scribbly Gum Woodland (S_DSF19) is more common. Greater shale influence in the soil in lower rainfall zones introduces Cumberland Plain woodlands (S_GW02, S_GW03), whereas in higher rainfall zones Sydney Turpentine-Ironbark Forest (S_WSF09) may be prevalent.

## Accuracy

Sampling density in the study area is high. Map boundaries were informed by the interpretation of lateritic gravels, clays and shale-sandstone substrates, sample sites and a vegetation structure of forest, low forest and woodland

A 0.04 hectare site located in this map unit is expected to contain at least 13 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 28 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia decurrens* | 2 | 39% | 2 | 5% | Positive diagnostic |
| *Acacia falcata* | 1 | 57% | 1 | 3% | Positive diagnostic |
| *Acacia parramattensis* | 1 | 22% | 1 | 5% | Positive diagnostic |
| *Adiantum aethiopicum* | 2 | 13% | 2 | 7% | Uninformative |
| *Allocasuarina littoralis* | 1 | 17% | 2 | 27% | Uninformative |
| *Aristida ramosa* | 1 | 13% | 2 | 3% | Uninformative |
| *Aristida vagans* | 2 | 70% | 2 | 14% | Positive diagnostic |
| *Arthropodium milleflorum* | 2 | 17% | 2 | 3% | Uninformative |
| *Austrodanthonia tenuior* | 2 | 26% | 2 | 4% | Positive diagnostic |
| *Austrostipa rudis* | 2 | 13% | 2 | 2% | Uninformative |
| *Billardiera scandens* | 1 | 13% | 1 | 37% | Uninformative |
| *Bossiaea prostrata* | 1 | 13% | 1 | 2% | Uninformative |
| *Bothriochloa macra* | 2 | 13% | 1 | 1% | Uninformative |
| *Brunoniella australis* | 2 | 39% | 2 | 6% | Positive diagnostic |
| *Brunoniella pumilio* | 2 | 17% | 2 | 7% | Uninformative |
| *Bursaria spinosa* | 2 | 83% | 2 | 11% | Positive diagnostic |
| *Cassytha glabella* | 1 | 13% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 1 | 22% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 2 | 13% | 2 | 7% | Uninformative |
| *Centella asiatica* | 1 | 26% | 2 | 6% | Positive diagnostic |
| *Cheilanthes sieberi* subsp. *sieberi* | 2 | 83% | 2 | 12% | Positive diagnostic |
| *Coronidium scorpioides* | 1 | 13% | 2 | 2% | Uninformative |
| *Daviesia ulicifolia* | 2 | 43% | 2 | 3% | Positive diagnostic |
| *Desmodium varians* | 1 | 22% | 2 | 8% | Uninformative |
| *Dianella longifolia* | 1 | 22% | 2 | 5% | Positive diagnostic |
| *Dianella revoluta* | 2 | 74% | 1 | 16% | Positive diagnostic |
| *Dichelachne micrantha* | 2 | 48% | 2 | 9% | Positive diagnostic |
| *Dichondra repens* | 2 | 39% | 2 | 14% | Positive diagnostic |
| *Dillwynia parvifolia* | 2 | 13% | 2 | 1% | Uninformative |
| *Dillwynia sieberi* | 2 | 13% | 2 | 1% | Uninformative |
| *Echinopogon caespitosus* | 1 | 22% | 2 | 11% | Uninformative |
| *Echinopogon ovatus* | 2 | 30% | 2 | 6% | Positive diagnostic |
| *Einadia hastata* | 1 | 30% | 2 | 4% | Positive diagnostic |
| *Entolasia marginata* | 2 | 26% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 57% | 2 | 59% | Constant |
| *Eragrostis brownii* | 2 | 17% | 2 | 7% | Uninformative |
| *Eragrostis leptostachya* | 2 | 30% | 2 | 4% | Positive diagnostic |
| *Eucalyptus crebra* | 3 | 30% | 2 | 2% | Positive diagnostic |
| *Eucalyptus eugenioides* | 1 | 22% | 1 | 2% | Positive diagnostic |
| *Eucalyptus fibrosa* | 3 | 65% | 3 | 3% | Positive diagnostic |
| *Eucalyptus globoidea* | 1 | 13% | 3 | 4% | Uninformative |
| *Eucalyptus moluccana* | 2 | 48% | 3 | 4% | Positive diagnostic |
| *Eucalyptus tereticornis* | 2 | 48% | 2 | 5% | Positive diagnostic |
| *Euchiton sphaericus* | 1 | 22% | 1 | 3% | Positive diagnostic |
| *Exocarpos cupressiformis* | 1 | 17% | 1 | 4% | Uninformative |
| *Fimbristylis dichotoma* | 2 | 13% | 1 | 1% | Uninformative |
| *Glycine clandestina* | 2 | 48% | 2 | 18% | Positive diagnostic |
| *Glycine microphylla* | 2 | 26% | 2 | 9% | Uninformative |
| *Glycine tabacina* | 1 | 43% | 2 | 8% | Positive diagnostic |
| *Gonocarpus tetragynus* | 2 | 22% | 2 | 8% | Uninformative |
| *Goodenia hederacea* | 1 | 35% | 1 | 10% | Positive diagnostic |
| *Hardenbergia violacea* | 1 | 22% | 1 | 16% | Uninformative |
| *Hibbertia aspera* | 2 | 17% | 2 | 11% | Uninformative |
| *Hydrocotyle peduncularis* | 2 | 17% | 2 | 6% | Uninformative |
| *Hypericum gramineum* | 1 | 13% | 2 | 3% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 30% | 2 | 20% | Uninformative |
| *Lagenophora stipitata* | 2 | 13% | 2 | 3% | Uninformative |
| *Laxmannia gracilis* | 1 | 30% | 1 | 5% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 65% | 2 | 42% | Constant |
| *Leucopogon juniperinus* | 2 | 13% | 2 | 10% | Uninformative |
| *Lissanthe strigosa* | 1 | 22% | 2 | 8% | Uninformative |
| *Lomandra filiformis* | 2 | 61% | 2 | 22% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 52% | 2 | 24% | Positive diagnostic |
| *Maytenus silvestris* | 2 | 17% | 1 | 3% | Uninformative |
| *Melaleuca decora* | 3 | 65% | 2 | 2% | Positive diagnostic |
| *Melaleuca nodosa* | 3 | 48% | 2 | 5% | Positive diagnostic |
| *Melaleuca styphelioides* | 1 | 26% | 2 | 1% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 87% | 2 | 35% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 17% | 1 | 21% | Uninformative |
| *Olearia microphylla* | 1 | 13% | 1 | 3% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Opercularia diphylla* | 2 | 48% | 2 | 8% | Positive diagnostic |
| *Oxalis exilis* | 2 | 13% | 1 | 3% | Uninformative |
| *Oxalis perennans* | 2 | 22% | 2 | 7% | Uninformative |
| *Ozothamnus diosmifolius* | 1 | 35% | 1 | 11% | Positive diagnostic |
| *Panicum simile* | 2 | 39% | 2 | 10% | Positive diagnostic |
| *Paspalidium distans* | 2 | 22% | 2 | 7% | Uninformative |
| *Persoonia linearis* | 2 | 17% | 1 | 20% | Uninformative |
| *Pimelea linifolia* | 2 | 26% | 2 | 27% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 2 | 17% | 2 | 6% | Uninformative |
| *Polymeria calycina* | 1 | 22% | 1 | 1% | Positive diagnostic |
| *Pomax umbellata* | 1 | 17% | 2 | 15% | Uninformative |
| *Poranthera microphylla* | 2 | 30% | 2 | 7% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 52% | 2 | 17% | Positive diagnostic |
| *Pultenaea villosa* | 1 | 43% | 2 | 2% | Positive diagnostic |
| *Senecio hispidulus* | 2 | 13% | 1 | 2% | Uninformative |
| *Senecio lautus* | 1 | 13% | 1 | 1% | Uninformative |
| *Stackhousia viminea* | 1 | 13% | 1 | 3% | Uninformative |
| *Syncarpia glomulifera* | 1 | 13% | 3 | 13% | Uninformative |
| *Themeda australis* | 3 | 74% | 2 | 22% | Positive diagnostic |
| *Vernonia cinerea* var. *cinerea* | 2 | 13% | 2 | 3% | Uninformative |
| *Veronica plebeia* | 2 | 26% | 1 | 7% | Positive diagnostic |
| *Wahlenbergia gracilis* | 1 | 30% | 1 | 8% | Positive diagnostic |

# COASTAL SAND APPLE-BLOODWOOD FOREST S_DSF03

## Description

Coastal Sand Apple-Bloodwood Forest is one of several vegetation communities found on the large sand dunes associated with the prominent headlands of the Sydney coastline. The forest is of low to moderate height and is characterised by an open cover of dry shrub and heath plants. Typically the canopy comprises smooth-barked apple (*Angophora costata*), old-man banksia (*Banksia serrata*) and red bloodwood (*Corymbia gummifera*), though may also include broad-leaved scribbly gum (*Eucalyptus haemastoma*) and less frequently bangalay (*Eucalyptus botryoides*). The surface soil is generally deeply podsolised, inferring that the dune systems upon which this forest grows have been stable for a long time. These impoverished soils, in combination with the exposed wind-blown situations, support a heath understorey of tea-trees, banksias, broom heath and grass trees above a ferny ground cover.

These forests are found on the larger headland systems at Jibbon Head near Bundeena, Kurnell and La Perouse. The massive dune systems that once covered the Botany-Randwick area would have once supported a network of these low-growing forests amongst the treeless sandplain heaths. Some examples are on thin sand mantles above sandstone rock plates. Beyond the Sydney metropolis, the community is found on low elevation dunes of the Central Coast (NPWS 2000c, Bell 2002).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 12 m ±2<br>10-15 | 39% ± 3<br>35-40 | *Angophora costata, Corymbia gummifera, Banksia serrata, Eucalyptus botryoides, Eucalyptus piperita, Eucalyptus haemastoma, Banksia aemula* |
| Small Trees | 6 m ±2<br>3-8 | 20% ±15<br>5-40 | *Acacia suaveolens, Acacia longifolia, Banksia serrata, Xylomelum pyriforme, Elaeocarpus reticulatus, Banksia integrifolia* |
| Shrubs | 2.3 m ±0.4<br>2.0-2.5 | 25% ±7<br>20-30 | *Acacia ulicifolia, Bossiaea heterophylla, Leucopogon ericoides, Aotus ericoides, Breynia oblongifolia, Monotoca elliptica, Banksia ericifolia* subsp. *ericifolia* |
| Ground Covers | 1.0 m ±0.6<br>0.5-2.0 | 35% ±24<br>10-60 | *Dianella caerulea, Pteridium esculentum, Entolasia stricta, Imperata cylindrica* var. *major, Lomandra longifolia, Themeda australis, Gonocarpus teucrioides, Lepidosperma laterale, Pomax umbellata* |
| Vines & Climbers | N/A | N/A | *Hibbertia scandens, Smilax glyciphylla, Billardiera scandens, Hardenbergia violacea* |

*Compiled from 4 sites with structural data recorded.

## Threats

Coastal development has removed extensive areas of this community in the eastern suburbs of Sydney. However, the threats arising from the invasive bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*), amongst other exotic species, persists across the range of this community. Clearing for urban development continues to threaten areas outside of Sydney on the Central Coast.

## Conservation Status

The majority of the remaining area of this community in the study area is located within Royal and Kamay Botany Bay national parks.

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 32,000-38,000 hectares |
| Estimated percentage cleared | Not available | 35-50% |
| Total NPWS reserves | 100 +0.1 hectares<br>68% of extant area | 6500-6550 hectares<br>30-35% of extant area<br>15-20% of pre-clearing area |
| Total reserved | 128 +0.1 hectares<br>86% of extant area | Not available |
| Total non-reserved | 20.0 +4.3 hectares | Not available |
| Total extant | 148 hectares | Est. 20,000 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o   Between Jibbon Beach and east of Eric Street, Bundeena, Royal NP

o   Kurnell Peninsula, Kamay Botany Bay NP

## Species Richness

| | |
|---|---|
| Number of sites | 15 |
| Total native species | 142 |
| Average no. native species per site | 34.9 ±6.1 |

## Variations and Dynamics

Variation in canopy height can vary depending on exposure and depth of the sand mass.

## Relationship to Other Communities

Floristically the community is closely related to other map units found on the older dune systems of the Sydney Basin Bioregion including forests (S_DSF21) and heaths (S_HL04, S_HL03). Where headland dune soils become shallower there is often a gentle transition into sandstone forests and woodlands such as S_DSF04 and S_DSF06.

## Accuracy

Sampling density is moderate. Map boundaries of the community were based on the interpretation of the presence of a eucalypt canopy, relative tree height and exposed aspects found on the dune systems of the coastal headlands and coastal sandplains.

A 0.04 hectare site located in this map unit is expected to contain at least 13 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 27 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 2 | 87% | 2 | 21% | Positive diagnostic |
| *Acacia suaveolens* | 1 | 73% | 1 | 28% | Positive diagnostic |
| *Acacia terminalis* | 1 | 60% | 1 | 19% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 47% | 1 | 25% | Constant |
| *Allocasuarina distyla* | 1 | 13% | 2 | 11% | Uninformative |
| *Angophora costata* | 3 | 100% | 3 | 36% | Positive diagnostic |
| *Aotus ericoides* | 2 | 53% | 2 | 8% | Positive diagnostic |
| *Austrostipa pubescens* | 1 | 13% | 2 | 20% | Uninformative |
| *Banksia ericifolia* subsp. *ericifolia* | 1 | 13% | 2 | 26% | Uninformative |
| *Banksia integrifolia* | 2 | 53% | 2 | 9% | Positive diagnostic |
| *Banksia serrata* | 2 | 93% | 2 | 33% | Positive diagnostic |
| *Billardiera scandens* | 1 | 60% | 1 | 37% | Constant |
| *Bossiaea heterophylla* | 2 | 73% | 2 | 17% | Positive diagnostic |
| *Bossiaea scolopendria* | 1 | 27% | 2 | 7% | Uninformative |
| *Breynia oblongifolia* | 1 | 60% | 1 | 16% | Positive diagnostic |
| *Cassytha pubescens* | 2 | 33% | 2 | 27% | Uninformative |
| *Clematis aristata* | 1 | 20% | 1 | 7% | Uninformative |
| *Corymbia gummifera* | 3 | 73% | 2 | 41% | Constant |
| *Cupaniopsis anacardioides* | 1 | 27% | 2 | 2% | Positive diagnostic |
| *Daviesia mimosoides* | 2 | 20% | 1 | 0% | Positive diagnostic |
| *Dianella caerulea* | 2 | 80% | 2 | 45% | Constant |
| *Dianella revoluta* | 1 | 20% | 2 | 17% | Uninformative |
| *Dichelachne micrantha* | 1 | 13% | 2 | 9% | Uninformative |
| *Dillwynia retorta* | 2 | 27% | 2 | 26% | Uninformative |
| *Dodonaea triquetra* | 2 | 27% | 2 | 23% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 47% | 1 | 20% | Constant |
| *Entolasia stricta* | 2 | 53% | 2 | 59% | Constant |
| *Eragrostis brownii* | 1 | 13% | 2 | 7% | Uninformative |
| *Eucalyptus botryoides* | 1 | 20% | 3 | 5% | Uninformative |
| *Eucalyptus haemastoma* | 3 | 20% | 2 | 12% | Uninformative |
| *Eucalyptus piperita* | 2 | 33% | 3 | 20% | Uninformative |
| *Eustrephus latifolius* | 1 | 13% | 2 | 15% | Uninformative |
| *Geitonoplesium cymosum* | 2 | 27% | 2 | 9% | Uninformative |
| *Glochidion ferdinandi* | 1 | 20% | 2 | 13% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 67% | 2 | 23% | Positive diagnostic |
| *Grevillea mucronulata* | 2 | 13% | 2 | 7% | Uninformative |
| *Hardenbergia violacea* | 1 | 53% | 1 | 16% | Positive diagnostic |
| *Hibbertia acicularis* | 1 | 20% | 1 | 0% | Positive diagnostic |
| *Hibbertia obtusifolia* | 1 | 27% | 1 | 1% | Positive diagnostic |
| *Hibbertia scandens* | 1 | 60% | 2 | 6% | Positive diagnostic |
| *Hybanthus monopetalus* | 2 | 13% | 1 | 3% | Uninformative |
| *Hypolaena fastigiata* | 2 | 13% | 2 | 3% | Uninformative |
| *Imperata cylindrica* var. *major* | 1 | 67% | 2 | 20% | Positive diagnostic |
| *Isopogon anemonifolius* | 1 | 33% | 2 | 18% | Uninformative |
| *Lepidosperma concavum* | 3 | 67% | 2 | 4% | Positive diagnostic |
| *Lepidosperma filiforme* | 2 | 20% | 2 | 8% | Uninformative |
| *Leptospermum laevigatum* | 2 | 40% | 2 | 5% | Positive diagnostic |
| *Leucopogon ericoides* | 1 | 40% | 1 | 8% | Positive diagnostic |
| *Leucopogon parviflorus* | 2 | 13% | 1 | 1% | Uninformative |
| *Lomandra cylindrica* | 1 | 13% | 2 | 11% | Uninformative |
| *Lomandra glauca* | 3 | 13% | 2 | 16% | Uninformative |
| *Lomandra gracilis* | 2 | 13% | 2 | 10% | Uninformative |
| *Lomandra longifolia* | 2 | 87% | 2 | 46% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 20% | 2 | 24% | Uninformative |
| *Macrozamia communis* | 3 | 53% | 1 | 4% | Positive diagnostic |
| *Monotoca elliptica* | 2 | 87% | 1 | 6% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 67% | 1 | 21% | Positive diagnostic |
| *Omalanthus nutans* | 1 | 27% | 1 | 9% | Uninformative |
| *Persoonia lanceolata* | 1 | 20% | 1 | 11% | Uninformative |
| *Persoonia levis* | 1 | 27% | 1 | 33% | Uninformative |
| *Persoonia linearis* | 1 | 13% | 1 | 20% | Uninformative |
| *Petrophile pulchella* | 2 | 13% | 2 | 16% | Uninformative |
| *Philotheca salsolifolia* | 2 | 13% | 2 | 2% | Uninformative |
| *Phyllota phylicoides* | 1 | 13% | 2 | 13% | Uninformative |
| *Pimelea linifolia* | 2 | 20% | 2 | 27% | Uninformative |
| *Pittosporum revolutum* | 3 | 13% | 1 | 9% | Uninformative |
| *Pittosporum undulatum* | 1 | 13% | 2 | 25% | Uninformative |
| *Poa affinis* | 1 | 33% | 2 | 11% | Uninformative |
| *Pomax umbellata* | 2 | 13% | 2 | 15% | Uninformative |
| *Pteridium esculentum* | 3 | 100% | 2 | 40% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Ricinocarpos pinifolius* | 2 | 60% | 1 | 7% | Positive diagnostic |
| *Schizaea dichotoma* | 1 | 20% | 1 | 1% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 93% | 2 | 32% | Positive diagnostic |
| *Themeda australis* | 2 | 60% | 2 | 23% | Positive diagnostic |
| *Woollsia pungens* | 1 | 20% | 2 | 12% | Uninformative |
| *Xanthorrhoea arborea* | 2 | 20% | 2 | 11% | Uninformative |
| *Xanthorrhoea resinosa* | 2 | 33% | 2 | 10% | Uninformative |
| *Xylomelum pyriforme* | 2 | 60% | 1 | 6% | Positive diagnostic |

# COASTAL ENRICHED SANDSTONE DRY FOREST

<div align="right">

## S_DSF04

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**Statewide Class**
Sydney Coastal Dry Sclerophyll Forests

NSW Plant Community Type:
1181: Smooth-barked Apple-Red Bloodwood-Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin

Biometric Number(s):
HN586; ME029; SR635



## Description

Coastal Enriched Sandstone Dry Forest is commonly encountered on the upper slopes and dry gullies of Sydney urban areas. It is a tall open eucalypt forest with an understorey of dry sclerophyll shrubs with ferns and forbs amongst the ground cover. The commonly recorded eucalypts are smooth-barked apple (*Angophora costata*), red bloodwood (*Corymbia gummifera*) and Sydney peppermint (*Eucalyptus piperita*). Blackbutt (*Eucalyptus pilularis*) is common on gully slopes of the north shore and Hacking River valley while broad-leaved white mahogany (*Eucalyptus umbra*) replaces this species along the Warringah and Pittwater escarpments. A sparse layer of small trees such as *Allocasuarina littoralis* and old-man banksia (*Banksia serrata*) is common above a variety of wattles, tea-trees, gee bungs and grass trees. In long unburnt areas sweet pittosporum (*Pittosporum undulatum*) may be prevalent. It is widespread on the Hornsby plateau in areas that receive greater than 1000 millimetres of mean annual rainfall and are at elevations less than 200 metres above sea level. It extends north of the Sydney area into the hinterland of the Central Coast.

One of the distinguishing features of the community is that it appears to persist in areas that have subtle clay enrichment to the sandstone soils. Typically sites are located downslope from large residual shale caps or on exposed Narrabeen sandstone or thin clay bands on coastal sandstone ridgetops. The clay influence is not immediately discernable at sites but does appear expressed in the plant assemblage, resulting in more prominent mesic and grass species and less abundant heath plants than occur in the sheltered forests found on rockier and more siliceous sandstones.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 20 m ±5 <br> 8-30 | 29% ±16 <br> 5-85 | *Angophora costata Corymbia gummifera, Eucalyptus piperita, Eucalyptus pilularis, Eucalyptus umbra, Syncarpia glomulifera* |
| Small Trees | 8 m ±4 <br> 2-15 | 20% ±15 <br> 3-55 | *Allocasuarina littoralis, Banksia serrata, Elaeocarpus reticulatus, Pittosporum undulatum, Ceratopetalum gummiferum* |
| Shrubs | 3.4 m ±2.0 <br> 0.5-10.0 | 19% ±14 <br> 2-60 | *Acacia ulicifolia, Leptospermum trinervium, Persoonia levis, Acacia suaveolens, Acacia terminalis Lomatia silaifolia, Dodonaea triquetra, Banksia spinulosa* |
| Ground Covers | 1.3 m ±0.6 <br> 0.5-3.0 | 27% ±21 <br> 3-90 | *Dianella caerulea, Entolasia stricta, Lomandra longifolia, Pteridium esculentum, Xanthosia pilosa* |
| Vines & Climbers | N/A | N/A | *Smilax glyciphylla, Billardiera scandens, Cassytha pubescens* |

*Compiled from 42 sites with structural data recorded.

*The Native Vegetation of the Sydney Metropolitan Area*

## Threats

Clearing for urban development has occurred across the range of the community, although given the association with rugged infertile environments the ongoing threat is low. Localised weed infestation occurs in proximity to the urban margins. Frequent fire is prevalent in these zones.

## Conservation Status

A high proportion of the extant distribution remains in the protected area network. The vegetation community is represented in Garigal, Georges River, Lane Cove and Royal national parks.

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 28,710-34,860 hectares |
| Estimated percentage cleared | Not available | 15-30% |
| Total NPWS reserves | 514 +0.9 hectares<br>30% of extant area | 7700 hectares<br>32% of extant area<br>15-35% of pre-clearing area |
| Total reserved | 1223 +14.0 hectares<br>70% of extant area | Not available |
| Total non-reserved | 518 +435 hectares | Not available |
| Total extant | 1741 hectares | 24,400 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o   Oatley Park, Oatley, Hurstville LGA

o   Harold Reid Reserve, Middle Cove, Willoughby LGA

o   Ingleside Park, Ingleside, Pittwater LGA

## Species Richness

| | |
|---|---|
| Number of sites | 90 |
| Total native species | 403 |
| Average no. native species per site | 46.5 ±9.2 |

## Variations and Dynamics

Local variations in eucalypt canopy dominants occur depending on geographic location. Degree of shelter resulting from topographic position may result in a more mesic-influenced understorey composition. In the Pittwater area this forest is associated with residual Hawkesbury sandstones that occupy crests and upper slopes of the Pittwater peninsula. Taller *Angophora costata*, *Corymbia gummifera* and *Eucalyptus umbra* are common and are pruned by ocean breezes on exposed sites. Elsewhere crests and upper slope positions may feature tall scribbly gums including *Eucalyptus racemosa.*

## Relationship to Other Communities

The community forms one of a suite of sheltered forests found on enriched sandstone soils (S_DSF13, S_DSF17). Each are separated geographically between drier locations in the Georges River area (S_DSF17) and the southern Sydney area south of the Hacking River (S_DSF13).

It grades into a range of mesic sandstone forests as greater shelter is provided by gully lines (S_DSF08), steep south-facing slopes (S_WSF02) and harbourside locations (S_DSF06).

## Accuracy

Sampling density is high. Map unit boundaries were based on the interpretation of forests found on sandstone substrates associated with the Gymea, Lucas Heights and Hawkesbury soil landscapes (Chapman and Murphy 1989).

A 0.04 hectare site located in this map unit is expected to contain at least 21 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 38 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia linifolia* | 1 | 40% | 2 | 19% | Positive diagnostic |
| *Acacia longifolia* | 2 | 31% | 2 | 21% | Uninformative |
| *Acacia suaveolens* | 2 | 38% | 1 | 28% | Constant |
| *Acacia terminalis* | 2 | 20% | 1 | 20% | Uninformative |
| *Acacia ulicifolia* | 1 | 54% | 1 | 24% | Positive diagnostic |
| *Actinotus helianthi* | 2 | 23% | 1 | 7% | Positive diagnostic |
| *Actinotus minor* | 1 | 12% | 2 | 22% | Uninformative |
| *Allocasuarina littoralis* | 2 | 81% | 2 | 25% | Positive diagnostic |
| *Allocasuarina torulosa* | 2 | 10% | 2 | 10% | Uninformative |
| *Angophora costata* | 3 | 74% | 2 | 35% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 17% | 2 | 14% | Uninformative |
| *Aristida vagans* | 2 | 18% | 2 | 14% | Uninformative |
| *Austrostipa pubescens* | 2 | 46% | 2 | 19% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 2 | 12% | 2 | 26% | Uninformative |
| *Banksia integrifolia* | 1 | 19% | 2 | 9% | Uninformative |
| *Banksia serrata* | 1 | 40% | 2 | 33% | Constant |
| *Banksia spinulosa* | 2 | 40% | 2 | 26% | Constant |
| *Billardiera scandens* | 2 | 72% | 1 | 35% | Positive diagnostic |
| *Bossiaea obcordata* | 2 | 24% | 2 | 6% | Positive diagnostic |
| *Breynia oblongifolia* | 1 | 26% | 1 | 16% | Uninformative |
| *Caesia parviflora* | 1 | 11% | 1 | 3% | Positive diagnostic |
| *Calochlaena dubia* | 2 | 27% | 2 | 16% | Uninformative |
| *Cassytha glabella* | 1 | 11% | 2 | 15% | Uninformative |
| *Cassytha pubescens* | 2 | 51% | 2 | 26% | Positive diagnostic |
| *Caustis flexuosa* | 2 | 10% | 2 | 18% | Uninformative |
| *Ceratopetalum gummiferum* | 2 | 32% | 2 | 17% | Positive diagnostic |
| *Cissus hypoglauca* | 2 | 13% | 2 | 8% | Uninformative |
| *Correa reflexa* | 2 | 21% | 1 | 4% | Positive diagnostic |
| *Corymbia gummifera* | 2 | 71% | 2 | 40% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 18% | 2 | 27% | Uninformative |
| *Dianella caerulea* | 2 | 98% | 2 | 43% | Positive diagnostic |
| *Dianella revoluta* | 1 | 13% | 2 | 17% | Uninformative |
| *Dillwynia retorta* | 2 | 17% | 2 | 26% | Uninformative |
| *Dodonaea triquetra* | 2 | 61% | 2 | 21% | Positive diagnostic |
| *Echinopogon caespitosus* | 1 | 17% | 2 | 10% | Uninformative |
| *Elaeocarpus reticulatus* | 2 | 67% | 1 | 18% | Positive diagnostic |
| *Entolasia marginata* | 2 | 38% | 2 | 22% | Positive diagnostic |
| *Entolasia stricta* | 2 | 97% | 2 | 57% | Positive diagnostic |
| *Epacris longiflora* | 1 | 12% | 2 | 8% | Uninformative |
| *Epacris pulchella* | 1 | 30% | 2 | 15% | Positive diagnostic |
| *Eragrostis brownii* | 2 | 11% | 2 | 7% | Uninformative |
| *Eucalyptus haemastoma* | 2 | 10% | 2 | 12% | Uninformative |
| *Eucalyptus pilularis* | 3 | 34% | 3 | 13% | Positive diagnostic |
| *Eucalyptus piperita* | 3 | 44% | 3 | 19% | Positive diagnostic |
| *Eucalyptus punctata* | 2 | 10% | 2 | 11% | Uninformative |
| *Eucalyptus resinifera* subsp. *resinifera* | 1 | 18% | 1 | 5% | Positive diagnostic |
| *Eustrephus latifolius* | 2 | 12% | 2 | 15% | Uninformative |
| *Geitonoplesium cymosum* | 2 | 12% | 2 | 9% | Uninformative |
| *Glochidion ferdinandi* | 1 | 39% | 2 | 12% | Positive diagnostic |
| *Glycine clandestina* | 1 | 18% | 2 | 18% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 42% | 2 | 23% | Positive diagnostic |
| *Goodenia hederacea* | 2 | 21% | 1 | 10% | Positive diagnostic |
| *Grevillea buxifolia* | 1 | 16% | 2 | 14% | Uninformative |
| *Grevillea linearifolia* | 2 | 20% | 2 | 7% | Positive diagnostic |
| *Grevillea sericea* | 2 | 24% | 2 | 15% | Uninformative |
| *Hakea dactyloides* | 2 | 17% | 2 | 24% | Uninformative |
| *Hakea sericea* | 1 | 47% | 2 | 20% | Positive diagnostic |
| *Hardenbergia violacea* | 1 | 27% | 1 | 16% | Uninformative |
| *Hibbertia aspera* | 2 | 12% | 2 | 11% | Uninformative |
| *Hibbertia dentata* | 2 | 14% | 2 | 8% | Uninformative |
| *Hovea linearis* | 2 | 10% | 1 | 11% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 40% | 2 | 19% | Positive diagnostic |
| *Isopogon anemonifolius* | 2 | 10% | 2 | 19% | Uninformative |
| *Kennedia rubicunda* | 1 | 13% | 1 | 9% | Uninformative |
| *Kunzea ambigua* | 2 | 23% | 2 | 14% | Uninformative |
| *Lambertia formosa* | 2 | 18% | 2 | 27% | Uninformative |
| *Lasiopetalum ferrugineum* | 2 | 20% | 2 | 11% | Uninformative |
| *Lepidosperma gunnii* | 3 | 9% | 2 | 1% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 66% | 2 | 41% | Positive diagnostic |
| *Lepidosperma urophorum* | 2 | 8% | 2 | 2% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Leptospermum polygalifolium* | 1 | 14% | 2 | 14% | Uninformative |
| *Leptospermum trinervium* | 2 | 58% | 2 | 36% | Positive diagnostic |
| *Lepyrodia scariosa* | 1 | 11% | 2 | 21% | Uninformative |
| *Leucopogon ericoides* | 1 | 10% | 1 | 8% | Uninformative |
| *Leucopogon juniperinus* | 2 | 21% | 2 | 10% | Positive diagnostic |
| *Leucopogon lanceolatus* | 1 | 13% | 1 | 8% | Uninformative |
| *Lindsaea linearis* | 2 | 14% | 2 | 16% | Uninformative |
| *Lomandra cylindrica* | 1 | 13% | 2 | 10% | Uninformative |
| *Lomandra filiformis* | 2 | 21% | 2 | 23% | Uninformative |
| *Lomandra glauca* | 1 | 26% | 2 | 16% | Uninformative |
| *Lomandra gracilis* | 2 | 21% | 2 | 10% | Positive diagnostic |
| *Lomandra longifolia* | 2 | 88% | 2 | 45% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 24% | 1 | 24% | Uninformative |
| *Lomandra obliqua* | 2 | 61% | 2 | 31% | Positive diagnostic |
| *Lomatia silaifolia* | 1 | 59% | 1 | 26% | Positive diagnostic |
| *Macrozamia communis* | 2 | 16% | 1 | 4% | Positive diagnostic |
| *Micrantheum ericoides* | 2 | 38% | 2 | 16% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 51% | 2 | 35% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 51% | 1 | 20% | Positive diagnostic |
| *Olearia microphylla* | 1 | 9% | 1 | 3% | Positive diagnostic |
| *Omalanthus nutans* | 1 | 14% | 1 | 9% | Uninformative |
| *Opercularia aspera* | 1 | 10% | 1 | 8% | Uninformative |
| *Oplismenus aemulus* | 2 | 13% | 2 | 10% | Uninformative |
| *Ozothamnus diosmifolius* | 1 | 27% | 1 | 11% | Positive diagnostic |
| *Pandorea pandorana* | 2 | 41% | 2 | 15% | Positive diagnostic |
| *Panicum simile* | 1 | 17% | 2 | 10% | Uninformative |
| *Paspalidium distans* | 1 | 13% | 2 | 7% | Uninformative |
| *Patersonia glabrata* | 2 | 21% | 2 | 16% | Uninformative |
| *Patersonia sericea* | 1 | 10% | 1 | 16% | Uninformative |
| *Persoonia levis* | 1 | 58% | 1 | 32% | Positive diagnostic |
| *Persoonia linearis* | 2 | 40% | 1 | 19% | Positive diagnostic |
| *Persoonia pinifolia* | 1 | 14% | 1 | 21% | Uninformative |
| *Phyllanthus hirtellus* | 2 | 71% | 2 | 26% | Positive diagnostic |
| *Pimelea linifolia* | 2 | 30% | 2 | 26% | Uninformative |
| *Pittosporum undulatum* | 2 | 76% | 2 | 23% | Positive diagnostic |
| *Platylobium formosum* | 2 | 29% | 2 | 7% | Positive diagnostic |
| *Platysace lanceolata* | 2 | 21% | 2 | 8% | Positive diagnostic |
| *Platysace linearifolia* | 1 | 28% | 2 | 30% | Uninformative |
| *Poa affinis* | 2 | 29% | 2 | 10% | Positive diagnostic |
| *Podocarpus spinulosus* | 2 | 10% | 2 | 2% | Positive diagnostic |
| *Polyscias sambucifolia* | 2 | 63% | 1 | 13% | Positive diagnostic |
| *Pomaderris elliptica* subsp. *elliptica* | 1 | 7% | 1 | 1% | Positive diagnostic |
| *Pomax umbellata* | 2 | 34% | 2 | 14% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 38% | 2 | 17% | Positive diagnostic |
| *Pseuderanthemum variabile* | 2 | 13% | 2 | 12% | Uninformative |
| *Pteridium esculentum* | 2 | 80% | 2 | 39% | Positive diagnostic |
| *Pultenaea daphnoides* | 2 | 19% | 2 | 8% | Positive diagnostic |
| *Pultenaea flexilis* | 2 | 14% | 2 | 6% | Positive diagnostic |
| *Schoenus melanostachys* | 2 | 12% | 2 | 6% | Uninformative |
| *Smilax glyciphylla* | 2 | 77% | 2 | 31% | Positive diagnostic |
| *Syncarpia glomulifera* | 2 | 33% | 3 | 12% | Positive diagnostic |
| *Themeda australis* | 2 | 40% | 2 | 22% | Positive diagnostic |
| *Xanthorrhoea arborea* | 2 | 20% | 2 | 11% | Uninformative |
| *Xanthorrhoea concava* | 2 | 11% | 2 | 7% | Uninformative |
| *Xanthorrhoea media* | 2 | 28% | 2 | 19% | Uninformative |
| *Xanthosia pilosa* | 2 | 40% | 2 | 20% | Positive diagnostic |
| *Xanthosia tridentata* | 2 | 36% | 2 | 21% | Positive diagnostic |
| *Xylomelum pyriforme* | 1 | 13% | 1 | 6% | Uninformative |
| *Zieria pilosa* | 2 | 16% | 2 | 5% | Positive diagnostic |
| *Zieria smithii* | 2 | 16% | 1 | 5% | Positive diagnostic |

# SYDNEY SOUTH EXPOSED SANDSTONE WOODLAND             S_DSF05

**Statewide Class**                 Sydney Coastal Dry Sclerophyll Forests
NSW Plant Community Type:           1083: Red Bloodwood-Scribbly Gum Heathy Woodland on Sandstone Plateaux,
                                    Sydney Basin
Biometric Number(s):                HN566; HU595; ME014; SR595



## Description

Sydney South Exposed Sandstone Woodland is a low eucalypt woodland with a diverse heathy understorey found on Hawkesbury sandstone ridgetops in the north-east of the Woronora Plateau. It is associated with high mean annual rainfall (greater than 1200 millimetres) and coastal elevations (10-250 metres above sea level). In these moister climates sites are dominated by scribbly gum (*Eucalyptus haemastoma/Eucalyptus racemosa*) and/or silvertop ash (*Eucalyptus sieberi)* with red bloodwood (*Corymbia gummifera*) a frequent associate. The rainfall level also appears to encourage a very diverse and dense shrub layer in which five species of banksia are known to occur. The taller old-man banksia (*Banksia serrata*) and heath-leaved banksia (*Banksia ericifolia* subsp. *ericifolia*) are the most common. Other genera are similarly diverse with multiple species of hakeas, wattles, tea-trees and peas found within the community. The ground layer is a sparse cover of forbs, grasses and sedges. The distinctive Gymea lily (*Doryanthes excelsa*) occurs amongst the ground and lower shrub layers on sites of heavily eroded ironstone laterite. These mantles are a feature of the central and eastern Woronora Plateau. The community occurs extensively throughout Royal and Dharawal national parks and eastern sections of the Woronora catchment area.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 12 m ±5  8-25 | 12% ±10  5-40 | *Corymbia gummifera, Eucalyptus sieberi, Eucalyptus racemosa, Eucalyptus haemastoma* |
| Small Trees | 6 m ±3  3-15 | 16% ±11  5-40 | *Banksia serrata, Leptospermum trinervium, Banksia ericifolia* subsp. *ericifolia, Acacia suaveolens* |
| Shrubs | 3.0 m ±1.3  1.3-6.0 | 23% ±13  5-50 | *Platysace linearifolia, Lambertia formosa, Isopogon anemonifolius, Persoonia levis, Hakea dactyloides, Petrophile pulchella, Banksia marginata, Dillwynia retorta, Lomatia silaifolia, Persoonia pinifolia, Bossiaea heterophylla, Hakea teretifolia, Eriostemon australasius, Pultenaea tuberculata, Monotoca scoparia, Leucopogon microphyllus, Banksia spinulosa, Grevillea sphacelata, Hakea sericea* |
| Ground Covers | 0.9 m ±0.6  0.1-2.0 | 25% ±17  5-65 | *Xanthorrhoea media, Actinotus minor, Dampiera stricta, Lomandra obliqua, Caustis flexuosa, Lepidosperma laterale, Cyathochaeta diandra, Lomandra filiformis, Lomandra glauca* |
| Vines & Climbers | N/A | N/A | |

*Compiled from 16 sites with structural data recorded.

## Threats

The original extent of the community has been diminished by clearing for urban development between Heathcote and Sutherland although a far greater proportion still remains within protected areas on the Woronora Plateau. Frequent fire represents the greatest threat, particularly in Royal NP. Other impacts are likely to be highly localised including rubbish dumping, illegal bike trails, weed infestations near urban edges and clearing.

## Conservation Status

This vegetation community is represented in Royal, Heathcote, Garawarra and Dharawal reserves.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 123,330-148,000 hectares |
| Estimated percentage cleared | Not available | 10-25% |
| Total NPWS reserves | 7022 +11.1 hectares<br>49% of extant area | 49,900 hectares<br>45% of extant area<br>25-45% of pre-clearing area |
| Total reserved | 10,293 +23.5 hectares<br>72% of extant area | Not available |
| Total non-reserved | 3909 +87.5 hectares | Not available |
| Total extant | 14,202 hectares | 111,000 hectares |

*As this woodland is only a component of the equivalent regional community, these figures overestimate the regional extent.



Map unit
Study area
Extant vegetation

## Example Locations

o   Widespread on ridges and exposed slopes in Royal NP

## Species Richness

| Number of sites | 107 |
|---|---|
| Total native species | 374 |
| Average no. native species per site | 52.7 ±7.9 |

## Variations and Dynamics

The height and cover of the eucalypt layer varies in response to soil depth, exposure, rock outcropping and time since fire. The latter can result in very dense stands of mallee-like eucalypts. Alternatively fire can leave the canopy very open and mirror patterns associated with stands on rocky exposed ridgelines.

## Relationship to Other Communities

This woodland is a member of the widely recognised group of sandstone ridgetop woodlands occurring throughout the Sydney basin. Floristically it is most closely related to sandstone woodlands found the high rainfall areas of the eastern Hornsby plateau in Warringah and Pittwater local government areas (S_DSF11). Both are characterised by a heathy understorey with high frequencies of heath-leaved banksia. The frequency and abundance of some species are not shared including *Grevillea oleoides, Banksia marginata* and *Eucalyptus sieberi* all of which are more common in southern Sydney. On the Woronora Plateau this community will grade into a sheltered sandstone forest (S_DSF09) on protected slopes and gullies. It will also grade into a treeless heath where soils thin out or rock plates are exposed (S_HL08, S_HL09). As mean annual rainfall falls below 1100 millimetres silvertop ash and heath-leaved banksia become less frequently recorded marking the grade into drier sandstone ridgetop woodland (S_DSF15).

## Accuracy

Sampling density is moderate. Delineation of sandstone woodlands in the Woronora River and O'Hares Creek catchments was taken from NPWS (2002b) and modified. Mean annual rainfall data was used to discriminate sandstone woodland from S_DSF15.

A 0.04 hectare site located in this map unit is expected to contain at least 33 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 43 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia hispidula* | 2 | 6% | 1 | 1% | Positive diagnostic |
| *Acacia linifolia* | 2 | 28% | 2 | 20% | Uninformative |
| *Acacia myrtifolia* | 2 | 45% | 2 | 11% | Positive diagnostic |
| *Acacia suaveolens* | 2 | 69% | 1 | 26% | Positive diagnostic |
| *Acacia ulicifolia* | 2 | 41% | 1 | 25% | Positive diagnostic |
| *Actinotus minor* | 2 | 67% | 2 | 19% | Positive diagnostic |
| *Allocasuarina distyla* | 2 | 25% | 2 | 10% | Positive diagnostic |
| *Allocasuarina littoralis* | 1 | 11% | 2 | 28% | Uninformative |
| *Angophora hispida* | 2 | 19% | 2 | 9% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 23% | 2 | 14% | Uninformative |
| *Aotus ericoides* | 2 | 18% | 2 | 8% | Positive diagnostic |
| *Austrostipa pubescens* | 2 | 15% | 2 | 20% | Uninformative |
| *Banksia ericifolia* subsp. *ericifolia* | 2 | 71% | 2 | 24% | Positive diagnostic |
| *Banksia marginata* | 2 | 60% | 1 | 7% | Positive diagnostic |
| *Banksia oblongifolia* | 2 | 24% | 2 | 14% | Uninformative |
| *Banksia serrata* | 2 | 94% | 2 | 30% | Positive diagnostic |
| *Banksia spinulosa* | 2 | 54% | 2 | 25% | Positive diagnostic |
| *Billardiera scandens* | 1 | 22% | 1 | 37% | Uninformative |
| *Blandfordia nobilis* | 1 | 6% | 1 | 1% | Positive diagnostic |
| *Boronia ledifolia* | 1 | 25% | 2 | 12% | Positive diagnostic |
| *Boronia serrulata* | 1 | 8% | 2 | 1% | Positive diagnostic |
| *Bossiaea ensata* | 2 | 42% | 1 | 4% | Positive diagnostic |
| *Bossiaea heterophylla* | 2 | 64% | 2 | 15% | Positive diagnostic |
| *Brachyloma daphnoides* | 2 | 15% | 1 | 5% | Positive diagnostic |
| *Calytrix tetragona* | 2 | 9% | 2 | 3% | Positive diagnostic |
| *Cassytha glabella* | 2 | 13% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 47% | 2 | 26% | Positive diagnostic |
| *Caustis flexuosa* | 2 | 53% | 2 | 16% | Positive diagnostic |
| *Caustis pentandra* | 2 | 18% | 2 | 4% | Positive diagnostic |
| *Ceratopetalum gummiferum* | 2 | 12% | 2 | 18% | Uninformative |
| *Chordifex dimorphus* | 2 | 16% | 2 | 3% | Positive diagnostic |
| *Choretrum candollei* | 1 | 5% | 1 | 0% | Positive diagnostic |
| *Conospermum longifolium* | 2 | 37% | 1 | 5% | Positive diagnostic |
| *Conospermum taxifolium* | 1 | 10% | 2 | 2% | Positive diagnostic |
| *Conospermum tenuifolium* | 2 | 4% | 1 | 0% | Positive diagnostic |
| *Corymbia gummifera* | 2 | 97% | 2 | 38% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 64% | 2 | 24% | Positive diagnostic |
| *Dampiera stricta* | 2 | 67% | 2 | 21% | Positive diagnostic |
| *Daviesia corymbosa* | 1 | 19% | 1 | 2% | Positive diagnostic |
| *Dillwynia floribunda* | 2 | 14% | 2 | 5% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 68% | 2 | 24% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 12% | 2 | 23% | Uninformative |
| *Doryanthes excelsa* | 2 | 33% | 2 | 8% | Positive diagnostic |
| *Drosera peltata* | 2 | 9% | 1 | 3% | Positive diagnostic |
| *Entolasia stricta* | 2 | 54% | 2 | 59% | Constant |
| *Epacris microphylla* | 2 | 40% | 2 | 9% | Positive diagnostic |
| *Epacris pulchella* | 2 | 36% | 2 | 15% | Positive diagnostic |
| *Eriostemon australasius* | 2 | 63% | 2 | 11% | Positive diagnostic |
| *Eucalyptus camfieldii* | 2 | 4% | 2 | 0% | Positive diagnostic |
| *Eucalyptus consideniana* | 2 | 7% | 1 | 0% | Positive diagnostic |
| *Eucalyptus haemastoma* | 2 | 40% | 2 | 11% | Positive diagnostic |
| *Eucalyptus luehmanniana* | 3 | 7% | 3 | 2% | Positive diagnostic |
| *Eucalyptus multicaulis* | 3 | 10% | 2 | 0% | Positive diagnostic |
| *Eucalyptus oblonga* | 2 | 33% | 2 | 6% | Positive diagnostic |
| *Eucalyptus piperita* | 2 | 12% | 3 | 20% | Uninformative |
| *Eucalyptus racemosa* | 3 | 31% | 2 | 2% | Positive diagnostic |
| *Eucalyptus sieberi* | 2 | 51% | 2 | 7% | Positive diagnostic |
| *Euryomyrtus ramosissima* subsp. *ramosissima* | 2 | 14% | 2 | 2% | Positive diagnostic |
| *Gompholobium glabratum* | 2 | 16% | 1 | 4% | Positive diagnostic |
| *Gompholobium grandiflorum* | 2 | 44% | 1 | 7% | Positive diagnostic |
| *Gompholobium minus* | 2 | 13% | 2 | 3% | Positive diagnostic |
| *Gompholobium virgatum* | 2 | 5% | 2 | 0% | Positive diagnostic |
| *Gonocarpus tetragynus* | 2 | 16% | 2 | 8% | Uninformative |
| *Gonocarpus teucrioides* | 1 | 14% | 2 | 24% | Uninformative |
| *Grevillea buxifolia* | 2 | 37% | 2 | 13% | Positive diagnostic |
| *Grevillea capitellata* | 2 | 6% | 2 | 1% | Positive diagnostic |
| *Grevillea diffusa* | 2 | 33% | 2 | 5% | Positive diagnostic |
| *Grevillea oleoides* | 2 | 37% | 2 | 5% | Positive diagnostic |
| *Grevillea sericea* | 2 | 26% | 2 | 15% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| Grevillea sphacelata | 2 | 46% | 2 | 5% | Positive diagnostic |
| Haemodorum corymbosum | 1 | 7% | 1 | 2% | Positive diagnostic |
| Hakea dactyloides | 2 | 79% | 2 | 21% | Positive diagnostic |
| Hakea gibbosa | 2 | 27% | 2 | 6% | Positive diagnostic |
| Hakea propinqua | 2 | 14% | 1 | 2% | Positive diagnostic |
| Hakea sericea | 2 | 39% | 2 | 20% | Positive diagnostic |
| Hakea teretifolia | 2 | 46% | 2 | 15% | Positive diagnostic |
| Hemigenia purpurea | 1 | 11% | 2 | 4% | Positive diagnostic |
| Hibbertia linearis | 2 | 20% | 1 | 6% | Positive diagnostic |
| Hibbertia nitida | 1 | 11% | 1 | 2% | Positive diagnostic |
| Hibbertia riparia | 2 | 21% | 2 | 3% | Positive diagnostic |
| Hovea linearis | 1 | 21% | 1 | 10% | Positive diagnostic |
| Hybanthus monopetalus | 1 | 8% | 1 | 2% | Positive diagnostic |
| Hypolaena fastigiata | 2 | 9% | 2 | 2% | Positive diagnostic |
| Isopogon anemonifolius | 2 | 82% | 2 | 15% | Positive diagnostic |
| Isopogon anethifolius | 2 | 15% | 2 | 5% | Positive diagnostic |
| Lambertia formosa | 2 | 87% | 2 | 23% | Positive diagnostic |
| Lasiopetalum rufum | 1 | 5% | 1 | 1% | Positive diagnostic |
| Lepidosperma filiforme | 2 | 15% | 2 | 8% | Uninformative |
| Lepidosperma laterale | 2 | 51% | 2 | 42% | Constant |
| Leptomeria acida | 1 | 20% | 1 | 5% | Positive diagnostic |
| Leptospermum arachnoides | 2 | 33% | 2 | 7% | Positive diagnostic |
| Leptospermum polygalifolium | 2 | 21% | 2 | 14% | Uninformative |
| Leptospermum squarrosum | 2 | 14% | 2 | 7% | Uninformative |
| Leptospermum trinervium | 2 | 91% | 2 | 35% | Positive diagnostic |
| Lepyrodia scariosa | 2 | 45% | 2 | 19% | Positive diagnostic |
| Leucopogon ericoides | 1 | 13% | 1 | 8% | Uninformative |
| Leucopogon esquamatus | 2 | 13% | 2 | 4% | Positive diagnostic |
| Leucopogon microphyllus | 2 | 45% | 2 | 12% | Positive diagnostic |
| Lindsaea linearis | 2 | 38% | 2 | 15% | Positive diagnostic |
| Lissanthe strigosa | 1 | 29% | 2 | 7% | Positive diagnostic |
| Lomandra cylindrica | 2 | 24% | 2 | 10% | Positive diagnostic |
| Lomandra filiformis | 2 | 46% | 2 | 21% | Positive diagnostic |
| Lomandra glauca | 2 | 56% | 2 | 14% | Positive diagnostic |
| Lomandra multiflora subsp. multiflora | 1 | 27% | 2 | 24% | Uninformative |
| Lomandra obliqua | 2 | 56% | 2 | 31% | Positive diagnostic |
| Lomatia silaifolia | 1 | 65% | 1 | 25% | Positive diagnostic |
| Melaleuca deanei | 2 | 5% | 1 | 1% | Positive diagnostic |
| Micrantheum ericoides | 1 | 20% | 2 | 17% | Uninformative |
| Mirbelia speciosa | 2 | 12% | 1 | 1% | Positive diagnostic |
| Mitrasacme polymorpha | 1 | 18% | 2 | 5% | Positive diagnostic |
| Monotoca scoparia | 2 | 58% | 1 | 14% | Positive diagnostic |
| Olax stricta | 1 | 7% | 1 | 1% | Positive diagnostic |
| Patersonia glabrata | 2 | 35% | 2 | 15% | Positive diagnostic |
| Patersonia sericea | 2 | 41% | 1 | 14% | Positive diagnostic |
| Persoonia lanceolata | 1 | 30% | 1 | 10% | Positive diagnostic |
| Persoonia levis | 1 | 83% | 1 | 31% | Positive diagnostic |
| Persoonia pinifolia | 2 | 64% | 1 | 19% | Positive diagnostic |
| Petrophile pulchella | 2 | 65% | 2 | 14% | Positive diagnostic |
| Petrophile sessilis | 2 | 19% | 2 | 6% | Positive diagnostic |
| Phyllanthus hirtellus | 1 | 35% | 2 | 27% | Uninformative |
| Phyllota phylicoides | 2 | 34% | 2 | 12% | Positive diagnostic |
| Pimelea linifolia | 2 | 47% | 2 | 26% | Positive diagnostic |
| Platysace ericoides | 2 | 19% | 2 | 5% | Positive diagnostic |
| Platysace lanceolata | 1 | 12% | 2 | 8% | Uninformative |
| Platysace linearifolia | 2 | 87% | 2 | 27% | Positive diagnostic |
| Poranthera corymbosa | 1 | 6% | 1 | 0% | Positive diagnostic |
| Ptilothrix deusta | 2 | 12% | 2 | 5% | Uninformative |
| Pultenaea stipularis | 2 | 30% | 2 | 7% | Positive diagnostic |
| Pultenaea tuberculata | 2 | 59% | 2 | 14% | Positive diagnostic |
| Ricinocarpos pinifolius | 1 | 19% | 1 | 7% | Positive diagnostic |
| Scaevola ramosissima | 1 | 17% | 1 | 5% | Positive diagnostic |
| Schizaea bifida | 1 | 15% | 1 | 3% | Positive diagnostic |
| Schoenus ericetorum | 2 | 30% | 2 | 5% | Positive diagnostic |
| Schoenus turbinatus | 1 | 9% | 1 | 0% | Positive diagnostic |
| Smilax glyciphylla | 1 | 16% | 2 | 34% | Uninformative |
| Sphaerolobium vimineum | 1 | 4% | 2 | 0% | Positive diagnostic |
| Stylidium graminifolium | 2 | 16% | 1 | 5% | Positive diagnostic |
| Stylidium lineare | 2 | 35% | 2 | 4% | Positive diagnostic |
| Styphelia tubiflora | 2 | 17% | 1 | 4% | Positive diagnostic |
| Telopea speciosissima | 1 | 13% | 1 | 3% | Positive diagnostic |
| Tetratheca ericifolia | 2 | 12% | 2 | 3% | Positive diagnostic |
| Tetratheca neglecta | 2 | 41% | 2 | 3% | Positive diagnostic |
| Tricostularia pauciflora | 1 | 11% | 1 | 1% | Positive diagnostic |
| Woollsia pungens | 2 | 35% | 2 | 11% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Xanthorrhoea arborea* | 2 | 11% | 2 | 12% | Uninformative |
| *Xanthorrhoea concava* | 2 | 10% | 2 | 7% | Uninformative |
| *Xanthorrhoea media* | 2 | 65% | 2 | 17% | Positive diagnostic |
| *Xanthorrhoea minor* subsp. *minor* | 2 | 7% | 1 | 1% | Positive diagnostic |
| *Xanthorrhoea resinosa* | 2 | 24% | 2 | 10% | Positive diagnostic |
| *Xanthosia pilosa* | 2 | 26% | 2 | 20% | Uninformative |
| *Xanthosia tridentata* | 2 | 44% | 2 | 20% | Positive diagnostic |
| *Xylomelum pyriforme* | 1 | 15% | 1 | 6% | Positive diagnostic |
| *Xyris gracilis* | 1 | 21% | 2 | 2% | Positive diagnostic |

# COASTAL SANDSTONE FORESHORES FOREST

<div style="text-align:right">

## S_DSF06

</div>

**Statewide Class**
NSW Plant Community Type:
Biometric Number(s):

Sydney Coastal Dry Sclerophyll Forests
1778
ME65



## Description

Coastal Sandstone Foreshores Forest is found on sheltered sandstone slopes along the foreshores of Sydney's major waterways and coastal escarpments. It is an open forest with a moist shrub layer and a ground cover of ferns, rushes and grasses. The flora of this community has a maritime influence given its exposure to prevailing sea breezes. The canopy can be dominated by pure stands of smooth-barked apple (*Angophora costata)*, though more regularly this is found in combination with other tree species. Localised patches of bangalay (*Eucalyptus botryoides*) and coast banksia (*Banksia integrifolia*) occur closest to the coast, whereas Sydney peppermint (*Eucalyptus piperita*) and blackbutt (*Eucalyptus pilularis*) prefer more protected locations and in the case of the latter some minor shale enrichment in the soil. A prominent layer of hardy mesic small trees and shrubs is present. These include sweet pittosporum (*Pittosporum undulatum*), cheese tree (*Glochidion ferdinandi*) and blueberry ash (*Elaeocarpus reticulatus*). In the suburban environment the proliferation of these species in the understorey at long unburnt sites has generated considerable debate, particularly as there appears to be strong correlation between time since fire and their density (Rose and Fairweather 1997). It is also appears that these species are more common in these littoral zones than in other sheltered sandstone forests situated further away from the coast.

This forest is restricted to sandstone soils derived from either Hawkesbury or Narrabeen geology. The distribution is coastal and requires a combination of low elevation (between two and 45 metres above sea level) and mean annual rainfall that exceeds 1100 millimetres per annum. It is noticeable that most sites are exposed to salt-laden winds. Samples are situated up to 10 kilometres from the coastline, but still in close proximity to major waterways.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 18 m ±7<br>6-28 | 30% ±14<br>8-55 | *Angophora costata, Banksia integrifolia, Eucalyptus piperita, Eucalyptus botryoides, Eucalyptus pilularis* |
| Small Trees | 6 m ±4<br>1-15 | 24% ±17<br>1-55 | *Glochidion ferdinandi, Pittosporum undulatum, Allocasuarina littoralis, Breynia oblongifolia, Notelaea longifolia, Dodonaea triquetra, Elaeocarpus reticulatus, Polyscias sambucifolia, Acacia longifolia, Myrsine variabilis* |
| Ground Covers | 1.1 m ±0.5<br>0.2-2.0 | 27% ±21<br>5-80 | *Dianella caerulea, Pteridium esculentum, Lomandra longifolia, Entolasia stricta, Imperata cylindrica* var. *major, Microlaena stipoides* var. *stipoides, Poa affinis, Themeda australis, Xanthorrhoea arborea, Lepidosperma laterale, Pratia purpurascens* |
| Vines & Climbers | N/A | N/A | *Smilax glyciphylla, Billardiera scandens, Pandorea pandorana, Glycine clandestina* |

*Compiled from 17 sites with structural data recorded.

## Threats

Clearing for urban development has occurred across the range of the community. Weed infestation is widespread in stands close to urban margins. Fire is likely to have been excluded for long periods of time and many stands are isolated within dense urban landuses. The absence of fire may be preferentially encouraging some mesic woody species over pyrophytic species. Many stands, given there proximity to water views, experience very high recreational pressures. Dieback arising from *Phytophora* is severely affecting stands in the Sydney Harbour area.

## Conservation Status

This vegetation community is represented in Sydney Harbour NP, Royal NP and Lane Cove NP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 164 +0.9 hectares<br>25% of extant area | Not available |
| Total reserved | 403 +7.7 hectares<br>62% of extant area | Not available |
| Total non-reserved | 245 +54.4 hectares | Not available |
| Total extant | 648 hectares | Not available |



Map unit
Study area
Extant vegetation
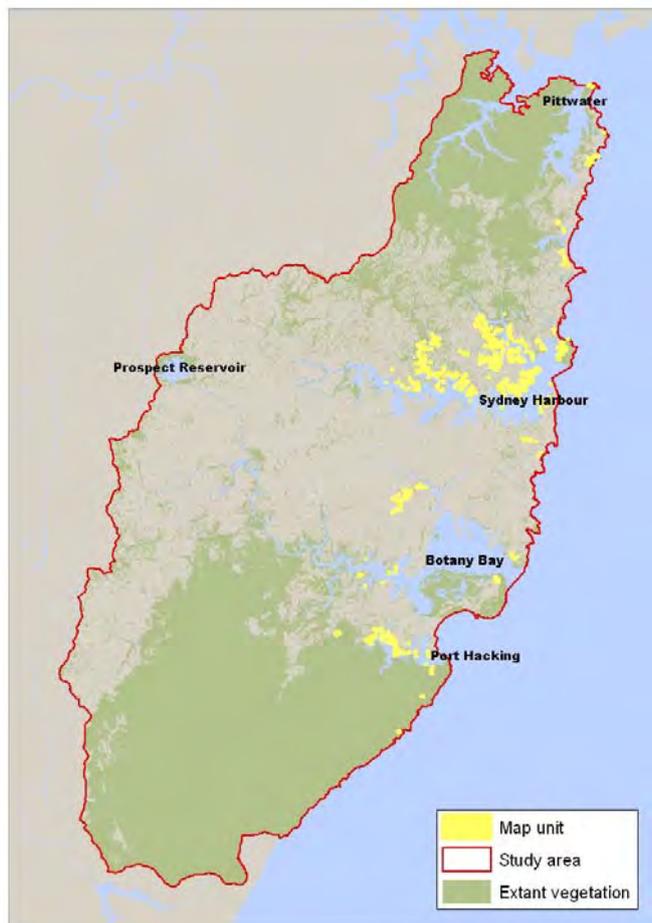
## Example Locations

o   Ridgetops of Jamieson Park, Warringah LGA

o   South-facing slopes North Head, Sydney Harbour NP

o   Hacking River foreshores, Lilli Pilli, Sutherland LGA

## Species Richness

| Number of sites | 69 |
|---|---|
| Total native species | 303 |
| Average no. native species per site | 35.4 ±9.2 |

## Variations and Dynamics

Forest height varies depending on exposure to coastal winds and disturbance history. On some coastal foreshores the combination of exposure and disturbance produces a low scrub with scattered eucalypts. Sites with greater shelter are taller and marked by a mesic shrub layer.

## Relationship to Other Communities

Floristically the community is closely related to the taller wet sclerophyll forests (S_WSF02) found in nearby enriched sandstone gullies of the coast and hinterland. It also shares species with littoral rainforest (S_RF07) into which it grades in much protected harbourside escarpment gullies. Typically, as distance from the coast increases the forest grades into less mesic, enriched sandstone forest (S_DSF04).

## Accuracy

Sampling density is high. Map unit boundaries were based on the interpretation of sheltered forests on sandstone comprising a semi-mesic understorey. Mapped area may include some stands better describing S_DSF04.

A 0.04 hectare site located in this map unit is expected to contain at least 14 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 28 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia implexa* | 1 | 10% | 1 | 4% | Uninformative |
| *Acacia linifolia* | 1 | 20% | 2 | 20% | Uninformative |
| *Acacia longifolia* | 1 | 38% | 2 | 21% | Positive diagnostic |
| *Acacia suaveolens* | 1 | 33% | 1 | 28% | Uninformative |
| *Acacia terminalis* | 1 | 25% | 2 | 20% | Uninformative |
| *Acacia ulicifolia* | 1 | 28% | 1 | 25% | Uninformative |
| *Allocasuarina littoralis* | 1 | 45% | 2 | 26% | Positive diagnostic |
| *Angophora costata* | 3 | 77% | 2 | 36% | Positive diagnostic |
| *Banksia integrifolia* | 1 | 42% | 2 | 8% | Positive diagnostic |
| *Billardiera scandens* | 1 | 51% | 1 | 36% | Constant |
| *Breynia oblongifolia* | 1 | 59% | 1 | 15% | Positive diagnostic |
| *Callicoma serratifolia* | 1 | 10% | 2 | 5% | Uninformative |
| *Calochlaena dubia* | 2 | 33% | 2 | 16% | Positive diagnostic |
| *Cassytha pubescens* | 1 | 35% | 2 | 27% | Uninformative |
| *Ceratopetalum gummiferum* | 2 | 13% | 2 | 18% | Uninformative |
| *Cissus hypoglauca* | 1 | 16% | 2 | 8% | Uninformative |
| *Commelina cyanea* | 1 | 39% | 2 | 8% | Positive diagnostic |
| *Dianella caerulea* | 2 | 94% | 2 | 43% | Positive diagnostic |
| *Dianella revoluta* | 1 | 35% | 2 | 16% | Positive diagnostic |
| *Digitaria didactyla* | 2 | 12% | 2 | 0% | Positive diagnostic |
| *Digitaria parviflora* | 1 | 13% | 2 | 5% | Uninformative |
| *Dillwynia retorta* | 1 | 10% | 2 | 26% | Uninformative |
| *Dodonaea triquetra* | 1 | 68% | 2 | 21% | Positive diagnostic |
| *Elaeocarpus reticulatus* | 2 | 74% | 1 | 19% | Positive diagnostic |
| *Entolasia marginata* | 1 | 46% | 2 | 22% | Positive diagnostic |
| *Entolasia stricta* | 2 | 87% | 2 | 58% | Positive diagnostic |
| *Epacris longiflora* | 2 | 16% | 2 | 8% | Uninformative |
| *Eragrostis brownii* | 1 | 10% | 2 | 7% | Uninformative |
| *Eucalyptus botryoides* | 4 | 10% | 3 | 5% | Uninformative |
| *Eucalyptus pilularis* | 4 | 22% | 3 | 13% | Uninformative |
| *Eucalyptus piperita* | 3 | 16% | 3 | 20% | Uninformative |
| *Eucalyptus resinifera* subsp. *resinifera* | 3 | 16% | 1 | 5% | Positive diagnostic |
| *Eustrephus latifolius* | 1 | 45% | 2 | 14% | Positive diagnostic |
| *Ficus rubiginosa* | 1 | 41% | 1 | 3% | Positive diagnostic |
| *Gahnia clarkei* | 2 | 10% | 2 | 3% | Uninformative |
| *Geitonoplesium cymosum* | 1 | 19% | 2 | 9% | Uninformative |
| *Glochidion ferdinandi* | 2 | 87% | 1 | 11% | Positive diagnostic |
| *Glycine clandestina* | 1 | 14% | 2 | 18% | Uninformative |
| *Gonocarpus teucrioides* | 1 | 16% | 2 | 24% | Uninformative |
| *Grevillea linearifolia* | 1 | 32% | 2 | 6% | Positive diagnostic |
| *Hakea dactyloides* | 1 | 14% | 2 | 24% | Uninformative |
| *Hardenbergia violacea* | 1 | 13% | 1 | 16% | Uninformative |
| *Hibbertia dentata* | 1 | 32% | 2 | 7% | Positive diagnostic |
| *Hypolepis muelleri* | 2 | 12% | 2 | 5% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 33% | 2 | 20% | Uninformative |
| *Kennedia rubicunda* | 1 | 22% | 1 | 9% | Positive diagnostic |
| *Kunzea ambigua* | 2 | 36% | 2 | 14% | Positive diagnostic |
| *Leucopogon juniperinus* | 1 | 19% | 2 | 10% | Uninformative |
| *Livistona australis* | 1 | 13% | 2 | 10% | Uninformative |
| *Lomandra filiformis* | 1 | 14% | 2 | 23% | Uninformative |
| *Lomandra gracilis* | 1 | 13% | 2 | 10% | Uninformative |
| *Lomandra longifolia* | 2 | 94% | 2 | 45% | Positive diagnostic |
| *Lomandra obliqua* | 1 | 14% | 2 | 33% | Uninformative |
| *Lomatia silaifolia* | 1 | 20% | 1 | 28% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 67% | 2 | 35% | Positive diagnostic |
| *Monotoca elliptica* | 2 | 28% | 1 | 6% | Positive diagnostic |
| *Myrsine variabilis* | 1 | 16% | 1 | 8% | Uninformative |
| *Notelaea longifolia* | 2 | 64% | 1 | 20% | Positive diagnostic |
| *Omalanthus nutans* | 1 | 51% | 1 | 8% | Positive diagnostic |
| *Opercularia aspera* | 1 | 12% | 1 | 8% | Uninformative |
| *Oplismenus aemulus* | 1 | 45% | 2 | 9% | Positive diagnostic |
| *Oplismenus imbecillis* | 1 | 23% | 2 | 12% | Uninformative |
| *Ozothamnus diosmifolius* | 1 | 12% | 1 | 12% | Uninformative |
| *Pandorea pandorana* | 2 | 70% | 2 | 15% | Positive diagnostic |
| *Paspalidium distans* | 1 | 19% | 2 | 7% | Positive diagnostic |
| *Persoonia linearis* | 1 | 17% | 1 | 20% | Uninformative |
| *Phyllanthus hirtellus* | 1 | 14% | 2 | 28% | Uninformative |
| *Pittosporum revolutum* | 1 | 39% | 1 | 8% | Positive diagnostic |
| *Pittosporum undulatum* | 2 | 87% | 2 | 23% | Positive diagnostic |
| *Platylobium formosum* | 1 | 22% | 2 | 8% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Platysace lanceolata* | 1 | 28% | 2 | 8% | Positive diagnostic |
| *Poa affinis* | 2 | 43% | 2 | 10% | Positive diagnostic |
| *Polyscias sambucifolia* | 1 | 61% | 1 | 13% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 20% | 2 | 18% | Uninformative |
| *Pseuderanthemum variabile* | 2 | 12% | 2 | 13% | Uninformative |
| *Pteridium esculentum* | 2 | 77% | 2 | 39% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 81% | 2 | 31% | Positive diagnostic |
| *Syncarpia glomulifera* | 3 | 12% | 3 | 13% | Uninformative |
| *Themeda australis* | 1 | 29% | 2 | 23% | Uninformative |
| *Xanthorrhoea arborea* | 1 | 19% | 2 | 11% | Uninformative |
| *Xanthosia pilosa* | 1 | 16% | 2 | 21% | Uninformative |
| *Xanthosia tridentata* | 1 | 10% | 2 | 22% | Uninformative |
| *Zieria pilosa* | 1 | 13% | 2 | 6% | Uninformative |
| *Zieria smithii* | 1 | 23% | 1 | 5% | Positive diagnostic |

# COASTAL SANDSTONE RIPARIAN FOREST <span style="float:right">S_DSF08</span>

**Statewide Class** — Sydney Coastal Dry Sclerophyll Forests
NSW Plant Community Type: 1292: Water Gum-Coachwood Riparian Scrub Along Sandstone Streams, Sydney Basin
Biometric Number(s): HN607; ME035; SR660



## Description

Narrow sandstone gorges and minor creek lines of the sandstone plateaus carry a sandstone gully forest containing a suite of riparian and rainforest species. Often only narrow in width, this forest is dominated by smooth-barked apple (*Angophora costata*) and Sydney peppermint (*Eucalyptus piperita*). The small tree layer tends to feature a mix of species common to riparian scrubs and hardy rainforest communities. This includes low-growing coachwood (*Ceratopetalum apetalum*), water gum (*Tristaniopsis laurina*) and tea-tree (*Leptospermum* spp.). Also present is river lomatia (*Lomatia myricoides*). The ground is invariably rocky and covered in small-leaved ferns such as umbrella fern (*Sticherus flabellatus*) and coral fern (*Gleichenia* spp.).

This forest is widespread along the gully lines of the major sandstone plateaus, although very restricted in extent. Often this community forms a mosaic with other riparian vegetation (S_RF02 and S_DSF09). It extends across other sandstone plateaus north of the Hawkesbury River.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 19 m ±9 <br> 12-25 | 23% ±25 <br> 5-40 | *Angophora costata, Eucalyptus piperita* |
| Small Trees | 8 m ±1 <br> 7-8 | 35% ±35 <br> 10-60 | *Ceratopetalum apetalum, Acacia terminalis, Ceratopetalum gummiferum, Elaeocarpus reticulatus, Leptospermum polygalifolium, Callicoma serratifolia, Tristaniopsis laurina* |
| Shrubs | 4.0 m <br> (one record only) | 10% <br> (one record only) | *Epacris longiflora*, subsp. *polygalifolium, Dodonaea triquetra, Grevillea mucronulata, Banksia ericifolia* subsp. *ericifolia, Logania albiflora, Notelaea longifolia, Acacia obtusifolia, Leucopogon lanceolatus, Lomatia myricoides, Persoonia pinifolia, Podocarpus spinulosus* |
| Ground Covers | 1.8 m ±1.0 <br> 1.0-3.0 | 10% ±5 <br> 5-15 | *Lomandra longifolia, Calochlaena dubia, Entolasia stricta, Sticherus flabellatus, Caustis flexuosa, Gleichenia dicarpa, Gonocarpus teucrioides, Opercularia aspera, Lepidosperma laterale, Schoenus melanostachys, Bauera rubioides, Gahnia sieberiana, Gleichenia microphylla* |
| Vines & Climbers | N/A | N/A | *Smilax glyciphylla, Billardiera scandens, Cassytha pubescens* |

*Compiled from 2 sites with structural data recorded.

## Threats

Clearing is likely to have had limited affect on the distribution of this community because of the infertile soils and precipitous nature of the habitat. Current threats are likely to arise from local weed invasion from upstream developments and frequent fire.

## Conservation Status

This vegetation community is represented in Royal, Heathcote, Garawarra, Georges River, Garigal and Ku-ring-gai Chase national parks.

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | <3220 hectares |
| Estimated percentage cleared | Not available | <10% |
| Total NPWS reserves | 316 +<.1 hectares<br>58% of extant area | 1300 hectares<br>45% of extant area<br>30-50% of pre-clearing area |
| Total reserved | 359 +0 hectares<br>66% of extant area | Not available |
| Total non-reserved | 189 +<.1 hectares | Not available |
| Total extant | 548 hectares | 2900 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.
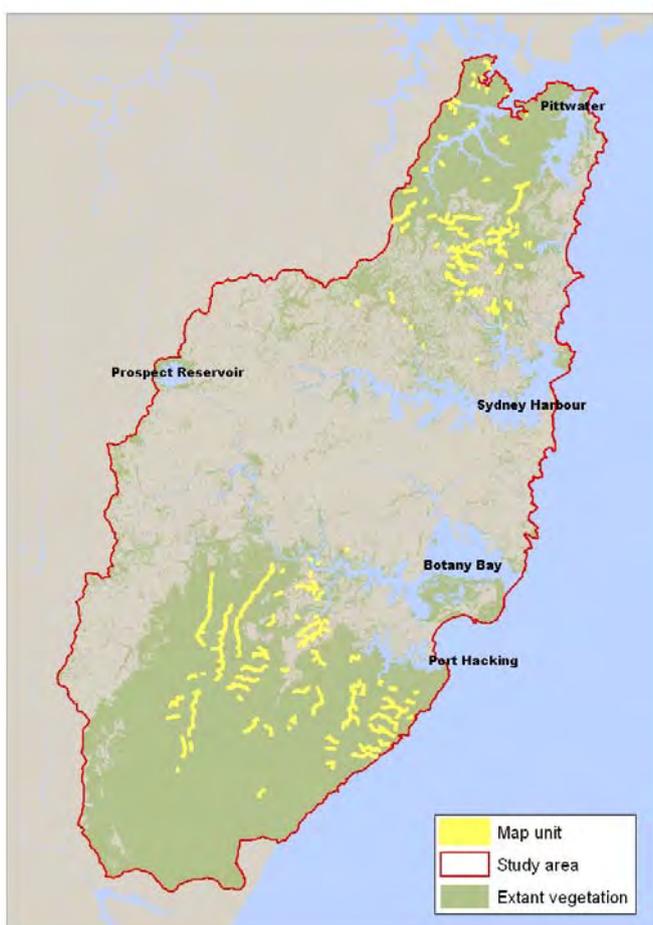


## Example Locations

o    Woronora River, Engadine, Sutherland LGA

## Species Richness

| Number of sites | 19 |
|---|---|
| Total native species | 243 |
| Average no. native species per site | 40.5 ±7.5 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

This community shares many species with other communities growing in riparian and creekline environments. These tend to be dominated by rainforest species (S_RF02) or are open low-growing scrubs (S_FoW20). The community grades into sheltered sandstone forests (S_DSF09) away from the riparian zone.

## Accuracy

Sampling intensity is moderate. Map unit boundaries are based on the interpretation of digital imagery to identify eucalypt-dominated vegetation that includes a mesic understorey within 50 metres of creeklines.

A 0.04 hectare site located in this map unit is expected to contain at least 10 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 32 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia elongata* | 2 | 11% | 2 | 1% | Uninformative |
| *Acacia linifolia* | 2 | 32% | 2 | 20% | Uninformative |
| *Acacia longifolia* | 2 | 21% | 2 | 21% | Uninformative |
| *Acacia obtusifolia* | 2 | 32% | 2 | 2% | Positive diagnostic |
| *Acacia suaveolens* | 1 | 21% | 1 | 28% | Uninformative |
| *Acacia terminalis* | 2 | 58% | 1 | 19% | Positive diagnostic |
| *Acacia ulicifolia* | 3 | 11% | 1 | 26% | Uninformative |
| *Acrotriche divaricata* | 2 | 11% | 1 | 2% | Uninformative |
| *Actinotus minor* | 2 | 16% | 2 | 22% | Uninformative |
| *Allocasuarina littoralis* | 2 | 37% | 2 | 27% | Constant |
| *Allocasuarina torulosa* | 3 | 11% | 2 | 10% | Uninformative |
| *Aotus ericoides* | 2 | 11% | 2 | 8% | Uninformative |
| *Astrotricha floccosa* | 2 | 16% | 2 | 2% | Uninformative |
| *Austromyrtus tenuifolia* | 3 | 26% | 1 | 1% | Positive diagnostic |
| *Baeckea linifolia* | 2 | 42% | 1 | 2% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 2 | 47% | 2 | 26% | Constant |
| *Banksia marginata* | 1 | 16% | 2 | 10% | Uninformative |
| *Banksia serrata* | 2 | 26% | 2 | 33% | Uninformative |
| *Bauera rubioides* | 2 | 47% | 2 | 6% | Positive diagnostic |
| *Billardiera scandens* | 1 | 37% | 1 | 37% | Constant |
| *Blechnum ambiguum* | 1 | 16% | 1 | 1% | Uninformative |
| *Blechnum cartilagineum* | 2 | 21% | 2 | 6% | Uninformative |
| *Blechnum nudum* | 2 | 11% | 1 | 0% | Uninformative |
| *Boronia fraseri* | 3 | 11% | 2 | 0% | Uninformative |
| *Callicoma serratifolia* | 2 | 68% | 2 | 5% | Positive diagnostic |
| *Callistemon citrinus* | 2 | 16% | 2 | 3% | Uninformative |
| *Calochlaena dubia* | 2 | 63% | 2 | 16% | Positive diagnostic |
| *Cassytha glabella* | 2 | 32% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 37% | 2 | 27% | Constant |
| *Casuarina glauca* | 2 | 11% | 2 | 7% | Uninformative |
| *Caustis flexuosa* | 2 | 37% | 2 | 17% | Constant |
| *Ceratopetalum apetalum* | 3 | 68% | 2 | 5% | Positive diagnostic |
| *Ceratopetalum gummiferum* | 1 | 53% | 2 | 17% | Positive diagnostic |
| *Dillwynia retorta* | 1 | 26% | 2 | 26% | Uninformative |
| *Dodonaea triquetra* | 2 | 58% | 2 | 23% | Positive diagnostic |
| *Doryanthes excelsa* | 1 | 16% | 2 | 9% | Uninformative |
| *Dracophyllum secundum* | 2 | 16% | 2 | 0% | Uninformative |
| *Drosera spatulata* | 2 | 11% | 2 | 3% | Uninformative |
| *Elaeocarpus reticulatus* | 2 | 53% | 1 | 20% | Positive diagnostic |
| *Empodisma minus* | 2 | 11% | 2 | 5% | Uninformative |
| *Entolasia marginata* | 2 | 11% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 74% | 2 | 59% | Constant |
| *Epacris longiflora* | 2 | 47% | 2 | 8% | Positive diagnostic |
| *Epacris microphylla* | 2 | 11% | 2 | 10% | Uninformative |
| *Epacris obtusifolia* | 3 | 11% | 2 | 2% | Uninformative |
| *Epacris pulchella* | 1 | 21% | 2 | 16% | Uninformative |
| *Eucalyptus agglomerata* | 3 | 11% | 2 | 1% | Uninformative |
| *Eucalyptus pilularis* | 1 | 11% | 3 | 14% | Uninformative |
| *Eucalyptus piperita* | 2 | 58% | 3 | 20% | Positive diagnostic |
| *Eucalyptus sieberi* | 2 | 11% | 2 | 9% | Uninformative |
| *Eucalyptus umbra* | 1 | 11% | 2 | 3% | Uninformative |
| *Ficus rubiginosa* | 1 | 11% | 1 | 4% | Uninformative |
| *Gahnia clarkei* | 2 | 16% | 2 | 4% | Uninformative |
| *Gahnia sieberiana* | 2 | 26% | 2 | 7% | Uninformative |
| *Gleichenia dicarpa* | 2 | 58% | 2 | 6% | Positive diagnostic |
| *Gleichenia microphylla* | 2 | 16% | 2 | 2% | Uninformative |
| *Gompholobium latifolium* | 1 | 11% | 1 | 4% | Uninformative |
| *Gonocarpus teucrioides* | 1 | 47% | 2 | 23% | Constant |
| *Grevillea diffusa* | 2 | 37% | 2 | 6% | Positive diagnostic |
| *Grevillea linearifolia* | 2 | 11% | 2 | 7% | Uninformative |
| *Grevillea mucronulata* | 2 | 32% | 2 | 6% | Positive diagnostic |
| *Grevillea sericea* | 2 | 16% | 2 | 15% | Uninformative |
| *Hakea dactyloides* | 2 | 16% | 2 | 24% | Uninformative |
| *Hakea sericea* | 1 | 16% | 2 | 21% | Uninformative |
| *Hibbertia bracteata* | 2 | 16% | 2 | 5% | Uninformative |
| *Hibbertia linearis* | 1 | 11% | 2 | 6% | Uninformative |
| *Hibbertia nitida* | 3 | 11% | 1 | 3% | Uninformative |
| *Hibbertia riparia* | 2 | 16% | 2 | 4% | Uninformative |
| *Histiopteris incisa* | 1 | 11% | 1 | 1% | Uninformative |
| *Isopogon anemonifolius* | 1 | 11% | 2 | 18% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lasiopetalum ferrugineum* | 1 | 26% | 2 | 11% | Uninformative |
| *Leionema dentatum* | 2 | 26% | 1 | 2% | Positive diagnostic |
| *Lepidosperma filiforme* | 2 | 16% | 2 | 8% | Uninformative |
| *Lepidosperma laterale* | 2 | 58% | 2 | 42% | Constant |
| *Leptospermum grandifolium* | 2 | 16% | 2 | 1% | Uninformative |
| *Leptospermum morrisonii* | 2 | 21% | 2 | 1% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 63% | 2 | 14% | Positive diagnostic |
| *Leptospermum squarrosum* | 2 | 21% | 2 | 8% | Uninformative |
| *Lepyrodia scariosa* | 1 | 16% | 2 | 21% | Uninformative |
| *Leucopogon amplexicaulis* | 2 | 16% | 2 | 3% | Uninformative |
| *Leucopogon lanceolatus* | 2 | 21% | 1 | 8% | Uninformative |
| *Lindsaea microphylla* | 1 | 26% | 1 | 8% | Uninformative |
| *Livistona australis* | 1 | 11% | 2 | 10% | Uninformative |
| *Logania albiflora* | 1 | 37% | 1 | 2% | Positive diagnostic |
| *Lomandra fluviatilis* | 2 | 21% | 2 | 1% | Positive diagnostic |
| *Lomandra longifolia* | 2 | 79% | 2 | 46% | Positive diagnostic |
| *Lomatia myricoides* | 3 | 63% | 2 | 3% | Positive diagnostic |
| *Lomatia silaifolia* | 2 | 11% | 1 | 27% | Uninformative |
| *Marsdenia suaveolens* | 1 | 21% | 1 | 3% | Positive diagnostic |
| *Monotoca scoparia* | 2 | 11% | 1 | 16% | Uninformative |
| *Notelaea longifolia* | 1 | 21% | 1 | 21% | Uninformative |
| *Opercularia aspera* | 1 | 37% | 1 | 8% | Positive diagnostic |
| *Pandorea pandorana* | 1 | 11% | 2 | 17% | Uninformative |
| *Patersonia glabrata* | 1 | 11% | 2 | 16% | Uninformative |
| *Persoonia levis* | 1 | 16% | 1 | 33% | Uninformative |
| *Persoonia linearis* | 1 | 21% | 1 | 20% | Uninformative |
| *Persoonia pinifolia* | 1 | 37% | 1 | 21% | Constant |
| *Petrophile pulchella* | 2 | 11% | 2 | 16% | Uninformative |
| *Phebalium squamulosum* | 2 | 11% | 2 | 3% | Uninformative |
| *Phyllota phylicoides* | 2 | 11% | 2 | 13% | Uninformative |
| *Platysace linearifolia* | 2 | 21% | 2 | 30% | Uninformative |
| *Poa affinis* | 2 | 11% | 2 | 11% | Uninformative |
| *Podocarpus spinulosus* | 2 | 16% | 2 | 2% | Uninformative |
| *Pomaderris ferruginea* | 1 | 11% | 1 | 2% | Uninformative |
| *Pomaderris intermedia* | 1 | 26% | 1 | 1% | Positive diagnostic |
| *Prostanthera linearis* | 2 | 21% | 2 | 1% | Positive diagnostic |
| *Pseudanthus pimeleoides* | 3 | 11% | 2 | 1% | Uninformative |
| *Pteridium esculentum* | 2 | 53% | 2 | 40% | Constant |
| *Pultenaea daphnoides* | 1 | 32% | 2 | 8% | Positive diagnostic |
| *Pultenaea flexilis* | 2 | 26% | 2 | 6% | Positive diagnostic |
| *Pultenaea stipularis* | 2 | 16% | 2 | 8% | Uninformative |
| *Schoenus brevifolius* | 2 | 16% | 2 | 4% | Uninformative |
| *Schoenus melanostachys* | 2 | 58% | 2 | 6% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 79% | 2 | 32% | Positive diagnostic |
| *Sporadanthus gracilis* | 2 | 11% | 2 | 0% | Uninformative |
| *Stenocarpus salignus* | 1 | 16% | 2 | 1% | Uninformative |
| *Sticherus flabellatus* var. *flabellatus* | 3 | 79% | 2 | 3% | Positive diagnostic |
| *Stylidium graminifolium* | 1 | 11% | 2 | 5% | Uninformative |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 11% | 2 | 5% | Uninformative |
| *Tetrarrhena juncea* | 2 | 11% | 2 | 4% | Uninformative |
| *Todea barbara* | 2 | 32% | 1 | 1% | Positive diagnostic |
| *Tristania neriifolia* | 2 | 37% | 2 | 1% | Positive diagnostic |
| *Tristaniopsis laurina* | 3 | 42% | 2 | 2% | Positive diagnostic |
| *Veronica plebeia* | 2 | 11% | 1 | 7% | Uninformative |
| *Viminaria juncea* | 3 | 11% | 2 | 2% | Uninformative |
| *Woollsia pungens* | 1 | 11% | 2 | 12% | Uninformative |
| *Xanthorrhoea arborea* | 2 | 26% | 2 | 11% | Uninformative |
| *Xanthorrhoea media* | 2 | 11% | 2 | 20% | Uninformative |
| *Xanthosia pilosa* | 1 | 21% | 2 | 21% | Uninformative |
| *Xanthosia tridentata* | 2 | 32% | 2 | 21% | Uninformative |

# COASTAL SANDSTONE GULLY FOREST                     S_DSF09

## Description

Coastal Sandstone Gully Forest is widely distributed along the eastern extent of the Sydney sandstone plateaus. It occupies sheltered aspects on infertile Hawkesbury sandstone in areas that receive more than 1000 millimetres of mean annual rainfall. Sydney peppermint (*Eucalyptus piperita*) and smooth-barked apple (*Angophora costata*) form a moderately tall open forest. These are rocky environments and the understorey is a diverse mix of heath and shrub species such as banksias, tea-trees and wattles. The taller NSW Christmas bush (*Ceratopetalum gummiferum*) is also commonly encountered and is conspicuous in early summer when it flowers profusely. South of Sydney the spectacular large red flower and luxuriant green leaves of the Gymea lily (*Doryanthes excelsa*) immediately catches the eye. They are found scattered across the forest floor amongst patches of ferns, grasses, sedges and rock outcrops. The Gymea lily however is uncommonly recorded in northern Sydney though it becomes more frequent again in this community north of the Hawkesbury River.

The community is found at elevations up to 500 metres above sea level.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 16 m ±6 <br> 6-25 | 30% ±14 <br> 5-65 | *Angophora costata, Corymbia gummifera, Eucalyptus piperita, Eucalyptus sieberi* |
| Small Trees | 8 m ±5 <br> 2-20 | 29% ±23 <br> 5-85 | *Banksia serrata, Ceratopetalum gummiferum* |
| Shrubs | 3.6 m ±1.7 <br> 1.0-8.0 | 30% ±18 <br> 5-70 | *Leptospermum trinervium, Persoonia levis, Banksia ericifolia* subsp. *ericifolia, Persoonia pinifolia, Dillwynia retorta, Platysace linearifolia, Acacia terminalis, Acacia suaveolens, Pimelea linifolia, Epacris longiflora, Lambertia formosa, Petrophile pulchella, Pultenaea stipularis, Woollsia pungens, Bossiaea heterophylla* |
| Ground Covers | 1.3 m ±0.7 <br> 0.4-3.0 | 22% ±16 <br> 3-65 | *Entolasia stricta, Lomandra longifolia, Caustis flexuosa, Gonocarpus teucrioides, Lomatia silaifolia, Pteridium esculentum, Xanthosia tridentata, Lepyrodia scariosa, Lomandra obliqua, Dianella caerulea, Lepidosperma laterale, Xanthosia pilosa, Doryanthes excelsa* |
| Vines & Climbers | N/A | N/A | *Smilax glyciphylla* |

*Compiled from 40 sites with structural data recorded.

## Threats

Clearing of this community has not been extensive because the community occurs on infertile sandy soils and steep rocky slopes which are unsuitable for both agriculture and urban development. However localised impacts occur where urban development abuts remnant sandstone gullies. Local weed invasion and frequent fire are the most common issues.

## Conservation Status

A large proportion of the extant area of this forest is protected in Garigal, Royal, Heathcote and Dharawal, Garigal and Ku-ring-gai Chase reserves.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 28,705-34,860 hectares |
| Estimated percentage cleared | Not available | 15-30% |
| Total NPWS reserves | 10,872 +11.2 hectares<br>61% of extant area | 7700 hectares<br>32% of extant area<br>15-35% of pre-clearing area |
| Total reserved | 14,488 +39.2 hectares<br>81% of extant area | Not available |
| Total non-reserved | 3432 +91.8 hectares | Not available |
| Total extant | 17,920 hectares | 24,400 hectares |
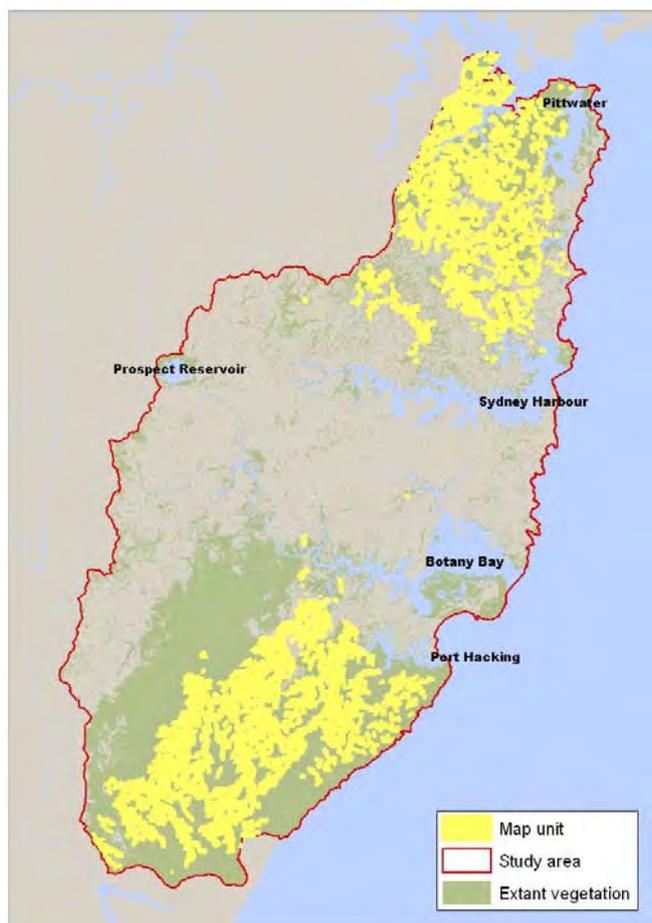


## Example Locations

o  Widespread in gullies of Royal NP (e.g. McKell Avenue, Waterfall)

o  Magazine Track and Two Creeks Track, Garigal NP

## Species Richness

| | |
|---|---|
| Number of sites | 181 |
| Total native species | 508 |
| Average no. native species per site | 54.4 ±11.1 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

Floristically this community shares many species with exposed forests and woodlands found on coastal sandstone plateaus (S_DSF11, S_DSF05). The statistical analysis of sample sites suggests greater floristic association with these assemblages than with other sheltered forests on enriched sandstones (S_DSF04, S_DSF17). Coastal Sandstone Gully Forest grades into drier heath communities with increasing exposure. It may also grade into one of several riparian communities (such as S_RF02, S_FoW20, S_DSF08) near creeklines. It is also known to grade into Southern Sydney Sheltered Forest (S_DSF13), a community listed under the TSC Act. It may be difficult to distinguish the two without careful attention to the species present at a given site. One of the more prominent features that separate the two is the presence of blackbutt (*Eucalyptus pilularis*) though this is not always the case. At times the two communities may have a similar visual appearance masking differences present in the shrub and ground layers.

## Accuracy

Sampling density is high. Mapped boundaries have been determined based on the rainfall and elevation parameters of site data, and the interpretation of image patterns that defines Sydney peppermint and smooth-barked apple-dominated forests on sheltered aspects on Hawkesbury sandstone. Map unit boundaries for the Woronora River and O'Hares Creek catchments were modified from NPWS (2003b).

A 0.04 hectare site located in this map unit is expected to contain at least 32 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 45 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia elongata* | 2 | 4% | 1 | 0% | Positive diagnostic |
| *Acacia linifolia* | 2 | 50% | 2 | 17% | Positive diagnostic |
| *Acacia longifolia* | 2 | 28% | 2 | 21% | Uninformative |
| *Acacia obtusifolia* | 2 | 8% | 2 | 1% | Positive diagnostic |
| *Acacia oxycedrus* | 2 | 3% | 1 | 1% | Positive diagnostic |
| *Acacia suaveolens* | 2 | 61% | 1 | 25% | Positive diagnostic |
| *Acacia terminalis* | 2 | 76% | 1 | 15% | Positive diagnostic |
| *Acacia ulicifolia* | 2 | 57% | 1 | 23% | Positive diagnostic |
| *Actinotus helianthi* | 2 | 16% | 1 | 7% | Positive diagnostic |
| *Actinotus minor* | 2 | 48% | 2 | 19% | Positive diagnostic |
| *Allocasuarina littoralis* | 2 | 41% | 2 | 26% | Positive diagnostic |
| *Amperea xiphoclada* | 1 | 25% | 1 | 4% | Positive diagnostic |
| *Angophora costata* | 3 | 90% | 2 | 32% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 22% | 2 | 14% | Uninformative |
| *Aotus ericoides* | 2 | 34% | 2 | 6% | Positive diagnostic |
| *Astrotricha longifolia* | 1 | 8% | 2 | 0% | Positive diagnostic |
| *Austrostipa pubescens* | 2 | 23% | 2 | 20% | Uninformative |
| *Baeckea linifolia* | 2 | 14% | 1 | 1% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 2 | 56% | 2 | 23% | Positive diagnostic |
| *Banksia marginata* | 2 | 18% | 2 | 9% | Positive diagnostic |
| *Banksia oblongifolia* | 1 | 17% | 2 | 14% | Uninformative |
| *Banksia serrata* | 2 | 88% | 2 | 28% | Positive diagnostic |
| *Banksia spinulosa* | 2 | 52% | 2 | 24% | Positive diagnostic |
| *Bauera rubioides* | 2 | 29% | 2 | 4% | Positive diagnostic |
| *Billardiera scandens* | 1 | 52% | 1 | 35% | Positive diagnostic |
| *Boronia ledifolia* | 2 | 34% | 2 | 11% | Positive diagnostic |
| *Boronia pinnata* | 1 | 11% | 1 | 5% | Positive diagnostic |
| *Bossiaea heterophylla* | 2 | 48% | 2 | 15% | Positive diagnostic |
| *Bossiaea scolopendria* | 2 | 11% | 2 | 7% | Uninformative |
| *Bossiaea stephensonii* | 2 | 6% | 2 | 2% | Positive diagnostic |
| *Callicoma serratifolia* | 2 | 15% | 2 | 4% | Positive diagnostic |
| *Calochlaena dubia* | 2 | 24% | 2 | 16% | Uninformative |
| *Cassytha glabella* | 2 | 25% | 2 | 14% | Positive diagnostic |
| *Cassytha pubescens* | 2 | 41% | 2 | 26% | Positive diagnostic |
| *Caustis flexuosa* | 2 | 64% | 2 | 13% | Positive diagnostic |
| *Ceratopetalum gummiferum* | 2 | 69% | 2 | 13% | Positive diagnostic |
| *Chloanthes stoechadis* | 1 | 4% | 2 | 0% | Positive diagnostic |
| *Corymbia gummifera* | 2 | 72% | 2 | 38% | Positive diagnostic |
| *Crowea saligna* | 2 | 15% | 2 | 2% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 19% | 2 | 27% | Uninformative |
| *Dampiera purpurea* | 1 | 11% | 1 | 4% | Positive diagnostic |
| *Dampiera stricta* | 2 | 37% | 2 | 22% | Positive diagnostic |
| *Darwinia procera* | 2 | 3% | 1 | 0% | Positive diagnostic |
| *Dianella caerulea* | 2 | 69% | 2 | 43% | Positive diagnostic |
| *Dianella prunina* | 1 | 12% | 1 | 3% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 70% | 2 | 22% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 53% | 2 | 20% | Positive diagnostic |
| *Doryanthes excelsa* | 2 | 36% | 2 | 7% | Positive diagnostic |
| *Dracophyllum secundum* | 2 | 4% | 2 | 0% | Positive diagnostic |
| *Drosera binata* | 1 | 3% | 2 | 1% | Positive diagnostic |
| *Drosera spatulata* | 2 | 8% | 2 | 3% | Positive diagnostic |
| *Elaeocarpus reticulatus* | 1 | 36% | 1 | 19% | Positive diagnostic |
| *Empodisma minus* | 2 | 17% | 2 | 4% | Positive diagnostic |
| *Entolasia marginata* | 2 | 21% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 77% | 2 | 57% | Positive diagnostic |
| *Epacris longiflora* | 2 | 41% | 2 | 5% | Positive diagnostic |
| *Epacris microphylla* | 2 | 15% | 2 | 10% | Uninformative |
| *Epacris pulchella* | 2 | 29% | 2 | 14% | Positive diagnostic |
| *Eriostemon australasius* | 2 | 11% | 2 | 14% | Uninformative |
| *Eucalyptus piperita* | 3 | 78% | 2 | 15% | Positive diagnostic |
| *Eucalyptus sieberi* | 2 | 28% | 2 | 7% | Positive diagnostic |
| *Gahnia erythrocarpa* | 2 | 8% | 1 | 1% | Positive diagnostic |
| *Gahnia sieberiana* | 2 | 24% | 2 | 6% | Positive diagnostic |
| *Gleichenia dicarpa* | 2 | 30% | 2 | 5% | Positive diagnostic |
| *Gleichenia microphylla* | 2 | 7% | 2 | 1% | Positive diagnostic |
| *Gleichenia rupestris* | 2 | 4% | 2 | 1% | Positive diagnostic |
| *Gompholobium latifolium* | 2 | 17% | 1 | 3% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 62% | 2 | 20% | Positive diagnostic |
| *Grevillea buxifolia* | 2 | 36% | 2 | 12% | Positive diagnostic |
| *Grevillea capitellata* | 2 | 6% | 2 | 0% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Grevillea diffusa* | 2 | 19% | 2 | 6% | Positive diagnostic |
| *Grevillea linearifolia* | 2 | 28% | 2 | 5% | Positive diagnostic |
| *Grevillea longifolia* | 3 | 3% | 1 | 0% | Positive diagnostic |
| *Grevillea mucronulata* | 2 | 13% | 2 | 6% | Positive diagnostic |
| *Grevillea sericea* | 1 | 20% | 2 | 15% | Uninformative |
| *Hakea dactyloides* | 2 | 37% | 2 | 23% | Positive diagnostic |
| *Hakea gibbosa* | 2 | 16% | 2 | 6% | Positive diagnostic |
| *Hakea salicifolia* | 2 | 9% | 2 | 2% | Positive diagnostic |
| *Hakea sericea* | 1 | 33% | 2 | 20% | Positive diagnostic |
| *Hakea teretifolia* | 2 | 29% | 2 | 15% | Positive diagnostic |
| *Hardenbergia violacea* | 1 | 19% | 1 | 16% | Uninformative |
| *Hibbertia bracteata* | 2 | 12% | 2 | 5% | Positive diagnostic |
| *Hibbertia linearis* | 1 | 22% | 2 | 5% | Positive diagnostic |
| *Hibbertia monogyna* | 2 | 9% | 1 | 1% | Positive diagnostic |
| *Hibbertia nitida* | 1 | 14% | 1 | 2% | Positive diagnostic |
| *Hibbertia sp. aff. riparia* | 1 | 6% | 1 | 1% | Positive diagnostic |
| *Isopogon anemonifolius* | 2 | 16% | 2 | 18% | Uninformative |
| *Lambertia formosa* | 1 | 44% | 2 | 25% | Positive diagnostic |
| *Lasiopetalum ferrugineum* | 2 | 30% | 2 | 10% | Positive diagnostic |
| *Leionema dentatum* | 2 | 9% | 1 | 2% | Positive diagnostic |
| *Lepidosperma filiforme* | 2 | 21% | 2 | 7% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 51% | 2 | 41% | Constant |
| *Leptomeria acida* | 1 | 22% | 1 | 5% | Positive diagnostic |
| *Leptospermum grandifolium* | 2 | 6% | 2 | 0% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 46% | 2 | 11% | Positive diagnostic |
| *Leptospermum squarrosum* | 2 | 20% | 2 | 7% | Positive diagnostic |
| *Leptospermum trinervium* | 2 | 71% | 2 | 34% | Positive diagnostic |
| *Lepyrodia scariosa* | 2 | 39% | 2 | 19% | Positive diagnostic |
| *Leucopogon amplexicaulis* | 2 | 26% | 2 | 1% | Positive diagnostic |
| *Leucopogon ericoides* | 1 | 27% | 1 | 7% | Positive diagnostic |
| *Leucopogon lanceolatus* | 1 | 11% | 1 | 8% | Uninformative |
| *Leucopogon microphyllus* | 2 | 13% | 2 | 13% | Uninformative |
| *Leucopogon setiger* | 1 | 7% | 1 | 0% | Positive diagnostic |
| *Lindsaea linearis* | 2 | 20% | 2 | 16% | Uninformative |
| *Lindsaea microphylla* | 1 | 23% | 1 | 7% | Positive diagnostic |
| *Logania albiflora* | 1 | 12% | 1 | 2% | Positive diagnostic |
| *Lomandra cylindrica* | 2 | 16% | 2 | 10% | Uninformative |
| *Lomandra filiformis* | 2 | 24% | 2 | 22% | Uninformative |
| *Lomandra glauca* | 2 | 15% | 2 | 16% | Uninformative |
| *Lomandra gracilis* | 2 | 18% | 2 | 9% | Positive diagnostic |
| *Lomandra longifolia* | 2 | 83% | 2 | 43% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 22% | 2 | 24% | Uninformative |
| *Lomandra obliqua* | 2 | 50% | 2 | 31% | Positive diagnostic |
| *Lomatia myricoides* | 2 | 11% | 2 | 3% | Positive diagnostic |
| *Lomatia silaifolia* | 1 | 58% | 1 | 25% | Positive diagnostic |
| *Marsdenia flavescens* | 1 | 3% | 2 | 0% | Positive diagnostic |
| *Marsdenia suaveolens* | 1 | 8% | 1 | 3% | Positive diagnostic |
| *Micrantheum ericoides* | 2 | 28% | 2 | 16% | Positive diagnostic |
| *Mitrasacme polymorpha* | 1 | 11% | 2 | 5% | Positive diagnostic |
| *Monotoca scoparia* | 1 | 25% | 1 | 15% | Positive diagnostic |
| *Opercularia aspera* | 1 | 18% | 1 | 7% | Positive diagnostic |
| *Ozothamnus diosmifolius* | 1 | 11% | 1 | 12% | Uninformative |
| *Patersonia glabrata* | 2 | 22% | 2 | 16% | Uninformative |
| *Patersonia sericea* | 1 | 14% | 1 | 16% | Uninformative |
| *Persoonia lanceolata* | 1 | 14% | 1 | 11% | Uninformative |
| *Persoonia levis* | 1 | 72% | 1 | 30% | Positive diagnostic |
| *Persoonia linearis* | 1 | 11% | 1 | 20% | Uninformative |
| *Persoonia pinifolia* | 2 | 64% | 1 | 17% | Positive diagnostic |
| *Petrophile pulchella* | 2 | 32% | 2 | 15% | Positive diagnostic |
| *Phyllanthus hirtellus* | 1 | 39% | 2 | 26% | Positive diagnostic |
| *Phyllota phylicoides* | 2 | 19% | 2 | 12% | Uninformative |
| *Pimelea linifolia* | 2 | 57% | 2 | 24% | Positive diagnostic |
| *Pittosporum undulatum* | 1 | 20% | 2 | 25% | Uninformative |
| *Platylobium formosum* | 2 | 15% | 2 | 8% | Positive diagnostic |
| *Platysace lanceolata* | 2 | 27% | 2 | 7% | Positive diagnostic |
| *Platysace linearifolia* | 2 | 65% | 2 | 26% | Positive diagnostic |
| *Podocarpus spinulosus* | 2 | 7% | 2 | 2% | Positive diagnostic |
| *Polyscias sambucifolia* | 1 | 11% | 1 | 15% | Uninformative |
| *Pomaderris andromedifolia* | 2 | 2% | 2 | 0% | Positive diagnostic |
| *Pomax umbellata* | 2 | 13% | 2 | 15% | Uninformative |
| *Prostanthera linearis* | 2 | 4% | 2 | 0% | Positive diagnostic |
| *Pteridium esculentum* | 2 | 74% | 2 | 37% | Positive diagnostic |
| *Pultenaea daphnoides* | 2 | 38% | 1 | 5% | Positive diagnostic |
| *Pultenaea linophylla* | 1 | 14% | 1 | 3% | Positive diagnostic |
| *Pultenaea polifolia* | 2 | 3% | 2 | 0% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Pultenaea rosmarinifolia* | 2 | 3% | 3 | 0% | Positive diagnostic |
| *Pultenaea stipularis* | 2 | 35% | 2 | 5% | Positive diagnostic |
| *Pultenaea tuberculata* | 1 | 22% | 2 | 15% | Uninformative |
| *Ricinocarpos pinifolius* | 1 | 27% | 1 | 5% | Positive diagnostic |
| *Schizaea bifida* | 1 | 9% | 1 | 3% | Positive diagnostic |
| *Schoenus brevifolius* | 2 | 8% | 2 | 3% | Positive diagnostic |
| *Schoenus melanostachys* | 2 | 23% | 2 | 5% | Positive diagnostic |
| *Selaginella uliginosa* | 1 | 11% | 2 | 3% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 80% | 2 | 29% | Positive diagnostic |
| *Sticherus flabellatus* var. *flabellatus* | 2 | 10% | 2 | 3% | Positive diagnostic |
| *Stylidium productum* | 2 | 29% | 2 | 3% | Positive diagnostic |
| *Styphelia longifolia* | 1 | 2% | 1 | 0% | Positive diagnostic |
| *Styphelia tubiflora* | 2 | 17% | 1 | 3% | Positive diagnostic |
| *Tetrarrhena juncea* | 2 | 20% | 2 | 3% | Positive diagnostic |
| *Tetratheca ericifolia* | 1 | 8% | 2 | 3% | Positive diagnostic |
| *Tristania neriifolia* | 2 | 6% | 2 | 1% | Positive diagnostic |
| *Woollsia pungens* | 2 | 50% | 2 | 9% | Positive diagnostic |
| *Xanthorrhoea arborea* | 2 | 40% | 2 | 9% | Positive diagnostic |
| *Xanthorrhoea media* | 2 | 29% | 2 | 19% | Positive diagnostic |
| *Xanthosia pilosa* | 2 | 65% | 2 | 17% | Positive diagnostic |
| *Xanthosia tridentata* | 2 | 50% | 2 | 19% | Positive diagnostic |
| *Zieria laevigata* | 1 | 7% | 1 | 1% | Positive diagnostic |
| *Zieria pilosa* | 2 | 30% | 2 | 4% | Positive diagnostic |

# HORNSBY ENRICHED SANDSTONE EXPOSED WOODLAND          S_DSF10

**Statewide Class**      Sydney Coastal Dry Sclerophyll Forests
NSW Plant Community Type:      1083: Red Bloodwood-Scribbly Gum Heathy Woodland on Sandstone Plateaux, Sydney Basin
Biometric Number(s):      HN566; HU595; ME014; SR595



## Description

Hornsby Enriched Sandstone Exposed Woodland is a low open eucalypt woodland with an open to dense shrub layer. It is one of a suite of heathy sandstone woodlands found in Sydney coastal environments. It occurs on sandstone ridges at the end of northern Sydney plateaus. These ridges may have a thin mantle of clay, though at other sites no evidence of enrichment is visible. This community is common, though not restricted to, the Lucas Heights soil landscape (Chapman and Murphy 1989). The most extensive areas of habitat that remain occur around northern Lane Cove NP and Pennant Hills Park (UBMC 2001, Clarke and Benson 1987). These ridges are in landscapes dominated by shale substrates and a subtle influence appears to extend across a range of sandstone communities in the area.

Broad-leaved scribbly gum (*Eucalyptus haemastoma*) is the most common eucalypt on ridgetop situations while Sydney peppermint (*Eucalyptus piperita*) is more prominent on exposed slopes. At times the canopy layer may only have a sparse eucalypt cover with black she-oak (*Allocasuarina littoralis*) forming dense scrubs sometimes with *Kunzea ambigua*. The abundance of these species may also suggest previous disturbance. The shrub layer otherwise carries a diverse mix of sclerophyllous shrubs that are typical in other Sydney sandstone woodlands. The ground layer is a sparse to moderate cover of grasses, sedges and small herbs. This woodland occurs within a narrow band of mean annual rainfall (900-1100 millimetres) at low elevations (between 30 and 130 metres above sea level).

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 14 m ±5<br>8-20 | 32% ±12<br>10-40 | *Angophora hispida, Eucalyptus haemastoma, Corymbia gummifera, Eucalyptus piperita* |
| Shrubs | 6 m ±3<br>2-10 | 20% ±12<br>5-40 | *Micrantheum ericoides, Leptospermum trinervium, Allocasuarina littoralis, Acacia suaveolens, Banksia ericifolia* subsp. *ericifolia, Lambertia formosa, Grevillea buxifolia, Banksia serrata, Woollsia pungens, Xanthorrhoea media, Pultenaea tuberculata, Banksia oblongifolia, Phyllota phylicoides, Dillwynia retorta, Persoonia levis, Leucopogon microphyllus, Acacia longifolia, Kunzea ambigua* |
| Ground Covers | 1.2 m ±0.6<br>0.3-2.0 | 15% ±12<br>3-45 | *Entolasia stricta, Actinotus minor, Cyathochaeta diandra, Dianella caerulea, Dampiera stricta, Boronia ledifolia, Austrostipa pubescens, Lomandra glauca* |
| Vines & Climbers | N/A | N/A | *Cassytha pubescens, Billardiera scandens* |

*Compiled from 6 sites with structural data recorded.

## Threats

Past clearing for urban development is likely to have reduced a significant proportion of the original extent of this community. Remnants present on the north shore are subject to urban pressures such as weed invasion, local clearing and recreation pressures. Areas located in reserves are threatened by frequent high intensity fires.

## Conservation Status

This vegetation community is represented in Lane Cove NP.

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 123,330-148,000 hectares |
| Estimated percentage cleared | Not available | 10-25% |
| Total NPWS reserves | 142 +1.6 hectares<br>40% of extant area | 49,900 hectares<br>45% of extant area<br>25-45% of pre-clearing area |
| Total reserved | 277 +3.0 hectares<br>78% of extant area | Not available |
| Total non-reserved | 80.0 +19.2 hectares | Not available |
| Total extant | 357 hectares | 11,000 hectares |

*As this woodland is only a component of the equivalent regional community, these figures overestimate the regional extent.
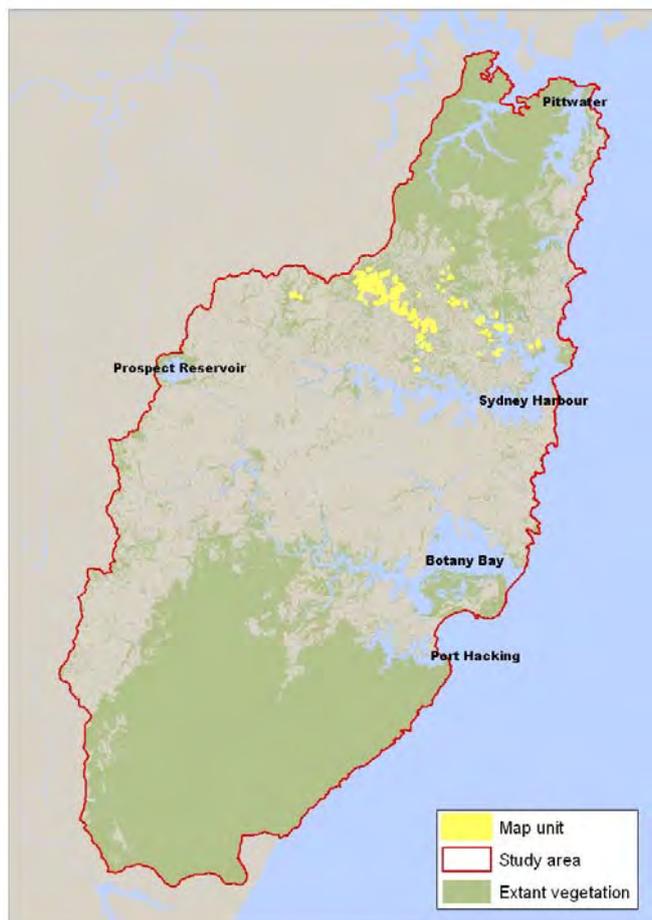


## Example Locations

o   Pennant Hills Park, Pennant Hills, Hornsby LGA

## Species Richness

| | |
|---|---|
| Number of sites | 41 |
| Total native species | 237 |
| Average no. native species per site | 46.9 ±7.4 |

## Variations and Dynamics

The density of the understorey layer is variable across the range of the community, perhaps depending on fire history and disturbance. Variation in canopy species also occurs and these variations have been mapped where visible.

## Relationship to Other Communities

This community is most closely related to sandstone woodlands of northern Sydney (S_DSF11). The differences appear to relate to a lower diversity of heath and shrub species and a prominent cover of *Allocasuarina littoralis* in S_DSF10.

It grades into the enriched sandstone forest S_DSF04 as greater shelter is afforded by protected slopes and gullies.

## Accuracy

Sampling density is high. Map unit boundaries have been interpreted to identify exposed sandstone woodlands. Sample sites and proximity to shale soils and enriched sandstones have been used to assign the community.

A 0.04 hectare site located in this map unit is expected to contain at least 21 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 38 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia linifolia* | 2 | 41% | 2 | 20% | Positive diagnostic |
| *Acacia longifolia* | 2 | 49% | 2 | 21% | Positive diagnostic |
| *Acacia suaveolens* | 1 | 80% | 1 | 27% | Positive diagnostic |
| *Acacia terminalis* | 1 | 49% | 2 | 19% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 39% | 1 | 25% | Constant |
| *Actinotus helianthi* | 1 | 20% | 1 | 8% | Uninformative |
| *Actinotus minor* | 2 | 76% | 2 | 21% | Positive diagnostic |
| *Allocasuarina littoralis* | 2 | 83% | 2 | 26% | Positive diagnostic |
| *Amperea xiphoclada* | 1 | 12% | 1 | 6% | Uninformative |
| *Angophora bakeri* | 2 | 20% | 2 | 5% | Positive diagnostic |
| *Angophora hispida* | 2 | 71% | 2 | 8% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 22% | 2 | 14% | Uninformative |
| *Aristida vagans* | 2 | 12% | 2 | 15% | Uninformative |
| *Austrostipa pubescens* | 2 | 49% | 2 | 20% | Positive diagnostic |
| *Baeckea diosmifolia* | 1 | 15% | 2 | 2% | Uninformative |
| *Banksia ericifolia* subsp. *ericifolia* | 2 | 71% | 2 | 25% | Positive diagnostic |
| *Banksia marginata* | 1 | 20% | 2 | 9% | Uninformative |
| *Banksia oblongifolia* | 2 | 54% | 2 | 13% | Positive diagnostic |
| *Banksia serrata* | 1 | 71% | 2 | 32% | Positive diagnostic |
| *Banksia spinulosa* | 1 | 29% | 2 | 26% | Uninformative |
| *Billardiera scandens* | 1 | 41% | 1 | 37% | Constant |
| *Boronia ledifolia* | 1 | 59% | 2 | 12% | Positive diagnostic |
| *Boronia pinnata* | 1 | 32% | 1 | 5% | Positive diagnostic |
| *Bossiaea heterophylla* | 1 | 37% | 2 | 17% | Positive diagnostic |
| *Bossiaea obcordata* | 1 | 12% | 2 | 7% | Uninformative |
| *Bossiaea scolopendria* | 1 | 49% | 2 | 6% | Positive diagnostic |
| *Brachyloma daphnoides* | 1 | 17% | 1 | 5% | Uninformative |
| *Cassytha pubescens* | 1 | 66% | 2 | 26% | Positive diagnostic |
| *Caustis flexuosa* | 1 | 37% | 2 | 17% | Positive diagnostic |
| *Caustis pentandra* | 2 | 12% | 2 | 5% | Uninformative |
| *Corymbia gummifera* | 2 | 44% | 2 | 41% | Constant |
| *Cyathochaeta diandra* | 2 | 73% | 2 | 25% | Positive diagnostic |
| *Dampiera stricta* | 2 | 73% | 2 | 22% | Positive diagnostic |
| *Darwinia biflora* | 1 | 27% | 2 | 0% | Positive diagnostic |
| *Dianella caerulea* | 2 | 59% | 2 | 45% | Constant |
| *Dianella prunina* | 1 | 37% | 1 | 3% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 61% | 2 | 25% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 24% | 2 | 23% | Uninformative |
| *Entolasia marginata* | 2 | 12% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 83% | 2 | 58% | Positive diagnostic |
| *Epacris microphylla* | 1 | 17% | 2 | 10% | Uninformative |
| *Epacris pulchella* | 1 | 27% | 2 | 15% | Uninformative |
| *Eucalyptus haemastoma* | 3 | 49% | 2 | 12% | Positive diagnostic |
| *Eucalyptus piperita* | 3 | 56% | 3 | 19% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 20% | 2 | 24% | Uninformative |
| *Goodenia bellidifolia* subsp. *bellidifolia* | 1 | 34% | 1 | 4% | Positive diagnostic |
| *Grevillea buxifolia* | 2 | 73% | 2 | 13% | Positive diagnostic |
| *Grevillea linearifolia* | 1 | 17% | 2 | 7% | Uninformative |
| *Grevillea sericea* | 2 | 37% | 2 | 15% | Positive diagnostic |
| *Grevillea speciosa* | 1 | 39% | 2 | 3% | Positive diagnostic |
| *Hakea dactyloides* | 1 | 49% | 2 | 23% | Positive diagnostic |
| *Hakea gibbosa* | 1 | 15% | 2 | 7% | Uninformative |
| *Hakea sericea* | 1 | 34% | 2 | 21% | Uninformative |
| *Hakea teretifolia* | 2 | 12% | 2 | 16% | Uninformative |
| *Hibbertia aspera* | 1 | 29% | 2 | 10% | Positive diagnostic |
| *Hibbertia bracteata* | 1 | 20% | 2 | 5% | Positive diagnostic |
| *Hibbertia sp. aff. riparia* | 1 | 27% | 1 | 1% | Positive diagnostic |
| *Hovea linearis* | 1 | 37% | 1 | 10% | Positive diagnostic |
| *Isopogon anemonifolius* | 1 | 15% | 2 | 18% | Uninformative |
| *Isopogon anethifolius* | 2 | 27% | 2 | 5% | Positive diagnostic |
| *Kunzea ambigua* | 2 | 41% | 2 | 14% | Positive diagnostic |
| *Lambertia formosa* | 1 | 76% | 2 | 25% | Positive diagnostic |
| *Lasiopetalum ferrugineum* | 2 | 20% | 2 | 11% | Uninformative |
| *Laxmannia gracilis* | 1 | 15% | 1 | 5% | Uninformative |
| *Lepidosperma filiforme* | 1 | 12% | 2 | 8% | Uninformative |
| *Lepidosperma laterale* | 2 | 51% | 2 | 42% | Constant |
| *Leptospermum arachnoides* | 1 | 20% | 2 | 8% | Uninformative |
| *Leptospermum trinervium* | 2 | 90% | 2 | 36% | Positive diagnostic |
| *Lepyrodia scariosa* | 2 | 22% | 2 | 21% | Uninformative |
| *Leucopogon ericoides* | 1 | 24% | 1 | 8% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Leucopogon esquamatus* | 1 | 12% | 2 | 5% | Uninformative |
| *Leucopogon microphyllus* | 2 | 51% | 2 | 12% | Positive diagnostic |
| *Lindsaea linearis* | 2 | 37% | 2 | 16% | Positive diagnostic |
| *Lindsaea microphylla* | 1 | 27% | 1 | 8% | Positive diagnostic |
| *Lomandra cylindrica* | 2 | 27% | 2 | 10% | Positive diagnostic |
| *Lomandra filiformis* | 2 | 15% | 2 | 23% | Uninformative |
| *Lomandra glauca* | 2 | 51% | 2 | 16% | Positive diagnostic |
| *Lomandra gracilis* | 2 | 15% | 2 | 10% | Uninformative |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 22% | 2 | 24% | Uninformative |
| *Lomandra obliqua* | 1 | 37% | 2 | 32% | Constant |
| *Lomatia silaifolia* | 1 | 27% | 1 | 27% | Uninformative |
| *Micrantheum ericoides* | 2 | 85% | 2 | 15% | Positive diagnostic |
| *Mitrasacme polymorpha* | 1 | 12% | 2 | 6% | Uninformative |
| *Monotoca scoparia* | 1 | 24% | 1 | 16% | Uninformative |
| *Patersonia glabrata* | 2 | 32% | 2 | 16% | Uninformative |
| *Patersonia sericea* | 1 | 41% | 1 | 15% | Positive diagnostic |
| *Persoonia lanceolata* | 1 | 49% | 1 | 10% | Positive diagnostic |
| *Persoonia levis* | 1 | 49% | 1 | 33% | Constant |
| *Persoonia pinifolia* | 1 | 39% | 2 | 21% | Constant |
| *Petrophile pulchella* | 1 | 44% | 2 | 15% | Positive diagnostic |
| *Phyllanthus hirtellus* | 1 | 29% | 2 | 27% | Uninformative |
| *Phyllota phylicoides* | 2 | 51% | 2 | 12% | Positive diagnostic |
| *Pimelea linifolia* | 1 | 37% | 2 | 26% | Constant |
| *Platysace linearifolia* | 1 | 49% | 2 | 29% | Constant |
| *Polyscias sambucifolia* | 1 | 29% | 1 | 15% | Uninformative |
| *Ptilothrix deusta* | 2 | 15% | 2 | 5% | Uninformative |
| *Pultenaea stipularis* | 2 | 20% | 2 | 7% | Uninformative |
| *Pultenaea tuberculata* | 2 | 59% | 2 | 15% | Positive diagnostic |
| *Schoenus brevifolius* | 1 | 41% | 2 | 3% | Positive diagnostic |
| *Schoenus ericetorum* | 2 | 39% | 2 | 6% | Positive diagnostic |
| *Smilax glyciphylla* | 1 | 24% | 2 | 33% | Uninformative |
| *Styphelia tubiflora* | 1 | 24% | 2 | 4% | Positive diagnostic |
| *Tetratheca glandulosa* | 1 | 15% | 1 | 0% | Uninformative |
| *Woollsia pungens* | 2 | 71% | 2 | 11% | Positive diagnostic |
| *Xanthorrhoea media* | 1 | 54% | 2 | 19% | Positive diagnostic |
| *Xanthosia pilosa* | 2 | 29% | 2 | 20% | Uninformative |
| *Xanthosia tridentata* | 2 | 37% | 2 | 21% | Constant |

# S<small>YDNEY</small> N<small>ORTH</small> E<small>XPOSED</small> S<small>ANDSTONE</small> W<small>OODLAND</small>    S_DSF11

**Statewide Class**    Sydney Coastal Dry Sclerophyll Forests
NSW Plant Community Type:    1083: Red Bloodwood-Scribbly Gum Heathy Woodland on Sandstone Plateaux,
Sydney Basin
Biometric Number(s):    HN566; HU595; ME014; SR595



## Description

This exposed heathy woodland is widespread across the Hawkesbury sandstone plateau of northern Sydney and the hinterland of the Central Coast. The eucalypt canopy is typically low in height with a structure that varies between an open woodland and an open forest. In long unburnt sites the dry shrub layer is thick and impenetrable, whereas elsewhere it is less dense. The ground layer comprises sedges and grasses. The canopy consistently includes red bloodwood (*Corymbia gummifera*) and scribbly gums (*Eucalyptus haemastoma* or *Eucalyptus racemosa*) with old-man banksia (*Banksia serrata*) present in the lower canopy. Other eucalypts include smooth-barked apple (*Angophora costata*) and broad-leaved white mahogany (*Eucalyptus umbra*) with yellow bloodwood (*Corymbia eximia*) occurring in the Cowan catchment in Ku-ring-gai Chase NP. The shrub layer comprises a diverse range of sclerophyllous plants such as banksias, tea-tree, wattle, geebungs and peas.

It occurs on free-draining sandy soils in exposed locations such as crests, ridges and exposed gully slopes. Soil development is generally poor. This is coastal woodland occurring within areas that receive more than 900 millimetres of mean annual rainfall. It is restricted to elevations between 200 and 500 metres above sea level.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Small Trees | 8 m<br>8-8 | 15%<br>15-15 | *Banksia serrata, Corymbia gummifera, Eucalyptus haemastoma, Corymbia eximia* |
| Shrubs | 2.5 m<br>2.5-2.5 | 35%<br>35-35 | *Acacia suaveolens, Allocasuarina distyla, Banksia ericifolia* subsp. *ericifolia, Boronia ledifolia, Gompholobium grandiflorum, Hakea dactyloides, Lambertia formosa, Leptospermum trinervium, Platysace linearifolia, Pultenaea tuberculata* |
| Ground Covers | 0.7m<br>0.7-0.7 | 15%<br>15-15 | *Cyathochaeta diandra, Entolasia stricta, Lepidosperma concavum, Lepyrodia scariosa, Lomandra glauca* |

*Compiled from 1 site with structural data recorded.

## Threats

Some areas with gentle sandstone gradients have been cleared for urban development giving rise to localised impacts such as weed infestation, rubbish dumping and frequent fire.

## Conservation Status

The community is well represented in a number of reserves of northern Sydney and the Central Coast hinterland. Within the Sydney area these include Ku-ring-gai Chase and Garigal national parks.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 3715-5200 hectares |
| Estimated percentage cleared | Not available | 30-50% |
| Total NPWS reserves | 7855 +7.6 hectares<br>85% of extant area | 1600 hectares<br>60% of extant area<br>30-50% of pre-clearing area |
| Total reserved | 8326 +15.6 hectares<br>90% of extant area | Not available |
| Total non-reserved | 920 +39.3 hectares | Not available |
| Total extant | 9246 hectares | 2600 hectares |



## Example Locations

o   Explosives Reserve, Castle Cove, Willoughby LGA

o   Morgan Road, Belrose, Warringah LGA

o   West Head Road, Ku-ring-gai Chase NP

## Species Richness

| | |
|---|---|
| Number of sites | 77 |
| Total native species | 315 |
| Average no. native species per site | 49.4 ±8.7 |

## Variations and Dynamics

The height and cover of the eucalypt layer varies in response to soil depth, exposure, rock outcropping and time since fire. The latter can result in very dense stands of mallee-like eucalypts. Alternatively fire can leave the canopy very open and mirror patterns associated with stands on rocky exposed ridgelines.

## Relationship to Other Communities

This community forms part of the vegetation complex found on the coastal sandstone plateaus of the Sydney area. Both the structure of this community and the floristic composition share similarities to S_DSF05 found in southern Sydney on the eastern Woronora Plateau. However eucalypts such as white mahogany and yellow bloodwood are scattered throughout S_DSF11 but not found to the south.

This map unit grades into sheltered sandstone forest S_DSF09 away from exposed ridges and slopes. Heath-dominated communities (S_HL08) may also adjoin where soil becomes increasingly shallow and rocky or poorly drained.

## Accuracy

Sampling density is high. Mapped boundaries were delineated from the interpretation of woodlands and open forests found on Hawkesbury sandstone.

A 0.04 hectare site located in this map unit is expected to contain at least 27 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 41 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia linifolia* | 2 | 14% | 2 | 20% | Uninformative |
| *Acacia myrtifolia* | 2 | 14% | 2 | 12% | Uninformative |
| *Acacia suaveolens* | 1 | 65% | 1 | 27% | Positive diagnostic |
| *Acacia terminalis* | 2 | 23% | 1 | 20% | Uninformative |
| *Acacia ulicifolia* | 2 | 38% | 1 | 25% | Constant |
| *Actinotus minor* | 2 | 79% | 2 | 20% | Positive diagnostic |
| *Allocasuarina distyla* | 2 | 27% | 2 | 10% | Positive diagnostic |
| *Allocasuarina littoralis* | 2 | 30% | 2 | 27% | Uninformative |
| *Angophora costata* | 2 | 36% | 3 | 37% | Constant |
| *Angophora hispida* | 1 | 21% | 2 | 9% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 45% | 2 | 13% | Positive diagnostic |
| *Aotus ericoides* | 2 | 12% | 2 | 8% | Uninformative |
| *Austrostipa pubescens* | 2 | 18% | 2 | 20% | Uninformative |
| *Baeckea diosmifolia* | 2 | 26% | 2 | 1% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 3 | 77% | 2 | 24% | Positive diagnostic |
| *Banksia oblongifolia* | 2 | 26% | 2 | 14% | Uninformative |
| *Banksia paludosa* | 2 | 6% | 1 | 1% | Positive diagnostic |
| *Banksia serrata* | 2 | 86% | 2 | 31% | Positive diagnostic |
| *Banksia spinulosa* | 2 | 29% | 2 | 26% | Uninformative |
| *Billardiera scandens* | 1 | 26% | 1 | 37% | Uninformative |
| *Boronia floribunda* | 2 | 13% | 2 | 1% | Positive diagnostic |
| *Boronia ledifolia* | 2 | 71% | 1 | 11% | Positive diagnostic |
| *Boronia pinnata* | 2 | 39% | 1 | 4% | Positive diagnostic |
| *Bossiaea heterophylla* | 1 | 43% | 2 | 17% | Positive diagnostic |
| *Bossiaea scolopendria* | 2 | 43% | 1 | 6% | Positive diagnostic |
| *Calytrix tetragona* | 2 | 16% | 2 | 3% | Positive diagnostic |
| *Cassytha glabella* | 2 | 29% | 2 | 14% | Positive diagnostic |
| *Cassytha pubescens* | 1 | 29% | 2 | 27% | Uninformative |
| *Caustis flexuosa* | 2 | 48% | 2 | 16% | Positive diagnostic |
| *Caustis pentandra* | 2 | 23% | 2 | 4% | Positive diagnostic |
| *Ceratopetalum gummiferum* | 2 | 21% | 2 | 17% | Uninformative |
| *Conospermum longifolium* | 2 | 52% | 1 | 5% | Positive diagnostic |
| *Corymbia eximia* | 2 | 21% | 3 | 1% | Positive diagnostic |
| *Corymbia gummifera* | 3 | 91% | 2 | 39% | Positive diagnostic |
| *Crowea saligna* | 2 | 19% | 2 | 3% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 64% | 2 | 25% | Positive diagnostic |
| *Dampiera stricta* | 2 | 69% | 2 | 22% | Positive diagnostic |
| *Darwinia fascicularis* | 2 | 14% | 2 | 5% | Positive diagnostic |
| *Dianella prunina* | 1 | 21% | 1 | 3% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 78% | 2 | 24% | Positive diagnostic |
| *Dodonaea triquetra* | 1 | 14% | 2 | 23% | Uninformative |
| *Elaeocarpus reticulatus* | 2 | 10% | 1 | 21% | Uninformative |
| *Entolasia stricta* | 2 | 69% | 2 | 58% | Constant |
| *Epacris longiflora* | 2 | 18% | 2 | 8% | Uninformative |
| *Epacris microphylla* | 1 | 21% | 2 | 10% | Uninformative |
| *Epacris pulchella* | 2 | 52% | 2 | 14% | Positive diagnostic |
| *Eriostemon australasius* | 2 | 51% | 2 | 12% | Positive diagnostic |
| *Eucalyptus haemastoma* | 2 | 53% | 2 | 11% | Positive diagnostic |
| *Eucalyptus luehmanniana* | 3 | 9% | 3 | 2% | Positive diagnostic |
| *Eucalyptus oblonga* | 3 | 21% | 2 | 7% | Positive diagnostic |
| *Eucalyptus piperita* | 2 | 21% | 3 | 20% | Uninformative |
| *Eucalyptus punctata* | 2 | 17% | 2 | 11% | Uninformative |
| *Eucalyptus racemosa* | 2 | 12% | 2 | 3% | Positive diagnostic |
| *Eucalyptus sieberi* | 2 | 18% | 2 | 9% | Uninformative |
| *Eucalyptus sparsifolia* | 3 | 9% | 3 | 1% | Positive diagnostic |
| *Eucalyptus umbra* | 2 | 27% | 2 | 3% | Positive diagnostic |
| *Gahnia sieberiana* | 1 | 10% | 2 | 7% | Uninformative |
| *Gompholobium grandiflorum* | 2 | 51% | 1 | 8% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 32% | 2 | 23% | Uninformative |
| *Grevillea buxifolia* | 2 | 64% | 2 | 12% | Positive diagnostic |
| *Grevillea sericea* | 2 | 55% | 2 | 14% | Positive diagnostic |
| *Grevillea speciosa* | 1 | 22% | 2 | 3% | Positive diagnostic |
| *Hakea bakeriana* | 2 | 12% | 2 | 0% | Positive diagnostic |
| *Hakea dactyloides* | 1 | 57% | 2 | 23% | Positive diagnostic |
| *Hakea gibbosa* | 2 | 22% | 2 | 6% | Positive diagnostic |
| *Hakea propinqua* | 2 | 10% | 1 | 2% | Positive diagnostic |
| *Hakea sericea* | 2 | 35% | 2 | 21% | Constant |
| *Hakea teretifolia* | 2 | 45% | 2 | 15% | Positive diagnostic |
| *Hemigenia purpurea* | 2 | 21% | 2 | 4% | Positive diagnostic |
| *Hibbertia aspera* | 1 | 22% | 2 | 10% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Hibbertia bracteata* | 2 | 38% | 1 | 4% | Positive diagnostic |
| *Hibbertia cistiflora* subsp. *cistiflora* | 2 | 10% | 1 | 1% | Positive diagnostic |
| *Hibbertia linearis* | 2 | 34% | 1 | 5% | Positive diagnostic |
| *Hibbertia monogyna* | 2 | 13% | 1 | 2% | Positive diagnostic |
| *Hibbertia obtusifolia* | 1 | 8% | 2 | 1% | Positive diagnostic |
| *Hovea linearis* | 1 | 26% | 1 | 10% | Positive diagnostic |
| *Isopogon anemonifolius* | 2 | 22% | 2 | 18% | Uninformative |
| *Isopogon anethifolius* | 2 | 32% | 2 | 5% | Positive diagnostic |
| *Kunzea capitata* | 2 | 12% | 2 | 5% | Uninformative |
| *Lambertia formosa* | 2 | 81% | 2 | 24% | Positive diagnostic |
| *Lasiopetalum ferrugineum* | 2 | 18% | 2 | 11% | Uninformative |
| *Lepidosperma filiforme* | 2 | 23% | 2 | 8% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 44% | 2 | 42% | Constant |
| *Leptospermum squarrosum* | 2 | 29% | 2 | 7% | Positive diagnostic |
| *Leptospermum trinervium* | 2 | 95% | 2 | 35% | Positive diagnostic |
| *Lepyrodia scariosa* | 2 | 70% | 2 | 19% | Positive diagnostic |
| *Leucopogon appressus* | 1 | 6% | 2 | 1% | Positive diagnostic |
| *Leucopogon microphyllus* | 2 | 53% | 2 | 12% | Positive diagnostic |
| *Lindsaea linearis* | 2 | 31% | 2 | 15% | Positive diagnostic |
| *Lomandra brevis* | 1 | 9% | 1 | 1% | Positive diagnostic |
| *Lomandra filiformis* | 1 | 17% | 2 | 23% | Uninformative |
| *Lomandra glauca* | 2 | 69% | 2 | 14% | Positive diagnostic |
| *Lomandra gracilis* | 2 | 18% | 2 | 10% | Uninformative |
| *Lomandra obliqua* | 2 | 38% | 2 | 32% | Constant |
| *Lomatia silaifolia* | 1 | 21% | 1 | 28% | Uninformative |
| *Micrantheum ericoides* | 2 | 43% | 2 | 16% | Positive diagnostic |
| *Monotoca scoparia* | 1 | 52% | 1 | 15% | Positive diagnostic |
| *Patersonia glabrata* | 2 | 39% | 2 | 15% | Positive diagnostic |
| *Patersonia longifolia* | 1 | 6% | 1 | 1% | Positive diagnostic |
| *Patersonia sericea* | 2 | 39% | 1 | 15% | Positive diagnostic |
| *Persoonia lanceolata* | 1 | 17% | 1 | 11% | Uninformative |
| *Persoonia levis* | 1 | 66% | 1 | 32% | Positive diagnostic |
| *Persoonia pinifolia* | 2 | 60% | 1 | 20% | Positive diagnostic |
| *Petrophile pulchella* | 2 | 70% | 2 | 14% | Positive diagnostic |
| *Phebalium squamulosum* | 2 | 14% | 2 | 2% | Positive diagnostic |
| *Phyllanthus hirtellus* | 2 | 48% | 2 | 27% | Positive diagnostic |
| *Phyllota grandiflora* | 2 | 10% | 1 | 1% | Positive diagnostic |
| *Phyllota phylicoides* | 2 | 49% | 2 | 11% | Positive diagnostic |
| *Pimelea linifolia* | 2 | 44% | 2 | 26% | Positive diagnostic |
| *Platysace linearifolia* | 2 | 91% | 2 | 27% | Positive diagnostic |
| *Pultenaea ferruginea* | 3 | 21% | 2 | 1% | Positive diagnostic |
| *Pultenaea stipularis* | 2 | 21% | 2 | 7% | Positive diagnostic |
| *Pultenaea tuberculata* | 2 | 47% | 2 | 15% | Positive diagnostic |
| *Scaevola ramosissima* | 1 | 13% | 1 | 5% | Uninformative |
| *Schizaea bifida* | 1 | 12% | 1 | 4% | Positive diagnostic |
| *Schoenus imberbis* | 2 | 39% | 1 | 2% | Positive diagnostic |
| *Smilax glyciphylla* | 1 | 17% | 2 | 33% | Uninformative |
| *Styphelia tubiflora* | 2 | 14% | 1 | 4% | Positive diagnostic |
| *Tetrarrhena juncea* | 2 | 16% | 2 | 4% | Positive diagnostic |
| *Tetratheca ericifolia* | 2 | 31% | 2 | 3% | Positive diagnostic |
| *Tetratheca thymifolia* | 1 | 12% | 1 | 1% | Positive diagnostic |
| *Woollsia pungens* | 2 | 34% | 2 | 12% | Positive diagnostic |
| *Xanthorrhoea arborea* | 2 | 14% | 2 | 11% | Uninformative |
| *Xanthorrhoea media* | 2 | 49% | 2 | 19% | Positive diagnostic |
| *Xanthorrhoea resinosa* | 2 | 30% | 2 | 10% | Positive diagnostic |
| *Xanthosia pilosa* | 1 | 30% | 2 | 20% | Uninformative |
| *Xanthosia tridentata* | 2 | 44% | 2 | 21% | Positive diagnostic |

# Southern Sydney Sheltered Forest

# S_DSF13

Statewide Class
NSW Plant Community Type:
Biometric Number(s):

Sydney Coastal Dry Sclerophyll Forests
1785
ME68



## Description

Southern Sydney Sheltered Forest (NSW Scientific Committee 2007b) is a tall open eucalypt forest found on transitional clay and sandy soils in a very restricted area centred on Helensburgh in southern Sydney. The canopy is generally dominated by smooth-barked apple (*Angophora costata*) which is present at almost every site in combination with Sydney peppermint (*Eucalyptus piperita*) and blackbutt (*Eucalyptus pilularis*). Red bloodwood (*Corymbia gummifera*) is frequently recorded though rarely dominates. A sparse sub-canopy of casuarinas (*Allocasuarina* spp.) is invariably present. Smaller shrubs including banksias, tea-trees, geebungs and wattles are patchily distributed. The ground layer includes a very prominent cover of Gymea lily (*Doryanthes excelsa*) amongst an abundance of ferns, grasses and grass-like plants.

At first glance this unit appears difficult to distinguish from the adjoining sandstone sheltered forests because many of the tree species overlap and Gymea lily (*Doryanthes excelsa*) can be common in both communities. The differences in shrub and ground cover plants tell the story. It is restricted to narrow zones of enriched sandstone soils receiving between 1200 and 1500 millimetres of mean annual rainfall and between elevations of 200 and 350 metres above sea level. These zones are often downslope or adjoining residual shale caps, but may also mark transitional zones between Hawkesbury and Narrabeen sandstones. Most sample sites are within eight kilometres of the shale cap at Helensburgh, with small outliers present in Bundeena, Menai and Cataract catchment.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 21 m ±9 <br> 6-35 | 30% ±10 <br> 13-40 | *Angophora costata, Corymbia gummifera, Eucalyptus piperita, Eucalyptus pilularis* |
| Small Trees | 7 m ±4 <br> 3-15 | 16% ±15 <br> 5-50 | *Allocasuarina littoralis, Leptospermum polygalifolium, Banksia serrata, Acacia binervata* |
| Shrubs | 2.2 m ±0.7 <br> 1.0-3.0 | 46% ±13 <br> 25-60 | *Leucopogon lanceolatus* var. *lanceolatus, Lomatia silaifolia, Banksia spinulosa, Acacia linifolia, Platysace linearifolia, Acacia ulicifolia, Acacia suaveolens, Aotus ericoides* |
| Ground Covers | 0.8 m ±0.4 <br> 0.4-1.5 | 31% ±22 <br> 15-80 | *Lomandra longifolia, Pteridium esculentum, Entolasia stricta, Doryanthes excelsa, Dianella caerulea, Gonocarpus teucrioides, Lepidosperma laterale, Calochlaena dubia, Lomandra obliqua, Imperata cylindrica* var. *major, Lomandra filiformis, Lepyrodia scariosa* |
| Vines & Climbers | N/A | N/A | *Smilax glyciphylla, Cassytha pubescens, Billardiera scandens, Hardenbergia violacea* |

*Compiled from 8 sites with structural data recorded.

## Threats

Threats are high. The NSW Scientific Committee (2007b) considers that past clearing has removed a small to moderate proportion of the original extent of this community. Further threats of localised clearing persist near the urban interface around Helensburgh. Other impacts are likely to arise from a number of key threatening processes including inappropriate fire regimes, weed invasion, rubbish dumping, grazing and trampling by feral deer and recreational pressures.

## Conservation Status

Southern Sydney Sheltered Forest on Transitional Sandstone Soils in the Sydney Basin Bioregion is listed as an Endangered Ecological Community under the NSW TSC Act. This vegetation community is represented in Royal and Garawarra reserves.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 666 +2.2 hectares<br>66% of extant area | Not available |
| Total reserved | 707 +6.8 hectares<br>70% of extant area | Not available |
| Total non-reserved | 308 +30.0 hectares | Not available |
| Total extant | 1015 hectares | Not available |
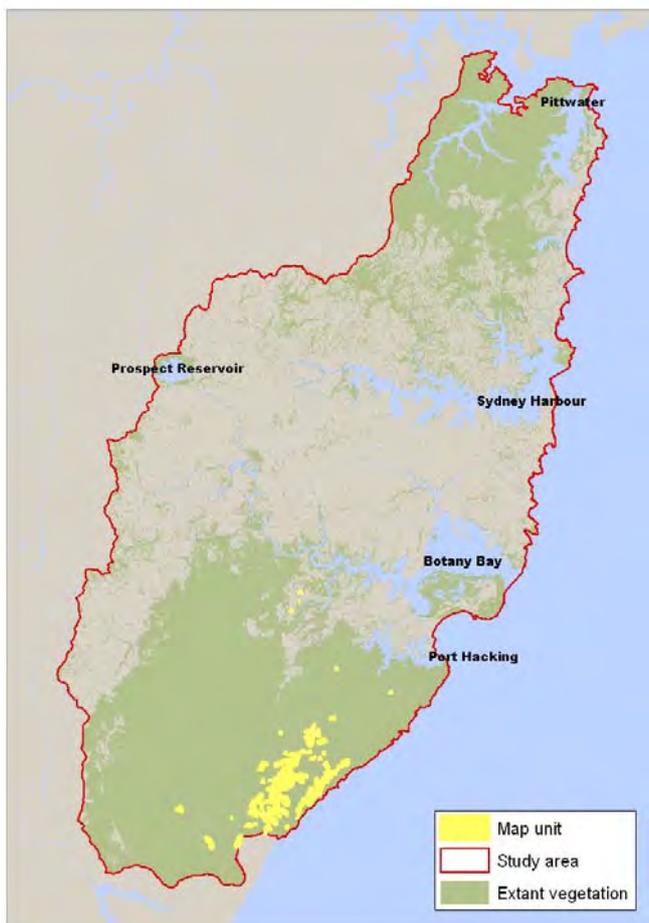


## Example Locations

o   Garawarra Ridge Track, Royal NP

o   Kellys Falls, Garawarra SCA

o   Bulgo Hill, Werrong Track, Royal NP

## Species Richness

| | |
|---|---|
| Number of sites | 51 |
| Total native species | 303 |
| Average no. native species per site | 42.6 ±9.4 |

## Variations and Dynamics

Variations in canopy species combinations are found throughout the range of the community. Sites nearer clay soils carry tall blackbutt and sometimes may include bangalay (*Eucalyptus botryoides*). At sites with a higher sandstone influence these species may be absent but the community may include silvertop ash (*Eucalyptus sieberi*).

## Relationship to Other Communities

The prevalence of tea-tree (*Leptospermum polygalifolium*), beard heath (*Leucopogon lanceolatus*), three veined hickory (*Acacia binervata*), the fern *Calochlaena dubia* are some understorey species help separate the community from sheltered sandstone forest (S_DSF09). On steep-sided gully slopes in the Hacking River valley the community grades into Narrabeen shale forests S_WSF05.

## Accuracy

Sampling intensity is high. Map boundaries are based on combinations of interpretation of tall forests on shale sandstone soils and field traverse.

A 0.04 hectare site located in this map unit is expected to contain at least 15 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 34 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia binervata* | 2 | 25% | 2 | 2% | Positive diagnostic |
| *Acacia linifolia* | 1 | 37% | 2 | 20% | Constant |
| *Acacia longifolia* | 2 | 27% | 2 | 21% | Uninformative |
| *Acacia myrtifolia* | 2 | 12% | 2 | 12% | Uninformative |
| *Acacia suaveolens* | 1 | 45% | 1 | 28% | Constant |
| *Acacia terminalis* | 2 | 16% | 1 | 20% | Uninformative |
| *Acacia ulicifolia* | 2 | 53% | 1 | 25% | Positive diagnostic |
| *Actinotus helianthi* | 2 | 16% | 1 | 8% | Uninformative |
| *Allocasuarina littoralis* | 2 | 71% | 2 | 26% | Positive diagnostic |
| *Amperea xiphoclada* | 1 | 29% | 1 | 5% | Positive diagnostic |
| *Angophora costata* | 3 | 88% | 2 | 36% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 29% | 2 | 14% | Uninformative |
| *Aotus ericoides* | 2 | 37% | 2 | 7% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 1 | 33% | 2 | 26% | Uninformative |
| *Banksia oblongifolia* | 1 | 24% | 2 | 14% | Uninformative |
| *Banksia serrata* | 2 | 65% | 2 | 32% | Positive diagnostic |
| *Banksia spinulosa* | 2 | 65% | 2 | 25% | Positive diagnostic |
| *Billardiera scandens* | 1 | 43% | 1 | 37% | Constant |
| *Breynia oblongifolia* | 1 | 12% | 1 | 17% | Uninformative |
| *Calochlaena dubia* | 3 | 37% | 2 | 16% | Positive diagnostic |
| *Cassytha glabella* | 2 | 18% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 1 | 33% | 2 | 27% | Uninformative |
| *Caustis flexuosa* | 2 | 12% | 2 | 18% | Uninformative |
| *Ceratopetalum gummiferum* | 2 | 22% | 2 | 17% | Uninformative |
| *Correa reflexa* | 2 | 14% | 1 | 5% | Uninformative |
| *Corymbia gummifera* | 2 | 71% | 2 | 40% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 12% | 2 | 26% | Uninformative |
| *Dampiera stricta* | 1 | 27% | 2 | 23% | Uninformative |
| *Dianella caerulea* | 2 | 84% | 2 | 44% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 24% | 2 | 26% | Uninformative |
| *Dodonaea triquetra* | 2 | 18% | 2 | 23% | Uninformative |
| *Doryanthes excelsa* | 2 | 92% | 2 | 7% | Positive diagnostic |
| *Elaeocarpus reticulatus* | 2 | 31% | 1 | 20% | Uninformative |
| *Empodisma minus* | 2 | 22% | 2 | 5% | Positive diagnostic |
| *Entolasia marginata* | 2 | 25% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 84% | 2 | 58% | Positive diagnostic |
| *Epacris longiflora* | 2 | 31% | 2 | 8% | Positive diagnostic |
| *Epacris pulchella* | 2 | 25% | 2 | 15% | Uninformative |
| *Eucalyptus pilularis* | 3 | 41% | 3 | 13% | Positive diagnostic |
| *Eucalyptus piperita* | 3 | 61% | 3 | 19% | Positive diagnostic |
| *Eucalyptus sieberi* | 2 | 20% | 2 | 9% | Uninformative |
| *Glycine clandestina* | 1 | 18% | 2 | 18% | Uninformative |
| *Gompholobium latifolium* | 2 | 24% | 1 | 4% | Positive diagnostic |
| *Gonocarpus tetragynus* | 2 | 14% | 2 | 8% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 65% | 2 | 22% | Positive diagnostic |
| *Grevillea oleoides* | 2 | 33% | 2 | 6% | Positive diagnostic |
| *Hakea salicifolia* | 2 | 12% | 2 | 2% | Uninformative |
| *Hakea sericea* | 2 | 20% | 2 | 21% | Uninformative |
| *Hakea teretifolia* | 2 | 12% | 2 | 16% | Uninformative |
| *Hardenbergia violacea* | 1 | 29% | 1 | 16% | Uninformative |
| *Hibbertia aspera* | 2 | 24% | 2 | 10% | Uninformative |
| *Hibbertia dentata* | 2 | 20% | 2 | 8% | Uninformative |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 2 | 20% | 1 | 5% | Positive diagnostic |
| *Hibbertia scandens* | 2 | 35% | 2 | 6% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 41% | 2 | 20% | Positive diagnostic |
| *Isopogon anemonifolius* | 1 | 12% | 2 | 18% | Uninformative |
| *Kennedia rubicunda* | 1 | 20% | 1 | 9% | Uninformative |
| *Kunzea ambigua* | 2 | 27% | 2 | 14% | Uninformative |
| *Lagenophora stipitata* | 2 | 14% | 2 | 3% | Positive diagnostic |
| *Lambertia formosa* | 2 | 22% | 2 | 26% | Uninformative |
| *Lepidosperma laterale* | 2 | 43% | 2 | 42% | Constant |
| *Leptomeria acida* | 1 | 41% | 1 | 5% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 63% | 2 | 13% | Positive diagnostic |
| *Lepyrodia scariosa* | 2 | 39% | 2 | 20% | Positive diagnostic |
| *Leucopogon ericoides* | 1 | 22% | 1 | 8% | Positive diagnostic |
| *Leucopogon lanceolatus* | 2 | 76% | 1 | 7% | Positive diagnostic |
| *Lindsaea linearis* | 2 | 33% | 2 | 16% | Positive diagnostic |
| *Livistona australis* | 1 | 27% | 2 | 10% | Positive diagnostic |
| *Lomandra cylindrica* | 2 | 18% | 2 | 10% | Uninformative |
| *Lomandra filiformis* | 2 | 37% | 2 | 22% | Constant |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lomandra glauca* | 1 | 14% | 2 | 16% | Uninformative |
| *Lomandra longifolia* | 2 | 94% | 2 | 46% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 22% | 2 | 24% | Uninformative |
| *Lomandra obliqua* | 2 | 49% | 2 | 32% | Constant |
| *Lomatia silaifolia* | 2 | 69% | 1 | 26% | Positive diagnostic |
| *Marsdenia suaveolens* | 1 | 14% | 1 | 3% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 43% | 2 | 36% | Constant |
| *Opercularia aspera* | 2 | 20% | 1 | 7% | Uninformative |
| *Patersonia glabrata* | 2 | 25% | 2 | 16% | Uninformative |
| *Patersonia sericea* | 2 | 16% | 1 | 15% | Uninformative |
| *Persoonia levis* | 1 | 31% | 1 | 33% | Uninformative |
| *Persoonia linearis* | 2 | 39% | 1 | 19% | Positive diagnostic |
| *Persoonia pinifolia* | 2 | 24% | 1 | 21% | Uninformative |
| *Phyllanthus hirtellus* | 1 | 25% | 2 | 27% | Uninformative |
| *Pimelea linifolia* | 2 | 31% | 2 | 26% | Uninformative |
| *Pittosporum undulatum* | 2 | 16% | 2 | 25% | Uninformative |
| *Platylobium formosum* | 2 | 41% | 2 | 7% | Positive diagnostic |
| *Platysace lanceolata* | 2 | 18% | 2 | 8% | Uninformative |
| *Platysace linearifolia* | 2 | 51% | 2 | 29% | Positive diagnostic |
| *Polyscias sambucifolia* | 1 | 14% | 1 | 15% | Uninformative |
| *Pomax umbellata* | 1 | 18% | 2 | 15% | Uninformative |
| *Pteridium esculentum* | 2 | 92% | 2 | 39% | Positive diagnostic |
| *Pultenaea daphnoides* | 2 | 16% | 2 | 8% | Uninformative |
| *Ricinocarpos pinifolius* | 2 | 22% | 1 | 7% | Positive diagnostic |
| *Schoenus melanostachys* | 2 | 12% | 2 | 6% | Uninformative |
| *Selaginella uliginosa* | 2 | 33% | 2 | 3% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 71% | 2 | 32% | Positive diagnostic |
| *Syncarpia glomulifera* | 3 | 12% | 3 | 13% | Uninformative |
| *Telopea speciosissima* | 2 | 12% | 1 | 3% | Uninformative |
| *Xanthorrhoea arborea* | 2 | 22% | 2 | 11% | Uninformative |
| *Xanthosia pilosa* | 2 | 20% | 2 | 21% | Uninformative |
| *Xanthosia tridentata* | 2 | 31% | 2 | 21% | Uninformative |
| *Zieria smithii* | 2 | 14% | 1 | 5% | Uninformative |

# SYDNEY IRONSTONE BLOODWOOD-SILVERTOP ASH FOREST   S_DSF14

**Statewide Class**
NSW Plant Community Type:

**Sydney Coastal Dry Sclerophyll Forests**
1085: Red Bloodwood-Smooth-barked Apple Shrubby Forest on Shale or Ironstone
of Coastal Plateaux, Sydney Basin

Biometric Number(s):   HN567; ME039; SR597



## Description

Known as Duffys Forest in some vegetation classifications (Benson and Howell 1994a, Smith and Smith 2000) this community forms a component of the shrubby forests and woodlands of coastal Sydney sandstone environments. This community is closely associated with rust-coloured ironstone mantles layered above sandstone ridgelines, with mean annual rainfall above 1100 millimetres. It features a low to moderately tall eucalypt cover of red bloodwood (*Corymbia gummifera*), silvertop ash (*Eucalyptus sieberi*) and stringybark (*Eucalyptus capitellata/Eucalyptus oblonga*) on flat to gently sloping terrain. Broad-leaved scribbly gum (*Eucalyptus haemastoma*) and smooth-barked apple (*Angophora costata*) are not uncommon at sites although they rarely dominate. The *Proteaceae* family is particularly diverse in the shrub layer; there are often multiple species of banksias, hakeas, persoonias and grevilleas present at a site. A moderate cover of grasses and forbs is found on the forest floor. Elevation for the community ranges between 100 and 300 metres above sea level. The thickness of the ironstone mantle varies considerably across sites and in some instances may be completely eroded. Sites typically have no outcropping sandstone. The extensive, though fragmented, distribution of this community across the lateritic soils of the suburb Duffys Forest and the northern beaches area gave rise to the use of the name in the classification nomenclature. However, lateritic ironstone is also present between Heathcote and Sutherland in southern Sydney where environmental conditions mirror those found to the north. Floristic sample sites confirm that vegetation assemblages found here form part of this ironstone assemblage formerly thought to be restricted to the north.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 19 m ±4<br>10-25 | 40% ±21<br>3-85 | *Corymbia gummifera, Eucalyptus haemastoma, Eucalyptus sieberi, Eucalyptus capitellata, Eucalyptus oblonga* |
| Small Trees | 6 m ±5<br>1-15 | 34% ±17<br>5-60 | *Banksia serrata, Leptospermum trinervium* |
| Shrubs | 4.7 m ±2.6<br>1.8-8.0 | 32% ±20<br>5-75 | *Persoonia levis, Banksia spinulosa, Lomatia silaifolia, Platysace linearifolia, Acacia myrtifolia, Persoonia pinifolia, Epacris pulchella, Micrantheum ericoides, Lambertia formosa, Boronia pinnata, Pultenaea tuberculata, Dillwynia retorta, Hakea dactyloides* |
| Ground Covers | 1.1 m ±0.6<br>0.3-2.0 | 31% ±22<br>5-90 | *Entolasia stricta, Cyathochaeta diandra, Lindsaea linearis, Dampiera stricta, Lomandra obliqua, Phyllanthus hirtellus, Lepidosperma laterale, Austrostipa pubescens, Xanthosia tridentata* |
| Vines & Climbers | N/A | N/A | *Billardiera scandens* |

*Compiled from 17 sites with structural data recorded.

## Threats

Ironstone mantles are likely to have been preferentially cleared for orchards and smaller agricultural pursuits during early settlement where arable, flat lands with good rainfall were sought after. Significant areas have since been removed for urban development and road building. Localised impacts include numerous gravel pits exploiting the laterite for road building. Remaining areas are highly fragmented and threatened by ongoing clearing, weed invasion, rubbish dumping, high fire frequency and erosion.

## Conservation Status

Sydney Ironstone Bloodwood-Silvertop Ash Forest conforms to Duffys Forest Ecological Community in the Sydney Basin Bioregion, listed as an Endangered Ecological Community under the TSC Act.

This vegetation community is represented in Garigal, Heathcote and Royal reserves.

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 3715-5200 hectares |
| Estimated percentage cleared | Not available | 30-50% |
| Total NPWS reserves | 359 +<.1 hectares<br>64% of extant area | 1600 hectares<br>60% of extant area<br>30-50% of pre-clearing area |
| Total reserved | 402 +0.5 hectares<br>71% of extant area | Not available |
| Total non-reserved | 161 +36.3 hectares | Not available |
| Total extant | 563 hectares | 2600 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.



Map legend:
- Map unit (yellow)
- Study area (red outline)
- Extant vegetation (green)
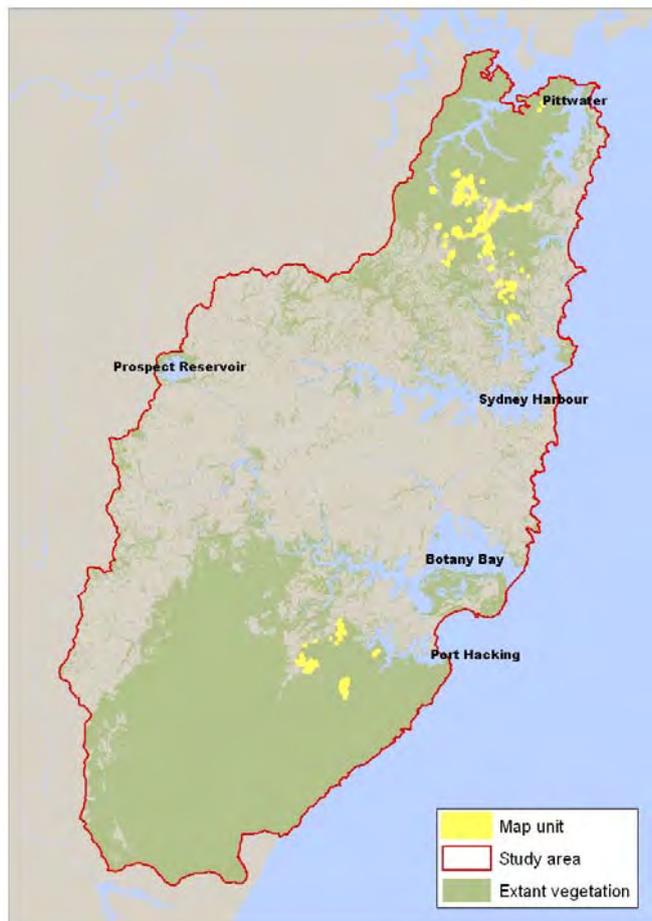
## Example Locations

o Intersection of Mona Vale Road and Terry Hills Road, Garigal NP

o Bottle Forest Track, Royal NP, Heathcote

## Species Richness

| | |
|---|---|
| Number of sites | 51 |
| Total native species | 250 |
| Average no. native species per site | 51.3 ±8.4 |

## Variations and Dynamics

Some floristic and structural variation occurs across the community's distribution. Sites with deeper lateritic soils are taller and more likely to exclude scribbly gums in the canopy. Ironstone mantles in southern Sydney may include similar though different species within the same genera compared to northern Sydney. Other species may be conspicuously different between areas. Gymea lily (*Doryanthes excelsa*) for example is prominent in southern Sydney but is absent in the north.

## Relationship to Other Communities

Floristically this community is related to exposed sandstone ridgetop woodlands (S_DSF05, S_DSF011). It grades into shale-sandstone forest (S_WSF06) where ironstone deepens and erodes to form a clay soil. Alternatively it grades to sandstone forests, woodlands or heaths as the depth of the ironstone mantle thins.

## Accuracy

Sampling density is high. Image interpretation, existing map data (Smith and Smith 2000) and field traverse were used to inform the map boundaries. Interpretation relied on the combination of identifiable orange lateritic soil in combination with prominent crown signature of taller silvertop ash on flat or gently sloping terrain. Proximity to clearing was used as a contextual indicator of possible occurrence of the community.

A 0.04 hectare site located in this map unit is expected to contain at least 29 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 42 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia myrtifolia* | 2 | 80% | 2 | 11% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 18% | 1 | 26% | Uninformative |
| *Actinotus minor* | 2 | 20% | 2 | 22% | Uninformative |
| *Allocasuarina littoralis* | 1 | 39% | 2 | 27% | Constant |
| *Amperea xiphoclada* | 1 | 12% | 1 | 6% | Uninformative |
| *Angophora costata* | 2 | 51% | 3 | 37% | Constant |
| *Anisopogon avenaceus* | 2 | 45% | 2 | 14% | Positive diagnostic |
| *Aristida vagans* | 1 | 20% | 2 | 14% | Uninformative |
| *Austrostipa pubescens* | 2 | 67% | 2 | 19% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 1 | 37% | 2 | 26% | Constant |
| *Banksia marginata* | 2 | 24% | 2 | 9% | Positive diagnostic |
| *Banksia oblongifolia* | 1 | 22% | 2 | 14% | Uninformative |
| *Banksia serrata* | 2 | 73% | 2 | 32% | Positive diagnostic |
| *Banksia spinulosa* | 2 | 88% | 2 | 25% | Positive diagnostic |
| *Billardiera scandens* | 1 | 82% | 1 | 36% | Positive diagnostic |
| *Boronia ledifolia* | 1 | 20% | 2 | 13% | Uninformative |
| *Boronia pinnata* | 2 | 61% | 1 | 4% | Positive diagnostic |
| *Bossiaea heterophylla* | 2 | 33% | 2 | 17% | Uninformative |
| *Bossiaea obcordata* | 2 | 55% | 2 | 6% | Positive diagnostic |
| *Brunoniella pumilio* | 1 | 41% | 2 | 6% | Positive diagnostic |
| *Cassytha glabella* | 2 | 29% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 57% | 2 | 26% | Positive diagnostic |
| *Caustis flexuosa* | 2 | 16% | 2 | 18% | Uninformative |
| *Ceratopetalum gummiferum* | 2 | 51% | 2 | 17% | Positive diagnostic |
| *Comesperma ericinum* | 1 | 37% | 1 | 2% | Positive diagnostic |
| *Comesperma volubile* | 1 | 14% | 1 | 1% | Positive diagnostic |
| *Conospermum longifolium* | 1 | 65% | 1 | 6% | Positive diagnostic |
| *Corymbia gummifera* | 3 | 100% | 2 | 40% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 90% | 2 | 25% | Positive diagnostic |
| *Dampiera purpurea* | 2 | 12% | 1 | 4% | Uninformative |
| *Dampiera stricta* | 1 | 71% | 2 | 22% | Positive diagnostic |
| *Daviesia alata* | 2 | 12% | 2 | 0% | Uninformative |
| *Dianella prunina* | 1 | 12% | 1 | 3% | Uninformative |
| *Dianella revoluta* | 1 | 24% | 2 | 17% | Uninformative |
| *Dillwynia retorta* | 2 | 45% | 2 | 25% | Positive diagnostic |
| *Doryanthes excelsa* | 2 | 18% | 2 | 9% | Uninformative |
| *Drosera peltata* | 2 | 12% | 1 | 3% | Uninformative |
| *Entolasia stricta* | 2 | 90% | 2 | 58% | Positive diagnostic |
| *Epacris pulchella* | 2 | 61% | 2 | 14% | Positive diagnostic |
| *Eucalyptus capitellata* | 3 | 53% | 2 | 1% | Positive diagnostic |
| *Eucalyptus haemastoma* | 2 | 55% | 2 | 11% | Positive diagnostic |
| *Eucalyptus oblonga* | 3 | 25% | 2 | 7% | Positive diagnostic |
| *Eucalyptus sieberi* | 3 | 67% | 2 | 8% | Positive diagnostic |
| *Gompholobium grandiflorum* | 1 | 45% | 1 | 8% | Positive diagnostic |
| *Gonocarpus teucrioides* | 1 | 29% | 2 | 23% | Uninformative |
| *Goodenia bellidifolia* subsp. *bellidifolia* | 1 | 14% | 1 | 4% | Uninformative |
| *Goodenia heterophylla* | 1 | 35% | 1 | 3% | Positive diagnostic |
| *Grevillea buxifolia* | 1 | 39% | 2 | 13% | Positive diagnostic |
| *Grevillea caleyi* | 3 | 14% | 0 | 0% | Positive diagnostic |
| *Grevillea linearifolia* | 2 | 24% | 2 | 7% | Positive diagnostic |
| *Grevillea sericea* | 2 | 43% | 2 | 15% | Positive diagnostic |
| *Hakea dactyloides* | 2 | 47% | 2 | 23% | Positive diagnostic |
| *Hakea sericea* | 2 | 61% | 2 | 20% | Positive diagnostic |
| *Hakea teretifolia* | 1 | 37% | 2 | 16% | Positive diagnostic |
| *Hibbertia aspera* | 2 | 25% | 2 | 10% | Positive diagnostic |
| *Hibbertia bracteata* | 2 | 65% | 2 | 4% | Positive diagnostic |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 2 | 39% | 1 | 5% | Positive diagnostic |
| *Hovea linearis* | 1 | 39% | 1 | 10% | Positive diagnostic |
| *Hybanthus monopetalus* | 1 | 14% | 1 | 2% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 22% | 2 | 20% | Uninformative |
| *Isopogon anemonifolius* | 2 | 25% | 2 | 18% | Uninformative |
| *Joycea pallida* | 3 | 12% | 2 | 1% | Uninformative |
| *Lambertia formosa* | 2 | 61% | 2 | 25% | Positive diagnostic |
| *Lasiopetalum ferrugineum* | 2 | 65% | 2 | 10% | Positive diagnostic |
| *Lepidosperma filiforme* | 3 | 14% | 2 | 8% | Uninformative |
| *Lepidosperma laterale* | 2 | 59% | 2 | 42% | Constant |
| *Leptospermum trinervium* | 2 | 49% | 2 | 37% | Constant |
| *Lepyrodia scariosa* | 2 | 27% | 2 | 20% | Uninformative |
| *Lindsaea linearis* | 2 | 73% | 2 | 15% | Positive diagnostic |
| *Lindsaea microphylla* | 1 | 39% | 1 | 7% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lissanthe strigosa* | 2 | 18% | 2 | 8% | Uninformative |
| *Lomandra brevis* | 1 | 16% | 1 | 1% | Positive diagnostic |
| *Lomandra cylindrica* | 1 | 16% | 2 | 10% | Uninformative |
| *Lomandra filiformis* | 1 | 29% | 2 | 22% | Uninformative |
| *Lomandra glauca* | 2 | 43% | 2 | 16% | Positive diagnostic |
| *Lomandra gracilis* | 1 | 12% | 2 | 10% | Uninformative |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 31% | 2 | 24% | Uninformative |
| *Lomandra obliqua* | 2 | 69% | 2 | 31% | Positive diagnostic |
| *Lomatia silaifolia* | 2 | 94% | 1 | 26% | Positive diagnostic |
| *Micrantheum ericoides* | 2 | 90% | 2 | 15% | Positive diagnostic |
| *Monotoca scoparia* | 1 | 37% | 1 | 16% | Positive diagnostic |
| *Patersonia glabrata* | 2 | 67% | 2 | 15% | Positive diagnostic |
| *Patersonia sericea* | 2 | 51% | 1 | 15% | Positive diagnostic |
| *Persoonia lanceolata* | 1 | 14% | 1 | 11% | Uninformative |
| *Persoonia laurina* | 2 | 20% | 1 | 2% | Positive diagnostic |
| *Persoonia levis* | 1 | 92% | 1 | 32% | Positive diagnostic |
| *Persoonia pinifolia* | 2 | 63% | 1 | 20% | Positive diagnostic |
| *Petrophile pulchella* | 2 | 47% | 2 | 15% | Positive diagnostic |
| *Petrophile sessilis* | 2 | 14% | 2 | 7% | Uninformative |
| *Phyllanthus hirtellus* | 2 | 80% | 2 | 26% | Positive diagnostic |
| *Phyllota grandiflora* | 1 | 16% | 2 | 1% | Positive diagnostic |
| *Phyllota phylicoides* | 2 | 37% | 2 | 12% | Positive diagnostic |
| *Pimelea linifolia* | 2 | 39% | 2 | 26% | Constant |
| *Pittosporum undulatum* | 1 | 16% | 2 | 25% | Uninformative |
| *Platysace linearifolia* | 2 | 86% | 2 | 28% | Positive diagnostic |
| *Pteridium esculentum* | 2 | 65% | 2 | 40% | Positive diagnostic |
| *Pultenaea linophylla* | 1 | 45% | 1 | 3% | Positive diagnostic |
| *Pultenaea tuberculata* | 2 | 43% | 2 | 15% | Positive diagnostic |
| *Scaevola ramosissima* | 1 | 24% | 1 | 5% | Positive diagnostic |
| *Smilax glyciphylla* | 1 | 22% | 2 | 33% | Uninformative |
| *Telopea speciosissima* | 1 | 35% | 1 | 2% | Positive diagnostic |
| *Tetrarrhena juncea* | 2 | 27% | 2 | 4% | Positive diagnostic |
| *Tetratheca thymifolia* | 1 | 18% | 1 | 1% | Positive diagnostic |
| *Themeda australis* | 2 | 33% | 2 | 23% | Uninformative |
| *Xanthorrhoea media* | 2 | 73% | 2 | 18% | Positive diagnostic |
| *Xanthosia tridentata* | 1 | 53% | 2 | 21% | Positive diagnostic |
| *Xylomelum pyriforme* | 1 | 39% | 1 | 6% | Positive diagnostic |

# Sydney Hinterland Exposed Sandstone Woodland    S_DSF15

| | |
|---|---|
| **Statewide Class** | **Sydney Coastal Dry Sclerophyll Forests** |
| NSW Plant Community Type: | 1081: Red Bloodwood-Grey Gum Woodland on the Edges of the Cumberland Plain, Sydney Basin |
| Biometric Number(s): | HN564; ME038 |



## Description

This is an exposed sandstone community distributed across the central and north-western Woronora Plateau and the western margin of the Hornsby plateau in north-west Sydney. It comprises a low-growing open eucalypt canopy with a dense shrub layer and an open ground cover of sedges and forbs. Common dominant tree species are red bloodwood (*Corymbia gummifera*), scribbly gums (*Eucalyptus racemosa/Eucalyptus haemastoma* complex and *Eucalyptus sclerophylla*) and stringybark (*Eucalyptus oblonga*). On the margins of the Georges River grey gum (*Eucalyptus punctata*) may be prominent, while on dry exposed slopes Sydney peppermint (*Eucalyptus piperita*) may join the canopy. The shrub layer is an array of common sandstone heath species such as banksias, wattles, tea-trees, hakeas and conesticks, though it is less diverse than sandstone communities found closer to the coast where mean annual rainfall is higher. For example heath-leaved banksia (*Banksia ericifolia* subsp. *ericifolia*) is generally absent from this community compared to sandstone heaths and woodlands further to the east.

The mean annual rainfall band for this community is 850-1000 millimetres with elevation extending from 50 to 400 metres above sea level. Soils are generally shallow sandy loams on broad ridges associated with Mittagong sandstones or rocky exposed Hawkesbury sandstone.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 16 m ±4<br>8-25 | 19% ±12<br>5-65 | *Corymbia gummifera, Angophora costata, Eucalyptus piperita, Eucalyptus punctata, Eucalyptus oblonga, Eucalyptus sclerophylla* |
| Small Trees | 4 m ±2<br>1-10 | 23% ±20<br>2-80 | *Leptospermum trinervium, Banksia serrata* |
| Shrubs | 2.1 m ±0.7<br>1.0-3.0 | 29% ±23<br>7-80 | *Banksia spinulosa, Persoonia levis, Isopogon anemonifolius, Dillwynia retorta, Acacia linifolia, Eriostemon australasius, Hakea sericea, Bossiaea heterophylla, Lambertia formosa, Acacia ulicifolia, Platysace linearifolia, Pimelea linifolia, Acacia suaveolens, Grevillea mucronulata* |
| Ground Covers | 0.9 m ±0.4<br>0.3-2.0 | 27% ±19<br>1-70 | *Entolasia stricta, Lomandra obliqua, Cyathochaeta diandra, Phyllanthus hirtellus Austrostipa pubescens, Lepidosperma laterale, Lomandra multiflora, Xanthorrhoea media, Lomandra filiformis, Caustis flexuosa, Dampiera stricta* |
| Vines & Climbers | N/A | N/A | *Cassytha pubescens Billardiera scandens* |

*Compiled from 32 sites with structural data recorded.

## Threats

Urban development has removed this community from broad flat sandstone ridgetops between Engadine and Menai and west of the Georges River near Campbelltown. Frequent fire from arson occurs near the perimeter of the urban areas in the Georges River catchment. Unformed motorbike trails are a common intrusion across the distribution of the community.

## Conservation Status

This vegetation community is represented in Dharawal, Heathcote and Georges River reserves.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 123,330-148,000 hectares |
| Estimated percentage cleared | Not available | 10-25% |
| Total NPWS reserves | 1184 +40.2 hectares<br>20% of extant area | 49,900 hectares<br>45% of extant area<br>25-45% of pre-clearing area |
| Total reserved | 1623 +53.6 hectares<br>27% of extant area | Not available |
| Total non-reserved | 4290 +123 hectares | Not available |
| Total extant | 5913 hectares | 111,000 hectares |

*As this woodland is only a component of the equivalent regional community, these figures overestimate the regional extent.



Map legend:
- Map unit (yellow)
- Study area (red)
- Extant vegetation (green)
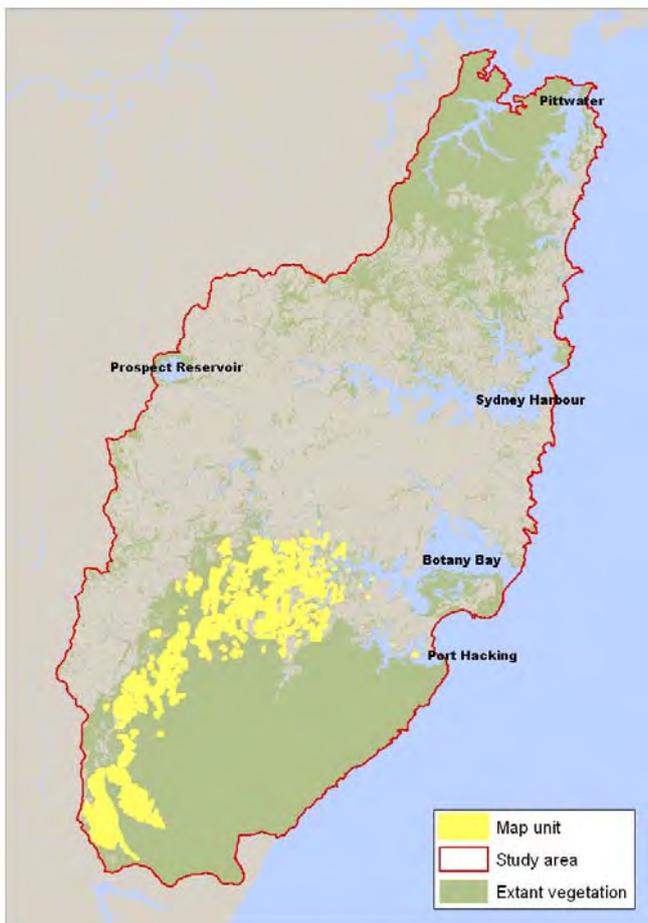
## Example Locations

o  Western areas of Dharawal SCA along Lysaghts Road

o  Wedderburn plateau, Campbelltown area

o  Georges River NP between Mill Creek and Heathcote Road

## Species Richness

| Number of sites | 61 |
|---|---|
| Total native species | 295 |
| Average no. native species per site | 52.0 ±9.8 |

## Variations and Dynamics

Some structural variations are present depending on the depth of the soil. Rockier sites support a lower open canopy and denser heath layer.

## Relationship to Other Communities

This community is often proximate to shale-sandstone soils associated with Mittagong sandstone, shale capping or the shale-sandstone boundary of the Cumberland Plain. Floristically it is closely associated with S_DSF18, a community found on enriched soils of the Cumberland Plain perimeter. It grades into sheltered sandstone forests (S_DSF04, S_DSF17 or S_DSF09) depending on distance from the coast and location.

## Accuracy

Sampling density is high. Mapped boundaries have been determined based on the rainfall and elevation parameters of site data, and the interpretation of image patterns that define open woodland on exposed ridges and slopes on Hawkesbury sandstone.

A 0.04 hectare site located in this map unit is expected to contain at least 30 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 43 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia linifolia* | 2 | 70% | 2 | 19% | Positive diagnostic |
| *Acacia myrtifolia* | 2 | 39% | 2 | 12% | Positive diagnostic |
| *Acacia suaveolens* | 1 | 51% | 1 | 27% | Positive diagnostic |
| *Acacia terminalis* | 1 | 26% | 2 | 20% | Uninformative |
| *Acacia ulicifolia* | 1 | 61% | 1 | 24% | Positive diagnostic |
| *Actinotus helianthi* | 1 | 25% | 1 | 7% | Positive diagnostic |
| *Actinotus minor* | 2 | 41% | 2 | 21% | Positive diagnostic |
| *Allocasuarina littoralis* | 2 | 44% | 2 | 26% | Positive diagnostic |
| *Angophora bakeri* | 2 | 15% | 2 | 5% | Positive diagnostic |
| *Angophora hispida* | 2 | 28% | 2 | 9% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 46% | 2 | 13% | Positive diagnostic |
| *Aristida vagans* | 1 | 26% | 2 | 14% | Uninformative |
| *Austrostipa pubescens* | 2 | 79% | 2 | 18% | Positive diagnostic |
| *Banksia marginata* | 2 | 15% | 2 | 9% | Uninformative |
| *Banksia oblongifolia* | 1 | 21% | 2 | 14% | Uninformative |
| *Banksia serrata* | 1 | 57% | 2 | 32% | Positive diagnostic |
| *Banksia spinulosa* | 2 | 89% | 2 | 24% | Positive diagnostic |
| *Billardiera scandens* | 1 | 64% | 1 | 36% | Positive diagnostic |
| *Boronia ledifolia* | 1 | 25% | 2 | 12% | Uninformative |
| *Bossiaea heterophylla* | 2 | 52% | 2 | 17% | Positive diagnostic |
| *Bossiaea stephensonii* | 2 | 15% | 2 | 1% | Positive diagnostic |
| *Brachyloma daphnoides* | 2 | 23% | 1 | 5% | Positive diagnostic |
| *Cassytha glabella* | 1 | 15% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 1 | 46% | 2 | 27% | Positive diagnostic |
| *Caustis flexuosa* | 2 | 52% | 2 | 17% | Positive diagnostic |
| *Corymbia gummifera* | 3 | 95% | 2 | 40% | Positive diagnostic |
| *Cryptandra amara* | 2 | 21% | 2 | 1% | Positive diagnostic |
| *Cyathochaeta diandra* | 3 | 90% | 2 | 24% | Positive diagnostic |
| *Dampiera stricta* | 2 | 51% | 2 | 23% | Positive diagnostic |
| *Dianella revoluta* | 1 | 46% | 2 | 16% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 57% | 2 | 25% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 11% | 2 | 23% | Uninformative |
| *Entolasia stricta* | 2 | 92% | 2 | 58% | Positive diagnostic |
| *Epacris pulchella* | 2 | 43% | 2 | 15% | Positive diagnostic |
| *Eragrostis brownii* | 1 | 15% | 2 | 6% | Uninformative |
| *Eriostemon australasius* | 1 | 48% | 2 | 13% | Positive diagnostic |
| *Eucalyptus haemastoma* | 2 | 41% | 2 | 11% | Positive diagnostic |
| *Eucalyptus oblonga* | 2 | 34% | 2 | 6% | Positive diagnostic |
| *Eucalyptus piperita* | 1 | 31% | 3 | 20% | Uninformative |
| *Eucalyptus punctata* | 2 | 30% | 2 | 11% | Positive diagnostic |
| *Eucalyptus sclerophylla* | 2 | 20% | 2 | 2% | Positive diagnostic |
| *Gompholobium glabratum* | 1 | 36% | 2 | 4% | Positive diagnostic |
| *Gompholobium grandiflorum* | 1 | 28% | 1 | 9% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 33% | 2 | 23% | Uninformative |
| *Goodenia hederacea* | 1 | 33% | 1 | 10% | Positive diagnostic |
| *Grevillea buxifolia* | 1 | 46% | 2 | 13% | Positive diagnostic |
| *Grevillea diffusa* | 2 | 26% | 2 | 6% | Positive diagnostic |
| *Grevillea mucronulata* | 1 | 11% | 2 | 6% | Uninformative |
| *Grevillea sericea* | 2 | 70% | 2 | 14% | Positive diagnostic |
| *Grevillea sphacelata* | 2 | 11% | 2 | 6% | Uninformative |
| *Hakea dactyloides* | 1 | 62% | 2 | 23% | Positive diagnostic |
| *Hakea sericea* | 1 | 79% | 2 | 20% | Positive diagnostic |
| *Hardenbergia violacea* | 1 | 18% | 1 | 16% | Uninformative |
| *Hibbertia circumdans* | 1 | 21% | 1 | 0% | Positive diagnostic |
| *Hibbertia* sp. nov. 'Menai' | 2 | 18% | 2 | 0% | Positive diagnostic |
| *Hovea linearis* | 1 | 43% | 1 | 10% | Positive diagnostic |
| *Isopogon anemonifolius* | 2 | 84% | 2 | 16% | Positive diagnostic |
| *Kunzea ambigua* | 1 | 16% | 2 | 15% | Uninformative |
| *Lambertia formosa* | 2 | 79% | 2 | 25% | Positive diagnostic |
| *Lasiopetalum ferrugineum* | 1 | 13% | 2 | 11% | Uninformative |
| *Lasiopetalum rufum* | 1 | 10% | 1 | 1% | Positive diagnostic |
| *Laxmannia gracilis* | 1 | 16% | 1 | 5% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 79% | 2 | 41% | Positive diagnostic |
| *Leptospermum arachnoides* | 2 | 34% | 2 | 8% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 13% | 2 | 14% | Uninformative |
| *Leptospermum trinervium* | 2 | 97% | 2 | 36% | Positive diagnostic |
| *Lepyrodia scariosa* | 2 | 64% | 2 | 19% | Positive diagnostic |
| *Leucopogon ericoides* | 2 | 23% | 1 | 8% | Positive diagnostic |
| *Leucopogon microphyllus* | 1 | 16% | 2 | 13% | Uninformative |
| *Lindsaea linearis* | 2 | 46% | 2 | 15% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lindsaea microphylla* | 1 | 18% | 1 | 8% | Uninformative |
| *Lissanthe strigosa* | 2 | 33% | 2 | 8% | Positive diagnostic |
| *Lobelia andrewsii* | 1 | 15% | 1 | 1% | Positive diagnostic |
| *Lomandra brevis* | 2 | 15% | 1 | 1% | Positive diagnostic |
| *Lomandra cylindrica* | 2 | 23% | 2 | 10% | Uninformative |
| *Lomandra filiformis* | 2 | 23% | 2 | 23% | Uninformative |
| *Lomandra glauca* | 2 | 15% | 2 | 16% | Uninformative |
| *Lomandra gracilis* | 2 | 25% | 2 | 10% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 66% | 2 | 23% | Positive diagnostic |
| *Lomandra obliqua* | 2 | 98% | 2 | 30% | Positive diagnostic |
| *Lomatia silaifolia* | 1 | 64% | 1 | 26% | Positive diagnostic |
| *Micrantheum ericoides* | 2 | 59% | 2 | 16% | Positive diagnostic |
| *Monotoca scoparia* | 1 | 46% | 1 | 15% | Positive diagnostic |
| *Opercularia diphylla* | 1 | 13% | 2 | 8% | Uninformative |
| *Patersonia sericea* | 1 | 30% | 1 | 15% | Uninformative |
| *Persoonia levis* | 1 | 85% | 1 | 32% | Positive diagnostic |
| *Persoonia linearis* | 1 | 25% | 1 | 20% | Uninformative |
| *Persoonia pinifolia* | 1 | 18% | 2 | 21% | Uninformative |
| *Petrophile pedunculata* | 2 | 13% | 2 | 1% | Positive diagnostic |
| *Petrophile sessilis* | 2 | 38% | 2 | 6% | Positive diagnostic |
| *Philotheca scabra* | 2 | 23% | 2 | 1% | Positive diagnostic |
| *Phyllanthus hirtellus* | 2 | 84% | 2 | 26% | Positive diagnostic |
| *Phyllota phylicoides* | 2 | 30% | 2 | 12% | Positive diagnostic |
| *Pimelea linifolia* | 2 | 66% | 2 | 25% | Positive diagnostic |
| *Platysace ericoides* | 2 | 49% | 2 | 5% | Positive diagnostic |
| *Platysace linearifolia* | 2 | 61% | 2 | 29% | Positive diagnostic |
| *Pomax umbellata* | 1 | 18% | 2 | 15% | Uninformative |
| *Ptilothrix deusta* | 2 | 13% | 2 | 5% | Uninformative |
| *Pultenaea stipularis* | 1 | 15% | 2 | 7% | Uninformative |
| *Pultenaea tuberculata* | 1 | 25% | 2 | 16% | Uninformative |
| *Scaevola ramosissima* | 1 | 23% | 1 | 5% | Positive diagnostic |
| *Schizaea dichotoma* | 1 | 10% | 1 | 1% | Positive diagnostic |
| *Schoenus ericetorum* | 2 | 39% | 2 | 6% | Positive diagnostic |
| *Stylidium graminifolium* | 1 | 18% | 2 | 5% | Positive diagnostic |
| *Stylidium lineare* | 1 | 15% | 2 | 6% | Uninformative |
| *Tetratheca neglecta* | 1 | 41% | 2 | 4% | Positive diagnostic |
| *Themeda australis* | 2 | 34% | 2 | 23% | Uninformative |
| *Tricoryne simplex* | 1 | 20% | 1 | 1% | Positive diagnostic |
| *Woollsia pungens* | 2 | 21% | 2 | 12% | Uninformative |
| *Xanthorrhoea concava* | 1 | 25% | 2 | 6% | Positive diagnostic |
| *Xanthorrhoea media* | 2 | 56% | 2 | 19% | Positive diagnostic |
| *Xanthorrhoea resinosa* | 2 | 13% | 2 | 10% | Uninformative |
| *Xanthosia pilosa* | 1 | 31% | 2 | 20% | Uninformative |
| *Xanthosia tridentata* | 2 | 52% | 2 | 21% | Positive diagnostic |

# SYDNEY HINTERLAND APPLE-BLACKBUTT GULLY FOREST          S_DSF17

**Statewide Class**          Sydney Hinterland Dry Sclerophyll Forests
NSW Plant Community Type:     1181: Smooth-barked Apple-Red Bloodwood-Sydney Peppermint Heathy Open
                             Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney,
                             Sydney Basin
Biometric Number(s):         HN586; ME029; SR635



## Description

This community is a moderately tall eucalypt forest with an understorey comprising dry shrubs, ferns and forbs. It occurs in the enriched sandstone gullies of the western Woronora Plateau and the tributaries of the Georges River between Wilton and Sandy Point. A large proportion of the extant area of this community occurs within the south-west Sydney area which experiences rainfall of 850-1050 millimetres per annum. The community occurs at elevations between four and 250 metres above sea level.

Typically the canopy is dominated by smooth-barked apple (*Angophora costata*) and blackbutt (*Eucalyptus pilularis*), with red bloodwood (*Corymbia gummifera*) common though less abundant. Grey gum (*Eucalyptus punctata*) may also be locally common in the western parts of the range with Sydney peppermint (*Eucalyptus piperita*) frequent in the east. A sparse layer of tall casuarinas (*Allocasuarina littoralis*/*Allocasuarina torulosa*) is often present just beneath the height of the eucalypts. Beneath these trees is a sparse sclerophyllous shrub layer that includes many species common in sandstone environments. This includes tea-trees, banksias, wattles, geebungs, grevilleas and peas. This community forms a component of the Hinterland Sandstone Gully Forests of Tozer et al. (2010) and the Western Gully Forest in Keith (1994) and DIPNR (2004).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 23 m ±4<br><br>15-32 | 20% ±10<br><br>5-45 | *Eucalyptus pilularis, Angophora costata, Corymbia gummifera, Eucalyptus punctata, Eucalyptus piperita, Syncarpia glomulifera, Eucalyptus agglomerata* |
| Small Trees | 8 m ±4<br><br>1-15 | 15% ±9<br><br>3-35 | *Ceratopetalum gummiferum, Allocasuarina littoralis, Xylomelum pyriforme, Banksia serrata, Syncarpia glomulifera* |
| Shrubs | 2.7 m ±0.9<br><br>1.0-4.0 | 12% ±8<br><br>2-30 | *Persoonia linearis, Acacia terminalis, Persoonia levis, Leptospermum trinervium, Lomatia silaifolia, Banksia spinulosa, Dodonaea triquetra, Platysace linearifolia, Acacia ulicifolia, Grevillea mucronulata, Eriostemon australasius* |
| Ground Covers | 1.2 m ±0.5<br><br>0.5-2.0 | 17% ±17<br><br>2-65 | *Pteridium esculentum, Entolasia stricta, Xanthosia pilosa, Dianella caerulea, Lomandra obliqua, Phyllanthus hirtellus, Lepidosperma laterale, Dianella revoluta, Lomandra gracilis, Lomandra multiflora, Lomandra filiformis, Gonocarpus teucrioides, Pomax umbellata, Austrostipa pubescens, Lomandra cylindrica, Xanthorrhoea arborea* |
| Vines & Climbers | N/A | N/A | *Smilax glyciphylla, Billardiera scandens, Hardenbergia violacea* |

*Compiled from 33 sites with structural data recorded.

## Threats

Much of the distribution of this community occurs away from urban development pressures and its associated impacts. Some loss has occurred on the foreshores of the Georges River and upper slopes and crests in the Wedderburn area. Military activity in the Holsworthy defence area may present localised impacts. Frequent fire arising from arson occurs along the western perimeter of the distribution. Fireweed (*Senecio madagascariensis*) was commonly recorded.

## Conservation Status

The community is considered to be well represented in Georges River NP and Dharawal SCA.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 95,680-113,625 hectares |
| Estimated percentage cleared | Not available | 5-20% |
| Total NPWS reserves | 468 +0.2 hectares<br>9% of extant area | 46,800 hectares<br>50% of extant area<br>35-55% of pre-clearing area |
| Total reserved | 706 +1.7 hectares<br>13% of extant area | Not available |
| Total non-reserved | 4666 +25.1 hectares | Not available |
| Total extant | 5372 hectares | 90,900 hectares |
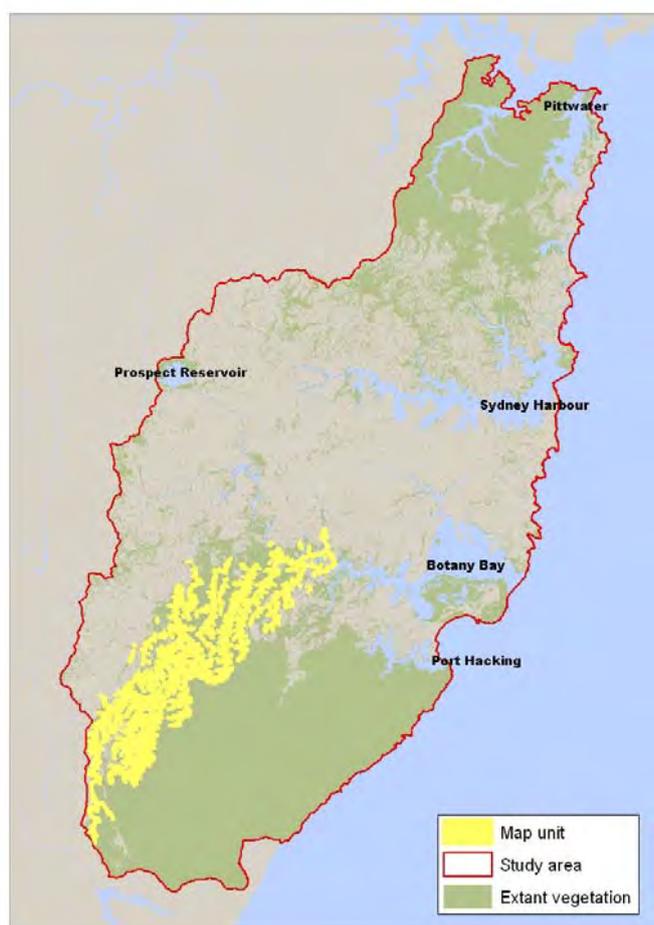


## Example Locations

o   Woolwash, upper Georges River, Airds, Campbelltown LGA

## Species Richness

| | |
|---|---|
| Number of sites | 83 |
| Total native species | 351 |
| Average no. native species per site | 48.2 ±10.1 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

Floristically this community shares species with S_DSF18, into which it grades in more exposed locations. However it forms a suite of sheltered sandstone forests enriched by proximity to shale-dominated landscapes. These forests include S_DSF04 and S_WSF06.

## Accuracy

Sampling density for this community is high. Map unit boundaries were interpreted from digital imagery using topographic position and crown signatures of blackbutt and/or grey gum with smooth-barked apple.

A 0.04 hectare site located in this map unit is expected to contain at least 25 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 39 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia hispidula* | 1 | 7% | 1 | 1% | Positive diagnostic |
| *Acacia linifolia* | 1 | 41% | 2 | 19% | Positive diagnostic |
| *Acacia longifolia* | 1 | 20% | 2 | 21% | Uninformative |
| *Acacia suaveolens* | 1 | 18% | 1 | 28% | Uninformative |
| *Acacia terminalis* | 2 | 65% | 1 | 18% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 53% | 1 | 24% | Positive diagnostic |
| *Actinotus helianthi* | 2 | 31% | 1 | 7% | Positive diagnostic |
| *Allocasuarina littoralis* | 2 | 48% | 2 | 26% | Positive diagnostic |
| *Allocasuarina torulosa* | 2 | 18% | 2 | 10% | Uninformative |
| *Amperea xiphoclada* | 1 | 16% | 1 | 5% | Positive diagnostic |
| *Angophora bakeri* | 2 | 17% | 2 | 5% | Positive diagnostic |
| *Angophora costata* | 3 | 83% | 3 | 35% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 17% | 2 | 14% | Uninformative |
| *Aristida vagans* | 2 | 20% | 2 | 14% | Uninformative |
| *Austrodanthonia fulva* | 1 | 8% | 2 | 2% | Positive diagnostic |
| *Austrostipa pubescens* | 2 | 41% | 2 | 19% | Positive diagnostic |
| *Banksia serrata* | 2 | 59% | 2 | 32% | Positive diagnostic |
| *Banksia spinulosa* | 2 | 76% | 2 | 24% | Positive diagnostic |
| *Billardiera scandens* | 1 | 58% | 1 | 36% | Positive diagnostic |
| *Blechnum cartilagineum* | 1 | 12% | 2 | 6% | Uninformative |
| *Boronia ledifolia* | 1 | 29% | 2 | 12% | Positive diagnostic |
| *Bossiaea heterophylla* | 1 | 37% | 2 | 17% | Positive diagnostic |
| *Bossiaea obcordata* | 2 | 13% | 2 | 7% | Uninformative |
| *Brunoniella pumilio* | 1 | 11% | 2 | 7% | Uninformative |
| *Bursaria spinosa* | 2 | 11% | 2 | 12% | Uninformative |
| *Calochlaena dubia* | 2 | 14% | 2 | 17% | Uninformative |
| *Cassytha glabella* | 2 | 12% | 2 | 15% | Uninformative |
| *Cassytha pubescens* | 2 | 28% | 2 | 27% | Uninformative |
| *Caustis flexuosa* | 2 | 41% | 2 | 17% | Positive diagnostic |
| *Ceratopetalum gummiferum* | 2 | 69% | 2 | 15% | Positive diagnostic |
| *Cheilanthes distans* | 1 | 11% | 1 | 1% | Positive diagnostic |
| *Cheilanthes sieberi subsp. sieberi* | 1 | 20% | 2 | 12% | Uninformative |
| *Clematis aristata* | 1 | 11% | 1 | 7% | Uninformative |
| *Correa reflexa* | 1 | 16% | 2 | 4% | Positive diagnostic |
| *Corymbia gummifera* | 2 | 78% | 2 | 40% | Positive diagnostic |
| *Crassula sieberiana* | 1 | 6% | 1 | 1% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 34% | 2 | 26% | Uninformative |
| *Dampiera purpurea* | 1 | 29% | 1 | 4% | Positive diagnostic |
| *Dampiera stricta* | 1 | 12% | 2 | 24% | Uninformative |
| *Dianella caerulea* | 2 | 66% | 2 | 44% | Positive diagnostic |
| *Dianella revoluta* | 2 | 55% | 1 | 15% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 49% | 2 | 25% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 47% | 2 | 22% | Positive diagnostic |
| *Doryanthes excelsa* | 2 | 16% | 2 | 9% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 30% | 1 | 20% | Uninformative |
| *Entolasia stricta* | 2 | 92% | 2 | 57% | Positive diagnostic |
| *Epacris pulchella* | 2 | 25% | 2 | 15% | Uninformative |
| *Eriostemon australasius* | 2 | 54% | 2 | 12% | Positive diagnostic |
| *Eucalyptus agglomerata* | 3 | 10% | 2 | 1% | Positive diagnostic |
| *Eucalyptus pilularis* | 3 | 55% | 3 | 12% | Positive diagnostic |
| *Eucalyptus piperita* | 3 | 41% | 3 | 19% | Positive diagnostic |
| *Eucalyptus punctata* | 2 | 34% | 2 | 10% | Positive diagnostic |
| *Exocarpos strictus* | 2 | 23% | 2 | 3% | Positive diagnostic |
| *Galium binifolium* | 1 | 13% | 1 | 1% | Positive diagnostic |
| *Glycine clandestina* | 1 | 11% | 2 | 18% | Uninformative |
| *Gompholobium grandiflorum* | 2 | 17% | 1 | 9% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 42% | 2 | 23% | Positive diagnostic |
| *Goodenia hederacea* | 1 | 18% | 1 | 10% | Uninformative |
| *Grevillea buxifolia* | 1 | 13% | 2 | 14% | Uninformative |
| *Grevillea mucronulata* | 2 | 53% | 2 | 5% | Positive diagnostic |
| *Grevillea sericea* | 2 | 17% | 2 | 15% | Uninformative |
| *Hakea dactyloides* | 2 | 23% | 2 | 24% | Uninformative |
| *Hakea sericea* | 1 | 30% | 2 | 21% | Uninformative |
| *Hardenbergia violacea* | 1 | 40% | 1 | 15% | Positive diagnostic |
| *Hibbertia nitida* | 1 | 11% | 1 | 3% | Positive diagnostic |
| *Hovea linearis* | 1 | 36% | 1 | 10% | Positive diagnostic |
| *Isopogon anemonifolius* | 2 | 23% | 2 | 18% | Uninformative |
| *Kennedia rubicunda* | 1 | 16% | 1 | 9% | Uninformative |
| *Lambertia formosa* | 2 | 35% | 2 | 26% | Uninformative |
| *Lepidosperma laterale* | 2 | 59% | 2 | 41% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Leptomeria acida* | 2 | 18% | 1 | 6% | Positive diagnostic |
| *Leptospermum polygalifolium* | 1 | 16% | 2 | 14% | Uninformative |
| *Leptospermum trinervium* | 2 | 83% | 2 | 36% | Positive diagnostic |
| *Leucopogon ericoides* | 2 | 22% | 1 | 8% | Positive diagnostic |
| *Leucopogon lanceolatus* | 1 | 19% | 1 | 8% | Positive diagnostic |
| *Lindsaea microphylla* | 1 | 31% | 1 | 7% | Positive diagnostic |
| *Lissanthe strigosa* | 1 | 14% | 2 | 8% | Uninformative |
| *Logania albiflora* | 2 | 10% | 1 | 2% | Positive diagnostic |
| *Lomandra confertifolia* | 2 | 28% | 2 | 4% | Positive diagnostic |
| *Lomandra cylindrica* | 2 | 37% | 2 | 10% | Positive diagnostic |
| *Lomandra filiformis* | 1 | 49% | 2 | 21% | Positive diagnostic |
| *Lomandra gracilis* | 2 | 48% | 2 | 9% | Positive diagnostic |
| *Lomandra multiflora subsp. multiflora* | 1 | 51% | 2 | 23% | Positive diagnostic |
| *Lomandra obliqua* | 2 | 81% | 2 | 30% | Positive diagnostic |
| *Lomatia silaifolia* | 1 | 75% | 1 | 25% | Positive diagnostic |
| *Macrozamia communis* | 1 | 14% | 2 | 4% | Positive diagnostic |
| *Marsdenia suaveolens* | 2 | 16% | 1 | 3% | Positive diagnostic |
| *Monotoca scoparia* | 1 | 31% | 1 | 15% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 18% | 1 | 21% | Uninformative |
| *Opercularia aspera* | 2 | 17% | 1 | 7% | Uninformative |
| *Pandorea pandorana* | 1 | 11% | 2 | 17% | Uninformative |
| *Patersonia glabrata* | 1 | 39% | 2 | 15% | Positive diagnostic |
| *Patersonia sericea* | 1 | 22% | 1 | 15% | Uninformative |
| *Persoonia levis* | 1 | 88% | 1 | 31% | Positive diagnostic |
| *Persoonia linearis* | 2 | 80% | 1 | 17% | Positive diagnostic |
| *Persoonia pinifolia* | 1 | 25% | 2 | 21% | Uninformative |
| *Petrophile sessilis* | 2 | 14% | 2 | 6% | Uninformative |
| *Philotheca scabra* | 2 | 11% | 2 | 2% | Positive diagnostic |
| *Phyllanthus hirtellus* | 2 | 76% | 2 | 25% | Positive diagnostic |
| *Pimelea linifolia* | 1 | 23% | 2 | 27% | Uninformative |
| *Platysace ericoides* | 2 | 11% | 2 | 6% | Uninformative |
| *Platysace linearifolia* | 2 | 77% | 2 | 28% | Positive diagnostic |
| *Podolobium ilicifolium* | 2 | 8% | 2 | 1% | Positive diagnostic |
| *Pomaderris discolor* | 1 | 6% | 2 | 1% | Positive diagnostic |
| *Pomaderris lanigera* | 3 | 7% | 1 | 1% | Positive diagnostic |
| *Pomax umbellata* | 2 | 39% | 2 | 14% | Positive diagnostic |
| *Pteridium esculentum* | 2 | 87% | 2 | 39% | Positive diagnostic |
| *Pultenaea daphnoides* | 2 | 16% | 2 | 8% | Uninformative |
| *Pultenaea flexilis* | 2 | 29% | 2 | 5% | Positive diagnostic |
| *Ricinocarpos pinifolius* | 1 | 23% | 1 | 7% | Positive diagnostic |
| *Smilax glyciphylla* | 1 | 75% | 2 | 31% | Positive diagnostic |
| *Stylidium laricifolium* | 2 | 13% | 1 | 1% | Positive diagnostic |
| *Stylidium productum* | 2 | 18% | 2 | 4% | Positive diagnostic |
| *Stypandra glauca* | 1 | 8% | 2 | 1% | Positive diagnostic |
| *Syncarpia glomulifera* | 2 | 18% | 3 | 13% | Uninformative |
| *Wahlenbergia gracilis* | 1 | 13% | 1 | 8% | Uninformative |
| *Xanthorrhoea arborea* | 2 | 33% | 2 | 11% | Positive diagnostic |
| *Xanthorrhoea concava* | 2 | 31% | 2 | 6% | Positive diagnostic |
| *Xanthorrhoea media* | 1 | 22% | 2 | 20% | Uninformative |
| *Xanthosia pilosa* | 2 | 87% | 2 | 18% | Positive diagnostic |
| *Xanthosia tridentata* | 2 | 33% | 2 | 21% | Uninformative |
| *Xylomelum pyriforme* | 1 | 42% | 1 | 5% | Positive diagnostic |
| *Zieria pilosa* | 1 | 16% | 2 | 5% | Positive diagnostic |

# SYDNEY HINTERLAND GREY GUM RIDGETOP FOREST     S_DSF18

| | |
|---|---|
| **Statewide Class** | **Sydney Hinterland Dry Sclerophyll Forests** |
| NSW Plant Community Type: | 1081: Red Bloodwood-Grey Gum Woodland on the Edges of the Cumberland Plain, Sydney Basin |
| Biometric Number(s): | HN564; ME038 |



## Description

This forest is primarily found on the broad ridges associated with Mittagong formation sandstone in the western stretches of the Woronora Plateau between Appin and Holsworthy. These bedrocks have interbanding layers of shale and sandstone material that erode to a sandy soil with a gentle shale influence. Often the presence of shale soil is not obvious as sites often include sandstone benching or outcropping. Described elsewhere as Upper Georges River Sandstone Woodland (Tozer 2003) it forms a moderately tall open eucalypt forest dominated by grey gum (*Eucalyptus punctata*) and red bloodwood (*Corymbia gummifera*) with one of a number of stringybarks (commonly *Eucalyptus oblonga*) as a regular associate. A sparse small tree layer of casuarina (*Allocasuarina littoralis/Allocasuarina torulosa*) is common. Local stands of blackbutt (*Eucalyptus pilularis*) are found close to residual shale caps near sheltered slopes and gullies (Tozer 2003) or at the narrowing end of broad sandstone ridges. The understorey is typically shrubby with a diverse mix of plants common on sandstone soils including wattles, tea-trees, banksias and geebungs. Unlike sandstone woodlands however, the ground layer supports a relatively high number of grass species of which kangaroo grass (*Themeda australis*) and spear grass (*Austrostipa pubescens)* and are indicative of the presence of shale in the soil.

Sydney Hinterland Grey Gum Ridgetop Forest is restricted to a narrow band of rainfall of 850-1050 millimetres per annum at elevations between 23 and 275 metres above sea level (Tozer 2003). It is most extensive within the Campbelltown and Liverpool local government areas. Outside of the study area it is likely to occur on the fringes of the Cumberland Plain in north-west Sydney and the lower Blue Mountains.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 17 m ±4<br>10-25 | 21% ±11<br>5-40 | *Corymbia gummifera, Eucalyptus punctata, Eucalyptus oblonga, Eucalyptus pilularis* |
| Small Trees | 5 m ±3<br>1-13 | 16% ±13<br>2-70 | *Allocasuarina littoralis* |
| Shrubs | 2.2 m ±0.7<br>1.0-3.0 | 16% ±14<br>1-50 | *Acacia ulicifolia, Persoonia linearis, Acacia terminalis, Banksia spinulosa, Goodenia hederacea, Persoonia levis, Pimelea linifolia, Leptospermum trinervium, Acacia linifolia, Exocarpos strictus, Lissanthe strigosa* |
| Ground Covers | 1.1 m ±0.4<br>0.5-2.0 | 31% ±21<br>2-75 | *Dianella revoluta, Entolasia stricta, Lomandra obliqua, Phyllanthus hirtellus, Pomax umbellata, Themeda australis, Austrostipa pubescens, Lomandra multiflora, Lepidosperma laterale* |
| Vines & Climbers | N/A | N/A | *Billardiera scandens, Cassytha pubescens* |

*Compiled from 52 sites with structural data recorded.

## Threats

Threats are moderate. Past clearing has depleted about one third of its original extent (Tozer et al. 2010). Remaining areas are contiguous along the ridges on either side of the Georges and Nepean rivers in Campbelltown where there are increasing urban pressures. Existing stands are under continuous pressure from physical damage arising from recreational activities, rubbish dumping, grazing, mowing and weed invasion. Frequent fire is also likely to represent an emerging threat.

## Conservation Status

This vegetation community is represented in Georges River NP.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 52,250-69,670 hectares |
| Estimated percentage cleared | Not available | 20-40% |
| Total NPWS reserves | 55.6 +0.8 hectares<br>2% of extant area | 13,000 hectares<br>30% of extant area<br>10-30% of pre-clearing area |
| Total reserved | 304 +7.3 hectares<br>10% of extant area | Not available |
| Total non-reserved | 2750 +245 hectares | Not available |
| Total extant | 3054 hectares | 41,800 hectares |
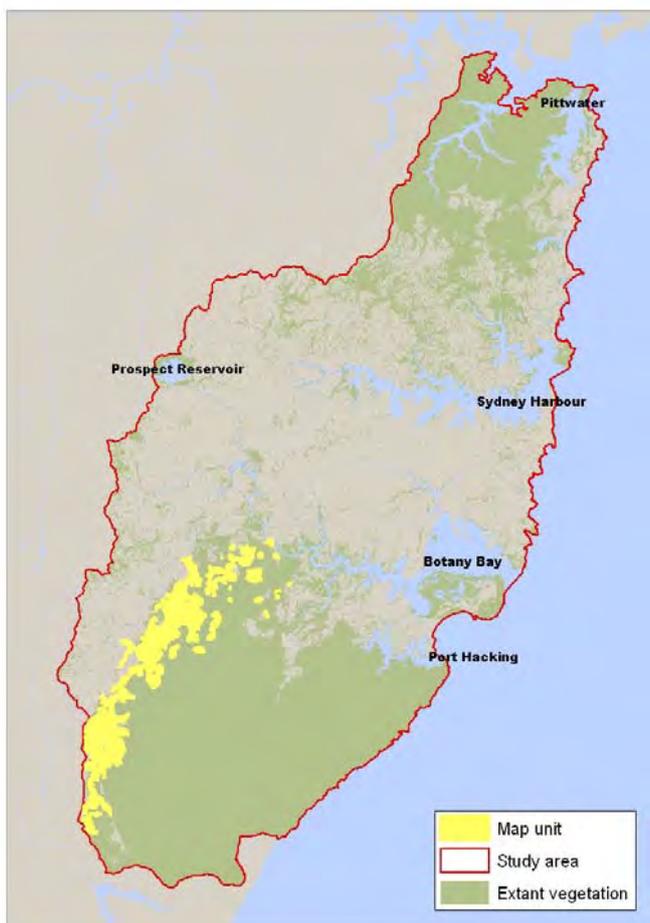


## Example Locations

o   Simmos Beach Recreation Reserve, Macquarie Fields, Campbelltown LGA

o   Wedderburn plateau, Campbelltown

## Species Richness

| | |
|---|---|
| Number of sites | 72 |
| Total native species | 345 |
| Average no. native species per site | 50.1 ±8.4 |

## Variations and Dynamics

Structural variation occurs with changes in soil depth. As soil becomes shallower the forest becomes lower and approaches an open woodland form. Floristic variation also changes as the understorey becomes shrubbier and less grassy. Some examples with tall stands of blackbutt were identified during the mapping interpretation and are included within this community.

## Relationship to Other Communities

This unit represents a grade between the sclerophyllous shrub woodlands on sandstone substrates to the east (S_DSF15) and the grassier ironbark-dominated shale-sandstone forests (S_GW04) closer to or on shale soils. Some of the sandstone plateau supporting this map unit is incised by steep gorges carved by the Georges River and its tributaries. These gullies mark the change into taller forests dominated by smooth-barked apple and blackbutt (S_DSF17).

## Accuracy

Sampling density is high. Map unit boundaries were interpreted from digital imagery based on taller forests associated with broad ridges with low levels of sandstone outcropping.

A 0.04 hectare site located in this map unit is expected to contain at least 28 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 41 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia decurrens* | 1 | 13% | 2 | 5% | Uninformative |
| *Acacia linifolia* | 2 | 53% | 2 | 19% | Positive diagnostic |
| *Acacia longifolia* | 2 | 25% | 2 | 21% | Uninformative |
| *Acacia myrtifolia* | 1 | 28% | 2 | 12% | Positive diagnostic |
| *Acacia suaveolens* | 1 | 24% | 1 | 28% | Uninformative |
| *Acacia terminalis* | 2 | 72% | 1 | 18% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 65% | 1 | 24% | Positive diagnostic |
| *Allocasuarina littoralis* | 2 | 69% | 2 | 26% | Positive diagnostic |
| *Angophora bakeri* | 2 | 40% | 2 | 4% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 17% | 2 | 14% | Uninformative |
| *Aristida vagans* | 2 | 57% | 2 | 13% | Positive diagnostic |
| *Astroloma humifusum* | 1 | 21% | 1 | 2% | Positive diagnostic |
| *Astroloma pinifolium* | 1 | 11% | 1 | 2% | Positive diagnostic |
| *Austrodanthonia fulva* | 2 | 38% | 2 | 1% | Positive diagnostic |
| *Austrostipa pubescens* | 2 | 75% | 2 | 18% | Positive diagnostic |
| *Banksia spinulosa* | 2 | 69% | 2 | 25% | Positive diagnostic |
| *Billardiera scandens* | 1 | 85% | 1 | 35% | Positive diagnostic |
| *Bossiaea heterophylla* | 1 | 14% | 2 | 18% | Uninformative |
| *Bossiaea obcordata* | 2 | 21% | 2 | 6% | Positive diagnostic |
| *Bossiaea prostrata* | 2 | 11% | 1 | 2% | Positive diagnostic |
| *Brachyloma daphnoides* | 2 | 31% | 1 | 5% | Positive diagnostic |
| *Brunoniella pumilio* | 1 | 29% | 2 | 6% | Positive diagnostic |
| *Callistemon linearis* | 1 | 10% | 1 | 2% | Positive diagnostic |
| *Cassytha glabella* | 2 | 13% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 56% | 2 | 26% | Positive diagnostic |
| *Cheilanthes sieberi* subsp. *sieberi* | 2 | 40% | 2 | 12% | Positive diagnostic |
| *Coronidium scorpioides* | 1 | 11% | 2 | 2% | Positive diagnostic |
| *Corymbia gummifera* | 3 | 79% | 2 | 40% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 78% | 2 | 24% | Positive diagnostic |
| *Dampiera stricta* | 2 | 11% | 2 | 24% | Uninformative |
| *Dianella revoluta* | 2 | 90% | 1 | 14% | Positive diagnostic |
| *Dichelachne micrantha* | 1 | 26% | 2 | 9% | Positive diagnostic |
| *Digitaria ramularis* | 1 | 10% | 2 | 2% | Positive diagnostic |
| *Dillwynia parvifolia* | 2 | 10% | 2 | 1% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 49% | 2 | 25% | Positive diagnostic |
| *Dodonaea triquetra* | 1 | 17% | 2 | 23% | Uninformative |
| *Echinopogon caespitosus* | 1 | 28% | 2 | 10% | Positive diagnostic |
| *Entolasia stricta* | 2 | 93% | 2 | 58% | Positive diagnostic |
| *Eragrostis benthamii* | 1 | 10% | 1 | 0% | Positive diagnostic |
| *Eragrostis brownii* | 2 | 24% | 2 | 6% | Positive diagnostic |
| *Eriostemon australasius* | 2 | 44% | 2 | 13% | Positive diagnostic |
| *Eucalyptus oblonga* | 2 | 36% | 2 | 6% | Positive diagnostic |
| *Eucalyptus pilularis* | 3 | 39% | 3 | 13% | Positive diagnostic |
| *Eucalyptus punctata* | 3 | 89% | 2 | 9% | Positive diagnostic |
| *Eucalyptus resinifera* subsp. *resinifera* | 2 | 11% | 1 | 5% | Uninformative |
| *Eucalyptus sclerophylla* | 3 | 21% | 2 | 2% | Positive diagnostic |
| *Exocarpos strictus* | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Glycine clandestina* | 1 | 28% | 2 | 18% | Uninformative |
| *Glycine tabacina* | 2 | 17% | 2 | 8% | Uninformative |
| *Gompholobium glabratum* | 1 | 14% | 2 | 4% | Positive diagnostic |
| *Gompholobium minus* | 2 | 35% | 2 | 2% | Positive diagnostic |
| *Gonocarpus tetragynus* | 2 | 39% | 2 | 7% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 13% | 2 | 24% | Uninformative |
| *Goodenia hederacea* | 1 | 64% | 2 | 9% | Positive diagnostic |
| *Grevillea diffusa* | 2 | 15% | 2 | 6% | Uninformative |
| *Grevillea mucronulata* | 2 | 32% | 2 | 6% | Positive diagnostic |
| *Grevillea sericea* | 2 | 13% | 2 | 15% | Uninformative |
| *Grevillea sphacelata* | 1 | 17% | 2 | 6% | Positive diagnostic |
| *Hakea dactyloides* | 1 | 32% | 2 | 23% | Uninformative |
| *Hakea sericea* | 2 | 54% | 2 | 20% | Positive diagnostic |
| *Hardenbergia violacea* | 1 | 33% | 1 | 15% | Positive diagnostic |
| *Hibbertia aspera* | 2 | 14% | 2 | 11% | Uninformative |
| *Hibbertia diffusa* | 1 | 21% | 2 | 2% | Positive diagnostic |
| *Hibbertia serpyllifolia* | 1 | 17% | 2 | 3% | Positive diagnostic |
| *Hovea linearis* | 1 | 60% | 1 | 9% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 25% | 2 | 20% | Uninformative |
| *Isopogon anemonifolius* | 2 | 50% | 2 | 17% | Positive diagnostic |
| *Jacksonia scoparia* | 2 | 19% | 1 | 2% | Positive diagnostic |
| *Kunzea ambigua* | 2 | 49% | 2 | 14% | Positive diagnostic |
| *Lagenophora gracilis* | 2 | 17% | 2 | 2% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lambertia formosa* | 2 | 28% | 2 | 26% | Uninformative |
| *Laxmannia gracilis* | 1 | 15% | 1 | 5% | Positive diagnostic |
| *Lepidosperma laterale* | 2 | 75% | 2 | 41% | Positive diagnostic |
| *Leptomeria acida* | 1 | 14% | 1 | 6% | Uninformative |
| *Leptospermum parvifolium* | 1 | 13% | 2 | 1% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 11% | 2 | 14% | Uninformative |
| *Leptospermum trinervium* | 2 | 67% | 2 | 36% | Positive diagnostic |
| *Leucopogon ericoides* | 1 | 11% | 1 | 8% | Uninformative |
| *Leucopogon virgatus* | 2 | 15% | 1 | 1% | Positive diagnostic |
| *Lindsaea microphylla* | 1 | 15% | 1 | 8% | Uninformative |
| *Lissanthe strigosa* | 2 | 60% | 1 | 7% | Positive diagnostic |
| *Lomandra confertifolia* | 2 | 21% | 2 | 4% | Positive diagnostic |
| *Lomandra cylindrica* | 2 | 43% | 2 | 9% | Positive diagnostic |
| *Lomandra filiformis* | 2 | 51% | 2 | 22% | Positive diagnostic |
| *Lomandra gracilis* | 2 | 11% | 2 | 10% | Uninformative |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 68% | 1 | 22% | Positive diagnostic |
| *Lomandra obliqua* | 2 | 94% | 2 | 30% | Positive diagnostic |
| *Lomatia silaifolia* | 1 | 35% | 1 | 27% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 53% | 2 | 35% | Positive diagnostic |
| *Monotoca scoparia* | 1 | 49% | 1 | 15% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 17% | 1 | 21% | Uninformative |
| *Olearia microphylla* | 2 | 19% | 1 | 2% | Positive diagnostic |
| *Opercularia diphylla* | 1 | 14% | 2 | 8% | Uninformative |
| *Ozothamnus diosmifolius* | 1 | 15% | 1 | 11% | Uninformative |
| *Panicum simile* | 2 | 35% | 2 | 9% | Positive diagnostic |
| *Patersonia glabrata* | 1 | 22% | 2 | 16% | Uninformative |
| *Patersonia sericea* | 1 | 36% | 2 | 15% | Positive diagnostic |
| *Persoonia lanceolata* | 1 | 13% | 1 | 11% | Uninformative |
| *Persoonia levis* | 1 | 63% | 1 | 32% | Positive diagnostic |
| *Persoonia linearis* | 1 | 69% | 1 | 18% | Positive diagnostic |
| *Persoonia pinifolia* | 2 | 14% | 1 | 21% | Uninformative |
| *Petrophile sessilis* | 2 | 18% | 2 | 6% | Positive diagnostic |
| *Phyllanthus hirtellus* | 2 | 93% | 2 | 25% | Positive diagnostic |
| *Pimelea linifolia* | 2 | 68% | 2 | 25% | Positive diagnostic |
| *Pittosporum undulatum* | 2 | 18% | 2 | 25% | Uninformative |
| *Platysace ericoides* | 1 | 29% | 2 | 5% | Positive diagnostic |
| *Poa labillardierei* var. *labillardierei* | 2 | 36% | 2 | 5% | Positive diagnostic |
| *Pomax umbellata* | 2 | 79% | 2 | 13% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 17% | 2 | 18% | Uninformative |
| *Stylidium graminifolium* | 2 | 31% | 2 | 4% | Positive diagnostic |
| *Syncarpia glomulifera* | 2 | 21% | 3 | 13% | Uninformative |
| *Themeda australis* | 2 | 83% | 2 | 21% | Positive diagnostic |
| *Trachymene incisa* | 2 | 17% | 2 | 1% | Positive diagnostic |
| *Wahlenbergia gracilis* | 1 | 17% | 1 | 8% | Uninformative |
| *Xanthorrhoea concava* | 2 | 44% | 2 | 5% | Positive diagnostic |
| *Xanthorrhoea media* | 2 | 33% | 2 | 19% | Uninformative |
| *Xanthosia pilosa* | 2 | 29% | 2 | 20% | Uninformative |
| *Xylomelum pyriforme* | 1 | 18% | 1 | 6% | Positive diagnostic |

# CASTLEREAGH SCRIBBLY GUM WOODLAND                                S_DSF19

Statewide Class                   Sydney Sand Flats Dry Sclerophyll Forests
NSW Plant Community Type:          883: Hard-leaved Scribbly Gum-Parramatta Red Gum Heathy Woodland of the
                                  Cumberland Plain, Sydney Basin
Biometric Number(s):              HN542; ME003



## Description

Castlereagh Scribbly Gum Woodland is one of several unique dry shrub woodland communities found on poorly consolidated sand deposits on hinterland plains and valleys of the Sydney region. In the study area it occurs on old stream deposits at Holsworthy, Voyager Point, and thin sand mantles in Rookwood Cemetery and Villawood. More extensive areas may have been present in these localities, although urban development has long since removed the native vegetation cover. The woodland comprises an open, low-growing eucalypt cover dominated by hard-leaved scribbly gum (*Eucalyptus sclerophylla*), narrow-leaved apple (*Angophora bakeri*) and drooping red gum (*Eucalyptus parramattensis* subsp. *parramattensis*). A sparse cover of tall paperbark (*Melaleuca decora*) is often present. Banksias, hakeas, wattles, tea-trees and paperbarks provide a well developed shrub layer. The ground cover is usually a diverse mix of species typically including a high cover of grasses and sedges.

It is situated on low-lying flat terrain at elevations of 7-65 metres above sea level. It occurs within a narrow mean annual rainfall band of 780-920 millimetres.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 14 m ±4<br>9-20 | 20% ±11<br>10-40 | *Eucalyptus sclerophylla, Eucalyptus parramattensis* subsp. *parramattensis, Angophora bakeri, Eucalyptus punctata* |
| Small Trees | 5 m ±4<br>1-12 | 29% ±28<br>5-80 | *Angophora bakeri, Melaleuca decora* |
| Shrubs | 2.3 m ±1.4<br>1.0-5.0 | 41% ±28<br>10-80 | *Banksia spinulosa, Lissanthe strigosa, Melaleuca nodosa, Hakea sericea, Pimelea linifolia, Goodenia hederacea, Leptospermum trinervium, Grevillea sericea, Callistemon linearis* |
| Ground Covers | 0.6 m ±0.3<br>0.3-1.0 | 43% ±27<br>3-80 | *Themeda australis, Cyathochaeta diandra, Entolasia stricta, Dianella revoluta, Stylidium graminifolium, Lepidosperma laterale, Trachymene incisa, Austrostipa pubescens, Cheilanthes sieberi* subsp. *sieberi, Dichelachne micrantha, Lomandra multiflora, Pomax umbellata, Laxmannia gracilis, Helichrysum scorpioides, Imperata cylindrica* var. *major* |
| Vines & Climbers | N/A | N/A | *Billardiera scandens, Cassytha glabella* |

*Compiled from 13 sites with structural data recorded.

## Threats

Clearing for urban development and sand mining has diminished the original extent of the community on the Cumberland Plain. The Voyager Point and Holsworthy area contains one of two large stands of the community remaining. Other stands are disjunct and isolated. Frequent fire, illegal trail riding, rubbish dumping and weed invasion are ongoing threats. This community has gradually been surrounded by urban development in recent years and it is expected that recreational and associated urban pressures will continue to grow.

## Conservation Status

This community is naturally rare. Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion is listed as a Vulnerable Ecological Community under the NSW TSC Act.

It is not represented in the NPWS estate in the Sydney metropolitan area.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 4430-6200 hectares |
| Estimated percentage cleared | Not available | 30-50% |
| Total NPWS reserves | <.1 +<.1 hectares<br>0% of extant area | 390 hectares<br>13% of extant area<br><10% of pre-clearing area |
| Total reserved | 0.8 +0 hectares<br>0.3% of extant area | Not available |
| Total non-reserved | 235 +50.5 hectares | Not available |
| Total extant | 236 hectares | 3100 hectares |



Map unit
Study area
Extant vegetation

## Example Locations

o  Lieutenant Cantello Reserve, Voyager Point, Liverpool LGA

## Species Richness

| Number of sites | 10 |
|---|---|
| Total native species | 159 |
| Average no. native species per site | 45.5 ±9.4 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

This woodland is one of several dry shrub forests and woodlands found on or near Tertiary sand deposits. Poorly drained sites, possibly resulting from underlying clay pans, carry a fresh water swamp eucalypt woodland (S_DSF20) and can be found nearby; this community is a TEC under the NSW TSC Act. Where these clay pans are exposed or where the sand is enriched by eroded shale material a distinctive dry shrub forest dominated by ironbarks occurs (S_DSF01); known as Castlereagh Ironbark Forest this community is also recognised as a TEC under the NSW TSC Act.

## Accuracy

Sampling density is moderate. The residual sand landforms upon which these forests grow provide a distinctive photo pattern and are easily interpretable. However several areas in Voyager Point and Holsworthy appear to have a very thin sand mantle mixing with lateritic gravels and sandstone bedrock. The species composition in these areas is very similar to that in S_DSF18.

A 0.04 hectare site located in this map unit is expected to contain at least 21 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 37 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia brownii* | 2 | 70% | 1 | 1% | Positive diagnostic |
| *Acacia decurrens* | 2 | 10% | 2 | 5% | Uninformative |
| *Acacia falcata* | 3 | 30% | 1 | 3% | Positive diagnostic |
| *Acacia linifolia* | 2 | 40% | 2 | 20% | Constant |
| *Acacia longifolia* | 1 | 20% | 2 | 21% | Uninformative |
| *Acacia myrtifolia* | 2 | 10% | 2 | 12% | Uninformative |
| *Acacia ulicifolia* | 1 | 10% | 1 | 26% | Uninformative |
| *Angophora bakeri* | 2 | 80% | 2 | 5% | Positive diagnostic |
| *Angophora floribunda* | 2 | 20% | 2 | 4% | Uninformative |
| *Aristida vagans* | 1 | 50% | 2 | 14% | Constant |
| *Aristida warburgii* | 1 | 30% | 1 | 1% | Positive diagnostic |
| *Austrodanthonia tenuior* | 2 | 30% | 2 | 4% | Positive diagnostic |
| *Austrostipa pubescens* | 2 | 70% | 2 | 20% | Positive diagnostic |
| *Banksia oblongifolia* | 2 | 40% | 2 | 14% | Constant |
| *Banksia spinulosa* | 2 | 90% | 2 | 26% | Positive diagnostic |
| *Billardiera scandens* | 1 | 40% | 1 | 37% | Constant |
| *Boronia polygalifolia* | 1 | 10% | 1 | 0% | Uninformative |
| *Bossiaea prostrata* | 2 | 10% | 1 | 2% | Uninformative |
| *Brachyloma daphnoides* | 1 | 10% | 1 | 5% | Uninformative |
| *Brunoniella pumilio* | 2 | 30% | 2 | 7% | Uninformative |
| *Burchardia umbellata* | 1 | 30% | 1 | 2% | Positive diagnostic |
| *Bursaria spinosa* | 1 | 30% | 2 | 12% | Uninformative |
| *Caesia parviflora* | 2 | 20% | 1 | 4% | Uninformative |
| *Callistemon linearis* | 2 | 60% | 1 | 2% | Positive diagnostic |
| *Callistemon pinifolius* | 1 | 30% | 2 | 1% | Positive diagnostic |
| *Cassytha glabella* | 2 | 70% | 2 | 14% | Positive diagnostic |
| *Cassytha pubescens* | 2 | 10% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 1 | 10% | 2 | 7% | Uninformative |
| *Centrolepis strigosa* subsp. *strigosa* | 1 | 10% | 1 | 0% | Uninformative |
| *Cheilanthes sieberi* subsp. *sieberi* | 2 | 50% | 2 | 12% | Positive diagnostic |
| *Chrysocephalum apiculatum* | 1 | 10% | 2 | 1% | Uninformative |
| *Coronidium scorpioides* | 2 | 60% | 1 | 2% | Positive diagnostic |
| *Cuscuta australis* | 2 | 10% | 2 | 0% | Uninformative |
| *Cyathochaeta diandra* | 3 | 80% | 2 | 26% | Positive diagnostic |
| *Dampiera stricta* | 2 | 20% | 2 | 23% | Uninformative |
| *Daviesia ulicifolia* | 2 | 40% | 2 | 3% | Positive diagnostic |
| *Dianella revoluta* | 2 | 80% | 1 | 17% | Positive diagnostic |
| *Dichelachne micrantha* | 1 | 50% | 2 | 9% | Positive diagnostic |
| *Dillwynia floribunda* | 2 | 10% | 2 | 5% | Uninformative |
| *Dillwynia parvifolia* | 3 | 40% | 2 | 1% | Positive diagnostic |
| *Dillwynia sericea* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Drosera spatulata* | 2 | 20% | 2 | 3% | Uninformative |
| *Echinopogon caespitosus* | 2 | 20% | 2 | 11% | Uninformative |
| *Entolasia marginata* | 2 | 10% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 100% | 2 | 59% | Positive diagnostic |
| *Epacris microphylla* | 1 | 10% | 2 | 10% | Uninformative |
| *Epaltes australis* | 2 | 10% | 2 | 0% | Uninformative |
| *Eragrostis brownii* | 2 | 30% | 2 | 7% | Uninformative |
| *Eragrostis leptostachya* | 2 | 10% | 2 | 4% | Uninformative |
| *Eucalyptus eugenioides* | 1 | 10% | 1 | 2% | Uninformative |
| *Eucalyptus fibrosa* | 2 | 20% | 3 | 3% | Uninformative |
| *Eucalyptus globoidea* | 2 | 10% | 3 | 4% | Uninformative |
| *Eucalyptus parramattensis* subsp. *parramattensis* | 2 | 80% | 2 | 0% | Positive diagnostic |
| *Eucalyptus sclerophylla* | 2 | 90% | 2 | 2% | Positive diagnostic |
| *Euryomyrtus ramosissima* subsp. *ramosissima* | 1 | 10% | 2 | 2% | Uninformative |
| *Exocarpos strictus* | 1 | 10% | 2 | 4% | Uninformative |
| *Fimbristylis dichotoma* | 2 | 10% | 1 | 1% | Uninformative |
| *Gahnia aspera* | 2 | 10% | 1 | 3% | Uninformative |
| *Glycine clandestina* | 2 | 30% | 2 | 18% | Uninformative |
| *Glycine microphylla* | 2 | 10% | 2 | 9% | Uninformative |
| *Gompholobium glabratum* | 2 | 10% | 1 | 5% | Uninformative |
| *Gompholobium minus* | 2 | 20% | 2 | 3% | Uninformative |
| *Gompholobium pinnatum* | 2 | 20% | 1 | 0% | Positive diagnostic |
| *Gonocarpus micranthus* | 2 | 10% | 2 | 1% | Uninformative |
| *Gonocarpus tetragynus* | 2 | 40% | 2 | 8% | Positive diagnostic |
| *Gonocarpus teucrioides* | 1 | 10% | 2 | 24% | Uninformative |
| *Goodenia bellidifolia* subsp. *bellidifolia* | 2 | 30% | 1 | 4% | Positive diagnostic |
| *Goodenia hederacea* | 2 | 70% | 1 | 10% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Goodenia paniculata* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Grevillea parviflora* | 2 | 10% | 1 | 0% | Uninformative |
| *Grevillea sericea* | 2 | 50% | 2 | 15% | Constant |
| *Hakea dactyloides* | 1 | 30% | 2 | 24% | Uninformative |
| *Hakea sericea* | 2 | 90% | 2 | 21% | Positive diagnostic |
| *Hardenbergia violacea* | 2 | 40% | 1 | 16% | Constant |
| *Harmogia densifolia* | 1 | 10% | 1 | 1% | Uninformative |
| *Hemarthria uncinata* | 1 | 10% | 2 | 1% | Uninformative |
| *Hibbertia aspera* | 2 | 20% | 2 | 11% | Uninformative |
| *Hibbertia pedunculata* | 1 | 10% | 2 | 0% | Uninformative |
| *Hibbertia serpyllifolia* | 2 | 20% | 2 | 3% | Uninformative |
| *Hydrocotyle peduncularis* | 1 | 10% | 2 | 6% | Uninformative |
| *Hypericum japonicum* | 2 | 10% | 1 | 0% | Uninformative |
| *Hypoxis hygrometrica* | 1 | 10% | 2 | 2% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 20% | 2 | 20% | Uninformative |
| *Isolepis inundata* | 2 | 10% | 1 | 1% | Uninformative |
| *Isopogon anemonifolius* | 2 | 20% | 2 | 18% | Uninformative |
| *Jacksonia scoparia* | 1 | 10% | 2 | 2% | Uninformative |
| *Joycea pallida* | 2 | 10% | 2 | 1% | Uninformative |
| *Juncus planifolius* | 3 | 10% | 2 | 1% | Uninformative |
| *Kunzea ambigua* | 2 | 10% | 2 | 15% | Uninformative |
| *Kunzea capitata* | 3 | 20% | 2 | 6% | Uninformative |
| *Lachnagrostis filiformis* | 2 | 10% | 1 | 2% | Uninformative |
| *Lagenophora gracilis* | 2 | 10% | 2 | 3% | Uninformative |
| *Lambertia formosa* | 2 | 20% | 2 | 26% | Uninformative |
| *Laxmannia gracilis* | 2 | 60% | 1 | 5% | Positive diagnostic |
| *Lepidosperma gunnii* | 1 | 10% | 2 | 2% | Uninformative |
| *Lepidosperma laterale* | 2 | 50% | 2 | 42% | Constant |
| *Lepidosperma urophorum* | 2 | 10% | 2 | 2% | Uninformative |
| *Leptospermum arachnoides* | 2 | 10% | 2 | 9% | Uninformative |
| *Leptospermum continentale* | 2 | 10% | 2 | 1% | Uninformative |
| *Leptospermum parvifolium* | 2 | 40% | 1 | 1% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 10% | 2 | 14% | Uninformative |
| *Leptospermum squarrosum* | 1 | 10% | 2 | 8% | Uninformative |
| *Leptospermum trinervium* | 2 | 60% | 2 | 37% | Constant |
| *Lepyrodia scariosa* | 2 | 10% | 2 | 21% | Uninformative |
| *Lindsaea linearis* | 1 | 20% | 2 | 16% | Uninformative |
| *Lissanthe strigosa* | 3 | 80% | 1 | 8% | Positive diagnostic |
| *Lomandra filiformis* | 2 | 10% | 2 | 23% | Uninformative |
| *Lomandra glauca* | 2 | 10% | 2 | 16% | Uninformative |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 70% | 2 | 24% | Positive diagnostic |
| *Lomandra obliqua* | 1 | 10% | 2 | 32% | Uninformative |
| *Melaleuca decora* | 2 | 60% | 2 | 3% | Positive diagnostic |
| *Melaleuca ericifolia* | 2 | 40% | 3 | 1% | Positive diagnostic |
| *Melaleuca erubescens* | 2 | 30% | 2 | 0% | Positive diagnostic |
| *Melaleuca nodosa* | 3 | 100% | 2 | 5% | Positive diagnostic |
| *Melaleuca thymifolia* | 2 | 30% | 2 | 1% | Positive diagnostic |
| *Melichrus procumbens* | 1 | 10% | 1 | 0% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 70% | 2 | 36% | Constant |
| *Mirbelia rubiifolia* | 2 | 20% | 2 | 4% | Uninformative |
| *Mitrasacme polymorpha* | 2 | 10% | 2 | 6% | Uninformative |
| *Olearia microphylla* | 1 | 10% | 1 | 3% | Uninformative |
| *Opercularia diphylla* | 2 | 50% | 2 | 8% | Positive diagnostic |
| *Panicum simile* | 1 | 30% | 2 | 10% | Uninformative |
| *Patersonia glabrata* | 2 | 30% | 2 | 16% | Uninformative |
| *Patersonia sericea* | 2 | 10% | 1 | 15% | Uninformative |
| *Persoonia lanceolata* | 1 | 10% | 1 | 11% | Uninformative |
| *Persoonia laurina* | 1 | 10% | 1 | 2% | Uninformative |
| *Persoonia linearis* | 1 | 10% | 1 | 20% | Uninformative |
| *Persoonia nutans* | 1 | 10% | 0 | 0% | Uninformative |
| *Petrophile pedunculata* | 2 | 30% | 2 | 1% | Positive diagnostic |
| *Petrophile sessilis* | 2 | 40% | 2 | 7% | Positive diagnostic |
| *Phyllanthus hirtellus* | 3 | 10% | 2 | 27% | Uninformative |
| *Pimelea linifolia* | 3 | 80% | 2 | 26% | Positive diagnostic |
| *Platysace ericoides* | 2 | 30% | 2 | 6% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 2 | 50% | 2 | 6% | Positive diagnostic |
| *Poa sieberiana* | 2 | 10% | 2 | 1% | Uninformative |
| *Pomax umbellata* | 2 | 30% | 2 | 15% | Uninformative |
| *Poranthera ericifolia* | 1 | 10% | 1 | 2% | Uninformative |
| *Pratia purpurascens* | 2 | 10% | 2 | 18% | Uninformative |
| *Ptilothrix deusta* | 2 | 50% | 2 | 5% | Positive diagnostic |
| *Pultenaea retusa* | 1 | 30% | 1 | 2% | Positive diagnostic |
| *Pultenaea tuberculata* | 2 | 20% | 2 | 16% | Uninformative |
| *Pultenaea villosa* | 2 | 30% | 2 | 3% | Positive diagnostic |
| *Schoenus apogon* | 2 | 30% | 2 | 1% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Schoenus brevifolius* | 2 | 10% | 2 | 4% | Uninformative |
| *Senecio hispidulus* | 1 | 10% | 1 | 2% | Uninformative |
| *Solenogyne bellioides* | 2 | 10% | 2 | 0% | Uninformative |
| *Stackhousia viminea* | 1 | 10% | 1 | 3% | Uninformative |
| *Stylidium graminifolium* | 1 | 80% | 2 | 5% | Positive diagnostic |
| *Themeda australis* | 3 | 90% | 2 | 23% | Positive diagnostic |
| *Thysanotus tuberosus* | 2 | 20% | 1 | 2% | Uninformative |
| *Trachymene incisa* | 2 | 50% | 2 | 1% | Positive diagnostic |
| *Tricoryne elatior* | 1 | 20% | 2 | 3% | Uninformative |
| *Vernonia cinerea* var. *cinerea* | 1 | 10% | 2 | 3% | Uninformative |
| *Wahlenbergia communis* | 2 | 20% | 2 | 0% | Positive diagnostic |
| *Wahlenbergia gracilis* | 2 | 20% | 1 | 8% | Uninformative |
| *Wahlenbergia stricta* subsp. *stricta* | 1 | 10% | 2 | 1% | Uninformative |
| *Xanthorrhoea concava* | 2 | 10% | 2 | 7% | Uninformative |
| *Xanthorrhoea minor* subsp. *minor* | 2 | 40% | 1 | 1% | Positive diagnostic |

# CASTLEREAGH SWAMP WOODLAND                                    S_DSF20

**Statewide Class**
NSW Plant Community Type:

**Biometric Number(s):**

**Sydney Sand Flats Dry Sclerophyll Forests**
1065: Parramatta Red Gum Woodland on Moist Alluvium of the Cumberland Plain, Sydney Basin
ME005



## Description

This community is a swamp sclerophyll forest associated with periodically inundated soils associated with Tertiary, Holocene and Quaternary sand deposits. This includes minor dune swales, creek lines and local depressions. It is characterised by a moderate to dense cover of paperbark trees of which *Melaleuca decora*, *Melaleuca linariifolia* and *Melaleuca nodosa* are most common. They may be joined by various small eucalypt trees. In older stands these eucalypts form a sparse emergent layer. In the Sydney area eucalypt species include drooping red gum (*Eucalyptus parramattensis* subsp. *parramattensis*), ironbark (including *Eucalyptus crebra*) and woollybutt (*Eucalyptus longifolia*). A wide variety of other eucalypt species may be included and these reflect the transition from the surrounding dry woodland communities. The ground layer may be damp or covered by water depending on the time of year and season. This encourages a diversity of grasses as well as a dense cover of water-loving herbs and sedges.

Castlereagh Swamp Woodland is found in low-lying situations where elevation is between 10 and 60 metres above sea level. Only small areas persist in the study area and they lie in areas receiving less than 850 millimetres of mean annual rainfall. Remnants occur in the Holsworthy and Bankstown areas. Elsewhere the community is found in the sand deposits at Castlereagh near Penrith and amongst the Mellong sand swamps in the Putty area (DECCW 2009). It is included within the dry sclerophyll formation of Keith (2004) owing to its association with the dry woodlands that form on the same distinctive substrates.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 12 m ±5 <br> 1-20 | 23% ±20 <br> 5-70 | *Eucalyptus parramattensis* subsp. *parramattensis*, *Eucalyptus longifolia* |
| Small Trees | 5 m ±3 <br> 1-12 | 26% ±21 <br> 5-60 | *Melaleuca decora, Melaleuca nodosa, Pultenaea villosa, Acacia longifolia, Melaleuca linariifolia* |
| Ground Covers | 0.8 m ±0.3 <br> 0.4-1.0 | 51% ±26 <br> 5-90 | *Entolasia stricta, Microlaena stipoides* var. *stipoides, Centella asiatica, Hydrocotyle peduncularis, Imperata cylindrica* var. *major, Dianella revoluta, Eragrostis brownii, Pratia purpurascens, Aristida vagans, Cheilanthes sieberi* subsp. *sieberi, Dichelachne micrantha, Goodenia paniculata, Lomandra longifolia, Poranthera microphylla* |
| Vines & Climbers | N/A | N/A | *Cassytha pubescens* |

*Compiled from 10 sites with structural data recorded.

## Threats

The threats facing this community are considered to be high because the community occurs in small patches and is naturally rare. The NSW Scientific Committee (1999a) list the following as primary threats: weed invasion related to nutrient enrichment from surrounding urban and rural areas; direct destruction for hobby farm, rural and residential development; and clay and shale extraction. Additional threatening processes include sedimentation, rubbish dumping, recreational vehicles and trail bikes.

## Conservation Status

Castlereagh Swamp Woodland Community is listed as an Endangered Ecological Community under the NSW TSC Act. It is not represented in NPWS estate in the Sydney metropolitan area but does occur in reserves managed by local government.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 870-1110 hectares |
| Estimated percentage cleared | Not available | 30-45% |
| Total NPWS reserves | <.1 +<.1 hectares<br>0% of extant area | 120 hectares<br>20% of extant area<br>5-15% of pre-clearing area |
| Total reserved | 3.2 +0 hectares<br>7% of extant area | Not available |
| Total non-reserved | 45.6 +0.9 hectares | Not available |
| Total extant | 48.8 hectares | 610 hectares |



## Example Locations

o Lieutenant Cantello Reserve, Voyager Point, Liverpool LGA

## Species Richness

| Number of sites | 7 |
|---|---|
| Total native species | 92 |
| Average no. native species per site | 23.9 ±16.7 |

## Variations and Dynamics

The eucalypt species present varies across the range of the community. The varying levels of moisture in the soil strongly exert differences in the floristic composition of this community. The density of the paperbark thickets may also be variable. This may be in response to local disturbance or fire (NSW Scientific Committee 1999a).

## Relationship to Other Communities

This swamp community sits amongst a range of forests and woodlands that occur on soils of clay and quartz materials on the Cumberland Plain. Where adjoining areas are sandy and well drained, Castlereagh Scribbly Gum Woodland (S_DSF19) occurs; this community is also recognised as a TEC under the TSC Act.

## Accuracy

Sampling density is moderate. Map unit boundaries relied on the API of low-lying swamp depressions dominated by paperbarks and supporting a distinctive wetland element.

A 0.04 hectare site located in this map unit is expected to contain at least 6 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 18 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia decurrens* | 1 | 14% | 2 | 5% | Uninformative |
| *Acacia floribunda* | 1 | 14% | 2 | 4% | Uninformative |
| *Acacia longifolia* | 2 | 29% | 2 | 21% | Uninformative |
| *Acacia parramattensis* | 3 | 14% | 1 | 5% | Uninformative |
| *Alternanthera denticulata* | 2 | 14% | 2 | 1% | Uninformative |
| *Angophora subvelutina* | 3 | 14% | 1 | 0% | Uninformative |
| *Austrodanthonia tenuior* | 1 | 14% | 2 | 4% | Uninformative |
| *Baumea articulata* | 2 | 14% | 2 | 1% | Uninformative |
| *Baumea teretifolia* | 6 | 14% | 2 | 0% | Uninformative |
| *Brunoniella australis* | 2 | 14% | 2 | 7% | Uninformative |
| *Brunoniella pumilio* | 1 | 14% | 2 | 7% | Uninformative |
| *Callistemon linearis* | 2 | 14% | 1 | 2% | Uninformative |
| *Callistemon salignus* | 1 | 14% | 1 | 1% | Uninformative |
| *Carex appressa* | 2 | 29% | 2 | 1% | Positive diagnostic |
| *Cassytha glabella* | 2 | 29% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 29% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 3 | 29% | 2 | 7% | Uninformative |
| *Centella asiatica* | 2 | 57% | 2 | 6% | Positive diagnostic |
| *Cheilanthes sieberi* subsp. *sieberi* | 1 | 29% | 2 | 13% | Uninformative |
| *Cryptandra spinescens* | 1 | 14% | 2 | 0% | Uninformative |
| *Daviesia ulicifolia* | 2 | 14% | 2 | 3% | Uninformative |
| *Dianella longifolia* | 1 | 14% | 2 | 5% | Uninformative |
| *Dianella revoluta* | 2 | 29% | 2 | 17% | Uninformative |
| *Dichelachne micrantha* | 2 | 14% | 2 | 9% | Uninformative |
| *Dichondra repens* | 2 | 29% | 2 | 14% | Uninformative |
| *Dillwynia sieberi* | 2 | 14% | 2 | 2% | Uninformative |
| *Echinopogon caespitosus* | 2 | 14% | 2 | 11% | Uninformative |
| *Empodisma minus* | 2 | 14% | 2 | 5% | Uninformative |
| *Entolasia marginata* | 2 | 29% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 71% | 2 | 59% | Constant |
| *Eragrostis brownii* | 1 | 14% | 2 | 7% | Uninformative |
| *Eragrostis leptostachya* | 2 | 43% | 2 | 4% | Positive diagnostic |
| *Eriochloa pseudoacrotricha* | 1 | 14% | 1 | 0% | Uninformative |
| *Eucalyptus eugenioides* | 1 | 14% | 1 | 2% | Uninformative |
| *Eucalyptus longifolia* | 1 | 43% | 1 | 1% | Positive diagnostic |
| *Eucalyptus parramattensis* subsp. *parramattensis* | 2 | 57% | 2 | 0% | Positive diagnostic |
| *Glycine tabacina* | 1 | 14% | 2 | 8% | Uninformative |
| *Goodenia paniculata* | 2 | 43% | 2 | 1% | Positive diagnostic |
| *Gratiola pedunculata* | 2 | 29% | 2 | 0% | Positive diagnostic |
| *Hemarthria uncinata* | 2 | 14% | 2 | 1% | Uninformative |
| *Hibbertia aspera* | 2 | 29% | 2 | 11% | Uninformative |
| *Hydrocotyle peduncularis* | 2 | 86% | 2 | 6% | Positive diagnostic |
| *Hypericum gramineum* | 1 | 14% | 2 | 3% | Uninformative |
| *Hypoxis hygrometrica* | 2 | 29% | 2 | 2% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 3 | 43% | 2 | 20% | Constant |
| *Isolepis inundata* | 3 | 43% | 1 | 1% | Positive diagnostic |
| *Juncus fockei* | 2 | 14% | 0 | 0% | Uninformative |
| *Juncus pallidus* | 2 | 29% | 1 | 0% | Positive diagnostic |
| *Juncus planifolius* | 2 | 43% | 2 | 1% | Positive diagnostic |
| *Juncus remotiflorus* | 2 | 14% | 2 | 0% | Uninformative |
| *Juncus subsecundus* | 2 | 14% | 1 | 0% | Uninformative |
| *Juncus usitatus* | 2 | 29% | 1 | 3% | Positive diagnostic |
| *Kunzea ambigua* | 1 | 14% | 2 | 15% | Uninformative |
| *Lachnagrostis filiformis* | 2 | 29% | 1 | 2% | Positive diagnostic |
| *Leptospermum polygalifolium* | 1 | 14% | 2 | 14% | Uninformative |
| *Lepyrodia muelleri* | 2 | 14% | 3 | 0% | Uninformative |
| *Leucopogon juniperinus* | 1 | 14% | 2 | 10% | Uninformative |
| *Lobelia anceps* | 2 | 29% | 2 | 2% | Positive diagnostic |
| *Lomandra filiformis* | 2 | 14% | 2 | 23% | Uninformative |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 29% | 2 | 24% | Uninformative |
| *Melaleuca decora* | 3 | 86% | 2 | 3% | Positive diagnostic |
| *Melaleuca ericifolia* | 3 | 43% | 2 | 1% | Positive diagnostic |
| *Melaleuca linariifolia* | 2 | 57% | 2 | 3% | Positive diagnostic |
| *Melaleuca nodosa* | 2 | 43% | 2 | 5% | Positive diagnostic |
| *Melaleuca styphelioides* | 4 | 14% | 1 | 2% | Uninformative |
| *Melaleuca thymifolia* | 1 | 43% | 2 | 1% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 2 | 43% | 2 | 36% | Constant |
| *Nymphoides geminata* | 2 | 14% | 0 | 0% | Uninformative |
| *Opercularia diphylla* | 2 | 29% | 2 | 8% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Oxalis exilis* | 1 | 14% | 1 | 4% | Uninformative |
| *Panicum simile* | 2 | 29% | 2 | 10% | Uninformative |
| *Paspalidium aversum* | 2 | 14% | 1 | 0% | Uninformative |
| *Paspalum distichum* | 3 | 14% | 2 | 0% | Uninformative |
| *Paspalum orbiculare* | 2 | 29% | 3 | 0% | Positive diagnostic |
| *Persicaria decipiens* | 2 | 14% | 2 | 1% | Uninformative |
| *Philydrum lanuginosum* | 2 | 14% | 1 | 0% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 2 | 14% | 2 | 6% | Uninformative |
| *Polymeria calycina* | 2 | 14% | 1 | 2% | Uninformative |
| *Poranthera microphylla* | 2 | 29% | 2 | 7% | Uninformative |
| *Pratia purpurascens* | 2 | 43% | 2 | 18% | Constant |
| *Pultenaea villosa* | 2 | 71% | 2 | 2% | Positive diagnostic |
| *Ranunculus inundatus* | 2 | 29% | 2 | 0% | Positive diagnostic |
| *Schenkia spicata* | 1 | 14% | 1 | 0% | Uninformative |
| *Schoenus apogon* | 2 | 29% | 2 | 1% | Positive diagnostic |
| *Solenogyne bellioides* | 1 | 14% | 2 | 0% | Uninformative |
| *Themeda australis* | 3 | 29% | 2 | 23% | Uninformative |
| *Tricoryne elatior* | 2 | 14% | 2 | 3% | Uninformative |
| *Typha orientalis* | 2 | 14% | 3 | 2% | Uninformative |
| *Viminaria juncea* | 1 | 14% | 2 | 2% | Uninformative |
| *Wahlenbergia gracilis* | 1 | 14% | 1 | 8% | Uninformative |

# COASTAL SAND BANGALAY FOREST                                    S_DSF21

## Description

Coastal Sand Bangalay Forest is found on flat, low-lying coastal marine sand deposits of the coastal zones. It is a low to moderately tall open forest of bangalay (*Eucalyptus botryoides*) and smooth-barked apple (*Angophora costata*). Tall banksia trees may join the eucalypt canopy or form a sparse layer underneath. This forest includes a mix of mesophyllous and sclerophyllous species in the shrub layer. Sweet pittosporum (*Pittosporum undulatum*), cheese tree (*Glochidion ferdinandi*), coffee bush (*Breynia oblongifolia*) and tree broom-heath (*Monotoca elliptica*) are typical. A high cover of bracken fern (*Pteridium esculentum*) and spiny-headed mat-rush (*Lomandra longifolia*) often dominates the ground layer with grasses, sedges and other forbs in lower abundance.

Where this forest is found elevations rarely exceed 10 metres above sea level. This flat to undulating landscape has been attractive for urban and industrial development in the Sans Souci, Narrabeen and Kurnell areas and as result much of the original forest cover is gone. This is typical for much of the distribution along the eastern seaboard, although significant stands still remain patchily distributed along the south and central coasts of New South Wales. In the Sydney region the community is part of the sand dune forests complex found between Port Stephens and Shellharbour.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 13 m ±6 <br> 9-20 | 35% ±13 <br> 25-50 | *Angophora costata, Eucalyptus botryoides, Banksia integrifolia* |
| Small Trees | 8 m ±7 <br> 2-15 | 23% ±18 <br> 5-40 | *Elaeocarpus reticulatus, Banksia integrifolia, Cupaniopsis anacardioides Glochidion ferdinandi, Pittosporum undulatum* |
| Shrubs | 4.5 m ±2.1 <br> 3.0-6.0 | 10% ±7 <br> 5-15 | *Breynia oblongifolia, Hibbertia scandens, Monotoca elliptica, Notelaea longifolia, Pittosporum revolutum* |
| Ground Covers | 1.5 m ±1.1 <br> 0.4-3.0 | 43% ±35 <br> 10-90 | *Lomandra longifolia, Pteridium esculentum, Dianella caerulea, Imperata cylindrica* var. *major, Entolasia marginata, Commelina cyanea, Microlaena stipoides* var. *stipoides* |
| Vines & Climbers | N/A | N/A | *Smilax glyciphylla, Eustrephus latifolius, Glycine clandestina, Stephania japonica, Billardiera scandens, Geitonoplesium cymosum* |

*Compiled from 3 sites with structural data recorded.

## Threats

In the study area this community has been extensively cleared. Remaining examples are highly fragmented and patchily distributed. Weed invasion (particularly from bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*)) is common within remaining stands. Heavy recreation use occurs within currently reserved areas. Frequent fire may pose localised threats near the urban perimeter.

## Conservation Status

Coastal Sand Bangalay Forest is a component of Bangalay Sand Forest, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act.

It is represented in Kamay Botany Bay and Royal national parks.

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 16,000-22,400 hectares |
| Estimated percentage cleared | Not available | 30-50% |
| Total NPWS reserves | 11.4 +0.9 hectares<br>64% of extant area | 6500 hectares<br>60% of extant area<br>20-40% of pre-clearing area |
| Total reserved | 12.7 +0.9 hectares<br>71% of extant area | Not available |
| Total non-reserved | 5.2 +3.3 hectares | Not available |
| Total extant | 17.9 hectares | 11,200 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o Main entrance to Kamay Botany Bay NP, Kurnell

o Leo Smith Reserve, Rockdale

o Shearwater Drive, Warriewood

## Species Richness

| | |
|---|---|
| Number of sites | 4 |
| Total native species | 81 |
| Average no. native species per site | 34.8 ±5.9 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community. Some variation in canopy height and cover occurs in disturbed environments.

## Relationship to Other Communities

Floristically and spatially the community marks a transition between the dry heath/shrub forests (S_DSF03) and heaths (S_HL04) found on podsolised dune crests and the mesic littoral forests (S_WSF03) situated in protected sites. The community also grades into sand swamp forests and wetlands (S_FoW04) in gentle depressions and swales.

## Accuracy

Sampling intensity is moderate. Map unit boundaries were based on the interpretation of Holocene sand transgressive barrier dunes and dry eucalypt forests and woodlands.

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia irrorata* | 3 | 25% | 1 | 3% | Uninformative |
| *Acacia longifolia* | 2 | 75% | 2 | 21% | Constant |
| *Acacia suaveolens* | 1 | 50% | 1 | 28% | Constant |
| *Acacia terminalis* | 1 | 25% | 1 | 20% | Uninformative |
| *Acacia ulicifolia* | 1 | 25% | 1 | 25% | Uninformative |
| *Allocasuarina littoralis* | 2 | 50% | 2 | 27% | Constant |
| *Allocasuarina torulosa* | 1 | 25% | 2 | 10% | Uninformative |
| *Alphitonia excelsa* | 3 | 25% | 1 | 1% | Positive diagnostic |
| *Angophora costata* | 3 | 100% | 3 | 37% | Positive diagnostic |
| *Aotus ericoides* | 2 | 50% | 2 | 8% | Constant |
| *Baloskion tetraphyllum* | 5 | 50% | 2 | 1% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 1 | 25% | 2 | 26% | Uninformative |
| *Banksia integrifolia* | 1 | 25% | 2 | 9% | Uninformative |
| *Banksia serrata* | 2 | 50% | 2 | 33% | Constant |
| *Billardiera scandens* | 1 | 75% | 1 | 37% | Constant |
| *Breynia oblongifolia* | 1 | 75% | 1 | 17% | Positive diagnostic |
| *Callistemon citrinus* | 1 | 25% | 2 | 3% | Uninformative |
| *Clematis aristata* | 1 | 25% | 1 | 7% | Uninformative |
| *Commelina cyanea* | 2 | 50% | 2 | 9% | Constant |
| *Cupaniopsis anacardioides* | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Desmodium varians* | 1 | 25% | 2 | 9% | Uninformative |
| *Dianella caerulea* | 2 | 100% | 2 | 45% | Positive diagnostic |
| *Dichelachne rara* | 1 | 25% | 2 | 1% | Positive diagnostic |
| *Dichondra repens* | 2 | 25% | 2 | 14% | Uninformative |
| *Digitaria parviflora* | 1 | 25% | 2 | 5% | Uninformative |
| *Dodonaea triquetra* | 2 | 25% | 2 | 23% | Uninformative |
| *Echinopogon caespitosus* | 2 | 25% | 2 | 11% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 75% | 1 | 20% | Constant |
| *Entolasia marginata* | 2 | 75% | 2 | 22% | Constant |
| *Eucalyptus botryoides* | 3 | 100% | 3 | 5% | Positive diagnostic |
| *Eustrephus latifolius* | 3 | 50% | 2 | 15% | Constant |
| *Ficinia nodosa* | 2 | 25% | 2 | 2% | Uninformative |
| *Gahnia sieberiana* | 2 | 50% | 2 | 7% | Constant |
| *Geitonoplesium cymosum* | 2 | 25% | 2 | 9% | Uninformative |
| *Glochidion ferdinandi* | 2 | 75% | 1 | 13% | Positive diagnostic |
| *Glycine clandestina* | 2 | 100% | 2 | 18% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 50% | 2 | 23% | Constant |
| *Grevillea mucronulata* | 1 | 25% | 2 | 7% | Uninformative |
| *Hardenbergia violacea* | 2 | 50% | 1 | 16% | Constant |
| *Hibbertia scandens* | 2 | 100% | 2 | 7% | Positive diagnostic |
| *Hydrocotyle acutiloba* | 2 | 25% | 2 | 1% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 100% | 2 | 20% | Positive diagnostic |
| *Kennedia rubicunda* | 2 | 25% | 1 | 9% | Uninformative |
| *Leptocarpus tenax* | 1 | 25% | 2 | 5% | Uninformative |
| *Leptospermum juniperinum* | 1 | 25% | 2 | 2% | Uninformative |
| *Leptospermum laevigatum* | 1 | 25% | 2 | 5% | Uninformative |
| *Leucopogon ericoides* | 2 | 25% | 1 | 9% | Uninformative |
| *Livistona australis* | 1 | 25% | 2 | 10% | Uninformative |
| *Lomandra longifolia* | 2 | 100% | 2 | 47% | Positive diagnostic |
| *Macrozamia spiralis* | 1 | 25% | 1 | 1% | Positive diagnostic |
| *Melaleuca armillaris* subsp. *armillaris* | 3 | 25% | 2 | 1% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 50% | 2 | 36% | Constant |
| *Monotoca elliptica* | 2 | 75% | 1 | 7% | Positive diagnostic |
| *Morinda jasminoides* | 2 | 25% | 2 | 7% | Uninformative |
| *Notelaea longifolia* | 1 | 75% | 1 | 21% | Constant |
| *Notelaea venosa* | 2 | 25% | 1 | 1% | Positive diagnostic |
| *Omalanthus nutans* | 2 | 25% | 1 | 9% | Uninformative |
| *Oplismenus imbecillis* | 2 | 25% | 2 | 13% | Uninformative |
| *Pandorea pandorana* | 2 | 25% | 2 | 16% | Uninformative |
| *Phyllanthus gunnii* | 1 | 25% | 2 | 1% | Uninformative |
| *Pimelea linifolia* | 1 | 25% | 2 | 27% | Uninformative |
| *Pittosporum revolutum* | 1 | 25% | 1 | 9% | Uninformative |
| *Pittosporum undulatum* | 1 | 25% | 2 | 25% | Uninformative |
| *Platysace linearifolia* | 2 | 25% | 2 | 29% | Uninformative |
| *Poa affinis* | 2 | 25% | 2 | 11% | Uninformative |
| *Polyscias sambucifolia* | 2 | 25% | 1 | 15% | Uninformative |
| *Pomax umbellata* | 1 | 75% | 2 | 15% | Positive diagnostic |
| *Poranthera microphylla* | 1 | 25% | 2 | 7% | Uninformative |
| *Pratia purpurascens* | 1 | 25% | 2 | 18% | Uninformative |
| *Pteridium esculentum* | 3 | 100% | 2 | 40% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Schoenus apogon* | 1 | 25% | 2 | 1% | Positive diagnostic |
| *Schoenus brevifolius* | 1 | 25% | 2 | 4% | Uninformative |
| *Senecio hispidulus* | 1 | 25% | 1 | 2% | Uninformative |
| *Smilax glyciphylla* | 1 | 100% | 2 | 33% | Positive diagnostic |
| *Stephania japonica* | 2 | 50% | 1 | 6% | Positive diagnostic |
| *Syzygium paniculatum* | 1 | 25% | 1 | 0% | Positive diagnostic |
| *Themeda australis* | 1 | 25% | 2 | 23% | Uninformative |
| *Xanthorrhoea arborea* | 2 | 25% | 2 | 12% | Uninformative |
| *Xanthorrhoea media* | 1 | 25% | 2 | 20% | Uninformative |

# HAWKESBURY RIVER ESCARPMENT DRY FOREST

## S_DSF69

**Statewide Class**
Sydney Hinterland Dry Sclerophyll Forests

NSW Plant Community Type:
1181: Smooth-barked Apple-Red Bloodwood-Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin

Biometric Number(s):
HN586; ME029; SR635
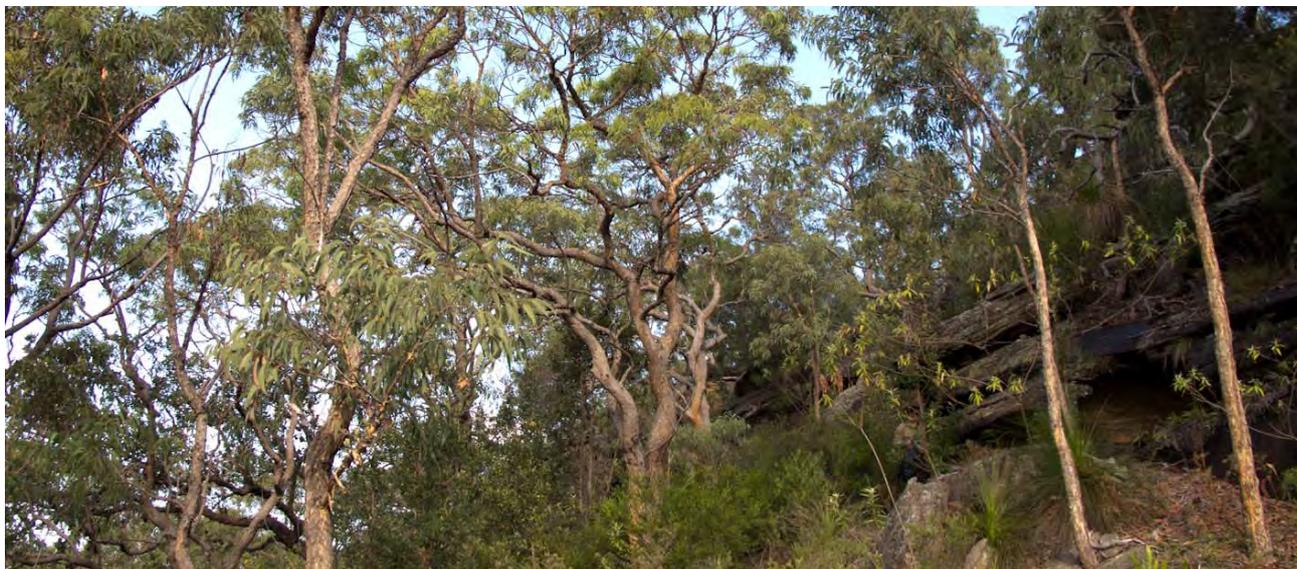


## Description

Hawkesbury River Escarpment Dry Forest occurs on the steep sandstone slopes that overlook the Hawkesbury River and its tributaries. It is a low to moderately tall eucalypt forest with an open sclerophyllous shrub layer and prominent cover of small grass trees. The canopy is characterised by smooth-barked apple (*Angophora costata*), broad-leaved white mahogany (*Eucalyptus umbra*), red bloodwood (*Corymbia gummifera*) and grey gum (*Eucalyptus punctata*) in the Cowan catchment between West Head and Jerusalem Bay in Ku-ring-gai Chase NP. Around Brooklyn yellow bloodwood (*Corymbia eximia*) dominates the canopy and is prevalent west of Hawkesbury River bridge. Casuarinas (*Allocasuarina* spp.) form a sparse to open small tree layer above a mixed shrubby understorey including prickly moses (*Acacia ulicifolia*), *Grevillea sericea*, Sydney boronia (*Boronia ledifolia*) and *Astrotricha floccosa*. Clumps of the low-growing grass tree *Xanthorrhoea arborea* are conspicuous on the broken rocky ground.

In the study area the forest occurs between two and 80 metres above sea level, spanning lower to upper escarpment slopes. The exposed slopes are underlain by Hawkesbury sandstone, perhaps enriched by thin shale lenses within the bedrock that are only revealed in the deeply dissected valley. Mean annual rainfall is between 1000 and 1200 millimetres. The forest is extensively distributed westwards along the river as far as Warragamba dam near Penrith and the junction with both the Colo and Macdonald rivers.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 15 m ±4.6 8-25 | 28% ±11.3 20-50 | *Angophora costata, Eucalyptus punctata, Eucalyptus umbra, Corymbia eximia, Corymbia gummifera* |
| Small Trees | 5.1 m ±1.5 2-8 | 7.5% ±2.0 5-10 | *Allocasuarina littoralis, Banksia integrifolia, Allocasuarina torulosa, Ceratopetalum gummiferum, Banksia serrata, Elaeocarpus reticulatus* |
| Shrubs | 2 m ±0.6 1.5-4.0 | 26% ±10.8 20-40 | *Acacia ulicifolia, Astrotricha floccosa, Boronia ledifolia, Grevillea sericea, Hovea linearis, Eriostemon australasius, Dillwynia retorta, Hibbertia obtusifolia* |
| Ground Covers | 0.4 m ±0.2 0.01-1 | 24.2% ±8.6 15-40 | *Entolasia stricta, Pteridium esculentum, Platysace linearifolia, Anisopogon avenaceus, Caustis flexuosa, Patersonia sericea, Lepidosperma laterale, Xanthorrhoea arborea* |
| Vines & Climbers | N/A | N/A | *Billardiera scandens, Smilax glyciphylla* |

*Compiled from 6 sites with structural data recorded.

## Threats

The precipitous landscape has minimised the encroachment of urban and agricultural impacts. Much of this community is also remote from existing roads and walking tracks, so is mainly accessed by recreational boaters on the foreshore. Threats are likely to be localised only and associated with frequent hazard reduction burning in the Brooklyn area or with weed encroachment from foreshore disturbance.

## Conservation Status

This vegetation community is represented in Ku-ring-gai Chase, Mougamarra, Marramarra, Parr, Burragorang, Blue Mountains, Brisbane Waters and Dharug reserves.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 511 +1.9 hectares 95% of extant area | Est. 1800 hectares |
| Total reserved | 521 +1.9 hectares 97% of extant area | Not available |
| Total non-reserved | 15.0 +<.1 hectares | Not available |
| Total extant | 536 hectares | Est. 3000 ha |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.
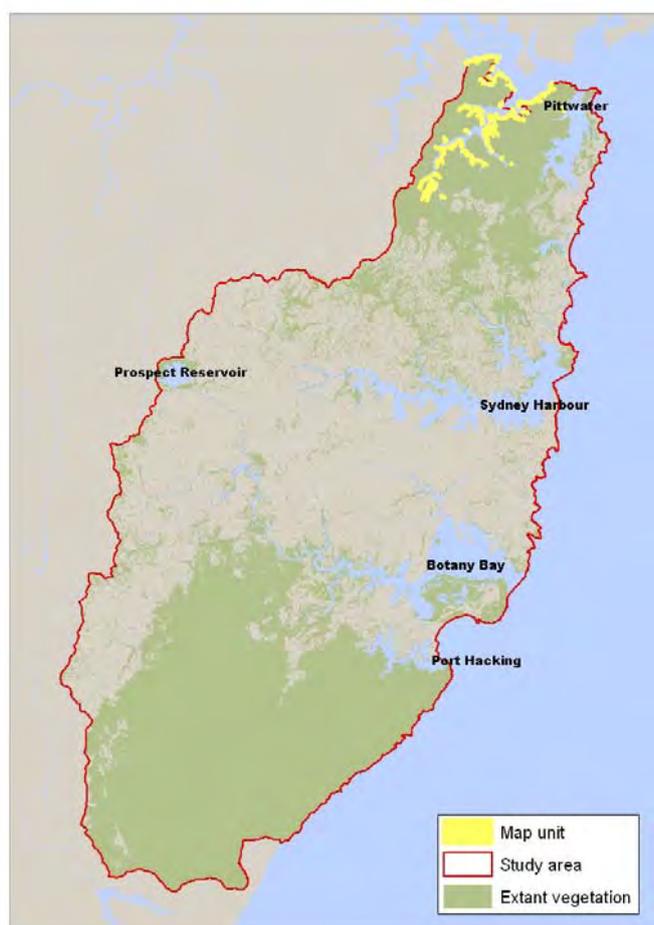


## Example Locations

o Exposed foreshores of Cowan Water (e.g. Cowan Point)

o North-facing slopes of Jerusalem Bay, Ku-ring-gai Chase NP

o North-facing slopes behind Brooklyn

## Species Richness

| | |
|---|---|
| Number of sites | 13 |
| Total native species | 135 |
| Average no. native species per site | 32.9 ±6.7 |

## Variations and Dynamics

Turnover of eucalypt species occurs across an east to west gradient with *Corymbia eximia* increasingly common with declining rainfall.

## Relationship to Other Communities

Floristically this unit is related to other sheltered Hawkesbury sandstone forests in the Sydney region, particularly those found on the drier hinterland plateaus. Within the study area it may be confused with Coastal Sandstone Gully Forest (S_DSF09). The proximity to river frontage is a preliminary diagnostic feature. Understorey features can reliably be used to discriminate the two, with *Astrotricha floccosa* and the grass tree *Xanthorrhoea arborea* (present in greater abundance in S_DSF69) being examples of obvious differences.

This community grades into Hawkesbury plateau woodlands (S_DSF11) above the escarpment slopes. Those communities feature a distinctive heathy understorey.

## Accuracy

Sampling intensity is moderate. Map unit boundaries were based on the interpretation of Hawkesbury sandstone that carried moderately tall dry sclerophyll forests found on exposed to semi-sheltered aspects. An elevation threshold of 80 metres above sea level was used to separate S_DSF09 from this unit on foreshore slopes.

A 0.04 hectare site located in this map unit is expected to contain at least 8 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 26 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia linifolia* | 2 | 23% | 2 | 20% | Uninformative |
| *Acacia oxycedrus* | 3 | 15% | 1 | 1% | Uninformative |
| *Acacia ulicifolia* | 2 | 92% | 1 | 25% | Positive diagnostic |
| *Allocasuarina littoralis* | 3 | 46% | 2 | 27% | Constant |
| *Allocasuarina torulosa* | 3 | 54% | 2 | 10% | Positive diagnostic |
| *Angophora costata* | 3 | 46% | 3 | 37% | Constant |
| *Angophora floribunda* | 2 | 23% | 2 | 4% | Uninformative |
| *Anisopogon avenaceus* | 2 | 46% | 2 | 14% | Positive diagnostic |
| *Astrotricha floccosa* | 2 | 77% | 2 | 2% | Positive diagnostic |
| *Austrostipa pubescens* | 2 | 23% | 2 | 20% | Uninformative |
| *Banksia integrifolia* | 2 | 31% | 2 | 9% | Uninformative |
| *Banksia serrata* | 3 | 38% | 2 | 33% | Constant |
| *Billardiera scandens* | 2 | 31% | 1 | 37% | Uninformative |
| *Boronia ledifolia* | 2 | 38% | 2 | 13% | Constant |
| *Bossiaea heterophylla* | 2 | 23% | 2 | 18% | Uninformative |
| *Bursaria spinosa* | 2 | 15% | 2 | 12% | Uninformative |
| *Calochlaena dubia* | 2 | 15% | 2 | 16% | Uninformative |
| *Cassytha pubescens* | 1 | 23% | 2 | 27% | Uninformative |
| *Caustis flexuosa* | 2 | 23% | 2 | 17% | Uninformative |
| *Corymbia eximia* | 3 | 46% | 2 | 1% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 23% | 2 | 26% | Uninformative |
| *Dianella caerulea* | 2 | 54% | 2 | 45% | Constant |
| *Dianella revoluta* | 1 | 31% | 2 | 17% | Uninformative |
| *Dillwynia floribunda* | 3 | 15% | 2 | 5% | Uninformative |
| *Dillwynia retorta* | 3 | 15% | 2 | 26% | Uninformative |
| *Dodonaea triquetra* | 3 | 15% | 2 | 23% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 23% | 1 | 20% | Uninformative |
| *Entolasia stricta* | 2 | 92% | 2 | 59% | Positive diagnostic |
| *Eriostemon australasius* | 2 | 31% | 2 | 14% | Uninformative |
| *Eucalyptus punctata* | 3 | 54% | 2 | 11% | Positive diagnostic |
| *Eucalyptus umbra* | 3 | 31% | 2 | 3% | Positive diagnostic |
| *Ficus rubiginosa* | 1 | 31% | 1 | 4% | Positive diagnostic |
| *Gompholobium grandiflorum* | 2 | 23% | 1 | 9% | Uninformative |
| *Goodenia heterophylla* | 1 | 15% | 1 | 4% | Uninformative |
| *Grevillea buxifolia* | 2 | 15% | 2 | 14% | Uninformative |
| *Grevillea sericea* | 2 | 46% | 2 | 15% | Constant |
| *Hakea dactyloides* | 2 | 38% | 2 | 24% | Constant |
| *Hakea propinqua* | 1 | 15% | 1 | 2% | Uninformative |
| *Hibbertia bracteata* | 2 | 15% | 2 | 5% | Uninformative |
| *Hibbertia diffusa* | 2 | 15% | 2 | 3% | Uninformative |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 2 | 15% | 1 | 6% | Uninformative |
| *Hibbertia obtusifolia* | 2 | 31% | 1 | 1% | Positive diagnostic |
| *Hovea linearis* | 1 | 62% | 1 | 11% | Positive diagnostic |
| *Isopogon anethifolius* | 2 | 15% | 2 | 5% | Uninformative |
| *Lambertia formosa* | 2 | 15% | 2 | 26% | Uninformative |
| *Lepidosperma laterale* | 2 | 69% | 2 | 42% | Constant |
| *Lomandra confertifolia* | 2 | 54% | 2 | 4% | Positive diagnostic |
| *Lomandra glauca* | 2 | 62% | 2 | 16% | Positive diagnostic |
| *Lomandra gracilis* | 2 | 15% | 2 | 10% | Uninformative |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 31% | 2 | 24% | Uninformative |
| *Micrantheum ericoides* | 2 | 15% | 2 | 17% | Uninformative |
| *Monotoca scoparia* | 1 | 31% | 1 | 16% | Uninformative |
| *Pandorea pandorana* | 1 | 23% | 2 | 16% | Uninformative |
| *Panicum simile* | 2 | 15% | 2 | 10% | Uninformative |
| *Patersonia sericea* | 2 | 46% | 1 | 15% | Constant |
| *Persoonia levis* | 1 | 31% | 1 | 33% | Uninformative |
| *Persoonia linearis* | 1 | 69% | 1 | 19% | Positive diagnostic |
| *Persoonia pinifolia* | 1 | 54% | 2 | 21% | Constant |
| *Petrophile pulchella* | 2 | 15% | 2 | 16% | Uninformative |
| *Phyllanthus hirtellus* | 2 | 54% | 2 | 27% | Constant |
| *Platysace linearifolia* | 2 | 77% | 2 | 29% | Positive diagnostic |
| *Pomax umbellata* | 1 | 54% | 2 | 15% | Positive diagnostic |
| *Pteridium esculentum* | 2 | 100% | 2 | 40% | Positive diagnostic |
| *Pultenaea ferruginea* | 2 | 23% | 2 | 1% | Positive diagnostic |
| *Scaevola ramosissima* | 2 | 15% | 1 | 5% | Uninformative |
| *Schoenus imberbis* | 2 | 46% | 2 | 3% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 31% | 2 | 33% | Uninformative |
| *Sticherus flabellatus* var. *flabellatus* | 2 | 15% | 2 | 4% | Uninformative |
| *Themeda australis* | 2 | 54% | 2 | 23% | Constant |
| *Xanthorrhoea arborea* | 3 | 85% | 2 | 11% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Xanthorrhoea media* | 2 | 15% | 2 | 20% | Uninformative |
| *Xanthorrhoea resinosa* | 2 | 23% | 2 | 10% | Uninformative |
| *Xanthosia pilosa* | 2 | 31% | 2 | 20% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Xanthorrhoea media* | 2 | 15% | 2 | 20% | |
| *Xanthorrhoea resinosa* | 2 | 23% | 2 | 10% | |

| | |
|---|---|
| Coastal Headland Clay Heath | S_HL01 |
| Coastal Sand Tea-tree-Banksia Scrub | S_HL02 |
| Coastal Sand Mantle Heath | S_HL03 |
| Coastal Sandplain Heath | S_HL04 |
| Coastal Foredune Wattle Scrub | S_HL05 |
| Coastal Headland Banksia Heath | S_HL06 |
| Coastal Headland Cliffline Scrub | S_HL07 |
| Coastal Sandstone Heath-Mallee | S_HL08 |
| Coastal Sandstone Rock Plate Heath | S_HL09 |
| Sydney Hinterland Dwarf Apple Heath-Woodland | S_HL10 |
| Coastal Clifftop Marsh | S_HL14 |

# COASTAL HEADLAND CLAY HEATH                                    S_HL01

**Statewide Class**                          Coastal Headland Heaths
NSW Plant Community Type:                     815 Dwarf Casuarina-Kangaroo Grass Heath of the Sydney Basin Bioregion
Biometric Number(s):                         HU536, SR530



## Description

Coastal Headland Clay Heath is found on headlands that have a clay-influenced soil. In the Sydney area these are associated with Narrabeen sandstone and shales on the northern beaches and south of Garie in Royal NP. Unlike in other headland heaths these soils promote a good cover of kangaroo grass (*Themeda australis*) and spiny-headed mat-rush (*Lomandra longifolia*) amongst the ground layer. Above them is a low scrub of banksias, tea-trees, casuarinas and hakeas that form a wind-sheared heath. Associated shrub species include coastal rosemary (*Westringia fruticosa*), rusty petals (*Lasiopetalum ferrugineum*) and coast wattle (*Acacia longifolia*). Aerial photography of Turimetta Head taken in 1943 (LPI 2013) shows it denuded of native vegetation cover, indicating that these headlands are likely to have been desirable for grazing. Today the vegetation has regrown to be dominated by impenetrable thickets of scrub she-oak (*Allocasuarina distyla*) (pictured). Less disturbed examples offer greater diversity in the canopy, although scrub she-oak remains an important component of the assemblage. Coastal Headland Clay Heath also occurs outside of the study area on the Central Coast (NPWS 2000c).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Shrubs | 2.3 m ±1.5 <br><br> 1.0-4.0 | 23% ±14 <br><br> 15-40 | *Hibbertia empetrifolia, Westringia fruticosa, Acacia longifolia, Banksia integrifolia, Leptospermum laevigatum, Pittosporum undulatum, Acacia myrtifolia, Allocasuarina distyla, Breynia oblongifolia, Homalanthus populifolius, Lasiopetalum ferrugineum* |
| Ground Covers | 1.0 m <br><br> 1.0-1.0 | 40% <br><br> 40-40 | *Hibbertia empetrifolia Dianella caerulea, Lomandra longifolia, Lomandra multiflora, Themeda australis, Pratia purpurascens, Astroloma humifusum, Centella asiatica, Desmodium varians, Dichondra repens, Entolasia stricta, Gahnia aspera, Gonocarpus teucrioides, Microlaena stipoides* var. *stipoides* |
| Vines & Climbers | N/A | N/A | *Billardiera scandens, Cassytha glabella, Polymeria calycina* |

*Compiled from 1 site with structural data recorded.

## Threats

Exotic species are commonly encountered, with catsear (*Hypochaeris radicata*) and lantana (*Lantana camara*) frequently recorded. Proximity to residential areas means the community is subject to recreational pressures, rubbish dumping, continued weed invasion and localised clearing and trimming to maintain views. Feral rabbits and illegal clearing are cited as threats in Pittwater LGA (Bangalay and East Coast Flora Survey 2011).

## Conservation Status

This heath occurs in Royal NP and several council reserves in the Pittwater LGA.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 600 hectares |
| Estimated percentage cleared | Not available | 55-60% |
| Total NPWS reserves | 29.8 +2.2 hectares<br>46% of extant area | 163 hectares<br>45-50% of extant area<br>25-30% of pre-clearing area |
| Total reserved | 40.4 +2.2 hectares<br>63% of extant area | Not available |
| Total non-reserved | 23.9 +<.1 hectares | Not available |
| Total extant | 64.3 hectares | 350 hectares |



## Example Locations

o   Turimetta Head off Pittwater Road, Warriewood

o   Garie headlands, Royal NP

## Species Richness

| | |
|---|---|
| Number of sites | 22 |
| Total native species | 223 |
| Average no. native species per site | 30.3 ±10.6 |

## Variations and Dynamics

The prolific seeding shrub *Allocasuarina distyla* forms monospecific stands following fire or other ground disturbance ((Bangalay and East Coast Flora Survey 2011).

## Relationship to Other Communities

This community is related to Coastal Headland Grassland (S_GL02).

## Accuracy

Sampling density is high. Mapped boundaries are based on the interpretation of low heath vegetation found on headlands underlain by Narrabeen shales and sandstone.

A 0.04 hectare site located in this map unit is expected to contain at least 5 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 23 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 2 | 55% | 2 | 21% | Positive diagnostic |
| *Acacia myrtifolia* | 2 | 27% | 2 | 12% | Uninformative |
| *Acacia suaveolens* | 2 | 14% | 1 | 28% | Uninformative |
| *Actinotus helianthi* | 1 | 14% | 1 | 8% | Uninformative |
| *Adiantum aethiopicum* | 2 | 18% | 2 | 7% | Uninformative |
| *Allocasuarina distyla* | 4 | 45% | 2 | 11% | Positive diagnostic |
| *Allocasuarina verticillata* | 2 | 14% | 0 | 0% | Uninformative |
| *Astroloma humifusum* | 1 | 18% | 1 | 3% | Uninformative |
| *Baeckea imbricata* | 2 | 14% | 2 | 4% | Uninformative |
| *Banksia ericifolia* subsp. *ericifolia* | 2 | 14% | 2 | 26% | Uninformative |
| *Banksia integrifolia* | 2 | 91% | 1 | 9% | Positive diagnostic |
| *Banksia oblongifolia* | 2 | 14% | 2 | 14% | Uninformative |
| *Banksia serrata* | 1 | 14% | 2 | 33% | Uninformative |
| *Billardiera scandens* | 1 | 32% | 1 | 37% | Uninformative |
| *Breynia oblongifolia* | 1 | 27% | 1 | 17% | Uninformative |
| *Carpobrotus glaucescens* | 2 | 18% | 2 | 1% | Uninformative |
| *Cassytha glabella* | 1 | 27% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 23% | 2 | 27% | Uninformative |
| *Centella asiatica* | 2 | 18% | 2 | 6% | Uninformative |
| *Chorizandra cymbaria* | 2 | 23% | 1 | 1% | Positive diagnostic |
| *Clematis aristata* | 1 | 14% | 1 | 7% | Uninformative |
| *Commelina cyanea* | 2 | 27% | 2 | 8% | Uninformative |
| *Coronidium elatum* | 1 | 14% | 2 | 1% | Uninformative |
| *Desmodium varians* | 1 | 32% | 2 | 8% | Positive diagnostic |
| *Dianella caerulea* | 2 | 41% | 2 | 45% | Constant |
| *Dichondra repens* | 2 | 64% | 2 | 14% | Positive diagnostic |
| *Entolasia stricta* | 2 | 45% | 2 | 59% | Constant |
| *Eragrostis brownii* | 2 | 14% | 2 | 7% | Uninformative |
| *Ficinia nodosa* | 2 | 27% | 2 | 2% | Positive diagnostic |
| *Gahnia aspera* | 2 | 18% | 1 | 3% | Uninformative |
| *Gahnia melanocarpa* | 1 | 23% | 2 | 3% | Positive diagnostic |
| *Gahnia sieberiana* | 1 | 18% | 2 | 7% | Uninformative |
| *Geranium solanderi* | 1 | 14% | 2 | 1% | Uninformative |
| *Glochidion ferdinandi* | 1 | 18% | 2 | 13% | Uninformative |
| *Glycine clandestina* | 2 | 32% | 2 | 18% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 36% | 2 | 23% | Constant |
| *Hakea teretifolia* | 1 | 27% | 2 | 16% | Uninformative |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 2 | 36% | 1 | 5% | Positive diagnostic |
| *Hibbertia scandens* | 2 | 59% | 2 | 6% | Positive diagnostic |
| *Hydrocotyle acutiloba* | 2 | 14% | 2 | 1% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 27% | 2 | 20% | Uninformative |
| *Kennedia rubicunda* | 2 | 36% | 1 | 9% | Positive diagnostic |
| *Kunzea ambigua* | 2 | 14% | 2 | 15% | Uninformative |
| *Lasiopetalum ferrugineum* | 2 | 41% | 2 | 11% | Positive diagnostic |
| *Leptospermum laevigatum* | 2 | 77% | 2 | 5% | Positive diagnostic |
| *Leptospermum polygalifolium* | 1 | 18% | 2 | 14% | Uninformative |
| *Leucopogon parviflorus* | 1 | 18% | 2 | 1% | Uninformative |
| *Lindsaea linearis* | 2 | 14% | 2 | 16% | Uninformative |
| *Lobelia anceps* | 2 | 14% | 2 | 2% | Uninformative |
| *Lomandra longifolia* | 3 | 100% | 2 | 46% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 27% | 2 | 24% | Uninformative |
| *Lomandra obliqua* | 2 | 14% | 2 | 32% | Uninformative |
| *Melaleuca hypericifolia* | 2 | 36% | 1 | 1% | Positive diagnostic |
| *Micrantheum ericoides* | 2 | 14% | 2 | 17% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 36% | 2 | 36% | Constant |
| *Mitrasacme polymorpha* | 2 | 14% | 2 | 6% | Uninformative |
| *Monotoca elliptica* | 1 | 32% | 2 | 6% | Positive diagnostic |
| *Myrsine variabilis* | 1 | 14% | 1 | 8% | Uninformative |
| *Notelaea longifolia* | 1 | 14% | 1 | 21% | Uninformative |
| *Omalanthus nutans* | 1 | 14% | 1 | 9% | Uninformative |
| *Oplismenus imbecillis* | 2 | 32% | 2 | 12% | Uninformative |
| *Pelargonium australe* | 2 | 18% | 2 | 0% | Uninformative |
| *Pelargonium inodorum* | 2 | 18% | 1 | 0% | Uninformative |
| *Pimelea linifolia* | 2 | 18% | 2 | 27% | Uninformative |
| *Pittosporum undulatum* | 1 | 23% | 2 | 25% | Uninformative |
| *Plectranthus parviflorus* | 2 | 14% | 2 | 3% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 4 | 14% | 2 | 6% | Uninformative |
| *Polymeria calycina* | 1 | 23% | 1 | 1% | Positive diagnostic |
| *Pratia purpurascens* | 2 | 18% | 2 | 18% | Uninformative |
| *Pseuderanthemum variabile* | 2 | 14% | 2 | 12% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Smilax glyciphylla* | 2 | 18% | 2 | 33% | Uninformative |
| *Solanum prinophyllum* | 1 | 14% | 1 | 5% | Uninformative |
| *Stephania japonica* | 2 | 14% | 1 | 6% | Uninformative |
| *Themeda australis* | 3 | 68% | 2 | 23% | Positive diagnostic |
| *Viola hederacea* | 2 | 41% | 2 | 6% | Positive diagnostic |
| *Westringia fruticosa* | 2 | 64% | 1 | 1% | Positive diagnostic |
| *Xanthosia tridentata* | 2 | 23% | 2 | 21% | Uninformative |

# COASTAL SAND TEA-TREE-BANKSIA SCRUB <span style="float:right">S_HL02</span>

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Coastal Headland Heaths**
771: Coast Banksia-Coast Tea-tree Low Moist Forest on Coastal Sands and
Headlands, Sydney Basin and South East Corner
HN518; ME055; SR530



## Description

Coastal Sand Tea-tree-Banksia Scrub is a littoral heath and scrub that occupies coastal foredunes and beach ridges near the open ocean. Typically it comprises a dense cover of coast tea-tree (*Leptospermum laevigatum*) and coast banksia (*Banksia integrifolia*). The height of the scrub varies considerably in response to exposure to prevailing winds. This can result in a dramatically different visual appearance between patches. Despite the exposed locations there is usually some development of a soil profile as a result of clay influence in a sandstone headland or of sheltering and protection from leeward scrubs on dune systems. This is sufficient to support some mesic shrubs and eucalypt species that otherwise prefer more sheltered environments in the littoral zone. These species may share or penetrate the canopy, but in the case of the former are more likely to be found amongst a shrub layer of hardy coast-loving plants.

The scrub has a small and patchy distribution along the coastal zone of the Sydney region between Port Stephens and Wollongong. Elsewhere it is found on the New South Wales south coast (Tozer et al. 2010).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 11 m ±5 <br> 5-25 | 40% ±27 <br> 5-75 | *Leptospermum laevigatum, Banksia integrifolia, Cupaniopsis anacardioides* |
| Shrubs | 4.0 m ±1.9 <br> 1.0-8.0 | 28% ±21 <br> 5-70 | *Monotoca elliptica, Breynia oblongifolia, Acacia longifolia, Pittosporum undulatum, Notelaea longifolia, Westringia fruticosa* |
| Ground Covers | 0.9 m ±0.7 <br> 0.1-2.0 | 27% ±24 <br> 2-90 | *Lomandra longifolia, Commelina cyanea, Ficinia nodosa, Pelargonium australe, Pteridium esculentum, Dichondra repens, Viola hederacea, Imperata cylindrica* var. *major* |
| Vines & Climbers | N/A | N/A | *Hibbertia scandens, Glycine clandestina, Kennedia rubicunda* |

*Compiled from 12 sites with structural data recorded.

## Threats

Headland development and sandmining have been particularly destructive on the original distribution in Sydney with these landuses now occupying extensive areas once dominated by this scrub.

Infestations of the invasive weeds lantana (*Lantana camara*) and bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*) are common throughout. Most remnants persist in close proximity to built environments and as a result are highly disturbed from recreational pursuits, weeds, rubbish dumping, clearing and tree pruning for views.

## Conservation Status

This vegetation community is represented in Towra Point NR, Kamay Botany Bay NP and Royal NP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 2570-3600 hectares |
| Estimated percentage cleared | Not available | 30-50% |
| Total NPWS reserves | 89.4 +6.5 hectares<br>52% of extant area | 110 hectares<br>6% of extant area<br>20-40% of pre-clearing area |
| Total reserved | 130 +9.1 hectares<br>75% of extant area | Not available |
| Total non-reserved | 43.0 +4.4 hectares | Not available |
| Total extant | 173 hectares | 1800 hectares |



## Example Locations

o   Charlotte Breen Memorial Park, Kurnell

o   Jibbon Head, Royal NP

## Species Richness

| Number of sites | 15 |
|---|---|
| Total native species | 113 |
| Average no. native species per site | 19.7 ±8.1 |

## Variations and Dynamics

Variations in height of the shrub stratum arise from disturbance history, exposure and fire history. Some sites retain a greater component of littoral rainforest species than others.

## Relationship to Other Communities

This community shares species and proximity to Coastal Foredune Wattle Scrub (S_HL05) in more exposed locations on sand dunes. More sheltered situations on dune slopes or hind dunes grade toward more mesic littoral forests (S_WSF03, S_DSF21).

## Accuracy

Sampling density is moderate. Mapped boundaries are defined by the location of sample sites and the interpretation of tea-tree and banksia scrubs on coastal sand dunes.

A 0.04 hectare site located in this map unit is expected to contain at least 4 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 14 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 2 | 80% | 2 | 21% | Positive diagnostic |
| *Acmena smithii* | 2 | 13% | 2 | 6% | Uninformative |
| *Acrotriche divaricata* | 1 | 13% | 1 | 2% | Uninformative |
| *Allocasuarina littoralis* | 1 | 13% | 2 | 27% | Uninformative |
| *Aotus ericoides* | 1 | 27% | 2 | 8% | Uninformative |
| *Banksia aemula* | 4 | 13% | 3 | 1% | Uninformative |
| *Banksia integrifolia* | 3 | 93% | 1 | 9% | Positive diagnostic |
| *Breynia oblongifolia* | 2 | 67% | 1 | 16% | Positive diagnostic |
| *Cassytha pubescens* | 3 | 27% | 2 | 27% | Uninformative |
| *Cayratia clematidea* | 3 | 20% | 2 | 4% | Uninformative |
| *Clematis aristata* | 2 | 13% | 1 | 7% | Uninformative |
| *Clematis glycinoides* | 2 | 40% | 2 | 6% | Positive diagnostic |
| *Commelina cyanea* | 2 | 27% | 2 | 9% | Uninformative |
| *Cupaniopsis anacardioides* | 1 | 60% | 2 | 2% | Positive diagnostic |
| *Dianella revoluta* | 1 | 20% | 2 | 17% | Uninformative |
| *Elaeodendron australe* | 1 | 13% | 2 | 1% | Uninformative |
| *Entolasia marginata* | 2 | 13% | 2 | 22% | Uninformative |
| *Eustrephus latifolius* | 1 | 13% | 2 | 15% | Uninformative |
| *Ficinia nodosa* | 2 | 40% | 2 | 2% | Positive diagnostic |
| *Geitonoplesium cymosum* | 2 | 40% | 2 | 9% | Positive diagnostic |
| *Glochidion ferdinandi* | 2 | 13% | 1 | 13% | Uninformative |
| *Glycine clandestina* | 1 | 20% | 2 | 18% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 20% | 2 | 23% | Uninformative |
| *Grevillea mucronulata* | 2 | 13% | 2 | 7% | Uninformative |
| *Hibbertia scandens* | 1 | 40% | 2 | 7% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 3 | 40% | 2 | 20% | Constant |
| *Isolepis inundata* | 1 | 13% | 1 | 1% | Uninformative |
| *Lepidosperma concavum* | 3 | 13% | 2 | 4% | Uninformative |
| *Leptospermum laevigatum* | 4 | 93% | 2 | 5% | Positive diagnostic |
| *Leucopogon parviflorus* | 1 | 20% | 1 | 1% | Positive diagnostic |
| *Lomandra longifolia* | 2 | 87% | 2 | 46% | Positive diagnostic |
| *Maclura cochinchinensis* | 1 | 13% | 2 | 1% | Uninformative |
| *Macrozamia communis* | 2 | 13% | 1 | 4% | Uninformative |
| *Monotoca elliptica* | 2 | 87% | 1 | 6% | Positive diagnostic |
| *Myrsine variabilis* | 1 | 13% | 1 | 8% | Uninformative |
| *Notelaea longifolia* | 2 | 47% | 1 | 21% | Constant |
| *Omalanthus nutans* | 2 | 13% | 1 | 9% | Uninformative |
| *Oplismenus imbecillis* | 1 | 13% | 2 | 13% | Uninformative |
| *Parsonsia straminea* | 1 | 13% | 1 | 5% | Uninformative |
| *Pelargonium australe* | 3 | 27% | 2 | 0% | Positive diagnostic |
| *Persoonia lanceolata* | 1 | 13% | 1 | 11% | Uninformative |
| *Pimelea linifolia* | 1 | 20% | 2 | 27% | Uninformative |
| *Pittosporum undulatum* | 3 | 40% | 2 | 25% | Constant |
| *Poa affinis* | 2 | 20% | 2 | 11% | Uninformative |
| *Pteridium esculentum* | 2 | 67% | 2 | 40% | Constant |
| *Smilax glyciphylla* | 1 | 13% | 2 | 33% | Uninformative |
| *Themeda australis* | 2 | 20% | 2 | 23% | Uninformative |
| *Viola hederacea* | 2 | 20% | 2 | 6% | Uninformative |

# COASTAL SAND MANTLE HEATH                                          S_HL03

| Statewide Class | Wallum Sand Heaths |
|---|---|
| NSW Plant Community Type: | 664: Banksia heath on Aeolian Sands of Eastern Sydney Suburbs, Sydney Basin |
| Biometric Number(s): | ME022 |



## Description

Coastal Sand Mantle Heath is an open to closed heath found on shallow to moderately deep sand mantles that are perched above some of Sydney's major sandstone headlands. It is recognised as part of Eastern Suburbs Banksia Scrub, an Endangered Ecological Community under the NSW TSC Act. The soils on which it occurs are components of ancient dune systems formed from deposits of wind-blown sand. As a result of their age they have been exposed to long periods of weathering and soil leaching, producing highly podsolised soils. These shallower dunes support a wallum heath community that is unlike those found on Pleistocene dunes elsewhere in the greater Sydney region. The heath has a diverse range of larger shrubs with coast tea-tree (*Leptospermum laevigatum*), wallum banksia (*Banksia aemula*), scrub she-oak (*Allocasuarina distyla*) and heath-leaved banksia (*Banksia ericifolia*) commonly recorded, though no single species dominates at all sites. The composition of the heath, such as the prominence of the heath-leaved banksia, appears to reflect a transitional environment between the sandstone headland heaths nearby and the heaths found on deeper dunes.

Occasionally there are localised patches of emergent low-growing eucalypts including red bloodwood (*Corymbia gummifera*) and smooth-barked apple (*Angophora costata*). More consistent however is the diverse range of woody shrubs such as wattles, geebungs, peas, grevilleas and paperbarks. Other smaller plants are indicative of a sand heath assemblage. These include wedding bush (*Ricinocarpos pinifolius*), grass tree (*Xanthorrhoea resinosa*) and tree broom-heath (*Monotoca elliptica*). The cover of vegetation is variable depending on disturbance and drainage conditions. On drier sites that carry a more open heath structure a dense cover of ferns can be found, whereas poorly drained sites will include a greater abundance and cover of sedge species. This heath community is situated on headlands at North Head, Malabar, La Perouse and the Kurnell Peninsula. It is restricted to elevations between 20 and 80 metres above sea level.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Small Trees | (no data) | (no data) | *Angophora costata, Corymbia gummifera* |
| Shrubs | 3.8 m ±2.7<br>1.4-8.0 | 52% 31<br>25-90 | *Leptospermum laevigatum, Banksia aemula, Lambertia formosa, Woollsia pungens, Acacia suaveolens, Banksia ericifolia* subsp. *ericifolia, Monotoca elliptica, Allocasuarina distyla, Bossiaea heterophylla, Dillwynia retorta, Philotheca buxifolia, Persoonia lanceolata, Acacia longifolia, Bossiaea scolopendria, Leucopogon ericoides, Melaleuca nodosa, Ricinocarpos pinifolius, Philotheca salsolifolia* |
| Ground Covers | 0.4 m ±0.2<br>0.3-0.6 | 5% ±5<br>1-10 | *Xanthorrhoea resinosa, Dampiera stricta, Haemodorum planifolium, Lepidosperma laterale, Lomandra glauca, Xanthosia pilosa* |
| Vines & Climbers | N/A | N/A | *Cassytha pubescens* |

*Compiled from 3 sites with structural data recorded.

## Threats

Past clearing has removed a significant proportion of this community from headland dune systems in the eastern suburbs. The North Head dune system was cleared for military purposes in the mid-twentieth century and has been partly rehabilitated. The recovery plan for Eastern Suburbs Banksia Scrub (DEC 2004) indicates that further clearing and habitat fragmentation are continuing threats. Remnants are further impacted by urban-related disturbances including weed invasion, heavy recreational pressures, rubbish dumping, inappropriate fire regimes and altered hydrological regimes.

## Conservation Status

Coastal Sand Mantle Heath is a component of Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion, an Endangered Ecological Community listed under the NSW TSC Act. Eastern Suburbs Banksia Scrub of the Sydney Region is also listed as an Endangered Ecological Community under the Commonwealth EPBC Act. This vegetation community is represented in Kamay Botany Bay and Sydney Harbour national parks.

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | >2500 hectares |
| Estimated percentage cleared | Not available | >90 % |
| Total NPWS reserves | 48.0 +5.7 hectares 38% of extant area | 90 hectares 36% of extant area <2% of pre-clearing area |
| Total reserved | 78.4 +20.6 hectares 62% of extant area | Not available |
| Total non-reserved | 48.6 +7.2 hectares | Not available |
| Total extant | 127 hectares | 250 hectares |

*The modelling in Tozer et al. (2010) underestimates the regional extent of this community.



## Example Locations

o   North Head, Sydney Harbour NP

o   Jennifer Street, La Perouse

## Species Richness

| | |
|---|---|
| Number of sites | 20 |
| Total native species | 173 |
| Average no. native species per site | 31.5 ±9.8 |

## Variations and Dynamics

The community exhibits variations that are likely to arise from fire history. Benson and Howell (1994a) discuss the impacts of long time since fire on sand heaths that appear to favour taller-growing coast tea-tree to the exclusion of other smaller shrubs. Another potential influence on the assemblage may arise from variation in the depth of the dune.

## Relationship to Other Communities

Coastal Sand Mantle Heath (S_HL03) is a transitional community between heath and woodland assemblages found on larger Pleistocene dunes (S_HL04, S_DSF03) and the headland heaths on sandstone (S_HL06, S_HL07). On the basis of floristic composition the community is more closely associated with coastal sandstone headland heaths than it is with heath on deep sand dunes.

## Accuracy

Sample density is moderate. Map boundaries were drawn using the interpretation of current and historic digital imagery to identify patterns in sandstone and sand substrates. Map boundaries were supplemented with extensive field traverse and the review of existing map sources.

A 0.04 hectare site located in this map unit is expected to contain at least 9 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 24 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 2 | 50% | 2 | 21% | Positive diagnostic |
| *Acacia myrtifolia* | 1 | 15% | 2 | 12% | Uninformative |
| *Acacia suaveolens* | 1 | 65% | 1 | 28% | Positive diagnostic |
| *Acacia terminalis* | 1 | 10% | 1 | 20% | Uninformative |
| *Actinotus helianthi* | 1 | 15% | 1 | 8% | Uninformative |
| *Actinotus minor* | 1 | 25% | 2 | 22% | Uninformative |
| *Allocasuarina distyla* | 2 | 60% | 2 | 11% | Positive diagnostic |
| *Amperea xiphoclada* | 2 | 10% | 1 | 6% | Uninformative |
| *Aotus ericoides* | 1 | 10% | 2 | 8% | Uninformative |
| *Astroloma pinifolium* | 1 | 10% | 1 | 2% | Uninformative |
| *Banksia aemula* | 3 | 85% | 1 | 0% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 2 | 65% | 2 | 26% | Positive diagnostic |
| *Banksia marginata* | 2 | 30% | 2 | 9% | Uninformative |
| *Banksia oblongifolia* | 1 | 10% | 2 | 14% | Uninformative |
| *Billardiera scandens* | 2 | 30% | 1 | 37% | Uninformative |
| *Boronia ledifolia* | 1 | 20% | 2 | 13% | Uninformative |
| *Bossiaea ensata* | 3 | 10% | 1 | 6% | Uninformative |
| *Bossiaea heterophylla* | 1 | 55% | 2 | 17% | Positive diagnostic |
| *Bossiaea scolopendria* | 1 | 50% | 2 | 6% | Positive diagnostic |
| *Brachyloma daphnoides* | 1 | 30% | 1 | 5% | Positive diagnostic |
| *Cassytha pubescens* | 2 | 30% | 2 | 27% | Uninformative |
| *Caustis flexuosa* | 1 | 20% | 2 | 17% | Uninformative |
| *Caustis pentandra* | 2 | 30% | 2 | 5% | Positive diagnostic |
| *Chordifex dimorphus* | 4 | 20% | 2 | 4% | Positive diagnostic |
| *Chordifex fastigiatus* | 1 | 25% | 2 | 2% | Positive diagnostic |
| *Conospermum taxifolium* | 1 | 10% | 2 | 2% | Uninformative |
| *Correa reflexa* | 2 | 10% | 1 | 5% | Uninformative |
| *Cyathochaeta diandra* | 1 | 15% | 2 | 26% | Uninformative |
| *Dampiera stricta* | 1 | 45% | 2 | 23% | Constant |
| *Darwinia fascicularis* | 1 | 35% | 2 | 5% | Positive diagnostic |
| *Dianella longifolia* | 1 | 10% | 2 | 5% | Uninformative |
| *Dianella revoluta* | 1 | 10% | 2 | 17% | Uninformative |
| *Dillwynia floribunda* | 1 | 15% | 2 | 5% | Uninformative |
| *Dillwynia retorta* | 1 | 60% | 2 | 26% | Positive diagnostic |
| *Elaeocarpus reticulatus* | 2 | 30% | 1 | 20% | Uninformative |
| *Empodisma minus* | 1 | 10% | 2 | 5% | Uninformative |
| *Entolasia marginata* | 1 | 15% | 2 | 22% | Uninformative |
| *Epacris longiflora* | 2 | 10% | 2 | 8% | Uninformative |
| *Eragrostis brownii* | 1 | 10% | 2 | 7% | Uninformative |
| *Eriostemon australasius* | 2 | 20% | 2 | 14% | Uninformative |
| *Eucalyptus camfieldii* | 1 | 15% | 2 | 0% | Uninformative |
| *Glochidion ferdinandi* | 1 | 10% | 2 | 13% | Uninformative |
| *Gonocarpus tetragynus* | 2 | 10% | 2 | 8% | Uninformative |
| *Gonocarpus teucrioides* | 1 | 25% | 2 | 23% | Uninformative |
| *Grevillea buxifolia* | 3 | 25% | 2 | 14% | Uninformative |
| *Grevillea speciosa* | 1 | 15% | 2 | 4% | Uninformative |
| *Haemodorum planifolium* | 1 | 40% | 1 | 2% | Positive diagnostic |
| *Hakea dactyloides* | 2 | 20% | 2 | 24% | Uninformative |
| *Hakea gibbosa* | 1 | 15% | 2 | 7% | Uninformative |
| *Hardenbergia violacea* | 1 | 10% | 1 | 16% | Uninformative |
| *Hibbertia acicularis* | 1 | 15% | 1 | 0% | Uninformative |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 1 | 15% | 1 | 6% | Uninformative |
| *Hibbertia fasciculata* | 1 | 20% | 2 | 2% | Positive diagnostic |
| *Hibbertia linearis* | 2 | 30% | 1 | 6% | Positive diagnostic |
| *Hibbertia riparia* | 1 | 10% | 2 | 4% | Uninformative |
| *Hypolaena fastigiata* | 1 | 20% | 2 | 3% | Positive diagnostic |
| *Isopogon anethifolius* | 2 | 15% | 2 | 5% | Uninformative |
| *Kunzea ambigua* | 3 | 30% | 2 | 15% | Uninformative |
| *Lambertia formosa* | 2 | 75% | 2 | 26% | Positive diagnostic |
| *Lasiopetalum ferrugineum* | 2 | 20% | 2 | 11% | Uninformative |
| *Lepidosperma concavum* | 1 | 15% | 2 | 4% | Uninformative |
| *Lepidosperma laterale* | 3 | 50% | 2 | 42% | Constant |
| *Lepidosperma viscidum* | 1 | 15% | 2 | 2% | Uninformative |
| *Leptocarpus tenax* | 2 | 15% | 2 | 5% | Uninformative |
| *Leptospermum laevigatum* | 3 | 90% | 2 | 5% | Positive diagnostic |
| *Lepyrodia scariosa* | 1 | 25% | 2 | 21% | Uninformative |
| *Leucopogon ericoides* | 1 | 45% | 1 | 8% | Positive diagnostic |
| *Leucopogon esquamatus* | 1 | 10% | 2 | 5% | Uninformative |
| *Leucopogon microphyllus* | 3 | 10% | 2 | 13% | Uninformative |
| *Lomandra filiformis* | 1 | 15% | 2 | 23% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lomandra glauca* | 1 | 50% | 2 | 16% | Positive diagnostic |
| *Melaleuca armillaris* subsp. *armillaris* | 2 | 15% | 2 | 1% | Uninformative |
| *Melaleuca nodosa* | 2 | 45% | 2 | 5% | Positive diagnostic |
| *Micrantheum ericoides* | 1 | 20% | 2 | 17% | Uninformative |
| *Micromyrtus ciliata* | 1 | 10% | 2 | 1% | Uninformative |
| *Monotoca elliptica* | 1 | 70% | 2 | 6% | Positive diagnostic |
| *Monotoca scoparia* | 1 | 20% | 1 | 16% | Uninformative |
| *Olax stricta* | 1 | 10% | 1 | 2% | Uninformative |
| *Opercularia aspera* | 1 | 15% | 1 | 8% | Uninformative |
| *Patersonia glabrata* | 1 | 20% | 2 | 16% | Uninformative |
| *Patersonia sericea* | 1 | 20% | 1 | 15% | Uninformative |
| *Persoonia lanceolata* | 1 | 55% | 1 | 11% | Positive diagnostic |
| *Petrophile pulchella* | 2 | 15% | 2 | 16% | Uninformative |
| *Philotheca buxifolia* | 1 | 65% | 2 | 1% | Positive diagnostic |
| *Philotheca salsolifolia* | 1 | 35% | 2 | 1% | Positive diagnostic |
| *Phyllanthus hirtellus* | 1 | 20% | 2 | 27% | Uninformative |
| *Pimelea linifolia* | 1 | 30% | 2 | 27% | Uninformative |
| *Pittosporum revolutum* | 2 | 10% | 1 | 9% | Uninformative |
| *Pittosporum undulatum* | 1 | 25% | 2 | 25% | Uninformative |
| *Platysace linearifolia* | 2 | 15% | 2 | 30% | Uninformative |
| *Ricinocarpos pinifolius* | 1 | 40% | 1 | 7% | Positive diagnostic |
| *Schoenus ericetorum* | 1 | 15% | 2 | 6% | Uninformative |
| *Smilax glyciphylla* | 1 | 20% | 2 | 33% | Uninformative |
| *Styphelia triflora* | 1 | 15% | 1 | 1% | Uninformative |
| *Styphelia viridis* subsp. *viridis* | 2 | 10% | 1 | 0% | Uninformative |
| *Woollsia pungens* | 1 | 75% | 2 | 12% | Positive diagnostic |
| *Xanthorrhoea media* | 3 | 10% | 2 | 20% | Uninformative |
| *Xanthorrhoea resinosa* | 2 | 60% | 2 | 10% | Positive diagnostic |
| *Xanthosia pilosa* | 1 | 40% | 2 | 20% | Constant |

# COASTAL SANDPLAIN HEATH

## S_HL04

## Description

Coastal Sandplain Heath (Tozer et al. 2010) is an open to dense shrubland community found on large, deep Pleistocene sand dunes along the New South Wales coast. In the Sydney area it occurs south of Sydney Harbour on deep Pleistocene sand dunes such as at Kurnell (where depth reaches 40 metres (Roy and Crawford 1981)) and at Jibbon near Bundeena in Royal NP. It also occurs on smaller though prominent dunes at La Perouse. Deep dunes would have been far more extensive between Botany and Woollahra, however these are now highly modified and urbanised with remaining vegetation very highly disturbed. It resembles Coastal Sand Mantle Heath (S_HL03) because it shares a similar habitat and structure and has also adapted to the low nutrient podsolised soils that are associated with older hind dunes and headland sand masses found along the coastal zone. Coastal Sandplain Heath in the Botany and Woollahra area is included as a component of Eastern Suburbs Banksia Scrub (Benson and Howell 1990) and has been listed as an Endangered Ecological Community under the NSW TSC Act in recognition of its conservation status.

In the Sydney area the heath layer supports an open cover of stunted old-man banksia (*Banksia serrata*) and scrub she-oak (*Allocasuarina distyla*). Sites north of Botany Bay may include wallum banksia (*Banksia aemula*). At times clumps of low eucalypts may be present. The remainder of the dense shrub layer comprises a wide variety of woody species such as tea-trees, grevilleas, peas and wattles. The ground layer comprises on open cover of sedges and forbs.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Small Trees | 2.1 m ±0.4 <br> 1.5-2.5 | 48% ±20 <br> 25-80 | *Banksia serrata, Allocasuarina distyla, Leptospermum laevigatum* |
| Shrubs | 0.9 m ±0.2 <br> 0.7-1.0 | 40% ±0 <br> 40-40 | *Isopogon anemonifolius, Monotoca scoparia, Pimelea linifolia, Aotus ericoides, Acacia suaveolens, Allocasuarina distyla, Ricinocarpos pinifolius, Hakea dactyloides, Bossiaea scolopendria, Brachyloma daphnoides, Leucopogon ericoides, Grevillea sphacelata, Platysace linearifolia, Bossiaea ensata, Hibbertia fasciculata* |
| Ground Covers | 0.7 m ±0.2 <br> 0.3-1.0 | 51% ±19 <br> 25-80 | *Hypolaena fastigiata, Lomandra glauca, Gonocarpus teucrioides, Lepidosperma concavum, Schoenus ericetorum, Dampiera stricta, Entolasia stricta, Pteridium esculentum, Xanthorrhoea media, Austrostipa pubescens, Haemodorum planifolium, Patersonia glabrata* |
| Vines & Climbers | N/A | N/A | *Cassytha pubescens* |

*Compiled from 7 sites with structural data recorded.

## Threats

Coastal and urban development and sandmining have depleted extensive stands of this heath community across its range in New South Wales. Within Sydney large areas are likely to have been lost in the eastern suburbs. The recovery plan for Eastern Suburbs Banksia Scrub (DEC 2004) indicates that further clearing and habitat fragmentation are continuing threats. Remnants are further impacted by a range of urban-related disturbances including weed invasion, heavy recreational pressures, rubbish dumping, inappropriate fire regimes and altered hydrological regimes (DEC 2004). In Royal NP local dune erosion may occur from recreational pressures and trampling by feral deer. Weed invasion, particularly from bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*), and frequent fire may also impact upon the community.

## Conservation Status

Coastal Sandplain Heath is a component of Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion, an Endangered Ecological Community listed under the NSW TSC Act. Eastern Suburbs Banksia Scrub of the Sydney Region is also listed as an Endangered Ecological Community under the Commonwealth EPBC Act.

This vegetation community is represented in Royal and Kamay Botany Bay national parks.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | <1110 hectares |
| Estimated percentage cleared | Not available | <70% |
| Total NPWS reserves | 273 +1.7 hectares<br>79% of extant area | 530 hectares<br>53% of extant area<br>20-40% of pre-clearing area |
| Total reserved | 308 +1.9 hectares<br>90% of extant area | Not available |
| Total non-reserved | 36.0 +3.9 hectares | Not available |
| Total extant | 344 hectares | 1000 hectares |



Map legend:
- Map unit (yellow)
- Study area (red outline)
- Extant vegetation (green)

## Example Locations

o   Dunes at Jibbon, Bundeena, Royal NP

## Species Richness

| Number of sites | 23 |
|---|---|
| Total native species | 166 |
| Average no. native species per site | 34.2 ±7.7 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

This community is most closely related to Coastal Sand Apple-Bloodwood Forest (S_DSF03). It grades into coastal sand mantle heath (S_HL03) as the sand dune thins to expose sandstone bedrock. It grades into forests (S_DSF03, S_DSF21) in more protected situations. Small swales and drainage depressions may also be situated nearby which support an open sedgeland or heath swamp (S_FrW13).

## Accuracy

Sampling density is high. Map boundaries were drawn using the interpretation of current and historic digital imagery to identify patterns in sandstone and sand substrates. Map boundaries were supplemented with extensive field traverse and the review of existing map data.

A 0.04 hectare site located in this map unit is expected to contain at least 12 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 27 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 2 | 52% | 2 | 21% | Positive diagnostic |
| *Acacia suaveolens* | 1 | 74% | 1 | 28% | Positive diagnostic |
| *Acacia ulicifolia* | 2 | 17% | 1 | 26% | Uninformative |
| *Actinotus helianthi* | 2 | 26% | 1 | 8% | Uninformative |
| *Allocasuarina distyla* | 3 | 70% | 2 | 10% | Positive diagnostic |
| *Amperea xiphoclada* | 1 | 22% | 1 | 6% | Uninformative |
| *Anisopogon avenaceus* | 2 | 17% | 2 | 14% | Uninformative |
| *Aotus ericoides* | 2 | 83% | 2 | 7% | Positive diagnostic |
| *Astroloma pinifolium* | 1 | 35% | 1 | 2% | Positive diagnostic |
| *Austrostipa mollis* | 2 | 17% | 1 | 0% | Uninformative |
| *Austrostipa pubescens* | 2 | 35% | 2 | 20% | Uninformative |
| *Banksia ericifolia* subsp. *ericifolia* | 2 | 13% | 2 | 26% | Uninformative |
| *Banksia integrifolia* | 2 | 22% | 2 | 9% | Uninformative |
| *Banksia marginata* | 2 | 17% | 2 | 9% | Uninformative |
| *Banksia serrata* | 3 | 96% | 2 | 32% | Positive diagnostic |
| *Billardiera scandens* | 1 | 35% | 1 | 37% | Uninformative |
| *Boronia ledifolia* | 2 | 17% | 2 | 13% | Uninformative |
| *Bossiaea ensata* | 2 | 43% | 1 | 6% | Positive diagnostic |
| *Bossiaea heterophylla* | 2 | 35% | 2 | 17% | Uninformaive |
| *Bossiaea scolopendria* | 2 | 43% | 1 | 6% | Positive diagnostic |
| *Brachyloma daphnoides* | 2 | 43% | 1 | 5% | Positive diagnostic |
| *Cassytha glabella* | 1 | 26% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 57% | 2 | 27% | Positive diagnostic |
| *Caustis pentandra* | 2 | 17% | 2 | 5% | Uninformative |
| *Ceratopetalum gummiferum* | 2 | 13% | 2 | 17% | Uninformative |
| *Conospermum taxifolium* | 1 | 22% | 2 | 2% | Positive diagnostic |
| *Correa reflexa* | 1 | 13% | 2 | 5% | Uninformative |
| *Dampiera stricta* | 2 | 48% | 2 | 23% | Constant |
| *Dianella revoluta* | 2 | 35% | 1 | 17% | Uninformative |
| *Dillwynia glaberrima* | 2 | 17% | 2 | 1% | Uninformative |
| *Dillwynia retorta* | 2 | 22% | 2 | 26% | Uninformative |
| *Entolasia stricta* | 2 | 48% | 2 | 59% | Constant |
| *Gompholobium glabratum* | 1 | 26% | 2 | 4% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 78% | 2 | 23% | Positive diagnostic |
| *Grevillea sphacelata* | 2 | 30% | 2 | 6% | Positive diagnostic |
| *Haemodorum planifolium* | 2 | 35% | 1 | 2% | Positive diagnostic |
| *Hakea dactyloides* | 2 | 57% | 2 | 23% | Positive diagnostic |
| *Hardenbergia violacea* | 1 | 22% | 1 | 16% | Uninformative |
| *Hibbertia fasciculata* | 2 | 39% | 2 | 1% | Positive diagnostic |
| *Hibbertia obtusifolia* | 1 | 13% | 1 | 1% | Uninformative |
| *Hibbertia serpyllifolia* | 2 | 17% | 2 | 3% | Uninformative |
| *Hypolaena fastigiata* | 3 | 70% | 2 | 2% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 17% | 2 | 20% | Uninformative |
| *Isopogon anemonifolius* | 2 | 70% | 2 | 18% | Positive diagnostic |
| *Lambertia formosa* | 2 | 22% | 2 | 26% | Uninformative |
| *Lepidosperma concavum* | 2 | 65% | 2 | 3% | Positive diagnostic |
| *Lepidosperma viscidum* | 3 | 13% | 2 | 2% | Uninformative |
| *Leptospermum laevigatum* | 2 | 70% | 2 | 5% | Positive diagnostic |
| *Leucopogon ericoides* | 2 | 57% | 1 | 8% | Positive diagnostic |
| *Leucopogon parviflorus* | 2 | 17% | 1 | 1% | Uninformative |
| *Leucopogon virgatus* | 2 | 17% | 1 | 1% | Uninformative |
| *Lomandra glauca* | 2 | 57% | 2 | 16% | Positive diagnostic |
| *Lomandra longifolia* | 2 | 52% | 2 | 47% | Constant |
| *Lomandra obliqua* | 2 | 13% | 2 | 32% | Uninformative |
| *Melaleuca armillaris* subsp. *armillaris* | 2 | 13% | 2 | 1% | Uninformative |
| *Melaleuca nodosa* | 3 | 26% | 2 | 5% | Positive diagnostic |
| *Monotoca elliptica* | 2 | 43% | 1 | 6% | Positive diagnostic |
| *Monotoca scoparia* | 2 | 65% | 1 | 16% | Positive diagnostic |
| *Patersonia glabrata* | 2 | 30% | 2 | 16% | Uninformative |
| *Persoonia lanceolata* | 1 | 39% | 1 | 11% | Positive diagnostic |
| *Persoonia levis* | 1 | 17% | 1 | 33% | Uninformative |
| *Petrophile pulchella* | 2 | 13% | 2 | 16% | Uninformative |
| *Petrophile sessilis* | 2 | 13% | 2 | 7% | Uninformative |
| *Philotheca salsolifolia* | 2 | 39% | 1 | 1% | Positive diagnostic |
| *Phyllota phylicoides* | 2 | 26% | 2 | 13% | Uninformative |
| *Pimelea linifolia* | 2 | 87% | 2 | 26% | Positive diagnostic |
| *Platysace lanceolata* | 3 | 13% | 2 | 8% | Uninformative |
| *Platysace linearifolia* | 2 | 35% | 2 | 29% | Uninformative |
| *Pomax umbellata* | 2 | 17% | 2 | 15% | Uninformative |
| *Pteridium esculentum* | 2 | 61% | 2 | 40% | Constant |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Ricinocarpos pinifolius* | 2 | 61% | 1 | 7% | Positive diagnostic |
| *Schizaea bifida* | 1 | 13% | 1 | 4% | Uninformative |
| *Schoenus ericetorum* | 2 | 39% | 2 | 6% | Positive diagnostic |
| *Styphelia viridis* subsp. *viridis* | 1 | 17% | 1 | 0% | Uninformative |
| *Themeda australis* | 2 | 26% | 2 | 23% | Uninformative |
| *Woollsia pungens* | 2 | 17% | 2 | 12% | Uninformative |
| *Xanthorrhoea media* | 2 | 35% | 2 | 19% | Uninformative |
| *Xanthorrhoea resinosa* | 1 | 35% | 2 | 10% | Positive diagnostic |
| *Xanthosia pilosa* | 2 | 43% | 2 | 20% | Constant |
| *Xylomelum pyriforme* | 1 | 22% | 1 | 6% | Uninformative |
| *Zieria pilosa* | 1 | 13% | 2 | 6% | Uninformative |

# COASTAL FOREDUNE WATTLE SCRUB

## S_HL05

**Statewide Class**
Sydney Coastal Heaths

NSW Plant Community Type: 772: Coast Banksia-Coast Wattle Dune Scrub, Sydney Basin and South East Corner
Biometric Number(s): HN519; HU530; ME006; SR531



## Description

This low dense scrub is found on coastal sand mass frontal dunes and beach ridges along the eastern coastline of New South Wales. Its coast tea-tree (*Leptospermum laevigatum*) and coastal wattle (*Acacia longifolia*) are pruned by the prevailing winds that buffet these exposed scarped dunes. Throughout the Sydney metropolitan area this assemblage suffers from infestation of bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*). Some of the small patches that remain are derived from native plantings as part of dune stabilisation works and bush regeneration. As a result some scrubs are species poor. More diverse remnants include salt-tolerant succulent herbs and grasses, several of which are unique to these environments.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Small Trees | 5 m ±2 <br> 3-7 | 21% ±23 <br> 2-60 | *Acacia longifolia, Leptospermum laevigatum, Banksia integrifolia, Monotoca elliptica* |
| Shrubs | 2.7 m ±1.1 <br> 1.0-4.0 | 42% ±24 <br> 10-75 | *Leucopogon parviflorus, Breynia oblongifolia, Rhagodia candolleana* |
| Ground Covers | 0.9 m ±0.4 <br> 0.5-1.5 | 20% ±15 <br> 5-50 | *Spinifex sericeus, Carpobrotus glaucescens, Ficinia nodosa, Pelargonium australe, Dianella congesta, Dichondra repens, Scaevola calendulacea* |

*Compiled from 6 sites with structural data recorded.

## Threats

Coastal foredunes have been heavily cleared and modified by urban development. A high proportion of the total taxa recorded in this community are exotic. Some sites are simplified by profuse regeneration of coast tea-tree (*Leptospermum laevigatum*), a species that strongly recolonises disturbed ground (Keith 2004). High levels of disturbance arise from recreational pressures associated with beach and boating leisure.

## Conservation Status

This vegetation community is represented in Kamay Botany Bay NP, Sydney Harbour NP and Royal NP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 6200-8860 hectares |
| Estimated percentage cleared | Not available | 50-65% |
| Total NPWS reserves | 33.4 +2.5 hectares 14% of extant area | 1700 hectares 55% of extant area 25-35% of pre-clearing area |
| Total reserved | 128 +3.5 hectares 55% of extant area | Not available |
| Total non-reserved | 103 +38.6 hectares | Not available |
| Total extant | 231 hectares | 3100 hectares |



## Example Locations

o    Wanda Beach, Cronulla

o    Narrabeen Beach carpark, Narrabeen

o    Southern end of walking path at Maroubra Beach, Maroubra

## Species Richness

| Number of sites | 13 |
|---|---|
| Total native species | 39 |
| Average no. native species per site | 9.2 ±2.8 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

This community grades into Beach Spinifex Grassland (S_GL01) closer to the beach sand and a littoral thicket (S_HL02) on protected hind dunes.

## Accuracy

Sampling density is moderate. Mapping boundaries rely on the interpretation of low scrubs found on coastal foredunes.

A 0.04 hectare site located in this map unit is expected to contain at least 3 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 5 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 4 | 100% | 2 | 21% | Positive diagnostic |
| *Banksia integrifolia* | 3 | 46% | 1 | 9% | Positive diagnostic |
| *Breynia oblongifolia* | 1 | 23% | 1 | 17% | Uninformative |
| *Calystegia soldanella* | 2 | 23% | 0 | 0% | Positive diagnostic |
| *Carpobrotus glaucescens* | 2 | 69% | 2 | 1% | Positive diagnostic |
| *Cayratia clematidea* | 2 | 15% | 2 | 4% | Uninformative |
| *Dianella congesta* | 3 | 15% | 2 | 0% | Uninformative |
| *Dichondra repens* | 3 | 15% | 2 | 14% | Uninformative |
| *Ficinia nodosa* | 1 | 46% | 2 | 2% | Positive diagnostic |
| *Hibbertia scandens* | 2 | 15% | 2 | 7% | Uninformative |
| *Leptospermum laevigatum* | 3 | 85% | 2 | 5% | Positive diagnostic |
| *Leucopogon parviflorus* | 2 | 54% | 1 | 1% | Positive diagnostic |
| *Melaleuca armillaris* subsp. *armillaris* | 2 | 15% | 2 | 1% | Uninformative |
| *Monotoca elliptica* | 1 | 31% | 2 | 7% | Uninformative |
| *Myoporum boninense* subsp. *australe* | 3 | 15% | 1 | 0% | Uninformative |
| *Pelargonium australe* | 2 | 38% | 2 | 0% | Positive diagnostic |
| *Rhagodia candolleana* subsp. *candolleana* | 3 | 31% | 2 | 0% | Positive diagnostic |
| *Scaevola calendulacea* | 3 | 31% | 2 | 0% | Positive diagnostic |
| *Spinifex sericeus* | 2 | 69% | 5 | 0% | Positive diagnostic |
| *Stephania japonica* | 2 | 23% | 1 | 6% | Uninformative |
| *Zoysia macrantha* | 3 | 15% | 3 | 0% | Uninformative |

# COASTAL HEADLAND BANKSIA HEATH                                    S_HL06

| | |
|---|---|
| **Statewide Class** | **Sydney Coastal Heaths** |
| NSW Plant Community Type: | 1143: She-oak-Hairpin Banksia Heathland on Sandstone Headlands of the Sydney Basin |
| Biometric Number(s): | ME034; SR618 |



## Description

Coastal Headland Banksia Heath is a closed heath community found on Hawkesbury sandstone rock platforms associated with ocean and harbour headlands. These exposed environments are underlain by a skeletal and infertile soil. Typically heath-leaved banksia (*Banksia ericifolia* subsp. *ericifolia*) and scrub she-oak (*Allocasuarina distyla*) form the dominant upper strata. Tick bush (*Kunzea ambigua*) may also be common, and sample sites where this species was dominant appear to have suffered some soil disturbance in the past. These larger shrubs may be over-topped by a sparse cover of emergent mallee-form eucalypts. Other woody shrubs include wattle (*Acacia longifolia*), needlebush (*Hakea teretifolia*), *Darwinia fascicularis*, and pink tea-tree (*Leptospermum squarrosum*). The rare sprawling shrub wrinkled kerrawang (*Rulingia hermanniifolia*) is also encountered in the lower shrub layer. Many sites have impeded drainage because the sandstone bedrock is very close to the surface. The ground can at times have a sparse cover of sedges amongst clumps of forbs.

This heath is found at many of the prominent vantage points of Sydney Harbour including Middle Head, North Head and South Head as well as the Kurnell Peninsula and Bundeena headland. These are flat plateau-like landforms that have minor sandstone benching and outcropping. It is not restricted to exposed clifflines and can be situated some distance from the coast. It is however restricted to low elevations (10-120 metres above sea level) in zones of high rainfall (1200-1400 millimetres per annum). Beyond the Sydney area the community extends from the Central Coast to Jervis Bay.

Some sample sites located within heathlands at Middle Harbour and La Perouse contained species that are more common in sheltered environments and may reflect decreased fire frequencies as result of fragmentation. These species include sweet pittosporum (*Pittosporum undulatum*), blueberry ash (*Elaeocarpus reticulatus*) and cheese tree (*Glochidion ferdinandi*).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Small Trees | 4.5 m ±1.9<br>0.8-8.0 | 52% ±26<br>5-80 | *Banksia ericifolia* subsp. *ericifolia, Allocasuarina distyla, Pittosporum undulatum, Angophora hispida* |
| Shrubs | 2.6 m ±1.4<br>0.8-6.0 | 30% ±28<br>5-80 | *Banksia ericifolia* subsp. *ericifolia, Allocasuarina distyla, Acacia suaveolens, Kunzea ambigua, Darwinia fascicularis, Melaleuca nodosa, Acacia longifolia, Hakea teretifolia, Leptospermum squarrosum, Leucopogon microphyllus, Pimelea linifolia, Epacris longiflora, Persoonia lanceolata* |
| Ground Covers | 1.1 m ±0.8<br>0.1-3.0 | 19% ±14<br>5-45 | *Entolasia stricta, Xanthosia tridentata, Lepyrodia scariosa, Actinotus minor, Gonocarpus teucrioides, Lomandra longifolia, Actinotus helianthi, Dampiera stricta, Setaria distans, Xanthosia pilosa* |
| Vines & Climbers | N/A | N/A | *Billardiera scandens* |

*Compiled from 11 sites with structural data recorded.

## Threats

Past clearing for suburban development has removed significant stands of this scrub in the Sydney metropolitan area particularly in the eastern suburbs and northern Sydney Harbour. Threats to remaining stands arise from infection by *Phytophthora* (a fungus of plant roots resulting in dieback) in Sydney Harbour (Suddaby and Liew 2008), inappropriate fire regimes, rubbish dumping and heavy recreational impacts at harbourside localities.

## Conservation Status

This vegetation community is represented in Kamay Botany Bay, Sydney Harbour and Royal national parks.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | <305 hectares |
| Estimated percentage cleared | Not available | 5% |
| Total NPWS reserves | 305 +2.1 hectares<br>80% of extant area | 200 hectares<br>70% of extant area<br>60-80% of pre-clearing area |
| Total reserved | 325 +2.1 hectares<br>85% of extant area | Not available |
| Total non-reserved | 56.0 +6.6 hectares | Not available |
| Total extant | 381 hectares | 290 hectares |

*The modeling in Tozer et al. (2010) underestimates the regional extent of this community.



## Example Locations

o    North Head, Sydney Harbour NP, Manly LGA

o    Dobroyd Head, North Balgowlah, Manly LGA

o    Jennifer Street, La Perouse, Randwick LGA

o    Near Yena Picnic Area, Kamay Botany Bay NP, Sutherland LGA

## Species Richness

| Number of sites | 34 |
|---|---|
| Total native species | 267 |
| Average no. native species per site | 31.5 ±11.2 |

## Variations and Dynamics

A selection of sites at Middle Harbour and La Perouse are dominated by *Kunzea ambigua* and mesic species including *Pittosporum undulatum*. To what extent this reflects a natural variation in species composition is unresolved in this study. It may be that the absence of fire explains the occurrence of these species. Other variations in structure arise from the presence or absence of a eucalypt canopy.

## Relationship to Other Communities

Larger ocean headlands are characterised by a mosaic of substrates that vary from sandstone rock platforms, to sand mantles and fossilised sand dunes. This community grades into Coastal Sand Mantle Heath (S_HL03) wherever the sand mantle becomes deep enough to support a podsolised soil. It will grade into cliffline heath (S_HL07) where soil remains skeletal and the landscape is exposed to greater maritime influences. Poorly drained sites or seepage areas may form clifftop marshes (S_HL14).

## Accuracy

Sampling density is high. Map boundaries were interpreted from digital imagery to identify treeless banksia heaths and mallees on Hawkesbury sandstone.

A 0.04 hectare site located in this map unit is expected to contain at least 5 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 24 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 2 | 50% | 2 | 21% | Positive diagnostic |
| *Acacia suaveolens* | 2 | 59% | 1 | 28% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 24% | 1 | 25% | Uninformative |
| *Actinotus helianthi* | 2 | 18% | 1 | 8% | Uninformative |
| *Actinotus minor* | 2 | 26% | 2 | 22% | Uninformative |
| *Allocasuarina distyla* | 2 | 88% | 2 | 10% | Positive diagnostic |
| *Allocasuarina littoralis* | 3 | 12% | 2 | 27% | Uninformative |
| *Angophora hispida* | 2 | 15% | 2 | 9% | Uninformative |
| *Anisopogon avenaceus* | 2 | 18% | 2 | 14% | Uninformative |
| *Baeckea imbricata* | 3 | 21% | 2 | 4% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 3 | 91% | 2 | 25% | Positive diagnostic |
| *Banksia integrifolia* | 2 | 15% | 1 | 9% | Uninformative |
| *Banksia oblongifolia* | 1 | 26% | 2 | 14% | Uninformative |
| *Banksia serrata* | 3 | 24% | 2 | 33% | Uninformative |
| *Billardiera scandens* | 1 | 32% | 1 | 37% | Uninformative |
| *Callistemon citrinus* | 2 | 12% | 2 | 3% | Uninformative |
| *Callistemon linearis* | 2 | 21% | 1 | 2% | Positive diagnostic |
| *Callistemon pinifolius* | 2 | 18% | 2 | 1% | Uninformative |
| *Callistemon rigidus* | 2 | 12% | 2 | 0% | Uninformative |
| *Cassytha pubescens* | 2 | 41% | 2 | 27% | Constant |
| *Cyathochaeta diandra* | 2 | 15% | 2 | 26% | Uninformative |
| *Dampiera stricta* | 2 | 26% | 2 | 23% | Uninformative |
| *Darwinia fascicularis* | 2 | 44% | 2 | 5% | Positive diagnostic |
| *Dianella caerulea* | 2 | 38% | 2 | 45% | Constant |
| *Dillwynia floribunda* | 1 | 21% | 2 | 5% | Positive diagnostic |
| *Dillwynia retorta* | 1 | 15% | 2 | 26% | Uninformative |
| *Dodonaea triquetra* | 2 | 12% | 2 | 23% | Uninformative |
| *Elaeocarpus reticulatus* | 2 | 24% | 1 | 20% | Uninformative |
| *Entolasia marginata* | 1 | 21% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 59% | 2 | 59% | Constant |
| *Epacris longiflora* | 2 | 24% | 2 | 8% | Uninformative |
| *Epacris microphylla* | 1 | 26% | 2 | 10% | Uninformative |
| *Ficinia nodosa* | 2 | 12% | 2 | 2% | Uninformative |
| *Gahnia sieberiana* | 1 | 18% | 2 | 7% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 38% | 2 | 23% | Constant |
| *Goodenia stelligera* | 2 | 15% | 1 | 0% | Uninformative |
| *Grevillea buxifolia* | 2 | 12% | 2 | 14% | Uninformative |
| *Grevillea sericea* | 2 | 12% | 2 | 15% | Uninformative |
| *Hakea gibbosa* | 3 | 18% | 2 | 6% | Uninformative |
| *Hakea teretifolia* | 2 | 65% | 2 | 15% | Positive diagnostic |
| *Hemigenia purpurea* | 2 | 12% | 2 | 5% | Uninformative |
| *Hibbertia fasciculata* | 2 | 12% | 2 | 2% | Uninformative |
| *Hypolaena fastigiata* | 2 | 18% | 2 | 2% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 15% | 2 | 20% | Uninformative |
| *Isopogon anethifolius* | 1 | 18% | 2 | 5% | Uninformative |
| *Kunzea ambigua* | 2 | 65% | 2 | 14% | Positive diagnostic |
| *Kunzea capitata* | 2 | 18% | 2 | 6% | Uninformative |
| *Lambertia formosa* | 2 | 12% | 2 | 26% | Uninformative |
| *Lasiopetalum ferrugineum* | 2 | 29% | 2 | 11% | Positive diagnostic |
| *Lepidosperma concavum* | 2 | 26% | 2 | 4% | Positive diagnostic |
| *Lepidosperma viscidum* | 3 | 18% | 2 | 2% | Uninformative |
| *Leptospermum arachnoides* | 2 | 18% | 2 | 8% | Uninformative |
| *Leptospermum laevigatum* | 2 | 41% | 2 | 5% | Positive diagnostic |
| *Leptospermum squarrosum* | 2 | 29% | 2 | 7% | Positive diagnostic |
| *Lepyrodia scariosa* | 2 | 53% | 2 | 20% | Positive diagnostic |
| *Leucopogon ericoides* | 2 | 18% | 1 | 8% | Uninformative |
| *Leucopogon microphyllus* | 2 | 38% | 2 | 13% | Positive diagnostic |
| *Lindsaea linearis* | 1 | 12% | 2 | 16% | Uninformative |
| *Lomandra glauca* | 1 | 21% | 2 | 16% | Uninformative |
| *Lomandra longifolia* | 2 | 38% | 2 | 47% | Constant |
| *Lomandra obliqua* | 1 | 15% | 2 | 33% | Uninformative |
| *Melaleuca armillaris* subsp. *armillaris* | 2 | 26% | 2 | 1% | Positive diagnostic |
| *Melaleuca hypericifolia* | 1 | 15% | 2 | 1% | Uninformative |
| *Melaleuca nodosa* | 2 | 47% | 2 | 5% | Positive diagnostic |
| *Micrantheum ericoides* | 2 | 18% | 2 | 17% | Uninformative |
| *Micromyrtus ciliata* | 2 | 15% | 2 | 1% | Uninformative |
| *Mirbelia rubiifolia* | 2 | 12% | 2 | 4% | Uninformative |
| *Mitrasacme polymorpha* | 2 | 12% | 2 | 6% | Uninformative |
| *Monotoca elliptica* | 2 | 24% | 1 | 6% | Positive diagnostic |
| *Opercularia aspera* | 2 | 18% | 1 | 8% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Opercularia varia* | 1 | 12% | 1 | 1% | Uninformative |
| *Pandorea pandorana* | 1 | 12% | 2 | 17% | Uninformative |
| *Paspalidium distans* | 1 | 15% | 2 | 7% | Uninformative |
| *Persoonia lanceolata* | 2 | 35% | 1 | 11% | Positive diagnostic |
| *Petrophile pulchella* | 1 | 15% | 2 | 16% | Uninformative |
| *Philotheca buxifolia* | 2 | 26% | 2 | 1% | Positive diagnostic |
| *Pimelea linifolia* | 2 | 29% | 2 | 27% | Uninformative |
| *Pittosporum undulatum* | 1 | 38% | 2 | 25% | Constant |
| *Platysace lanceolata* | 1 | 21% | 2 | 8% | Uninformative |
| *Platysace linearifolia* | 2 | 21% | 2 | 30% | Uninformative |
| *Pomax umbellata* | 2 | 12% | 2 | 15% | Uninformative |
| *Ptilothrix deusta* | 2 | 18% | 2 | 5% | Uninformative |
| *Pultenaea tuberculata* | 2 | 15% | 2 | 16% | Uninformative |
| *Rulingia hermanniifolia* | 2 | 15% | 2 | 0% | Uninformative |
| *Schoenus ericetorum* | 1 | 15% | 2 | 6% | Uninformative |
| *Smilax glyciphylla* | 1 | 15% | 2 | 33% | Uninformative |
| *Woollsia pungens* | 2 | 18% | 2 | 12% | Uninformative |
| *Xanthorrhoea resinosa* | 2 | 18% | 2 | 10% | Uninformative |
| *Xanthosia pilosa* | 1 | 38% | 2 | 20% | Constant |
| *Xanthosia tridentata* | 2 | 26% | 2 | 21% | Uninformative |
| *Zieria laevigata* | 2 | 18% | 1 | 2% | Uninformative |

# COASTAL HEADLAND CLIFFLINE SCRUB

## S_HL07

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Sydney Coastal Heaths**
1143: She-oak-Hairpin Banksia Heathland on Sandstone Headlands of the Sydney Basin
ME034; SR618



## Description

Coastal Headland Cliffline Scrub is a very restricted community found in a narrow band above Sydney's dramatic coastline cliffs and headlands. These are very exposed locations and the vegetation is pruned by sea breezes. Bracelet honey-myrtle (*Melaleuca armillaris*), scrub she-oak (*Allocasuarina distyla*) and heath-leaved banksia (*Banksia ericifolia* subsp. *ericifolia*) are the most common woody shrubs. The low shrub *Baeckea imbricata* is also very common, particularly near the cliff edge or where the water table is close to the surface (Adam et al. 1989, Fullerton 1998). Other woody shrubs include coastal rosemary (*Westringia fruticosa*), coast wattle (*Acacia longifolia*) and needlebush (*Hakea teretifolia*). The ground cover is sparse and variable in composition. Drier sites feature small herbs such as woolly xanthosia (*Xanthosia pilosa*). Wetter sites may include sedges and rushes (such as scale-rush (*Lepyrodia scariosa*)) amongst a patchy cover of bryophytes.

This community is closely associated with Hawkesbury sandstone rock platforms on headlands, however a small number of sites are located on poorly drained sand mantles atop sandstone headlands. Within the Sydney area it is found at headlands at Kurnell, La Perouse, North Head and in Royal NP. Outside of the study area this community extends from the Central Coast south to Jervis Bay.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Small Trees | 3.4 m ±1.9  2.0-6.0 | 67% ±12  50-80 | *Melaleuca armillaris, Allocasuarina distyla, Leptospermum laevigatum, Acacia longifolia* |
| Shrubs | 1.5 m ±0.0  1.5-1.5 | 10% ±7  5-15 | *Baeckea imbricata, Banksia ericifolia* subsp. *ericifolia, Darwinia fascicularis, Melaleuca nodosa, Dillwynia glaberrima, Kunzea ambigua, Callistemon linearis, Hakea teretifolia, Lasiopetalum parviflorum, Leucopogon ericoides, Micromyrtus ciliata, Westringia fruticosa* |
| Ground Covers | 0.7 m ±0.1  0.6-0.8 | 13% ±6  10-20 | *Entolasia stricta, Xanthosia pilosa, Cyathochaeta diandra, Dampiera stricta, Lepidosperma concavum, Lepyrodia scariosa, Chordifex fastigiatus* |
| Vines & Climbers | N/A | N/A | *Cassytha pubescens, Billardiera scandens* |

*Compiled from 5 sites with structural data recorded.

## Threats

Past clearing for cliff-top developments has removed significant stands of this scrub in the Sydney area. Although many examples are included within the reserve system, the invasive weed bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*) was recorded in or adjoining half of the sample sites. Remnants in the urban environment are also threatened by rubbish dumping and heavy recreational use.

## Conservation Status

This vegetation community is represented in Kamay Botany Bay, Sydney Harbour and Royal national parks.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | <305 hectares |
| Estimated percentage cleared | Not available | 5% |
| Total NPWS reserves | 141 +5.6 hectares<br>97% of extant area | 200 hectares<br>70% of extant area<br>60-80% of pre-clearing area |
| Total reserved | 141 +5.6 hectares<br>97% of extant area | Not available |
| Total non-reserved | 4.0 +<.1 hectares | Not available |
| Total extant | 145 hectares | 290 hectares |

*As this scrub is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o   North Head cliff edges, Sydney Harbour NP, Manly LGA

o   Coastline north of Tabbagai Gap, Kamay Botany Bay NP, Sutherland LGA

## Species Richness

| Number of sites | 9 |
|---|---|
| Total native species | 102 |
| Average no. native species per site | 22.3 ±7.7 |

## Variations and Dynamics

Floristic and structural variations in headland heath arise from changes in soil properties, fire history and exposure to maritime influences (Fullerton 1998). Fullerton (1998) provides a detailed description of local variations, however these are blurred by the broader sampling areas adopted by the current study.

## Relationship to Other Communities

This community grades into Coastal Headland Banksia Heath (S_HL06) as exposure to salt-laden winds decreases. Some sites are situated near headland sand dunes or thin sand mantles; here the community will grade toward Coastal Sand Mantle Heath (S_HL03).

## Accuracy

Sampling density is moderate. Map unit boundaries were based on interpretation of digital imagery to define coastline scrubs with a prominent signature of bracelet honey-myrtle.

A 0.04 hectare site located in this map unit is expected to contain at least 4 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 16 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 1 | 78% | 2 | 21% | Positive diagnostic |
| *Acacia myrtifolia* | 1 | 11% | 2 | 12% | Uninformative |
| *Acacia suaveolens* | 2 | 22% | 1 | 28% | Uninformative |
| *Actinotus helianthi* | 2 | 33% | 1 | 8% | Uninformative |
| *Allocasuarina distyla* | 2 | 78% | 2 | 11% | Positive diagnostic |
| *Angophora hispida* | 2 | 11% | 2 | 9% | Uninformative |
| *Austrodanthonia monticola* | 1 | 11% | 2 | 0% | Uninformative |
| *Austrostipa pubescens* | 1 | 11% | 2 | 20% | Uninformative |
| *Baeckea imbricata* | 2 | 78% | 2 | 3% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 3 | 78% | 2 | 26% | Positive diagnostic |
| *Banksia integrifolia* | 2 | 11% | 2 | 9% | Uninformative |
| *Banksia serrata* | 1 | 11% | 2 | 33% | Uninformative |
| *Bauera rubioides* | 2 | 11% | 2 | 6% | Uninformative |
| *Baumea juncea* | 3 | 22% | 2 | 4% | Uninformative |
| *Baumea rubiginosa* | 2 | 11% | 2 | 1% | Uninformative |
| *Billardiera scandens* | 1 | 33% | 1 | 37% | Uninformative |
| *Blechnum cartilagineum* | 1 | 11% | 2 | 7% | Uninformative |
| *Callistemon citrinus* | 2 | 11% | 2 | 3% | Uninformative |
| *Callistemon linearis* | 2 | 44% | 1 | 2% | Positive diagnostic |
| *Calytrix tetragona* | 2 | 22% | 2 | 3% | Uninformative |
| *Cassinia denticulata* | 1 | 11% | 2 | 1% | Uninformative |
| *Cassytha pubescens* | 2 | 22% | 2 | 27% | Uninformative |
| *Caustis flexuosa* | 2 | 11% | 2 | 18% | Uninformative |
| *Caustis pentandra* | 2 | 11% | 2 | 5% | Uninformative |
| *Chloanthes stoechadis* | 2 | 11% | 2 | 1% | Uninformative |
| *Chordifex fastigiatus* | 2 | 22% | 2 | 2% | Positive diagnostic |
| *Conospermum ellipticum* | 1 | 11% | 2 | 1% | Uninformative |
| *Conospermum taxifolium* | 2 | 11% | 1 | 2% | Uninformative |
| *Crowea saligna* | 2 | 11% | 2 | 3% | Uninformative |
| *Cryptandra amara* | 1 | 11% | 2 | 2% | Uninformative |
| *Cyathochaeta diandra* | 3 | 22% | 2 | 26% | Uninformative |
| *Dampiera stricta* | 1 | 22% | 2 | 23% | Uninformative |
| *Darwinia fascicularis* | 2 | 56% | 2 | 5% | Positive diagnostic |
| *Dillwynia floribunda* | 1 | 11% | 2 | 5% | Uninformative |
| *Dillwynia glaberrima* | 2 | 33% | 2 | 1% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 11% | 2 | 26% | Uninformative |
| *Doryanthes excelsa* | 4 | 11% | 2 | 9% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 11% | 1 | 20% | Uninformative |
| *Eleocharis sphacelata* | 5 | 11% | 2 | 1% | Uninformative |
| *Entolasia stricta* | 2 | 67% | 2 | 59% | Constant |
| *Epacris longiflora* | 2 | 33% | 2 | 8% | Uninformative |
| *Epaltes australis* | 3 | 11% | 2 | 0% | Uninformative |
| *Eucalyptus obstans* | 1 | 22% | 1 | 1% | Positive diagnostic |
| *Ficinia nodosa* | 2 | 11% | 2 | 2% | Uninformative |
| *Gahnia sieberiana* | 2 | 33% | 2 | 7% | Uninformative |
| *Gleichenia dicarpa* | 2 | 11% | 2 | 7% | Uninformative |
| *Gonocarpus micranthus* | 3 | 11% | 2 | 1% | Uninformative |
| *Gonocarpus teucrioides* | 4 | 22% | 2 | 23% | Uninformative |
| *Grevillea speciosa* | 1 | 11% | 2 | 4% | Uninformative |
| *Haemodorum planifolium* | 1 | 11% | 1 | 3% | Uninformative |
| *Hakea sericea* | 2 | 33% | 2 | 21% | Uninformative |
| *Hakea teretifolia* | 2 | 44% | 2 | 16% | Constant |
| *Juncus continuus* | 5 | 11% | 1 | 1% | Uninformative |
| *Kunzea ambigua* | 1 | 33% | 2 | 15% | Uninformative |
| *Lasiopetalum ferrugineum* | 1 | 11% | 2 | 11% | Uninformative |
| *Lasiopetalum parviflorum* | 2 | 33% | 1 | 1% | Positive diagnostic |
| *Lepidosperma concavum* | 2 | 44% | 2 | 4% | Positive diagnostic |
| *Lepidosperma forsythii* | 2 | 11% | 2 | 1% | Uninformative |
| *Lepidosperma neesii* | 2 | 33% | 2 | 1% | Positive diagnostic |
| *Lepidosperma viscidum* | 1 | 11% | 2 | 2% | Uninformative |
| *Leptospermum laevigatum* | 3 | 44% | 2 | 5% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 11% | 2 | 14% | Uninformative |
| *Leptospermum squarrosum* | 2 | 22% | 2 | 8% | Uninformative |
| *Lepyrodia scariosa* | 2 | 11% | 2 | 21% | Uninformative |
| *Leucopogon ericoides* | 2 | 22% | 1 | 8% | Uninformative |
| *Lindsaea linearis* | 1 | 22% | 2 | 16% | Uninformative |
| *Lobelia anceps* | 2 | 11% | 2 | 2% | Uninformative |
| *Lomandra filiformis* | 2 | 11% | 2 | 23% | Uninformative |
| *Lomandra longifolia* | 2 | 44% | 2 | 47% | Constant |
| *Lomatia silaifolia* | 1 | 11% | 1 | 27% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Melaleuca armillaris* subsp. *armillaris* | 3 | 78% | 2 | 1% | Positive diagnostic |
| *Melaleuca nodosa* | 2 | 56% | 2 | 5% | Positive diagnostic |
| *Micrantheum ericoides* | 2 | 11% | 2 | 17% | Uninformative |
| *Micromyrtus ciliata* | 2 | 22% | 2 | 1% | Positive diagnostic |
| *Mirbelia rubiifolia* | 1 | 11% | 2 | 4% | Uninformative |
| *Monotoca elliptica* | 1 | 11% | 2 | 7% | Uninformative |
| *Opercularia aspera* | 1 | 11% | 1 | 8% | Uninformative |
| *Panicum simile* | 2 | 11% | 2 | 10% | Uninformative |
| *Paspalidium distans* | 1 | 22% | 2 | 7% | Uninformative |
| *Patersonia glabrata* | 1 | 11% | 2 | 16% | Uninformative |
| *Persoonia lanceolata* | 2 | 11% | 1 | 11% | Uninformative |
| *Phebalium squamulosum* | 2 | 11% | 2 | 3% | Uninformative |
| *Philydrum lanuginosum* | 1 | 11% | 1 | 0% | Uninformative |
| *Pimelea linifolia* | 2 | 33% | 2 | 27% | Uninformative |
| *Portulaca oleracea* | 1 | 11% | 1 | 0% | Uninformative |
| *Prostanthera densa* | 2 | 11% | 0 | 0% | Uninformative |
| *Pultenaea daphnoides* | 1 | 11% | 2 | 8% | Uninformative |
| *Pultenaea scabra* | 1 | 11% | 2 | 1% | Uninformative |
| *Rulingia hermanniifolia* | 2 | 11% | 2 | 0% | Uninformative |
| *Scaevola ramosissima* | 1 | 22% | 1 | 5% | Uninformative |
| *Selaginella uliginosa* | 1 | 11% | 2 | 4% | Uninformative |
| *Smilax glyciphylla* | 1 | 11% | 2 | 33% | Uninformative |
| *Telopea speciosissima* | 1 | 11% | 1 | 3% | Uninformative |
| *Thelionema umbellatum* | 2 | 11% | 2 | 0% | Uninformative |
| *Westringia fruticosa* | 2 | 33% | 2 | 1% | Positive diagnostic |
| *Woollsia pungens* | 1 | 11% | 2 | 12% | Uninformative |
| *Xanthosia pilosa* | 1 | 44% | 2 | 20% | Constant |
| *Xanthosia tridentata* | 2 | 11% | 2 | 22% | Uninformative |
| *Zieria laevigata* | 2 | 11% | 1 | 2% | Uninformative |

# COASTAL SANDSTONE HEATH-MALLEE                    S_HL08

**Statewide Class**                     **Sydney Coastal Heaths**
NSW Plant Community Type:                882: Hairpin Banksia-Slender Tea-tree Heath on Coastal Sandstone Plateaux,
                                        Sydney Basin
Biometric Number(s):                    HN541; ME013; SR557; HU855



## Description

Coastal Sandstone Heath-Mallee is widespread across the coastal Hawkesbury sandstone plateaus of the Sydney region. It is variable in structure, ranging from a treeless heath to a low open woodland with mallees. It is common on exposed skeletal soils along narrow ridges and exposed slopes of both the Woronora and Hornsby plateaus. The heath is dominated by heath-leaved banksia (*Banksia ericifolia* subsp. *ericifolia*) and is joined by a highly diverse combination other banksias, tea-trees, hakeas, wattles, grevilleas and geebungs. Scrub she-oak (*Allocasuarina distyla*) may also be prominent. The heath is low-growing on rocky sites and exceeds several metres in height in long unburnt areas with slightly deeper soil. The upper stratum may include low mallees and mallee-form eucalypts including the Port Jackson mallee (*Eucalyptus obstans*) and yellow-topped mallee ash (*Eucalyptus luehmanniana*) as well as red bloodwood (*Corymbia gummifera*) and dwarf apple (*Angophora hispida*). There is a variable cover of sedges and other monocots in the ground layer.

This community is associated with the wetter zones of the sandstone plateau where mean annual rainfall exceeds 1100 millimetres per annum. It ranges in elevation between 50 and 250 metres above sea level. In the study area it covers extensive areas of Royal, Ku-ring-gai Chase and Garigal national parks. Elsewhere it is found between the Central Coast and Jervis Bay (Tozer et al. 2010).

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 7 m ±3<br>4.0-12.0 | 17% ±13<br>4-55 | *Angophora hispida, Banksia serrata, Corymbia gummifera, Eucalyptus obstans, Eucalyptus luehmanniana, Eucalyptus haemastoma. Eucalyptus multicaulis* |
| Shrubs | 3.08 m ±1.3<br>1.0-6.0 | 49% ±24<br>10-85 | *Banksia ericifolia* subsp. *ericifolia, Boronia ledifolia, Leptospermum trinervium, Leucopogon microphyllus, Acacia suaveolens, Leptospermum arachnoides, Grevillea oleoides, Hakea teretifolia, Banksia oblongifolia, Hakea dactyloides, Lambertia formosa, Leptospermum squarrosum, Darwinia fascicularis, Conospermum taxifolium, Hakea gibbosa, Pimelea linifolia, Epacris microphylla, Epacris pulchella, Kunzea capitata, Persoonia lanceolata, Hemigenia purpurea, Petrophile pulchella, Pultenaea tuberculata, Banksia marginata, Allocasuarina distyla* |
| Ground Covers | 0.8 m ±0.5<br>0.3-2.0 | 36% ±20<br>10-75 | *Lomandra obliqua, Xanthorrhoea media, Actinotus minor, Cyathochaeta diandra, Dampiera stricta, Caustis pentandra, Schoenus imberbis, Lepyrodia scariosa* |

*Compiled from 6 sites with structural data recorded.

## Threats

Much of the original extent of this community is persist today although the areas present in Royal and Ku-ring-gai Chase national parks are threatened by too frequent intense wildfire leading to extinctions of local populations (Keith 2004). Other threats are localised in areas of high recreation use.

## Conservation Status

This vegetation community is represented in Royal, Garigal, Ku-ring-gai Chase, Dharawal and Heathcote national parks.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | <17,890 hectares |
| Estimated percentage cleared | Not available | <10% |
| Total NPWS reserves | 7223 +11.0 hectares<br>69% of extant area | 11,300 hectares<br>70% of extant area<br>50-70% of pre-clearing area |
| Total reserved | 8771 +13.9 hectares<br>84% of extant area | Not available |
| Total non-reserved | 1633 +9.0 hectares | Not available |
| Total extant | 10,404 hectares | 16,100 hectares |
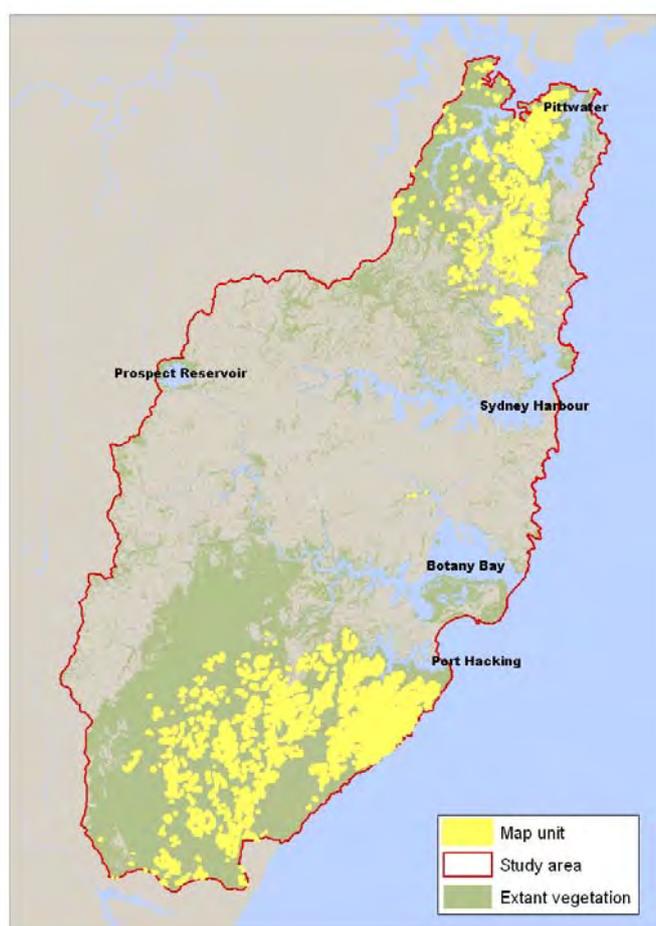


## Example Locations

o    Little Marley Fire Trail, Royal NP

o    West Head Road, Ku-ring-gai Chase NP

## Species Richness

| Number of sites | 100 |
|---|---|
| Total native species | 376 |
| Average no. native species per site | 50.5 ±10.2 |

## Variations and Dynamics

This community is highly variable in response to localised habitat conditions and time since fire. A number of variations of this community have been mapped though not displayed as separate communities. This includes mallee-heaths dominated by yellow topped mallee ash, very open eucalypt woodlands of low height with a dense heath understorey, and low heaths associated with rocky ridges.

## Relationship to Other Communities

This community is most closely related to exposed woodlands on coastal Hawkesbury sandstone plateaus (S_DSF05, S_DSF11). These two communities form complex mosaics with S_HL08 with the boundaries of eucalypt woodlands likely to expand and contract in response to fire history.

## Accuracy

Sampling density is moderate. Map boundaries were interpreted using the cover and height of the eucalypt canopy. Mallee species were readily interpretable from high resolution imagery.

A 0.04 hectare site located in this map unit is expected to contain at least 31 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 42 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia myrtifolia* | 2 | 27% | 2 | 12% | Positive diagnostic |
| *Acacia suaveolens* | 2 | 66% | 1 | 26% | Positive diagnostic |
| *Acacia ulicifolia* | 1 | 13% | 1 | 26% | Uninformative |
| *Actinotus helianthi* | 1 | 11% | 1 | 8% | Uninformative |
| *Actinotus minor* | 2 | 89% | 2 | 18% | Positive diagnostic |
| *Allocasuarina distyla* | 2 | 59% | 2 | 9% | Positive diagnostic |
| *Amphipogon strictus* var. *strictus* | 1 | 6% | 3 | 0% | Positive diagnostic |
| *Angophora hispida* | 2 | 52% | 2 | 7% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 36% | 2 | 13% | Positive diagnostic |
| *Aotus ericoides* | 2 | 14% | 2 | 8% | Uninformative |
| *Baeckea brevifolia* | 2 | 12% | 2 | 1% | Positive diagnostic |
| *Baeckea diosmifolia* | 2 | 12% | 2 | 2% | Positive diagnostic |
| *Baeckea imbricata* | 2 | 27% | 2 | 3% | Positive diagnostic |
| *Baloskion gracile* | 2 | 10% | 2 | 1% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 3 | 93% | 2 | 23% | Positive diagnostic |
| *Banksia marginata* | 2 | 24% | 2 | 9% | Positive diagnostic |
| *Banksia oblongifolia* | 2 | 76% | 2 | 11% | Positive diagnostic |
| *Banksia paludosa* | 2 | 8% | 2 | 1% | Positive diagnostic |
| *Banksia serrata* | 2 | 67% | 2 | 31% | Positive diagnostic |
| *Bauera microphylla* | 2 | 6% | 2 | 1% | Positive diagnostic |
| *Bauera rubioides* | 2 | 21% | 2 | 5% | Positive diagnostic |
| *Billardiera scandens* | 1 | 11% | 1 | 38% | Uninformative |
| *Blandfordia nobilis* | 1 | 12% | 1 | 1% | Positive diagnostic |
| *Boronia ledifolia* | 2 | 32% | 2 | 12% | Positive diagnostic |
| *Boronia pinnata* | 1 | 14% | 1 | 5% | Positive diagnostic |
| *Boronia serrulata* | 2 | 14% | 1 | 1% | Positive diagnostic |
| *Bossiaea ensata* | 1 | 33% | 1 | 5% | Positive diagnostic |
| *Bossiaea heterophylla* | 2 | 20% | 2 | 17% | Uninformative |
| *Bossiaea scolopendria* | 2 | 34% | 1 | 6% | Positive diagnostic |
| *Brachyloma daphnoides* | 1 | 10% | 1 | 5% | Uninformative |
| *Burchardia umbellata* | 1 | 14% | 1 | 2% | Positive diagnostic |
| *Calytrix tetragona* | 2 | 15% | 2 | 3% | Positive diagnostic |
| *Cassytha glabella* | 1 | 35% | 2 | 13% | Positive diagnostic |
| *Cassytha pubescens* | 1 | 10% | 2 | 28% | Uninformative |
| *Caustis flexuosa* | 1 | 18% | 2 | 17% | Uninformative |
| *Caustis pentandra* | 2 | 31% | 2 | 4% | Positive diagnostic |
| *Caustis recurvata* | 2 | 6% | 2 | 0% | Positive diagnostic |
| *Chordifex dimorphus* | 2 | 38% | 2 | 2% | Positive diagnostic |
| *Chordifex fastigiatus* | 2 | 32% | 2 | 1% | Positive diagnostic |
| *Conospermum ellipticum* | 2 | 6% | 2 | 0% | Positive diagnostic |
| *Conospermum taxifolium* | 2 | 19% | 1 | 1% | Positive diagnostic |
| *Corymbia gummifera* | 2 | 68% | 2 | 40% | Positive diagnostic |
| *Cryptandra ericoides* | 1 | 12% | 2 | 1% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 61% | 2 | 25% | Positive diagnostic |
| *Dampiera stricta* | 2 | 75% | 2 | 21% | Positive diagnostic |
| *Darwinia diminuta* | 1 | 12% | 2 | 1% | Positive diagnostic |
| *Darwinia fascicularis* | 2 | 54% | 2 | 3% | Positive diagnostic |
| *Daviesia corymbosa* | 2 | 12% | 1 | 2% | Positive diagnostic |
| *Dillwynia floribunda* | 2 | 26% | 2 | 4% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 44% | 2 | 25% | Positive diagnostic |
| *Dillwynia rudis* | 2 | 5% | 2 | 0% | Positive diagnostic |
| *Drosera auriculata* | 1 | 7% | 1 | 1% | Positive diagnostic |
| *Drosera peltata* | 2 | 19% | 1 | 3% | Positive diagnostic |
| *Drosera spatulata* | 2 | 12% | 2 | 3% | Positive diagnostic |
| *Empodisma minus* | 2 | 18% | 2 | 4% | Positive diagnostic |
| *Entolasia stricta* | 2 | 43% | 2 | 59% | Constant |
| *Epacris longiflora* | 2 | 10% | 2 | 8% | Uninformative |
| *Epacris microphylla* | 2 | 78% | 2 | 7% | Positive diagnostic |
| *Epacris obtusifolia* | 2 | 12% | 2 | 2% | Positive diagnostic |
| *Epacris pulchella* | 2 | 21% | 2 | 15% | Uninformative |
| *Eriostemon australasius* | 1 | 26% | 2 | 13% | Positive diagnostic |
| *Eucalyptus apiculata* | 3 | 8% | 0 | 0% | Positive diagnostic |
| *Eucalyptus haemastoma* | 2 | 37% | 2 | 11% | Positive diagnostic |
| *Eucalyptus luehmanniana* | 3 | 29% | 3 | 1% | Positive diagnostic |
| *Eucalyptus obstans* | 2 | 6% | 1 | 0% | Positive diagnostic |
| *Eucalyptus punctata* | 1 | 10% | 2 | 11% | Uninformative |
| *Eucalyptus racemosa* | 2 | 18% | 3 | 3% | Positive diagnostic |
| *Eucalyptus sieberi* | 2 | 15% | 2 | 9% | Uninformative |
| *Eurychorda complanata* | 2 | 4% | 2 | 1% | Positive diagnostic |
| *Gompholobium glabratum* | 1 | 13% | 2 | 4% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Gompholobium grandiflorum* | 1 | 12% | 1 | 9% | Uninformative |
| *Gonocarpus tetragynus* | 2 | 22% | 2 | 7% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 23% | 2 | 23% | Uninformative |
| *Goodenia bellidifolia* subsp. *bellidifolia* | 1 | 18% | 1 | 4% | Positive diagnostic |
| *Grevillea buxifolia* | 2 | 27% | 2 | 13% | Positive diagnostic |
| *Grevillea oleoides* | 2 | 49% | 2 | 5% | Positive diagnostic |
| *Grevillea sericea* | 2 | 19% | 2 | 15% | Uninformative |
| *Grevillea speciosa* | 2 | 30% | 1 | 3% | Positive diagnostic |
| *Grevillea sphacelata* | 1 | 26% | 2 | 6% | Positive diagnostic |
| *Haemodorum corymbosum* | 1 | 12% | 1 | 2% | Positive diagnostic |
| *Hakea dactyloides* | 2 | 71% | 2 | 22% | Positive diagnostic |
| *Hakea gibbosa* | 2 | 30% | 2 | 6% | Positive diagnostic |
| *Hakea propinqua* | 1 | 11% | 2 | 2% | Positive diagnostic |
| *Hakea sericea* | 2 | 12% | 2 | 22% | Uninformative |
| *Hakea teretifolia* | 2 | 81% | 2 | 13% | Positive diagnostic |
| *Harmogia densifolia* | 2 | 5% | 1 | 0% | Positive diagnostic |
| *Hemigenia purpurea* | 2 | 51% | 2 | 2% | Positive diagnostic |
| *Hibbertia cistiflora* subsp. *cistiflora* | 1 | 12% | 2 | 1% | Positive diagnostic |
| *Hibbertia linearis* | 2 | 15% | 1 | 6% | Positive diagnostic |
| *Hibbertia riparia* | 2 | 18% | 2 | 3% | Positive diagnostic |
| *Hibbertia serpyllifolia* | 2 | 17% | 2 | 3% | Positive diagnostic |
| *Isopogon anemonifolius* | 2 | 46% | 2 | 17% | Positive diagnostic |
| *Isopogon anethifolius* | 2 | 29% | 2 | 4% | Positive diagnostic |
| *Kunzea capitata* | 2 | 62% | 2 | 3% | Positive diagnostic |
| *Lambertia formosa* | 2 | 65% | 2 | 24% | Positive diagnostic |
| *Lepidosperma filiforme* | 2 | 39% | 2 | 7% | Positive diagnostic |
| *Lepidosperma forsythii* | 2 | 5% | 2 | 1% | Positive diagnostic |
| *Lepidosperma neesii* | 2 | 13% | 2 | 1% | Positive diagnostic |
| *Lepidosperma urophorum* | 2 | 12% | 2 | 2% | Positive diagnostic |
| *Lepidosperma viscidum* | 2 | 13% | 2 | 1% | Positive diagnostic |
| *Leptocarpus tenax* | 2 | 32% | 2 | 4% | Positive diagnostic |
| *Leptospermum arachnoides* | 2 | 60% | 2 | 6% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 17% | 2 | 14% | Uninformative |
| *Leptospermum squarrosum* | 2 | 42% | 2 | 6% | Positive diagnostic |
| *Leptospermum trinervium* | 2 | 74% | 2 | 36% | Positive diagnostic |
| *Lepyrodia scariosa* | 2 | 79% | 2 | 18% | Positive diagnostic |
| *Leucopogon appressus* | 2 | 5% | 1 | 1% | Positive diagnostic |
| *Leucopogon esquamatus* | 2 | 58% | 1 | 2% | Positive diagnostic |
| *Leucopogon microphyllus* | 2 | 78% | 2 | 10% | Positive diagnostic |
| *Lindsaea linearis* | 2 | 44% | 2 | 15% | Positive diagnostic |
| *Lomandra cylindrica* | 2 | 15% | 2 | 10% | Uninformative |
| *Lomandra filiformis* | 2 | 14% | 2 | 23% | Uninformative |
| *Lomandra glauca* | 2 | 37% | 2 | 15% | Positive diagnostic |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 14% | 2 | 24% | Uninformative |
| *Lomandra obliqua* | 2 | 54% | 2 | 31% | Positive diagnostic |
| *Lomatia silaifolia* | 2 | 20% | 1 | 28% | Uninformative |
| *Micrantheum ericoides* | 2 | 17% | 2 | 17% | Uninformative |
| *Micromyrtus ciliata* | 1 | 7% | 2 | 1% | Positive diagnostic |
| *Mirbelia rubiifolia* | 2 | 41% | 1 | 2% | Positive diagnostic |
| *Mirbelia speciosa* | 1 | 7% | 1 | 1% | Positive diagnostic |
| *Mitrasacme polymorpha* | 2 | 36% | 2 | 4% | Positive diagnostic |
| *Monotoca scoparia* | 1 | 22% | 1 | 16% | Uninformative |
| *Olax stricta* | 1 | 11% | 1 | 1% | Positive diagnostic |
| *Patersonia glabrata* | 2 | 43% | 2 | 15% | Positive diagnostic |
| *Patersonia longifolia* | 1 | 4% | 1 | 1% | Positive diagnostic |
| *Patersonia sericea* | 2 | 43% | 1 | 14% | Positive diagnostic |
| *Persoonia lanceolata* | 1 | 37% | 1 | 10% | Positive diagnostic |
| *Persoonia levis* | 1 | 32% | 1 | 33% | Uninformative |
| *Persoonia pinifolia* | 1 | 35% | 2 | 20% | Positive diagnostic |
| *Petrophile pulchella* | 2 | 72% | 2 | 13% | Positive diagnostic |
| *Phebalium squamulosum* | 2 | 19% | 2 | 2% | Positive diagnostic |
| *Philotheca buxifolia* | 2 | 8% | 2 | 1% | Positive diagnostic |
| *Philotheca salsolifolia* | 2 | 10% | 2 | 1% | Positive diagnostic |
| *Phyllota phylicoides* | 2 | 43% | 2 | 11% | Positive diagnostic |
| *Pimelea linifolia* | 2 | 39% | 2 | 26% | Constant |
| *Platysace linearifolia* | 2 | 66% | 2 | 28% | Positive diagnostic |
| *Ptilothrix deusta* | 3 | 19% | 2 | 5% | Positive diagnostic |
| *Pultenaea aristata* | 2 | 13% | 2 | 0% | Positive diagnostic |
| *Pultenaea stipularis* | 1 | 17% | 2 | 7% | Positive diagnostic |
| *Pultenaea tuberculata* | 2 | 66% | 2 | 14% | Positive diagnostic |
| *Scaevola ramosissima* | 1 | 18% | 1 | 5% | Positive diagnostic |
| *Schizaea bifida* | 1 | 10% | 1 | 4% | Uninformative |
| *Schoenus imberbis* | 2 | 15% | 2 | 3% | Positive diagnostic |
| *Schoenus lepidosperma* | 2 | 18% | 2 | 1% | Positive diagnostic |
| *Selaginella uliginosa* | 2 | 11% | 2 | 4% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Sowerbaea juncea* | 2 | 5% | 2 | 0% | Positive diagnostic |
| *Sphaerolobium vimineum* | 2 | 4% | 1 | 0% | Positive diagnostic |
| *Stylidium lineare* | 2 | 34% | 2 | 5% | Positive diagnostic |
| *Stylidium productum* | 2 | 14% | 2 | 5% | Positive diagnostic |
| *Styphelia tubiflora* | 1 | 15% | 2 | 4% | Positive diagnostic |
| *Tetratheca ericifolia* | 2 | 16% | 2 | 3% | Positive diagnostic |
| *Tetratheca neglecta* | 1 | 10% | 2 | 5% | Uninformative |
| *Tetratheca shiressii* | 2 | 5% | 1 | 0% | Positive diagnostic |
| *Thysanotus juncifolius* | 2 | 8% | 1 | 1% | Positive diagnostic |
| *Tricostularia pauciflora* | 2 | 5% | 1 | 1% | Positive diagnostic |
| *Woollsia pungens* | 2 | 16% | 2 | 12% | Uninformative |
| *Xanthorrhoea arborea* | 2 | 11% | 2 | 12% | Uninformative |
| *Xanthorrhoea media* | 2 | 36% | 2 | 19% | Positive diagnostic |
| *Xanthorrhoea resinosa* | 2 | 51% | 2 | 8% | Positive diagnostic |
| *Xanthosia pilosa* | 1 | 15% | 2 | 21% | Uninformative |
| *Xanthosia tridentata* | 2 | 45% | 2 | 20% | Positive diagnostic |
| *Xyris gracilis* | 2 | 27% | 2 | 2% | Positive diagnostic |
| *Zieria laevigata* | 1 | 8% | 2 | 2% | Positive diagnostic |

# COASTAL SANDSTONE ROCK PLATE HEATH                    S_HL09

**Statewide Class**                     Sydney Coastal Heaths
NSW Plant Community Type:               881: Hairpin Banksia-*Kunzea ambigua*-*Allocasuarina distyla* Heath on Coastal
                                        Sandstone Plateau, Sydney Basin
Biometric Number(s):                    HN540; ME008; SR556



## Description

Massive sandstone plates or pavements are exposed on Hawkesbury sandstone ridgetops across Sydney's coastal plateaus. A stunted open to sparse heath or shrub community forms on these outcrops in a mosaic with bare rock and moss. Tick bush (*Kunzea ambigua*) can be the dominant woody shrub while *Darwinia fascicularis* was present at half of the floristic sample sites. At other sites the cover is very low, with *Baeckea brevifolia* the primary shrub. A number of small shrubs from the Epacridaceae family are also localised. These include *Leucopogon microphyllus* and small-leaved white-beard (*Epacris microphylla*). Keith (1994) indicates that the patchiness of the understorey vegetation cover is determined by the available moisture present within minor cracks and depressions in the rock. These microhabitats develop sufficient damp organic matter to support a sparse cover of sundews (*Drosera* spp.) and sedges such as scale-rush (*Lepyrodia scariosa*).

Coastal Sandstone Rock Plate Heath is restricted to rock platforms mostly in areas of high coastal rainfall (1200-1500 millimetres per annum). These locations provide habitat for a number of uncommon species in the Sydney area. An isolated population of black cypress pine (*Callitris endlicheri*) is found amongst the rock plate heath in Dharawal NP near Darkes Forest. This stand is recognised as an endangered population under the NSW TSC Act.

This community occurs on both the Woronora and Hornsby plateaus. Elsewhere it is known as far south as Jervis Bay (Tozer et al. 2010) and small areas are recorded on the Nattai tableland near Picton (NPWS 2004).

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Shrubs | 2.0 m | 55% ±49 | *Kunzea ambigua, Leucopogon microphyllus, Banksia ericifolia* subsp. *ericifolia, Darwinia fascicularis, Epacris microphylla, Leptospermum trinervium, Persoonia pinifolia, Allocasuarina littoralis, Calytrix tetragona, Dillwynia retorta, Hakea sericea, Hakea teretifolia, Monotoca ledifolia, Pultenaea tuberculata, Zieria laevigata* |
| Ground Covers | 0.5 m | 35% ±7 | *Drosera peltata, Lepidosperma viscidum, Lepyrodia scariosa, Schoenus ericetorum, Cyathochaeta diandra, Empodisma minus, Poranthera ericifolia, Thelionema umbellatum, Tricostularia pauciflora* |

*No structural data recorded. Data inferred from NPWS (2003a).

## Threats

Past clearing has removed rock plate heaths for urban development on sandstone ridgetops, although the original extent is difficult to estimate. Illegal removal of rocks for the landscape industry continues to threaten accessible outcrops.

## Conservation Status

This vegetation community is represented in Lane Cove, Dharawal, Garigal, Ku-ring-gai Chase and Royal national parks.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 260 hectares |
| Estimated percentage cleared | Not available | 5% |
| Total NPWS reserves | 170 +<.1 hectares<br>73% of extant area | 50 hectares<br>19% of extant area<br>10-30% of pre-clearing area |
| Total reserved | 189 +0 hectares<br>81% of extant area | Not available |
| Total non-reserved | 44.0 +1.2 hectares | Not available |
| Total extant | 233 hectares | 275 hectares |



Map unit
Study area
Extant vegetation
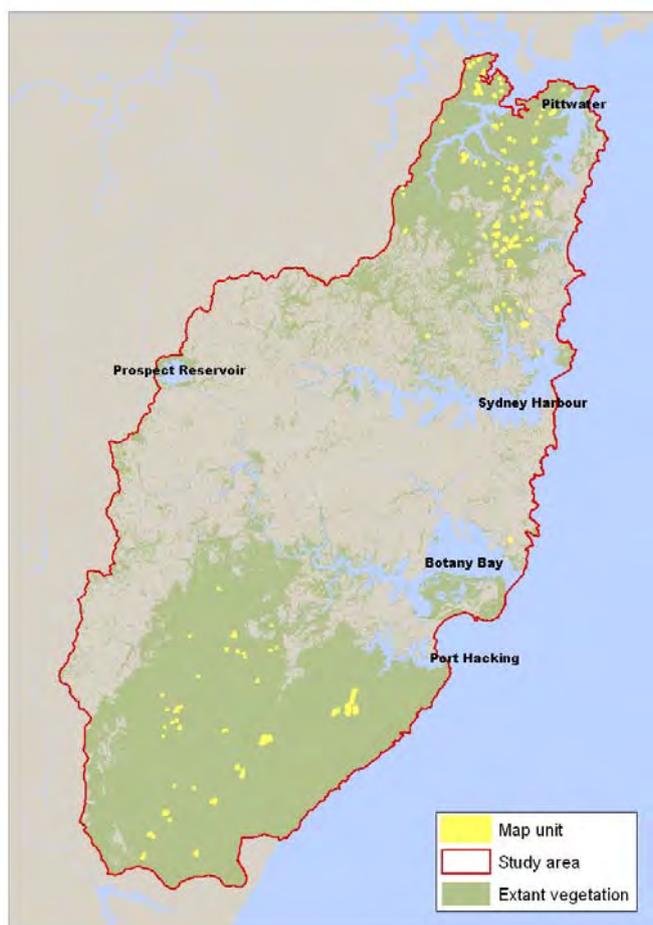
## Example Locations

o   Bundeena Drive, Maianbar, Royal NP

o   Devlins Creek catchment, Lane Cove NP

## Species Richness

| Number of sites | 11 |
|---|---|
| Total native species | 117 |
| Average no. native species per site | 18.1 ±6.1 |

## Variations and Dynamics

Sandstone rock plates support a varied floristic composition depending on location and depth of soil. Composition of the heath may change rapidly over a site depending on the accumulation of a soil profile and availability of habitat features such as crevices that help sustain moisture availability.

## Relationship to Other Communities

This community grades into plateau heath (S_HL08) or sandstone woodland (S_DSF05, S_DSF11) as distance from exposed rock increases.

## Accuracy

Sampling density is moderate. The map boundaries are based on the interpretation of exposed Hawkesbury sandstone rock plates. Rock plates in some areas may be more prominent as a result of recent fire. Small rock plates are likely to have been amalgamated with larger surrounding vegetation patterns.

*The Native Vegetation of the Sydney Metropolitan Area*

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the sites used to define this map unit in the study area are highly variable in species number and composition.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia myrtifolia* | 1 | 18% | 2 | 12% | Uninformative |
| *Acacia suaveolens* | 1 | 18% | 1 | 28% | Uninformative |
| *Allocasuarina distyla* | 2 | 27% | 2 | 11% | Uninformative |
| *Allocasuarina littoralis* | 2 | 27% | 2 | 27% | Uninformative |
| *Banksia ericifolia* subsp. *ericifolia* | 1 | 55% | 2 | 26% | Constant |
| *Banksia marginata* | 1 | 27% | 2 | 9% | Uninformative |
| *Bossiaea ensata* | 1 | 18% | 1 | 6% | Uninformative |
| *Calytrix tetragona* | 2 | 27% | 2 | 3% | Positive diagnostic |
| *Conospermum longifolium* | 1 | 27% | 1 | 7% | Uninformative |
| *Cyathochaeta diandra* | 2 | 18% | 2 | 26% | Uninformative |
| *Darwinia fascicularis* | 3 | 36% | 2 | 5% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 18% | 2 | 26% | Uninformative |
| *Drosera peltata* | 2 | 27% | 1 | 3% | Positive diagnostic |
| *Empodisma minus* | 2 | 18% | 2 | 5% | Uninformative |
| *Epacris microphylla* | 2 | 45% | 2 | 10% | Positive diagnostic |
| *Eragrostis brownii* | 2 | 18% | 2 | 7% | Uninformative |
| *Eucalyptus punctata* | 3 | 18% | 2 | 11% | Uninformative |
| *Grevillea speciosa* | 2 | 18% | 2 | 4% | Uninformative |
| *Grevillea sphacelata* | 1 | 18% | 2 | 6% | Uninformative |
| *Hakea sericea* | 2 | 27% | 2 | 21% | Uninformative |
| *Hakea teretifolia* | 2 | 27% | 2 | 16% | Uninformative |
| *Kunzea ambigua* | 4 | 82% | 2 | 14% | Positive diagnostic |
| *Laxmannia gracilis* | 1 | 18% | 1 | 5% | Uninformative |
| *Lepidosperma viscidum* | 3 | 27% | 2 | 2% | Positive diagnostic |
| *Leptospermum polygalifolium* | 1 | 18% | 2 | 14% | Uninformative |
| *Leptospermum squarrosum* | 1 | 18% | 2 | 8% | Uninformative |
| *Lepyrodia scariosa* | 3 | 45% | 2 | 21% | Constant |
| *Leucopogon microphyllus* | 2 | 55% | 2 | 13% | Positive diagnostic |
| *Lomandra cylindrica* | 1 | 18% | 2 | 11% | Uninformative |
| *Monotoca ledifolia* | 2 | 18% | 1 | 0% | Uninformative |
| *Olax stricta* | 1 | 18% | 1 | 2% | Uninformative |
| *Panicum simile* | 2 | 18% | 2 | 10% | Uninformative |
| *Patersonia sericea* | 1 | 18% | 1 | 15% | Uninformative |
| *Persoonia lanceolata* | 1 | 27% | 1 | 11% | Uninformative |
| *Persoonia pinifolia* | 2 | 36% | 1 | 21% | Constant |
| *Petrophile pulchella* | 3 | 18% | 2 | 16% | Uninformative |
| *Petrophile sessilis* | 1 | 18% | 2 | 7% | Uninformative |
| *Poranthera ericifolia* | 2 | 18% | 1 | 2% | Uninformative |
| *Pultenaea tuberculata* | 2 | 18% | 2 | 16% | Uninformative |
| *Schoenus ericetorum* | 1 | 27% | 2 | 6% | Uninformative |
| *Thelionema umbellatum* | 2 | 18% | 2 | 0% | Uninformative |
| *Tricostularia pauciflora* | 2 | 18% | 1 | 1% | Uninformative |
| *Zieria laevigata* | 2 | 18% | 1 | 2% | Uninformative |

# S� YDNEY H� INTERLAND Dᴡ ARF Aᴘ PLE Hᴇ EATH-Wᴏ OODLAND S_HL10

**Statewide Class** Sydney Coastal Heaths
NSW Plant Community Type: 882: Hairpin Banksia-Slender Tea-tree Heath on Coastal Sandstone Plateaux,
Sydney Basin
Biometric Number(s): HN541; ME013; SR557; HU855



## Description

Within this heath-woodland community the leathery grey-green leaves of the dwarf apple (*Angophora hispida*) are a highly visible feature, both on the ground and on aerial photographs. This small tree forms dense clusters amongst other common heath species such as banksias, tea-trees, conesticks and hakeas. At times a low open canopy of broad-leaved scribbly gum (*Eucalyptus haemastoma*) and red bloodwood (*Corymbia gummifera*) also occurs. The broad sandstone ridges of the northern and western Woronora Plateau encompass the primary distribution of this community within the Sydney area, although there are small disjunct patches found just north of the Georges River. Commonly this community is situated on skeletal soils on broad undulating ridgelines with crests that have a distinctive mantle of ironstone fragments above a highly leached white sandy soil.

Sydney Hinterland Dwarf Apple Heath-Woodland is common within the Holsworthy defence area (French et al. 2000). Elsewhere in the Sydney basin a closely related community is found occupying similar habitats on the sandstone plateau between Colo Heights and Mangrove Mountain. Both communities lie within a mean annual rainfall band of 900-1200 millimetres and at elevations between 50 and 210 metres above sea level.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Small Trees | 7 m ±2 <br> 4-10 | 12% ±3 <br> 10-15 | *Corymbia gummifera, Eucalyptus haemastoma* |
| Shrubs | 2.3 m ±2.0 <br> 0.4-6.0 | 23% ±16 <br> 5-50 | *Hakea dactyloides, Leptospermum trinervium, Angophora hispida, Isopogon anemonifolius, Lambertia formosa, Petrophile sessilis, Pultenaea tuberculata, Banksia oblongifolia, Leucopogon microphyllus, Banksia spinulosa, Leptospermum arachnoides, Phyllota phylicoides, Kunzea capitata, Persoonia levis, Pimelea linifolia, Eriostemon australasius, Grevillea sphacelata, Hakea sericea, Platysace ericoides* |
| Ground Covers | 0.9 m ±0.3 <br> 0.5-1.0 | 24% ±8 <br> 15-30 | *Cyathochaeta diandra, Dampiera stricta, Actinotus minor, Lepyrodia scariosa, Lomandra obliqua, Patersonia sericea, Ptilothrix deusta, Lindsaea linearis, Lomandra glauca, Entolasia stricta, Stylidium lineare, Xanthorrhoea resinosa, Xanthorrhoea media* |
| Vines & Climbers | N/A | N/A | *Cassytha pubescens* |

*Compiled from 5 sites with structural data recorded.

## Threats

The preference of this community for broad sandstone ridges suggests that some areas have been lost from the development of suburbs such as Menai, Barden Ridge, Engadine and surrounds. Large areas persist in Holsworthy defence area, although these are subject to ongoing military activity. Frequent fire, motorbike trail riding and gravel quarrying may also pose localised threats.

## Conservation Status

Within the Sydney area this community is represented in Georges River, Royal and Heathcote national parks.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | <17,890 hectares |
| Estimated percentage cleared | Not available | <10% |
| Total NPWS reserves | 57.1 +3.3 hectares<br>2% of extant area | 11,300 hectares<br>70% of extant area<br>50-70% of pre-clearing area |
| Total reserved | 90.6 +3.4 hectares<br>3% of extant area | Not available |
| Total non-reserved | 3449 +117 hectares | Not available |
| Total extant | 3540 hectares | 16,100 hectares |

*As this heath-woodland is only a component of the equivalent regional community, these figures overestimate its regional extent.



Map unit
Study area
Extant vegetation
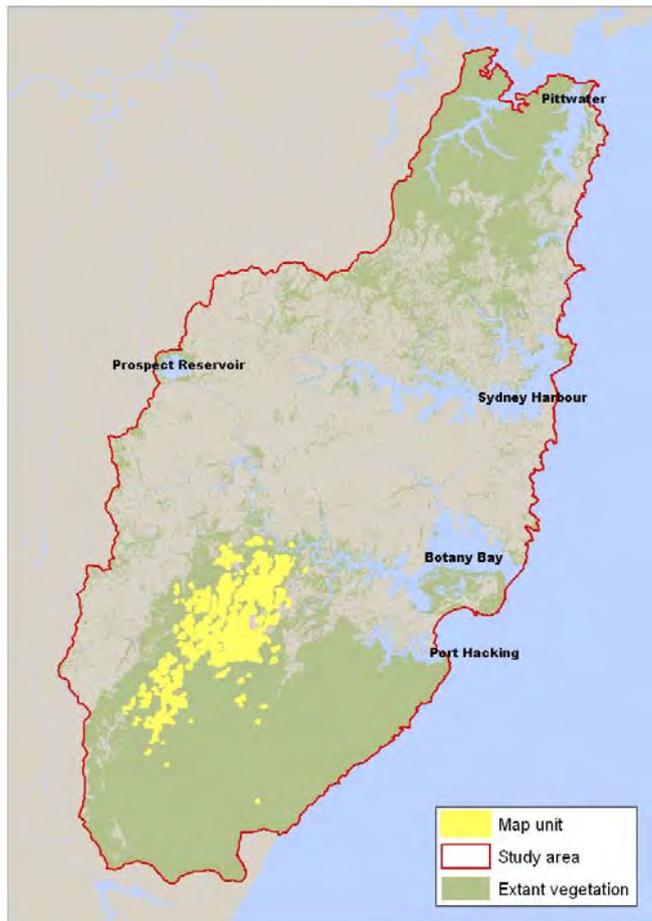
## Example Locations

o  Heathcote Road between Old Illawarra Road and Sandy Point

o  Barden Creek walking track, Barden Ridge

## Species Richness

| Number of sites | 48 |
|---|---|
| Total native species | 253 |
| Average no. native species per site | 48.3 ±8.4 |

## Variations and Dynamics

Structural variation arises from the presence of an emergent eucalypt layer. This layer can be sparse to open.

## Relationship to Other Communities

Floristically, this community is related to heath-mallee (S_HL08) found on ironstone mantles throughout Dharawal NR and Woronora catchment area. The community grades into surrounding sandstone woodlands (S_DSF15 or S_DSF05). Nearby vegetation communities (S_DSF18) may also occur as these also share broad flat ridges associated on Mittagong formation sandstones.

## Accuracy

Sampling density is moderate. Map unit boundaries were interpreted from digital imagery using the distinctive photo pattern of dwarf apple.

A 0.04 hectare site located in this map unit is expected to contain at least 26 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 40 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia linifolia* | 2 | 21% | 2 | 20% | Uninformative |
| *Acacia longifolia* | 1 | 13% | 2 | 21% | Uninformative |
| *Acacia myrtifolia* | 2 | 13% | 2 | 12% | Uninformative |
| *Acacia suaveolens* | 1 | 44% | 1 | 28% | Constant |
| *Acacia terminalis* | 1 | 17% | 1 | 20% | Uninformative |
| *Acacia ulicifolia* | 1 | 17% | 1 | 26% | Uninformative |
| *Actinotus minor* | 3 | 90% | 2 | 20% | Positive diagnostic |
| *Allocasuarina diminuta* | 2 | 21% | 1 | 0% | Positive diagnostic |
| *Allocasuarina littoralis* | 2 | 23% | 2 | 27% | Uninformative |
| *Angophora hispida* | 2 | 85% | 2 | 8% | Positive diagnostic |
| *Anisopogon avenaceus* | 2 | 44% | 2 | 14% | Positive diagnostic |
| *Astroloma humifusum* | 1 | 10% | 1 | 3% | Uninformative |
| *Austrostipa pubescens* | 2 | 48% | 2 | 19% | Positive diagnostic |
| *Baeckea brevifolia* | 2 | 19% | 2 | 1% | Positive diagnostic |
| *Baeckea imbricata* | 2 | 13% | 2 | 4% | Uninformative |
| *Banksia ericifolia* subsp. *ericifolia* | 2 | 46% | 2 | 25% | Positive diagnostic |
| *Banksia marginata* | 1 | 48% | 2 | 9% | Positive diagnostic |
| *Banksia oblongifolia* | 2 | 75% | 2 | 13% | Positive diagnostic |
| *Banksia serrata* | 1 | 25% | 2 | 33% | Uninformative |
| *Banksia spinulosa* | 2 | 52% | 2 | 26% | Positive diagnostic |
| *Billardiera scandens* | 1 | 25% | 1 | 37% | Uninformative |
| *Boronia ledifolia* | 1 | 13% | 2 | 13% | Uninformative |
| *Bossiaea ensata* | 1 | 15% | 1 | 6% | Uninformative |
| *Bossiaea heterophylla* | 1 | 40% | 2 | 17% | Positive diagnostic |
| *Brachyloma daphnoides* | 1 | 31% | 1 | 5% | Positive diagnostic |
| *Burchardia umbellata* | 1 | 15% | 1 | 2% | Uninformative |
| *Calytrix tetragona* | 2 | 21% | 2 | 3% | Positive diagnostic |
| *Cassytha glabella* | 2 | 42% | 2 | 14% | Positive diagnostic |
| *Cassytha pubescens* | 2 | 46% | 2 | 27% | Constant |
| *Caustis flexuosa* | 1 | 33% | 2 | 17% | Uninformative |
| *Conospermum longifolium* | 1 | 15% | 1 | 7% | Uninformative |
| *Corymbia gummifera* | 2 | 54% | 2 | 41% | Constant |
| *Cryptandra amara* | 2 | 27% | 2 | 1% | Positive diagnostic |
| *Cyathochaeta diandra* | 3 | 98% | 2 | 25% | Positive diagnostic |
| *Dampiera stricta* | 2 | 81% | 2 | 22% | Positive diagnostic |
| *Darwinia diminuta* | 2 | 13% | 1 | 1% | Uninformative |
| *Dillwynia floribunda* | 2 | 17% | 2 | 5% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 27% | 2 | 26% | Uninformative |
| *Dillwynia sericea* | 2 | 17% | 2 | 0% | Positive diagnostic |
| *Entolasia stricta* | 2 | 54% | 2 | 59% | Constant |
| *Epacris microphylla* | 2 | 25% | 2 | 10% | Positive diagnostic |
| *Epacris pulchella* | 2 | 29% | 2 | 15% | Uninformative |
| *Eriostemon australasius* | 2 | 54% | 2 | 13% | Positive diagnostic |
| *Eucalyptus haemastoma* | 2 | 48% | 2 | 11% | Positive diagnostic |
| *Eucalyptus oblonga* | 2 | 23% | 2 | 7% | Positive diagnostic |
| *Eucalyptus sclerophylla* | 3 | 10% | 2 | 2% | Uninformative |
| *Eucalyptus squamosa* | 2 | 40% | 1 | 1% | Positive diagnostic |
| *Euryomyrtus ramosissima* subsp. *ramosissima* | 2 | 33% | 1 | 2% | Positive diagnostic |
| *Gompholobium glabratum* | 2 | 44% | 1 | 4% | Positive diagnostic |
| *Gompholobium grandiflorum* | 1 | 25% | 1 | 9% | Positive diagnostic |
| *Gonocarpus tetragynus* | 2 | 13% | 2 | 8% | Uninformative |
| *Gonocarpus teucrioides* | 1 | 10% | 2 | 24% | Uninformative |
| *Goodenia bellidifolia* subsp. *bellidifolia* | 2 | 23% | 1 | 4% | Positive diagnostic |
| *Grevillea buxifolia* | 2 | 19% | 2 | 14% | Uninformative |
| *Grevillea diffusa* | 2 | 48% | 2 | 6% | Positive diagnostic |
| *Grevillea sericea* | 2 | 46% | 2 | 15% | Positive diagnostic |
| *Grevillea sphacelata* | 2 | 56% | 2 | 5% | Positive diagnostic |
| *Haemodorum corymbosum* | 2 | 17% | 1 | 2% | Positive diagnostic |
| *Hakea dactyloides* | 2 | 77% | 2 | 23% | Positive diagnostic |
| *Hakea sericea* | 2 | 46% | 2 | 21% | Positive diagnostic |
| *Hakea teretifolia* | 2 | 31% | 2 | 16% | Uninformative |
| *Hemigenia purpurea* | 1 | 10% | 2 | 5% | Uninformative |
| *Hibbertia riparia* | 2 | 35% | 2 | 3% | Positive diagnostic |
| *Hibbertia serpyllifolia* | 1 | 27% | 2 | 3% | Positive diagnostic |
| *Hovea linearis* | 1 | 19% | 1 | 11% | Uninformative |
| *Isopogon anemonifolius* | 2 | 90% | 2 | 17% | Positive diagnostic |
| *Kunzea ambigua* | 2 | 29% | 2 | 14% | Uninformative |
| *Kunzea capitata* | 2 | 54% | 2 | 5% | Positive diagnostic |
| *Lambertia formosa* | 2 | 77% | 2 | 25% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lasiopetalum ferrugineum* | 1 | 21% | 2 | 11% | Uninformative |
| *Lepidosperma filiforme* | 2 | 15% | 2 | 8% | Uninformative |
| *Lepidosperma laterale* | 2 | 52% | 2 | 42% | Constant |
| *Leptospermum arachnoides* | 2 | 69% | 2 | 7% | Positive diagnostic |
| *Leptospermum polygalifolium* | 1 | 10% | 2 | 14% | Uninformative |
| *Leptospermum trinervium* | 2 | 94% | 2 | 36% | Positive diagnostic |
| *Lepyrodia scariosa* | 2 | 79% | 2 | 19% | Positive diagnostic |
| *Leucopogon appressus* | 2 | 21% | 2 | 0% | Positive diagnostic |
| *Leucopogon esquamatus* | 2 | 15% | 1 | 5% | Uninformative |
| *Leucopogon microphyllus* | 2 | 75% | 2 | 12% | Positive diagnostic |
| *Lindsaea linearis* | 2 | 71% | 2 | 15% | Positive diagnostic |
| *Lissanthe strigosa* | 2 | 15% | 2 | 8% | Uninformative |
| *Lomandra filiformis* | 2 | 21% | 2 | 23% | Uninformative |
| *Lomandra glauca* | 2 | 50% | 2 | 15% | Positive diagnostic |
| *Lomandra gracilis* | 2 | 17% | 2 | 10% | Uninformative |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 17% | 2 | 24% | Uninformative |
| *Lomandra obliqua* | 2 | 77% | 2 | 31% | Positive diagnostic |
| *Lomatia silaifolia* | 1 | 23% | 1 | 27% | Uninformative |
| *Melaleuca deanei* | 1 | 13% | 2 | 0% | Uninformative |
| *Micrantheum ericoides* | 2 | 60% | 2 | 16% | Positive diagnostic |
| *Monotoca scoparia* | 1 | 33% | 1 | 16% | Positive diagnostic |
| *Patersonia glabrata* | 2 | 27% | 2 | 16% | Uninformative |
| *Patersonia sericea* | 2 | 75% | 1 | 14% | Positive diagnostic |
| *Persoonia lanceolata* | 2 | 44% | 1 | 10% | Positive diagnostic |
| *Persoonia levis* | 1 | 56% | 1 | 33% | Positive diagnostic |
| *Persoonia pinifolia* | 1 | 27% | 2 | 21% | Uninformative |
| *Petrophile sessilis* | 2 | 83% | 2 | 5% | Positive diagnostic |
| *Phyllanthus hirtellus* | 2 | 27% | 2 | 27% | Uninformative |
| *Phyllota phylicoides* | 2 | 71% | 2 | 11% | Positive diagnostic |
| *Pimelea linifolia* | 1 | 60% | 2 | 26% | Positive diagnostic |
| *Platysace ericoides* | 1 | 46% | 2 | 5% | Positive diagnostic |
| *Platysace linearifolia* | 2 | 46% | 2 | 29% | Constant |
| *Ptilothrix deusta* | 3 | 54% | 2 | 4% | Positive diagnostic |
| *Pultenaea tuberculata* | 2 | 79% | 2 | 14% | Positive diagnostic |
| *Scaevola ramosissima* | 1 | 10% | 1 | 5% | Uninformative |
| *Schizaea bifida* | 1 | 25% | 1 | 3% | Positive diagnostic |
| *Schoenus ericetorum* | 2 | 46% | 2 | 6% | Positive diagnostic |
| *Schoenus villosus* | 2 | 10% | 2 | 0% | Uninformative |
| *Stylidium graminifolium* | 2 | 15% | 2 | 5% | Uninformative |
| *Stylidium lineare* | 2 | 63% | 2 | 5% | Positive diagnostic |
| *Tetratheca neglecta* | 2 | 29% | 2 | 4% | Positive diagnostic |
| *Thysanotus tuberosus* | 1 | 21% | 1 | 2% | Positive diagnostic |
| *Woollsia pungens* | 1 | 19% | 2 | 12% | Uninformative |
| *Xanthorrhoea concava* | 2 | 33% | 2 | 6% | Positive diagnostic |
| *Xanthorrhoea media* | 2 | 29% | 2 | 19% | Uninformative |
| *Xanthorrhoea resinosa* | 2 | 42% | 2 | 10% | Positive diagnostic |
| *Xanthosia tridentata* | 1 | 21% | 2 | 22% | Uninformative |
| *Xyris gracilis* | 2 | 15% | 2 | 3% | Uninformative |

# COASTAL CLIFF-TOP MARSH                                    S_HL14

Statewide Class                    Coastal Headland Heaths
NSW Plant Community Type:           1810
Biometric Number(s)                 ME74



## Description

Coastal Cliff-top Marsh (Adam et al 1989) is a very low wind-pruned open to closed woody shrub community found on cliffline soaks and seepages that face the open ocean. Coast rosemary (*Westringia fruticosa*), *Baeckea imbricata* and coast wattle (*Acacia longifolia*) are common woody shrub species, though one or more may be absent at individual sites. The ground layer is a variable mix of sedges and graminoids that reflect the damp to wet soils that lie near the salt-spray zone. Some, like knobby club-rush (*Ficinia nodosa*) noticeable by its distinctive ball-like flower, can tolerate the salt-spray zone and proliferates on lower cliff positions. So too other salt-tolerant species such as *Samolus repens* and *Zoysia macrantha.* Elevated cliff soaks are less exposed to the continual mist from the crashing waves and retain a combination of freshwater wetland plants include twig rushes (*Baumea* spp.), *Schoenus brevifolius*, pink swamp heath (*Springelia incarnata*) and sundews (*Drosera* spp.)

This community is restricted to Hawkesbury sandstone and fossilised dunes on cliff lines between Royal NP and the northern beaches of Sydney.

## Floristic Summary*

|  | Average Height & Height Range (m) | Typical Species |  |
|---|---|---|---|
| Shrubs | 1.5 m ±0.0<br>1.5-1.5 | 10% ±7<br>5-15 | *Westringia fruticosa, Baeckea imbricata, Acacia longifolia* |
| Ground Covers | 0.7 m ±0.1<br>0.6-0.8 | 13% ±6<br>10-20 | *Ficinia nodosa* |
| Vines & Climbers | N/A | N/A | *Cassytha pubescens, Billardiera scandens* |

*Compiled from 2 sites with structural data recorded.

## Threats

Clearing of native vegetation along coastal headlands and clifflines has been extensive in the Sydney metropolitan area. Headland vegetation has been modified by fragmentation, disturbance and weed invasion. The invasive bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*) infests large areas in La Perouse. Remaining patches also overlap with some of the major vantage points in Sydney and consequently experience recreational pressure from visitation.

## Conservation Status

The community has a naturally restricted distribution. Small areas remain within ocean-front reserves in the Sydney region. It is found within Royal NP, Kamay Botany Bay NP and Sydney Harbour NP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 6.4 +0.1 hectares 80% of extant area | Not available |
| Total reserved | 7.8 +0.1 hectares 98% of extant area | Not available |
| Total non-reserved | 0.2 +<.1 hectares | Not available |
| Total extant | 8.0 hectares | Not available |



Legend:
- Map unit
- Study area
- Extant vegetation

## Example Locations

o   Henry Head, Kamay Botany Bay NP, La Perouse

o   Potter Point, Kamay Botany Bay NP, Kurnell

## Species Richness

| Number of sites | 2 |
|---|---|
| Total native species | 21 |
| Average no. native species per site | 13.0 ±0 |

## Variations and Dynamics

No variations identified.

## Relationship to Other Communities

Headland vegetation on Hawkesbury sandstone that is not periodically soaked by underground water seepage carries Coastal Headland Cliffline Scrub (S_HL07) or Coastal Headland Banksia Heath (S_HL06). Some headlands that expose clay soils on cliff edges feature Coastal Headland Grassland (S_GL02). Saltmarsh (S_SW02) can also be found on cliff rock plates nearby in areas affected by high levels of salt spray.

## Accuracy

Sampling density is low. Map unit boundaries were based on interpretation of low woody shrubs found on cliff-top and cliff face localities on Hawkesbury sandstone headlands. Exposed water seepage across rock plates was used as one of several indicators for likely occurrence. Field traverse was employed to examine boundaries of communities at Cape Banks and Potter Point. Small areas of this community are likely to be overlooked at the scale of mapping used for this project.

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 2 | 50% | 2 | 21% | Constant |
| *Actinotus helianthi* | 2 | 50% | 1 | 8% | Constant |
| *Baeckea imbricata* | 4 | 50% | 2 | 4% | Constant |
| *Carpobrotus glaucescens* | 2 | 100% | 2 | 1% | Positive diagnostic |
| *Casuarina glauca* | 3 | 50% | 2 | 7% | Constant |
| *Correa alba* var. *alba* | 3 | 100% | 2 | 0% | Positive diagnostic |
| *Dichelachne crinita* | 1 | 50% | 1 | 0% | Positive diagnostic |
| *Dichondra repens* | 1 | 50% | 2 | 14% | Constant |
| *Dillwynia floribunda* | 2 | 50% | 2 | 5% | Constant |
| *Dillwynia rudis* | 2 | 50% | 2 | 0% | Positive diagnostic |
| *Ficinia nodosa* | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Monotoca elliptica* | 3 | 100% | 1 | 7% | Positive diagnostic |
| *Opercularia aspera* | 2 | 100% | 1 | 8% | Positive diagnostic |
| *Pimelea linifolia* | 1 | 50% | 2 | 27% | Constant |
| *Platysace lanceolata* | 2 | 50% | 2 | 8% | Constant |
| *Rhagodia candolleana* subsp. *candolleana* | 2 | 50% | 2 | 0% | Positive diagnostic |
| *Schoenus maschalinus* | 1 | 50% | 2 | 0% | Positive diagnostic |
| *Themeda australis* | 3 | 50% | 2 | 23% | Constant |
| *Westringia fruticosa* | 3 | 100% | 2 | 1% | Positive diagnostic |
| *Zoysia macrantha* | 2 | 50% | 3 | 0% | Positive diagnostic |

| | |
|---|---|
| Coastal Upland Damp Heath Swamp | S_FrW01 |
| Coastal Upland Wet Heath Swamp | S_FrW02 |
| Coastal Freshwater Wetland | S_FrW03 |
| Estuarine Reedland | S_FrW06 |
| Coastal Sand Swamp Scrub | S_FrW13 |
| Coastal Lagoon Fringing Scrub | S_FrW19 |

# COASTAL UPLAND DAMP HEATH SWAMP

S_FRW01

**Statewide Class**
NSW Plant Community Type:
Biometric Number(s):

**Coastal Heath Swamps**
978: Needlebush-Banksia Wet Heath on Sandstone Plateau of the Sydney Basin
HN560; HU579; ME015; SR587



## Description

Coastal Upland Damp Heath Swamp is one of two hanging or upland swamp communities within the Sydney metropolitan area. These are distinctive communities found on impeded soils in creek headwaters and other seepage zones associated with the elevated sandstone plateau of the Sydney Basin Bioregion. Coastal Upland Damp Heath Swamp occurs on damp rather than wet peaty soils. It forms a treeless sedgeland with an overstorey of open low-growing shrubs. Needlebush (*Hakea teretifolia*) occurs in combination with two banksia species – heath-leaved banksia (*Banksia ericifolia* subsp. *ericifolia*) and fern-leaved banksia (*Banksia oblongifolia*). The damp soils support a generous cover of rushes and sedges including spreading rope-rush (*Empodisma minus*), slender twine-rush (*Leptocarpus tenax*), zig-zag bog-rush (*Schoenus brevifolius*) and scale-rush (*Lepyrodia scariosa*).

Within the Sydney region this community is sitiated in two discrete habitats – the drier margins of wetter coastal upland swamps or the zones of the sandstone plateau where annual rainfall falls below 1200 millimetres per annum. The latter includes the western Woronora Plateau and the Holsworthy defence area. Here the sloping gully head or 'hanging' swamps are typical. These landforms occur across the northern Sydney basin where the community is patchily distributed across the Central Coast hinterland and the lower Blue Mountains. Coastal Upland Damp Heath Swamp is incorporated within the broader regional mapping unit of Coastal Uplands Swamps (Tozer et al. 2010) which is distributed up to 600 metres above sea level between Jervis Bay and the Central Coast.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Shrubs | 4.0 m ±1.7<br><br>3.0-6.0 | 19% ±27<br><br>3-50 | *Banksia ericifolia* subsp. *ericifolia, Hakea teretifolia, Epacris obtusifolia, Banksia oblongifolia, Pimelea linifolia, Baeckea imbricata, Leptospermum squarrosum, Sprengelia incarnata, Lambertia formosa, Dillwynia floribunda, Grevillea oleoides, Grevillea sericea, Hakea dactyloides, Mirbelia rubiifolia, Viminaria juncea, Epacris microphylla* |
| Ground Covers | 0.7 m ±0.3<br><br>0.5-1.0 | 47% ±33<br><br>25-85 | *Dampiera stricta, Leptocarpus tenax, Xanthorrhoea resinosa, Actinotus minor, Lepyrodia scariosa, Empodisma minus, Cyathochaeta diandra, Drosera spatulata, Haemodorum corymbosum, Ptilothrix deusta, Schoenus brevifolius, Mitrasacme polymorpha, Stylidium graminifolium, Bauera microphylla, Blandfordia nobilis, Lindsaea linearis, Selaginella uliginosa, Stylidium lineare* |
| Vines & Climbers | N/A | N/A | *Cassytha glabella* |

*Compiled from 2 sites with structural data recorded.

## Threats

Past clearing has most likely resulted in the loss of this community from the Hornsby plateau, although a high proportion of the original area remains on the Woronora Plateau. Threats persisting on the Woronora Plateau arise from military activities in the Holsworthy defence area, frequent fire and alterations to drainage patterns associated with underground coal mining.

## Conservation Status

Coastal Upland Damp Heath Swamp is a component of Coastal Upland Swamp in the Sydney Basin Bioregion, an Endangered Ecological Community listed under the TSC Act.

This vegetation community is represented in Royal, Garigal, Ku-ring-gai Chase, Dharawal NPs

| | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | <5330 hectares |
| Estimated percentage cleared | Not available | <10% |
| Total NPWS reserves | 157 +<.1 hectares<br>23% of extant area | 1300 hectares<br>25% of extant area<br>15-30% of pre-clearing area |
| Total reserved | 340 +0 hectares<br>50% of extant area | Not available |
| Total non-reserved | 340 +2.1 hectares | Not available |
| Total extant | 680 hectares | 4800 hectares |

*As this heath swamp is only a component of the equivalent regional community, these figures overestimate its regional extent.



Map unit
Study area
Extant vegetation
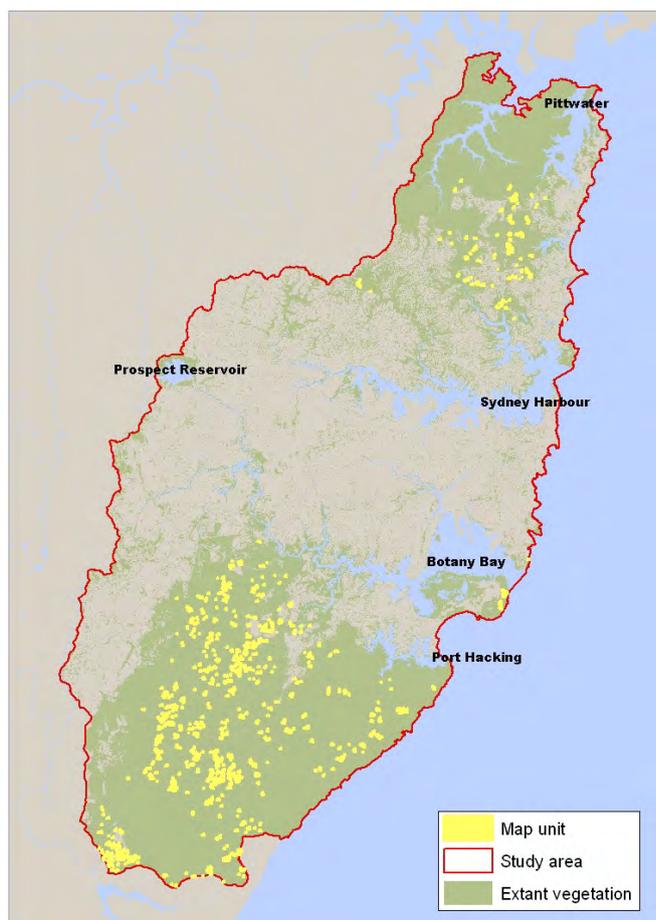
## Example Locations

o   Fire Trail 10B, Dharawal NR, Wollongong LGA

## Species Richness

| | |
|---|---|
| Number of sites | 18 |
| Total native species | 202 |
| Average no. native species per site | 36.4 ±7.8 |

## Variations and Dynamics

Some sites support only a sparse woody shrub layer above a continuous cover of sedges and herbs. These open sedgelands have not been mapped separately.

## Relationship to Other Communities

The Coastal Upland Swamps (Tozer et al. 2010) are a distinctive regional unit. S_FrW01 will grade into Coastal Upland Wet Heath Swamp (S_FrW02) in wetter parts of the swamp such as drainage lines or in areas receiving more than 1200 millimetres of rain per annum. Spatially S_FrW01 will grade into surrounding sandstone woodlands and heath (S_DSF05, S_HL08)

## Accuracy

Sampling density is moderate. Mapping is based on the interpretation of sandstone heath swamps found on gully headlands and drainage depressions. Sample sites were used to identify mean annual rainfall thresholds to separate S_FrW01 and S_FrW02.

A 0.04 hectare site located in this map unit is expected to contain at least 13 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 29 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia myrtifolia* | 2 | 17% | 2 | 12% | Uninformative |
| *Acacia suaveolens* | 2 | 33% | 1 | 28% | Uninformative |
| *Acacia terminalis* | 2 | 17% | 1 | 20% | Uninformative |
| *Actinotus minor* | 2 | 67% | 2 | 21% | Positive diagnostic |
| *Allocasuarina distyla* | 2 | 39% | 2 | 11% | Positive diagnostic |
| *Allocasuarina paludosa* | 2 | 11% | 2 | 0% | Uninformative |
| *Aotus ericoides* | 2 | 17% | 2 | 8% | Uninformative |
| *Baeckea diosmifolia* | 2 | 22% | 2 | 2% | Positive diagnostic |
| *Baeckea imbricata* | 2 | 67% | 2 | 3% | Positive diagnostic |
| *Banksia ericifolia* subsp. *ericifolia* | 3 | 100% | 2 | 25% | Positive diagnostic |
| *Banksia oblongifolia* | 3 | 61% | 2 | 14% | Positive diagnostic |
| *Banksia paludosa* | 4 | 11% | 1 | 1% | Uninformative |
| *Banksia robur* | 2 | 11% | 2 | 1% | Uninformative |
| *Bauera microphylla* | 3 | 33% | 2 | 1% | Positive diagnostic |
| *Bauera rubioides* | 3 | 17% | 2 | 6% | Uninformative |
| *Baumea rubiginosa* | 3 | 11% | 2 | 1% | Uninformative |
| *Blandfordia nobilis* | 2 | 22% | 1 | 1% | Positive diagnostic |
| *Boronia parviflora* | 3 | 22% | 2 | 1% | Positive diagnostic |
| *Burchardia umbellata* | 2 | 22% | 1 | 2% | Positive diagnostic |
| *Callistemon citrinus* | 3 | 11% | 2 | 3% | Uninformative |
| *Callistemon linearis* | 2 | 11% | 1 | 2% | Uninformative |
| *Callistemon pinifolius* | 2 | 11% | 2 | 1% | Uninformative |
| *Cassytha glabella* | 2 | 44% | 2 | 14% | Positive diagnostic |
| *Cassytha pubescens* | 2 | 28% | 2 | 27% | Uninformative |
| *Chordifex fastigiatus* | 3 | 17% | 2 | 2% | Uninformative |
| *Cryptandra ericoides* | 2 | 22% | 2 | 1% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 50% | 2 | 26% | Constant |
| *Dampiera stricta* | 2 | 83% | 2 | 23% | Positive diagnostic |
| *Darwinia fascicularis* | 2 | 22% | 2 | 5% | Uninformative |
| *Dillwynia floribunda* | 3 | 44% | 2 | 5% | Positive diagnostic |
| *Dillwynia retorta* | 2 | 22% | 2 | 26% | Uninformative |
| *Drosera peltata* | 2 | 17% | 1 | 3% | Uninformative |
| *Drosera spatulata* | 2 | 39% | 2 | 3% | Positive diagnostic |
| *Empodisma minus* | 2 | 50% | 2 | 5% | Positive diagnostic |
| *Entolasia marginata* | 2 | 11% | 2 | 22% | Uninformative |
| *Epacris microphylla* | 2 | 39% | 2 | 10% | Positive diagnostic |
| *Epacris obtusifolia* | 2 | 72% | 2 | 2% | Positive diagnostic |
| *Epacris pulchella* | 2 | 11% | 2 | 16% | Uninformative |
| *Eucalyptus haemastoma* | 2 | 22% | 2 | 12% | Uninformative |
| *Eurychorda complanata* | 3 | 28% | 2 | 0% | Positive diagnostic |
| *Gahnia sieberiana* | 2 | 17% | 2 | 7% | Uninformative |
| *Gleichenia dicarpa* | 2 | 22% | 2 | 7% | Uninformative |
| *Gonocarpus micranthus* | 2 | 22% | 2 | 1% | Positive diagnostic |
| *Gonocarpus tetragynus* | 2 | 28% | 2 | 8% | Uninformative |
| *Goodenia dimorpha* | 2 | 11% | 1 | 0% | Uninformative |
| *Grevillea buxifolia* | 4 | 11% | 2 | 14% | Uninformative |
| *Grevillea oleoides* | 2 | 33% | 2 | 7% | Positive diagnostic |
| *Grevillea sericea* | 2 | 33% | 2 | 15% | Uninformative |
| *Grevillea speciosa* | 2 | 11% | 1 | 4% | Uninformative |
| *Haemodorum corymbosum* | 2 | 33% | 1 | 2% | Positive diagnostic |
| *Hakea dactyloides* | 2 | 50% | 2 | 24% | Constant |
| *Hakea gibbosa* | 1 | 17% | 2 | 7% | Uninformative |
| *Hakea teretifolia* | 3 | 94% | 2 | 16% | Positive diagnostic |
| *Hibbertia fasciculata* | 2 | 11% | 2 | 2% | Uninformative |
| *Hibbertia riparia* | 3 | 17% | 2 | 4% | Uninformative |
| *Hibbertia serpyllifolia* | 2 | 17% | 2 | 3% | Uninformative |
| *Hypolaena fastigiata* | 4 | 11% | 2 | 3% | Uninformative |
| *Isopogon anemonifolius* | 2 | 33% | 2 | 18% | Uninformative |
| *Isopogon anethifolius* | 2 | 22% | 2 | 5% | Uninformative |
| *Kunzea capitata* | 2 | 17% | 2 | 6% | Uninformative |
| *Lambertia formosa* | 2 | 44% | 2 | 26% | Constant |
| *Lepidosperma filiforme* | 2 | 11% | 2 | 8% | Uninformative |
| *Lepidosperma neesii* | 2 | 11% | 2 | 1% | Uninformative |
| *Leptocarpus tenax* | 3 | 89% | 2 | 4% | Positive diagnostic |
| *Leptospermum arachnoides* | 3 | 11% | 2 | 9% | Uninformative |
| *Leptospermum continentale* | 2 | 22% | 2 | 1% | Positive diagnostic |
| *Leptospermum polygalifolium* | 3 | 17% | 2 | 14% | Uninformative |
| *Leptospermum squarrosum* | 3 | 72% | 2 | 7% | Positive diagnostic |
| *Lepyrodia scariosa* | 3 | 67% | 2 | 20% | Positive diagnostic |
| *Leucopogon esquamatus* | 2 | 22% | 1 | 5% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Leucopogon microphyllus* | 2 | 11% | 2 | 13% | Uninformative |
| *Lindsaea linearis* | 2 | 33% | 2 | 16% | Uninformative |
| *Lomandra cylindrica* | 2 | 11% | 2 | 11% | Uninformative |
| *Lomandra obliqua* | 2 | 11% | 2 | 32% | Uninformative |
| *Melaleuca nodosa* | 2 | 22% | 2 | 5% | Uninformative |
| *Mirbelia rubiifolia* | 2 | 44% | 1 | 4% | Positive diagnostic |
| *Mitrasacme polymorpha* | 2 | 39% | 2 | 5% | Positive diagnostic |
| *Patersonia sericea* | 1 | 17% | 1 | 15% | Uninformative |
| *Persoonia lanceolata* | 1 | 28% | 1 | 11% | Uninformative |
| *Persoonia levis* | 2 | 17% | 1 | 33% | Uninformative |
| *Persoonia pinifolia* | 2 | 11% | 1 | 21% | Uninformative |
| *Petrophile pulchella* | 3 | 22% | 2 | 16% | Uninformative |
| *Petrophile sessilis* | 2 | 17% | 2 | 7% | Uninformative |
| *Phyllota phylicoides* | 2 | 22% | 2 | 13% | Uninformative |
| *Pimelea linifolia* | 2 | 83% | 2 | 26% | Positive diagnostic |
| *Platysace linearifolia* | 2 | 33% | 2 | 29% | Uninformative |
| *Ptilothrix deusta* | 2 | 33% | 2 | 5% | Positive diagnostic |
| *Pultenaea aristata* | 2 | 11% | 2 | 1% | Uninformative |
| *Pultenaea ferruginea* | 3 | 11% | 2 | 1% | Uninformative |
| *Pultenaea tuberculata* | 2 | 22% | 2 | 16% | Uninformative |
| *Schoenus brevifolius* | 2 | 33% | 2 | 4% | Positive diagnostic |
| *Schoenus lepidosperma* | 2 | 11% | 2 | 1% | Uninformative |
| *Schoenus paludosus* | 2 | 17% | 2 | 0% | Uninformative |
| *Selaginella uliginosa* | 2 | 28% | 2 | 4% | Positive diagnostic |
| *Sowerbaea juncea* | 1 | 22% | 2 | 0% | Positive diagnostic |
| *Sporadanthus gracilis* | 2 | 11% | 2 | 0% | Uninformative |
| *Sprengelia incarnata* | 2 | 67% | 2 | 1% | Positive diagnostic |
| *Stylidium graminifolium* | 2 | 28% | 2 | 5% | Positive diagnostic |
| *Stylidium lineare* | 2 | 22% | 2 | 6% | Uninformative |
| *Symphionema paludosum* | 2 | 17% | 1 | 0% | Uninformative |
| *Tetrarrhena turfosa* | 2 | 17% | 2 | 1% | Uninformative |
| *Thysanotus juncifolius* | 1 | 11% | 2 | 1% | Uninformative |
| *Viminaria juncea* | 2 | 39% | 2 | 2% | Positive diagnostic |
| *Xanthorrhoea media* | 3 | 11% | 2 | 20% | Uninformative |
| *Xanthorrhoea resinosa* | 3 | 56% | 2 | 10% | Positive diagnostic |
| *Xanthosia tridentata* | 2 | 22% | 2 | 21% | Uninformative |
| *Xyris gracilis* | 2 | 17% | 2 | 3% | Uninformative |
| *Xyris operculata* | 2 | 22% | 2 | 0% | Positive diagnostic |

# COASTAL UPLAND WET HEATH SWAMP

# S_FRW02

**Statewide Class**
NSW Plant Community Type:
Biometric Number(s):

**Coastal Heath Swamps**
978: Needlebush-Banksia Wet Heath on Sandstone Plateau of the Sydney Basin
HN560; HU579; ME015; SR587; HU913



## Description

Coastal Upland Wet Heath Swamp is a component of the sandstone upland swamp complex found across the Sydney Basin Bioregion. It is a wet heath-open sedgeland community that has a sparse to dense heath layer. The upper stratum usually includes one or more species of banksia, hakea or tea-tree. Some sites more closely resemble an open sedgeland. However it is the distinctive broad hairy leaves of the low-growing shrub swamp banksia (*Banksia robur*) that helps distinguish this community from those in drier locations on the sandstone plateau. Typically this community occupies zones in or proximate to drainage lines where water seepage is more constant than it is in more elevated parts of the swamp. Soils are peaty and regularly waterlogged. The soil moisture levels are in part sustained by high coastal rainfall and mists that occur on the coastal edges of sandstone escarpments.. A diverse and abundant cover of sedges and ferns is present in the ground layer. Several species from the Cyperaceae family may be locally abundant such as roundhead bristle-sedge (*Chorizandra sphaerocephala*), soft twig-rush (*Baumea rubiginosa*) and button grass (*Gymnoschoenus sphaerocephalus*). At other sites these species are absent and the ground layer is instead dominated by slender twine-rush (*Leptocarpus tenax*) and spreading rope-rush (*Empodisma minus*). Dense patches of pouched coral fern *(Gleichenia dicarpa)* often adjoin drainage lines.

Coastal Upland Wet Heath Swamp is restricted to the coastal zone where mean annual rainfall exceeds1200 millimetres or greater. Some examples are found in drier zones (to 1000 millimetres per annum) however invariably these are drainage line swamps. Extensive areas of this community are found on Maddens Plains, with smaller examples present in Royal and Ku-ring-gai Chase national parks and above the Warringah escarpment on the northern beaches. Outside of the Sydney metropolitan area this community extends south from the hinterland of the Central Coast to the southern Woronora Plateau and Jervis Bay.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Shrubs | 1.5 m | 5-35% | *Hakea teretifolia, Banksia ericifolia* subsp. *ericifolia, Banksia robur, Viminaria juncea, Sprengelia incarnata, Banksia oblongifolia, Dillwynia floribunda, Leptospermum juniperinum, Boronia parviflora, Epacris obtusifolia, Isopogon anemonifolius* |
| Ground Covers | Up to 1 m | 70-90% | *Empodisma minus, Leptocarpus tenax, Gleichenia dicarpa, Xanthorrhoea resinosa, Entolasia stricta, Lepyrodia scariosa, Selaginella uliginosa, Dampiera stricta, Gahnia sieberiana, Lepidosperma limicola, Mitrasacme polymorpha, Blandfordia nobilis, Chorizandra sphaerocephala, Schoenus brevifolius, Gymnoschoenus sphaerocephalus* |
| Vines & Climbers | N/A | N/A | *Cassytha glabella* |

*Compiled from 0 sites with structural data recorded. Height and cover inferred from NPWS (2003b).

*The Native Vegetation of the Sydney Metropolitan Area*

## Threats

Threats are moderate. Urban development on the northern beaches and north shore has cleared localised patches of the community (pers. obs. from historical imagery). Extensive areas remain on the Woronora Plateau. The major threats here relate to illegal trail riding, frequent fire and underground mining.

## Conservation Status

Coastal Upland Wet Heath Swamp is a component of Coastal Upland Swamp in the Sydney Basin Bioregion, an Endangered Ecological Community listed under the TSC Act.

It is represented in Royal, Garigal, Dharawal, Ku-ring-gai Chase Sydney Harbour and Kamay Botany Bay national parks.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | <5330 hectares |
| Estimated percentage cleared | Not available | <10% |
| Total NPWS reserves | 863 +<.1 hectares<br>61% of extant area | 1300 hectares<br>25% of extant area<br>15-30% of pre-clearing area |
| Total reserved | 1100 +0 hectares<br>77% of extant area | Not available |
| Total non-reserved | 325 +4.4 hectares | Not available |
| Total extant | 1425 hectares | 4800 hectares |

*As this heath swamp is only a component of the equivalent regional community, these figures overestimate its regional extent.
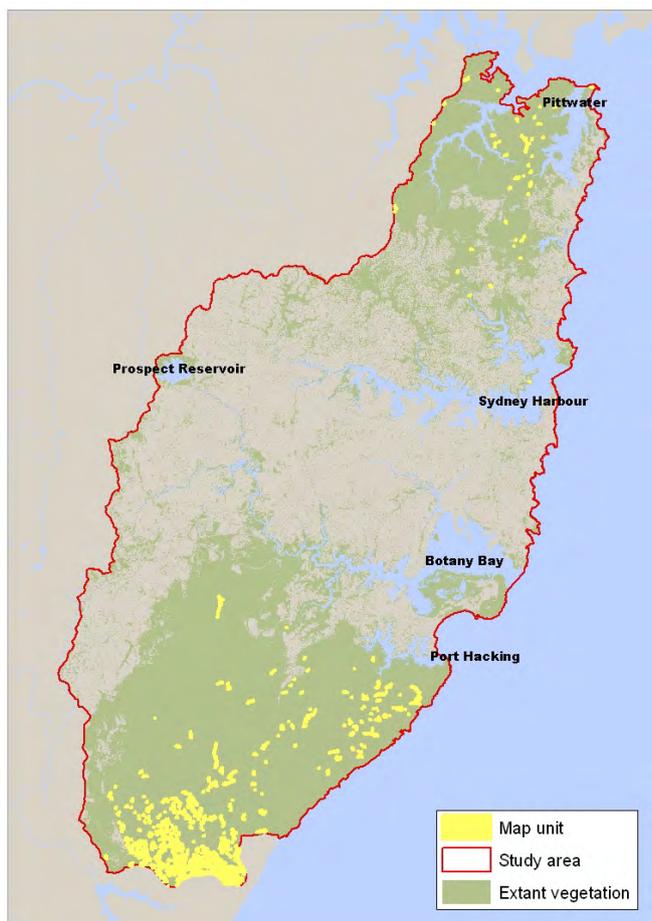
## Example Locations

o   Maddens Plains, Wollongong LGA

o   Uloola Swamp, Royal NP, Sutherland LGA

## Species Richness

| | |
|---|---|
| Number of sites | 22 |
| Total native species | 167 |
| Average no. native species per site | 26.1 ±7.9 |

## Variations and Dynamics

The community consists of open sedgelands and heath formations. These structural variations have not been mapped separately.

## Relationship to Other Communities

Coastal Upland Wet Heath Swamp is floristically related to other freshwater wetland communities in the region. It grades into Coastal Upland Damp Heath Swamp (S_FrW01) in drier parts of the swamp or in areas receiving less than 1200 millimetres of rain per annum. It grades into surrounding sandstone woodlands and heath (S_DSF05) where soils are better drained.

## Accuracy

Sampling density is moderate. Mapping is based on the interpretation of digital imagery. Mapping within the Woronora and O'Hares catchments was drawn from existing mapping (NPWS 2003b).

A 0.04 hectare site located in this map unit is expected to contain at least 8 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 20 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 3 | 18% | 2 | 21% | Uninformative |
| *Acacia myrtifolia* | 2 | 14% | 2 | 12% | Uninformative |
| *Acacia suaveolens* | 1 | 14% | 1 | 28% | Uninformative |
| Baeckea imbricata | 2 | 23% | 2 | 4% | Positive diagnostic |
| *Baloskion gracile* | 2 | 14% | 2 | 1% | Uninformative |
| Banksia ericifolia subsp. *ericifolia* | 2 | 73% | 2 | 25% | Positive diagnostic |
| Banksia oblongifolia | 2 | 50% | 2 | 14% | Positive diagnostic |
| Banksia robur | 3 | 73% | 1 | 0% | Positive diagnostic |
| Bauera microphylla | 2 | 23% | 2 | 1% | Positive diagnostic |
| *Bauera rubioides* | 1 | 14% | 2 | 6% | Uninformative |
| Baumea rubiginosa | 2 | 32% | 2 | 1% | Positive diagnostic |
| Baumea teretifolia | 2 | 23% | 2 | 0% | Positive diagnostic |
| Blandfordia nobilis | 1 | 27% | 1 | 1% | Positive diagnostic |
| Boronia parviflora | 2 | 36% | 2 | 0% | Positive diagnostic |
| Callistemon citrinus | 2 | 27% | 1 | 3% | Positive diagnostic |
| Cassytha glabella | 2 | 45% | 2 | 14% | Positive diagnostic |
| Chorizandra sphaerocephala | 3 | 27% | 2 | 0% | Positive diagnostic |
| *Cyathochaeta diandra* | 2 | 27% | 2 | 26% | Uninformative |
| Dampiera stricta | 2 | 41% | 2 | 23% | Constant |
| Dillwynia floribunda | 2 | 45% | 2 | 5% | Positive diagnostic |
| Drosera binata | 2 | 36% | 1 | 1% | Positive diagnostic |
| Drosera spatulata | 2 | 27% | 2 | 3% | Positive diagnostic |
| Empodisma minus | 2 | 77% | 2 | 4% | Positive diagnostic |
| Entolasia stricta | 2 | 50% | 2 | 59% | Constant |
| Epacris obtusifolia | 2 | 41% | 2 | 2% | Positive diagnostic |
| Gahnia sieberiana | 3 | 50% | 2 | 7% | Positive diagnostic |
| Gleichenia dicarpa | 4 | 64% | 2 | 6% | Positive diagnostic |
| *Gleichenia microphylla* | 1 | 14% | 2 | 2% | Uninformative |
| Gonocarpus micranthus | 2 | 23% | 2 | 1% | Positive diagnostic |
| *Goodenia dimorpha* | 1 | 14% | 1 | 0% | Uninformative |
| *Grevillea oleoides* | 2 | 14% | 2 | 7% | Uninformative |
| Gymnoschoenus sphaerocephalus | 2 | 27% | 2 | 1% | Positive diagnostic |
| *Haemodorum planifolium* | 2 | 14% | 1 | 3% | Uninformative |
| Hakea teretifolia | 2 | 86% | 2 | 16% | Positive diagnostic |
| *Hemigenia purpurea* | 1 | 14% | 2 | 5% | Uninformative |
| *Isopogon anemonifolius* | 1 | 27% | 2 | 18% | Uninformative |
| *Lepidosperma filiforme* | 2 | 23% | 2 | 8% | Uninformative |
| Lepidosperma limicola | 2 | 32% | 1 | 0% | Positive diagnostic |
| *Lepidosperma viscidum* | 2 | 14% | 2 | 2% | Uninformative |
| Leptocarpus tenax | 3 | 64% | 2 | 4% | Positive diagnostic |
| *Leptospermum continentale* | 4 | 14% | 2 | 1% | Uninformative |
| Leptospermum juniperinum | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 14% | 2 | 14% | Uninformative |
| *Leptospermum squarrosum* | 2 | 18% | 2 | 8% | Uninformative |
| Lepyrodia scariosa | 2 | 45% | 2 | 20% | Constant |
| *Leucopogon esquamatus* | 1 | 14% | 2 | 5% | Uninformative |
| *Lindsaea linearis* | 3 | 14% | 2 | 16% | Uninformative |
| Mitrasacme polymorpha | 2 | 32% | 2 | 5% | Positive diagnostic |
| *Persoonia lanceolata* | 1 | 27% | 1 | 11% | Uninformative |
| *Persoonia pinifolia* | 1 | 18% | 2 | 21% | Uninformative |
| *Petrophile pulchella* | 1 | 18% | 2 | 16% | Uninformative |
| *Pimelea linifolia* | 2 | 23% | 2 | 27% | Uninformative |
| Schoenus brevifolius | 2 | 32% | 2 | 3% | Positive diagnostic |
| Selaginella uliginosa | 2 | 41% | 2 | 4% | Positive diagnostic |
| *Sowerbaea juncea* | 2 | 18% | 1 | 0% | Uninformative |
| Sprengelia incarnata | 2 | 59% | 2 | 1% | Positive diagnostic |
| *Tetrarrhena turfosa* | 3 | 18% | 2 | 1% | Uninformative |
| Viminaria juncea | 2 | 73% | 2 | 2% | Positive diagnostic |
| Xanthorrhoea resinosa | 2 | 55% | 2 | 10% | Positive diagnostic |
| *Xanthosia tridentata* | 1 | 14% | 2 | 22% | Uninformative |
| *Xyris operculata* | 2 | 18% | 2 | 0% | Uninformative |

# COASTAL FRESHWATER WETLAND <span style="float:right">S_FRW03</span>

**Statewide Class**
NSW Plant Community Type:
Biometric Number(s):

**Coastal Freshwater Lagoons**
781: Coastal Freshwater Lagoons of the Sydney Basin and South East Corner
HN520; HU533; ME007; SR536; HN630; HU673



## Description

Coastal Freshwater Wetland is associated with freshwater lagoons and swamps on alluvial flats and sand depressions across the New South Wales east coast. Lagoons have fluctuating levels of standing water that gives rise to a varied assemblage of species. They include a range of sedges, rushes and aquatic herbs with woody shrubs and small trees found only on the margins of the wetlands in low abundance. Tall reedlands (reaching over three metres in height) may dominate individual wetlands. Cumbungi (*Typha orientalis)* is typically dominant in urban wetlands and may be joined by common reed (*Phragmites australis*). Other tall reeds include *Eleocharis sphacelata* and tall sedges such as twig-rushes (*Baumea* spp.). The margins of open water carry a range of aquatic herbs such as *Isachne gibbosa* and *Persicaria decipiens*. Less frequently inundated wetlands support only a few species of sedges or rushes such as *Carex appressa* and or *Baumea* spp. which do not reach the height of the taller reedlands found elsewhere.

In the Sydney metropolitan area Coastal Freshwater Wetland is most commonly found at low elevations less than five metres above sea level on coastal plains and flats. Several swamps occur on highly disturbed floodplains of the Cumberland Plain where elevations reach 20 metres above sea level. Many of the remaining swamps are situated amongst intensely developed urban landuses. In these environments drainage patterns have been altered and weeds may be prolific.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Shrubs | 4.0 m <br> 4.0-4.0 | 10% <br> 30-30 | *Casuarina glauca, Melaleuca ericifolia* |
| Ground Covers | 1.0 m ±0.0 <br> 1.0-1.0 | 45% ±21 <br> 30-60 | *Isachne globosa, Blechnum indicum, Eleocharis sphacelata, Hypolepis muelleri, Phragmites australis, Typha orientalis, Triglochin microtuberosa, Baumea juncea, Baumea articulata, Bolboschoenus fluviatilis, Carex appressa, Gleichenia dicarpa, Persicaria strigosa* |

*Compiled from 2 of 4 sites with structural data recorded.

## Threats

Impacts on Coastal Freshwater Wetlands are well documented. Coastal Freshwater Wetlands have been extensively cleared and modified. Threats include weed invasion, land infilling, altered drainage regimes, water pollution from urban runoff, trampling from recreational pressures and feral animals (NSW Scientific Committee 2001, 2005b).

## Conservation Status

Where Coastal Freshwater Wetland occurs on floodplains (below the one in a 100 year floodline, which in the study area is generally less than 20 metres above sea level) it is a component of Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act.

Where Coastal Freshwater Wetland occurs on sand deposits associated with sand dune and sandplains it is a component of Sydney Freshwater Wetlands in the Sydney Basin Bioregion, an Endangered Ecological Community under the TSC Act.

This community is represented in Towra Point NR, Georges River NP and Lane Cove NP.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 5300-12,000 hectares |
| Estimated percentage cleared | Not available | 30-70% |
| Total NPWS reserves | 27.0 +<.1 hectares<br>19% of extant area | 480 hectares<br>13% of extant area<br><15% of pre-clearing area |
| Total reserved | 52.5 +0 hectares<br>37% of extant area | Not available |
| Total non-reserved | 88.6 +11.3 hectares | Not available |
| Total extant | 141 hectares | Est. 3700 hectares |

*As this scrub is only a component of the equivalent regional community, these figures overestimate its regional extent.



Map legend:
- Map unit
- Study area
- Extant vegetation

## Example Locations

o   Warriewood Wetlands, Pittwater LGA

o   Cabramatta Creek Wetland, Fairfield LGA

o   Lieutenant Cantello Reserve, Voyager Point, Liverpool LGA

o   Botany Wetlands, Botany Bay LGA

## Species Richness

| | |
|---|---|
| Number of sites | 25 |
| Total native species | 61 |
| Average no. native species per site | 10.6 ±4.4 |

## Variations and Dynamics

The floristic composition is highly variable in the Sydney area, arising from prevailing climate conditions, local topography and levels of disturbance. Exotic species are common and abundant at highly modified sites.

## Relationship to Other Communities

Estuarine Reedlands (S_FrW06) include a suite of sedges and herbs that require a greater saline influence. On the margins of lagoons the wetlands grade into forested wetlands. These include those on lagoon margins (S_FrW19, S_FoW03,) and on floodplains (S_FoW01, S_FoW06, S_FoW09).

## Accuracy

Sampling density is high but unevenly distributed. Wetlands provide a high contrast feature on aerial photography and are likely to have been mapped with a high level of accuracy.

A 0.04 hectare site located in this map unit is expected to contain at least 3 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 7 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 2 | 28% | 2 | 21% | Uninformative |
| *Baumea articulata* | 3 | 24% | 2 | 1% | Positive diagnostic |
| *Baumea juncea* | 2 | 24% | 2 | 4% | Positive diagnostic |
| *Baumea rubiginosa* | 3 | 16% | 2 | 1% | Uninformative |
| *Blechnum indicum* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Bolboschoenus fluviatilis* | 3 | 32% | 3 | 0% | Positive diagnostic |
| *Callistemon citrinus* | 1 | 32% | 2 | 3% | Positive diagnostic |
| *Carex appressa* | 2 | 28% | 2 | 1% | Positive diagnostic |
| *Casuarina glauca* | 1 | 28% | 2 | 7% | Positive diagnostic |
| *Cyperus polystachyos* | 1 | 28% | 1 | 1% | Positive diagnostic |
| *Eleocharis sphacelata* | 3 | 32% | 2 | 0% | Positive diagnostic |
| *Gahnia sieberiana* | 1 | 12% | 2 | 7% | Uninformative |
| *Gleichenia dicarpa* | 3 | 24% | 2 | 7% | Uninformative |
| *Goodenia paniculata* | 2 | 12% | 2 | 1% | Uninformative |
| *Hypolepis muelleri* | 3 | 56% | 2 | 5% | Positive diagnostic |
| *Isachne globosa* | 3 | 80% | 3 | 0% | Positive diagnostic |
| *Juncus prismatocarpus* | 2 | 12% | 1 | 0% | Uninformative |
| *Juncus usitatus* | 1 | 16% | 1 | 3% | Uninformative |
| *Leptospermum juniperinum* | 2 | 36% | 2 | 2% | Positive diagnostic |
| *Melaleuca quinquenervia* | 3 | 20% | 3 | 0% | Positive diagnostic |
| *Persicaria decipiens* | 2 | 28% | 2 | 1% | Positive diagnostic |
| *Persicaria lapathifolia* | 2 | 16% | 2 | 0% | Uninformative |
| *Persicaria strigosa* | 2 | 52% | 2 | 1% | Positive diagnostic |
| *Phragmites australis* | 4 | 40% | 2 | 3% | Positive diagnostic |
| *Schoenoplectus validus* | 2 | 48% | 3 | 0% | Positive diagnostic |
| *Spirodela punctata* | 2 | 12% | 0 | 0% | Uninformative |
| *Triglochin microtuberosa* | 2 | 56% | 0 | 0% | Positive diagnostic |
| *Typha orientalis* | 3 | 72% | 2 | 1% | Positive diagnostic |

# ESTUARINE REEDLAND

# S_FRW06

Statewide Class
NSW Plant Community Type:
Biometric Number(s):

Coastal Freshwater Lagoons
1808
ME76



## Description

Estuarine Reedland is characterised by tall dense swards of the common reed (*Phragmites australis*). It is found in environments inundated by saline or brackish water. These include low-lying swamps on riverbanks, riverflat depressions, and banks on coastal lagoons that are open to tidal influence. This community is commonly encountered on the landward side of saltmarsh flats. Several salt-tolerant species are shared with saltmarshes including sea rush (*Juncus kraussii*), bare twig-rush (*Baumea juncea*) and the small herb creeping brookweed (*Samolus repens*).

In the Sydney metropolitan area this community is patchily distributed along lagoon fringes and riverflats of the Georges, Parramatta and Hacking rivers and in major brackish lagoons such as the Narrabeen Lakes. The common reed can be a vigorous recolonising species in disturbed environments. Estuarine Reedland is common and widespread along estuarine environments of the New South Wales coastline.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Emergent | 8 m<br>8-8 | 1%<br>1-1 | *Casuarina glauca* |
| Ground Covers | 2.0 m<br>2.0-2.0 | 95%<br>95-95 | *Juncus kraussii, Samolus repens, Baumea juncea, Lobelia anceps, Phragmites australis, Alternanthera denticulata, Apium prostratum, Cyperus polystachyos* |

*Compiled from 1 site with structural data recorded.

*The Native Vegetation of the Sydney Metropolitan Area*

## Threats

Threats to the community are moderate. Estuarine environments have been heavily cleared and modified in the Sydney area. These reedlands are vulnerable to changes in tidal inundation patterns due to land infill and sea level rise as a result of climate change. Stormwater runoff, aside from introducing nutrients and other pollutants, changes the balance in the ratio of freshwater to saltwater (Sainty and Associates 2000). Some stands of these reedlands were not present in 1943 (LPI 2013) indicating that the community has recolonised previously cleared environments or has responded to increased sedimentation along major waterways.

## Conservation Status

Estuarine Reedland is a component of Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions, and Endangered Ecological Community under the TSC Act. It is represented in Towra Point NR, Georges River NP, Garigal NP, Royal NP, Sydney Harbour NP and Lane Cove NP.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 22.5 +<.1 hectares 30% of extant area | Not available |
| Total reserved | 31.0 +0 hectares 41% of extant area | Not available |
| Total non-reserved | 44.8 +7.9 hectares | Not available |
| Total extant | 75.8 hectares | Not available |



## Example Locations

o    The fringes of Narrabeen Lakes, Warringah LGA

o    Lieutenant Cantello Reserve, Voyager Point, Liverpool LGA

## Species Richness

| | |
|---|---|
| Number of sites | 8 |
| Total native species | 34 |
| Average no. native species per site | 8.9 ±5.4 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

This community grades into Estuarine Swamp Oak Forest (S_FoW08) in less inundated situations or into Estuarine Saltmarsh (S_SW02) closer to tidal influences.

## Accuracy

Sampling density is moderate. Map boundaries have relied on the interpretation of fringing reedlands and treeless wetlands on estuarine riverflats and lagoons. The termination of saline influence in upstream locations was marked by the upper point identified in each river system by (Williams et al. 2004). At these localities some intergrading with floodplain freshwater wetlands (S_FoW03) is expected.

A 0.04 hectare site located in this map unit is expected to contain at least 2 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is5 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Alternanthera denticulata* | 2 | 25% | 2 | 1% | Positive diagnostic |
| *Apium prostratum* | 2 | 50% | 2 | 1% | Positive diagnostic |
| *Avicennia marina* subsp. *australasica* | 2 | 25% | 3 | 2% | Positive diagnostic |
| *Baumea juncea* | 4 | 50% | 2 | 4% | Positive diagnostic |
| *Calystegia marginata* | 1 | 13% | 2 | 0% | Uninformative |
| *Casuarina glauca* | 1 | 75% | 2 | 6% | Positive diagnostic |
| *Centella asiatica* | 2 | 25% | 2 | 6% | Uninformative |
| *Commelina cyanea* | 2 | 13% | 2 | 9% | Uninformative |
| *Crinum pedunculatum* | 1 | 13% | 2 | 0% | Uninformative |
| *Cyperus laevigatus* | 1 | 13% | 1 | 0% | Uninformative |
| *Cyperus polystachyos* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Ficinia nodosa* | 1 | 13% | 2 | 2% | Uninformative |
| *Fimbristylis ferruginea* | 3 | 25% | 3 | 0% | Positive diagnostic |
| *Gahnia clarkei* | 1 | 13% | 2 | 4% | Uninformative |
| *Hibiscus diversifolius* | 1 | 13% | 1 | 0% | Uninformative |
| *Isolepis cernua* | 1 | 13% | 2 | 0% | Uninformative |
| *Isolepis platycarpa* | 2 | 13% | 0 | 0% | Uninformative |
| *Juncus kraussii* subsp. *australiensis* | 3 | 75% | 2 | 2% | Positive diagnostic |
| *Lachnagrostis filiformis* | 1 | 13% | 1 | 2% | Uninformative |
| *Leptinella longipes* | 3 | 25% | 2 | 0% | Positive diagnostic |
| *Lobelia anceps* | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Mimulus repens* | 1 | 13% | 2 | 0% | Uninformative |
| *Paspalum vaginatum* | 1 | 13% | 2 | 0% | Uninformative |
| *Persicaria decipiens* | 3 | 13% | 2 | 1% | Uninformative |
| *Phragmites australis* | 4 | 88% | 2 | 3% | Positive diagnostic |
| *Samolus repens* | 2 | 63% | 2 | 2% | Positive diagnostic |
| *Sarcocornia quinqueflora* subsp. *quinqueflora* | 2 | 13% | 2 | 1% | Uninformative |
| *Selliera radicans* | 1 | 13% | 3 | 0% | Uninformative |
| *Tetragonia tetragonioides* | 2 | 13% | 2 | 2% | Uninformative |
| *Triglochin procera* | 1 | 13% | 1 | 1% | Uninformative |
| *Typha orientalis* | 4 | 13% | 2 | 2% | Uninformative |
| *Villarsia exaltata* | 1 | 13% | 2 | 0% | Uninformative |
| *Zoysia macrantha* | 2 | 13% | 3 | 0% | Uninformative |

# COASTAL SAND SWAMP SCRUB

## S_FRW13

## Description

Coastal Sand Swamp Scrub is a freshwater wetland community that comprises an open to closed cover of low sclerophyllous woody shrubs and an abundance of sedges, herbs and/or small ferns. It is restricted to dune swales associated with coastal sandplains or headland dune systems where it forms small patches in a mosaic of dry sand heaths or forests. The shrub layer features a distinctive suite of species that prefer the damp soils including bottlebrush (*Callistemon citrinus*), the low-growing swamp banksia (*Banksia robur*) and paperbarks (*Melaleuca* spp.). However these may not always dominate as they often mix with woody shrubs found in the drier coastal heaths including heath-leaved banksia (*Banksia ericifolia*), coast banksia (*Banksia integrifolia*), tree broom-heath (*Monotoca elliptica*) and coast wattle (*Acacia longifolia*). The ground layer is a conspicuous cover of coral fern (*Gleichenia* spp.) pierced by tall saw sedges (*Gahnia clarkei*), twig rush (*Baumea juncea*) and/or *Leptocarpus tenax.*

This swamp scrub is found at elevations between five and 60 metres above sea level, but is restricted to a narrow band along the coastline of the Sydney basin. In the study area many of the remaining swamps are perched on shallow sandy peat just above the underlying Hawkesbury sandstone bedrock. This swamp community is likely to be found elsewhere north and south of the Sydney area but may be included within broader mapping units that describe swamp sclerophyll forests or dry heath and forest systems.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Emergent | 11 m<br>4-20 | 6%<br>1-10 | *Casuarina glauca* |
| Shrubs | 1.9 m ±2.6<br>0.5-8.0 | 45% ±26<br>5-70 | *Callistemon citrinus, Banksia integrifolia, Melaleuca ericifolia, Glochidion ferdinandi, Acacia longifolia, Monotoca elliptica, Banksia ericifolia, Banksia robur, Melaleuca armillaris, Melaleuca nodosa, Melaleuca ericifolia, Melaleuca thymifolia* |
| Ground Covers | 0.5 m ±0.3<br>0.3-3.0 | 48% ±32<br>24-95 | *Baumea juncea, Gleichenia dicarpa, Pteridium esculentum, Leptocarpus tenax, Schoenus brevifolius, Gahnia clarkei, Imperata cylindrica* var. *major, Baumea articulata, Entolasia stricta, Gonocarpus micranthus, Lobelia anceps, Lomandra longifolia* |
| Vines & Climbers | N/A | N/A | *Parsonsia straminea, Billardiera scandens* |

*Compiled from 8 sites with structural data recorded.

## Threats

Coastal sand flats and headland dune systems have been extensively cleared and modified on the Kurnell Peninsula, Botany, Sans Souci, eastern suburbs and around the lagoon systems of the northern beaches. The NSW Scientific Committee (2001) considers these impacts will continue to threaten remaining areas. Existing patches are subject to habitat degradation resulting from altered hydrology/nutrient levels, weed invasion, off-road vehicles, illegal waste dumping and sand extraction (NSW Scientific Committee 2001).

## Conservation Status

Coastal Sand Swamp Scrub is a component of Sydney Freshwater Wetlands in the Sydney Basin Bioregion, an Endangered Ecological Community under the TSC Act. It is represented in Royal NP, Sydney Harbour NP and Kamay Botany Bay NP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 12,000-48,000 hectares |
| Estimated percentage cleared | Not available | 85-95% |
| Total NPWS reserves | 12.8 +0.6 hectares<br>38% of extant area | 480 hectares<br>20% of extant area<br><5% of pre-clearing area |
| Total reserved | 22.7 +0.6 hectares<br>67% of extant area | 2400 hectares |
| Total non-reserved | 11.2 +0.2 hectares | Not available |
| Total extant | 33.9 hectares | Not available |

*As this swamp is only a component of the equivalent regional community, these figures overestimate its regional extent.



## Example Locations

- o  Coast Hospital Cemetery, La Perouse
- o  Jennifer Street boardwalk and Cape Banks Trail, La Perouse
- o  Margins of Dee Why Lagoon

## Species Richness

| | |
|---|---|
| Number of sites | 8 |
| Total native species | 123 |
| Average no. native species per site | 31.8 ±9 |

## Variations and Dynamics

The structure of the community can be variable. At drier sites it may comprise a layered heath with taller woody shrubs forming a sparse cover above a dense low shrub layer. Wetter sites may have fewer tall woody shrubs with a prominent cover of coral fern, saw-sedges and rushes. Ground layer moisture levels are likely to vary throughout the year in response to seasonal conditions.

## Relationship to Other Communities

This community forms a mosaic with dry sand heaths, scrubs and forests. It grades into non woody sedgelands (S_FrW03) as substrates are more frequently inundated. Conversely it grades into drier heath assemblages away from the swale (S_HL03, S_HL04, S_HL05) as soil moisture decreases.

## Accuracy

Sampling density is moderate. Map unit boundaries relied on the interpretation of low woody vegetation found on the margins of swamps and dune swales. These features present a distinctive signature as a result of the abundance of sedges and ferns and the topographic position in which they occur.

A 0.04 hectare site located in this map unit is expected to contain at least 10 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 25 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| Acacia longifolia | 2 | 88% | 2 | 21% | Positive diagnostic |
| Acacia suaveolens | 2 | 25% | 1 | 28% | Uninformative |
| Allocasuarina torulosa | 1 | 13% | 2 | 10% | Uninformative |
| Aotus ericoides | 1 | 13% | 2 | 8% | Uninformative |
| Asplenium flabellifolium | 1 | 13% | 1 | 4% | Uninformative |
| Baeckea imbricata | 2 | 13% | 2 | 4% | Uninformative |
| Baloskion tetraphyllum | 2 | 25% | 2 | 1% | Positive diagnostic |
| Banksia aemula | 1 | 13% | 3 | 1% | Uninformative |
| Banksia ericifolia subsp. ericifolia | 3 | 25% | 2 | 26% | Uninformative |
| Banksia integrifolia | 3 | 50% | 2 | 9% | Positive diagnostic |
| Banksia robur | 2 | 25% | 2 | 1% | Positive diagnostic |
| Baumea articulata | 5 | 25% | 2 | 1% | Positive diagnostic |
| Baumea juncea | 3 | 88% | 2 | 4% | Positive diagnostic |
| Baumea rubiginosa | 2 | 25% | 2 | 1% | Positive diagnostic |
| Billardiera scandens | 1 | 50% | 1 | 37% | Constant |
| Blechnum camfieldii | 1 | 13% | 2 | 0% | Uninformative |
| Blechnum indicum | 2 | 25% | 2 | 1% | Positive diagnostic |
| Boronia parviflora | 2 | 13% | 2 | 1% | Uninformative |
| Bossiaea ensata | 2 | 13% | 1 | 6% | Uninformative |
| Brachyloma daphnoides | 1 | 13% | 1 | 5% | Uninformative |
| Breynia oblongifolia | 2 | 25% | 1 | 17% | Uninformative |
| Callistemon citrinus | 2 | 63% | 1 | 3% | Positive diagnostic |
| Cassytha glabella | 2 | 50% | 2 | 14% | Constant |
| Cassytha pubescens | 2 | 25% | 2 | 27% | Uninformative |
| Casuarina glauca | 1 | 25% | 2 | 7% | Uninformative |
| Centella asiatica | 2 | 25% | 2 | 6% | Uninformative |
| Centrolepis fascicularis | 2 | 13% | 1 | 0% | Uninformative |
| Clematis aristata | 1 | 13% | 1 | 7% | Uninformative |
| Cyperus polystachyos | 2 | 13% | 1 | 1% | Uninformative |
| Cyperus sanguinolentus | 2 | 13% | 1 | 0% | Uninformative |
| Dampiera stricta | 2 | 13% | 2 | 23% | Uninformative |
| Deyeuxia quadriseta | 2 | 25% | 1 | 0% | Positive diagnostic |
| Dianella revoluta | 2 | 13% | 1 | 17% | Uninformative |
| Dichondra repens | 1 | 13% | 2 | 14% | Uninformative |
| Digitaria parviflora | 5 | 13% | 2 | 5% | Uninformative |
| Drosera burmanni | 1 | 13% | 0 | 0% | Uninformative |
| Drosera pygmaea | 2 | 25% | 2 | 0% | Positive diagnostic |
| Drosera spatulata | 2 | 13% | 2 | 3% | Uninformative |
| Elaeocarpus reticulatus | 1 | 13% | 1 | 20% | Uninformative |
| Empodisma minus | 2 | 38% | 2 | 5% | Positive diagnostic |
| Entolasia marginata | 1 | 13% | 2 | 22% | Uninformative |
| Entolasia stricta | 2 | 75% | 2 | 59% | Constant |
| Epacris obtusifolia | 1 | 13% | 2 | 2% | Uninformative |
| Eragrostis leptostachya | 1 | 13% | 2 | 4% | Uninformative |
| Eucalyptus robusta | 2 | 25% | 3 | 2% | Positive diagnostic |
| Eurychorda complanata | 2 | 13% | 2 | 1% | Uninformative |
| Ficinia nodosa | 2 | 25% | 2 | 2% | Positive diagnostic |
| Gahnia clarkei | 2 | 50% | 2 | 4% | Positive diagnostic |
| Geitonoplesium cymosum | 1 | 13% | 2 | 9% | Uninformative |
| Gleichenia dicarpa | 2 | 63% | 2 | 7% | Positive diagnostic |
| Gleichenia microphylla | 1 | 13% | 2 | 2% | Uninformative |
| Glochidion ferdinandi | 2 | 50% | 1 | 13% | Constant |
| Gonocarpus micranthus | 2 | 50% | 2 | 1% | Positive diagnostic |
| Gonocarpus teucrioides | 2 | 38% | 2 | 23% | Constant |
| Goodenia dimorpha | 1 | 13% | 1 | 0% | Uninformative |
| Goodenia paniculata | 2 | 38% | 2 | 1% | Positive diagnostic |
| Gymnoschoenus sphaerocephalus | 2 | 25% | 2 | 1% | Positive diagnostic |
| Hakea teretifolia | 1 | 13% | 2 | 16% | Uninformative |
| Hardenbergia violacea | 1 | 13% | 1 | 16% | Uninformative |
| Hemarthria uncinata | 2 | 50% | 2 | 1% | Positive diagnostic |
| Hibbertia scandens | 1 | 25% | 2 | 7% | Uninformative |
| Hydrocotyle geraniifolia | 2 | 13% | 1 | 0% | Uninformative |
| Hydrocotyle peduncularis | 1 | 13% | 2 | 6% | Uninformative |
| Hypericum gramineum | 1 | 13% | 2 | 3% | Uninformative |
| Hypolaena fastigiata | 2 | 25% | 2 | 3% | Positive diagnostic |
| Imperata cylindrica var. major | 2 | 75% | 2 | 20% | Positive diagnostic |
| Isachne globosa | 2 | 13% | 3 | 1% | Uninformative |
| Lepidosperma concavum | 1 | 13% | 2 | 4% | Uninformative |
| Lepidosperma filiforme | 1 | 13% | 2 | 8% | Uninformative |
| Leptocarpus tenax | 3 | 75% | 2 | 5% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Leptospermum arachnoides* | 2 | 25% | 2 | 9% | Uninformative |
| *Leptospermum laevigatum* | 1 | 38% | 2 | 5% | Positive diagnostic |
| *Leptospermum polygalifolium* | 1 | 25% | 2 | 14% | Uninformative |
| *Leptospermum squarrosum* | 1 | 25% | 2 | 8% | Uninformative |
| *Lepyrodia anarthria* | 2 | 13% | 2 | 0% | Uninformative |
| *Lepyrodia muelleri* | 3 | 13% | 2 | 0% | Uninformative |
| *Leucopogon ericoides* | 2 | 25% | 1 | 8% | Uninformative |
| *Leucopogon parviflorus* | 1 | 13% | 1 | 1% | Uninformative |
| *Lobelia anceps* | 2 | 88% | 2 | 2% | Positive diagnostic |
| *Lomandra longifolia* | 2 | 50% | 2 | 47% | Constant |
| *Melaleuca armillaris subsp. armillaris* | 3 | 13% | 2 | 1% | Uninformative |
| *Melaleuca ericifolia* | 2 | 25% | 3 | 1% | Positive diagnostic |
| *Melaleuca linariifolia* | 2 | 25% | 2 | 3% | Uninformative |
| *Melaleuca nodosa* | 2 | 25% | 2 | 5% | Uninformative |
| *Melaleuca squarrosa* | 3 | 13% | 2 | 0% | Uninformative |
| *Melaleuca styphelioides* | 2 | 13% | 1 | 2% | Uninformative |
| *Melaleuca thymifolia* | 2 | 38% | 2 | 1% | Positive diagnostic |
| *Mitrasacme paludosa* | 1 | 13% | 2 | 0% | Uninformative |
| *Monotoca elliptica* | 2 | 38% | 1 | 7% | Constant |
| *Monotoca scoparia* | 1 | 13% | 1 | 16% | Uninformative |
| *Omalanthus nutans* | 2 | 38% | 1 | 9% | Constant |
| *Opercularia aspera* | 1 | 13% | 1 | 8% | Uninformative |
| *Oplismenus aemulus* | 1 | 13% | 2 | 10% | Uninformative |
| *Parsonsia straminea* | 1 | 63% | 1 | 4% | Positive diagnostic |
| *Paspalidium distans* | 2 | 13% | 2 | 7% | Uninformative |
| *Paspalum orbiculare* | 3 | 25% | 2 | 0% | Positive diagnostic |
| *Persoonia lanceolata* | 1 | 13% | 1 | 11% | Uninformative |
| *Persoonia levis* | 2 | 25% | 1 | 33% | Uninformative |
| *Pimelea linifolia* | 1 | 13% | 2 | 27% | Uninformative |
| *Pittosporum undulatum* | 2 | 25% | 2 | 25% | Uninformative |
| *Platysace lanceolata* | 2 | 13% | 2 | 8% | Uninformative |
| *Pomax umbellata* | 2 | 13% | 2 | 15% | Uninformative |
| *Pteridium esculentum* | 2 | 75% | 2 | 40% | Constant |
| *Schizaea fistulosa* | 1 | 13% | 1 | 0% | Uninformative |
| *Schoenus apogon* | 2 | 13% | 2 | 1% | Uninformative |
| *Schoenus brevifolius* | 2 | 63% | 2 | 4% | Positive diagnostic |
| *Schoenus maschalinus* | 2 | 13% | 1 | 0% | Uninformative |
| *Selaginella uliginosa* | 2 | 50% | 2 | 4% | Positive diagnostic |
| *Senecio linearifolius* | 1 | 13% | 2 | 0% | Uninformative |
| *Smilax glyciphylla* | 1 | 13% | 2 | 33% | Uninformative |
| *Stephania japonica* | 1 | 13% | 1 | 6% | Uninformative |
| *Trachymene incisa* | 2 | 13% | 2 | 1% | Uninformative |
| *Typha orientalis* | 2 | 13% | 3 | 2% | Uninformative |
| *Villarsia exaltata* | 2 | 50% | 2 | 0% | Positive diagnostic |
| *Viminaria juncea* | 1 | 25% | 2 | 2% | Positive diagnostic |
| *Viola hederacea* | 1 | 38% | 2 | 6% | Positive diagnostic |
| *Xanthorrhoea resinosa* | 2 | 13% | 2 | 10% | Uninformative |
| *Xanthosia pilosa* | 2 | 13% | 2 | 21% | Uninformative |
| *Xyris gracilis* | 2 | 13% | 2 | 3% | Uninformative |
| *Xyris operculata* | 3 | 13% | 2 | 0% | Uninformative |

# COASTAL LAGOON FRINGING SCRUB
# S_FRW19

**Statewide Class**
NSW Plant Community Type:
Biometric Number(s):

**Coastal Freshwater Lagoons**
781: Coastal Freshwater Lagoons of the Sydney Basin and South East Corner
HN520; HU533; ME007; SR536; HN630; HU673



## Description

Some coastal freshwater lagoons include a dense cover of saw-sedge and woody shrubs on the margins of standing water. These are transitional areas where deep peaty soils are frequently inundated but may also be dry at different times of the year. Red fruit saw-sedge (*Gahnia sieberiana*) can form a very prolific cover that reaches over head height. It is joined by very tall to tall rushes such as *Baumea articulata* and a scatter of tall woody shrubs including prickly tea-tree (*Leptospermum juniperinum*), paperbark (*Melaleuca* spp.), bottlebrush (*Callistemon* spp.) and banksias. The cover of woody shrubs grades from sparse to dense as distance from standing water increases.

These wetlands are restricted in area and do not extend far from the coast. In the Sydney area they are dotted on the sand masses present at Bundeena, Marley and the Kurnell Peninsula.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Emergent | 2.5 m<br>2.5-2.5 | 2%<br>2-2 | *Leptospermum juniperinum, Callistemon citrinus, Melaleuca linariifolia* |
| Shrubs | 1.5 m<br>1.5-1.5 | 60%<br>30-30 | *Gahnia sieberiana* |
| Ground Covers | 1.0 m<br>1.0-1.0 | 80%<br>80-80 | *Baumea articulata, Baumea rubiginosa, Triglochin procera, Schoenus melanostachys, Gleichenia dicarpa* |

*Compiled from 1 site with structural data recorded.

## Threats

Threats facing this community are high. Coastal sand flats have been extensively cleared and modified on the Kurnell Peninsula, Botany, Sans Souci and around the lagoon systems of the northern beaches. The NSW Scientific Committee (2001) considers that these threats continue to persist. Existing sites are subject to habitat degradation resulting from altered hydrology/nutrient levels, weed invasion, off-road vehicles, illegal waste dumping and sand extraction (NSW Scientific Committee 2001).

## Conservation Status

Coastal Lagoon Fringing Swamp is a component of Sydney Freshwater Wetlands in the Sydney Basin Bioregion, an Endangered Ecological Community under the TSC Act.

This vegetation community is represented in Kamay Botany Bay and Royal NP.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 5300-12,000 hectares |
| Estimated percentage cleared | Not available | 30-70% |
| Total NPWS reserves | 9.6 +<.1 hectares<br>54% of extant area | 480 hectares<br>13% of extant area<br><15% of pre-clearing area |
| Total reserved | 10.1 +0 hectares<br>57% of extant area | Not available |
| Total non-reserved | 7.7 +<.1 hectares | Not available |
| Total extant | 17.8 hectares | Est. 3700 hectares |

*As this sedgeland is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o Marley Lagoon, Royal NP

o Yarmouth Swamp, Bundeena, Sutherland LGA

## Species Richness

| | |
|---|---|
| Number of sites | 8 |
| Total native species | 72 |
| Average no. native species per site | 14.4 ±7.3 |

## Variations and Dynamics

Within the wetland there can be a mosaic of floristic compositions that reflect local variations in water availability and disturbance. During elevated water levels in the lagoon woody vegetation may be killed.

## Relationship to Other Communities

These wetlands form a mosaic with other freshwater wetland scrubs and forests found on coastal sand deposits including S_FoW03 and S_FrW03.

## Accuracy

Sampling density is moderate. Open water depressions are a highly visible pattern in aerial photographs. These features have been mapped with a high degree of accuracy.

A 0.04 hectare site located in this map unit is expected to contain at least 2 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 10 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia irrorata* | 1 | 25% | 1 | 3% | Positive diagnostic |
| *Acacia longifolia* | 2 | 38% | 2 | 21% | Constant |
| *Acacia obtusifolia* | 2 | 13% | 2 | 2% | Uninformative |
| *Acacia terminalis* | 1 | 13% | 1 | 20% | Uninformative |
| *Baeckea imbricata* | 2 | 13% | 2 | 4% | Uninformative |
| *Baeckea linifolia* | 1 | 13% | 2 | 2% | Uninformative |
| *Banksia ericifolia* subsp. *ericifolia* | 2 | 38% | 2 | 26% | Constant |
| *Banksia integrifolia* | 1 | 13% | 2 | 9% | Uninformative |
| *Banksia robur* | 2 | 13% | 2 | 1% | Uninformative |
| *Bauera rubioides* | 2 | 25% | 2 | 6% | Uninformative |
| *Baumea articulata* | 2 | 50% | 2 | 1% | Positive diagnostic |
| *Baumea juncea* | 5 | 25% | 2 | 4% | Uninformative |
| *Baumea rubiginosa* | 5 | 25% | 2 | 1% | Positive diagnostic |
| *Baumea teretifolia* | 4 | 13% | 2 | 0% | Uninformative |
| *Billardiera scandens* | 1 | 13% | 1 | 37% | Uninformative |
| *Blechnum indicum* | 1 | 13% | 2 | 1% | Uninformative |
| *Callicoma serratifolia* | 1 | 13% | 2 | 5% | Uninformative |
| *Callistemon citrinus* | 2 | 38% | 2 | 3% | Positive diagnostic |
| *Callistemon linearis* | 1 | 13% | 1 | 2% | Uninformative |
| *Carex gaudichaudiana* | 2 | 13% | 0 | 0% | Uninformative |
| *Cassytha pubescens* | 1 | 13% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 1 | 13% | 2 | 7% | Uninformative |
| *Chorizandra cymbaria* | 1 | 13% | 2 | 1% | Uninformative |
| *Drosera binata* | 1 | 13% | 1 | 1% | Uninformative |
| *Eleocharis acuta* | 2 | 13% | 3 | 0% | Uninformative |
| *Eleocharis sphacelata* | 1 | 13% | 2 | 1% | Uninformative |
| *Empodisma minus* | 3 | 13% | 2 | 5% | Uninformative |
| *Epacris obtusifolia* | 2 | 13% | 2 | 2% | Uninformative |
| *Epaltes australis* | 2 | 13% | 2 | 0% | Uninformative |
| *Eucalyptus robusta* | 1 | 13% | 3 | 2% | Uninformative |
| *Gahnia sieberiana* | 4 | 88% | 2 | 7% | Positive diagnostic |
| *Gleichenia dicarpa* | 3 | 63% | 2 | 7% | Positive diagnostic |
| *Hakea gibbosa* | 1 | 13% | 2 | 7% | Uninformative |
| *Hakea teretifolia* | 2 | 25% | 2 | 16% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 13% | 2 | 20% | Uninformative |
| *Isachne globosa* | 2 | 13% | 3 | 1% | Uninformative |
| *Isolepis inundata* | 1 | 25% | 1 | 1% | Positive diagnostic |
| *Isotoma fluviatilis* | 1 | 13% | 0 | 0% | Uninformative |
| *Juncus kraussii* subsp. *australiensis* | 2 | 13% | 2 | 3% | Uninformative |
| *Juncus planifolius* | 1 | 13% | 2 | 1% | Uninformative |
| *Kunzea ambigua* | 1 | 13% | 2 | 15% | Uninformative |
| *Lachnagrostis filiformis* | 1 | 13% | 1 | 2% | Uninformative |
| *Lepidosperma forsythii* | 2 | 25% | 2 | 1% | Positive diagnostic |
| *Leptospermum arachnoides* | 1 | 13% | 2 | 9% | Uninformative |
| *Leptospermum juniperinum* | 2 | 50% | 2 | 2% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 13% | 2 | 14% | Uninformative |
| *Leptospermum squarrosum* | 2 | 13% | 2 | 8% | Uninformative |
| *Lepyrodia anarthria* | 1 | 13% | 2 | 0% | Uninformative |
| *Lobelia anceps* | 1 | 13% | 2 | 2% | Uninformative |
| *Macrozamia communis* | 1 | 13% | 1 | 4% | Uninformative |
| *Melaleuca linariifolia* | 3 | 50% | 2 | 3% | Positive diagnostic |
| *Monotoca elliptica* | 1 | 25% | 2 | 7% | Uninformative |
| *Notelaea longifolia* | 1 | 13% | 1 | 21% | Uninformative |
| *Omalanthus nutans* | 2 | 13% | 1 | 9% | Uninformative |
| *Persicaria praetermissa* | 2 | 13% | 3 | 0% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Persoonia lanceolata* | 1 | 13% | 1 | 11% | Uninformative |
| *Phragmites australis* | 2 | 38% | 3 | 3% | Positive diagnostic |
| *Pteridium esculentum* | 2 | 38% | 2 | 40% | Constant |
| *Schoenus brevifolius* | 2 | 13% | 2 | 4% | Uninformative |
| *Schoenus melanostachys* | 2 | 38% | 2 | 6% | Positive diagnostic |
| *Selaginella uliginosa* | 2 | 13% | 2 | 4% | Uninformative |
| *Smilax glyciphylla* | 1 | 13% | 2 | 33% | Uninformative |
| *Sprengelia incarnata* | 3 | 13% | 2 | 2% | Uninformative |
| *Triglochin procera* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Typha orientalis* | 1 | 25% | 3 | 2% | Positive diagnostic |
| *Utricularia australis* | 2 | 13% | 0 | 0% | Uninformative |
| *Villarsia exaltata* | 2 | 13% | 2 | 0% | Uninformative |
| *Viminaria juncea* | 1 | 13% | 2 | 2% | Uninformative |
| *Westringia fruticosa* | 2 | 13% | 2 | 1% | Uninformative |

| | |
|---|---|
| Coastal Alluvial Bangalay Forest | S_FoW01 |
| Coastal Flats Swamp Mahogany Forest | S_FoW02 |
| Coastal Freshwater Swamp Forest | S_FoW03 |
| Coastal Sand Swamp Mahogany Forest | S_FoW04 |
| Riverflat Paperbark Swamp Forest | S_FoW05 |
| Cumberland Riverflat Forest | S_FoW06 |
| Cumberland Swamp Oak Riparian Forest | S_FoW07 |
| Estuarine Swamp Oak Forest | S_FoW08 |
| Hinterland Riverflat Eucalypt Forest | S_FoW09 |
| Coastal Swamp Paperbark-Swamp Oak Scrub | S_FoW12 |
| Coastal Sandstone Riparian Scrub | S_FoW20 |
| Sandstone Cliff-face Soak | S_FoW21 |

# COASTAL ALLUVIAL BANGALAY FOREST

# S_FoW01

Statewide Class | Coastal Swamp Forests
NSW Plant Community Type: | 1794
Biometric Number(s): | ME78



## Description

Coastal Alluvial Bangalay Forest is found on low-lying alluvial deposits associated with stream banks and inlets along the coastal zone. These deposits are sandy loams washed down from eroding sandstone ridges and gullies above. They form small delta-like landforms which after heavy rains become flooded by freshwater. After saturation these soils dry out gradually building a deep humic layer on top of the sand. The community growing on these landforms is most often dominated by bangalay (*Eucalyptus botryoides*), although smooth-barked apple may occur occasionally. A sparse lower layer of casuarinas is usually present, with swamp oak (*Casuarina glauca*) found adjacent to the water and forest oak (*Allocasuarina torulosa*) on drier, elevated parts of the flat. The understorey is generally open, with conspicuous isolated trees or clumps of cabbage tree palm (*Livistona australis)* found alongside a number of other mesic species and paperbarks. The ground layer is characterised by a high cover of ferns amongst a diverse range of grasses, herbs and sedges.

The distribution of this community is restricted to a narrow zone less than five kilometres from the coastline. It occurs at elevations less than 15 metres above sea level and where rainfall exceeds 1200 millimetres per annum. Small areas remain in Sydney in the Narrabeen Lakes area and the lower reaches of the Hacking River. Further work is required to clarify the distribution of this community elsewhere in the Sydney basin.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 22 m ±6 <br> 12-30 | 29% ±16 <br> 10-55 | *Eucalyptus botryoides, Angophora costata* |
| Small Trees | 8 m ±4 <br> 3-18 | 17% ±15 <br> 5-55 | *Allocasuarina torulosa, Livistona australis, Glochidion ferdinandi, Casuarina glauca* |
| Shrubs | 5.4 m ±2.6 <br> 4.0-10.0 | 34% ±32 <br> 5-80 | *Dodonaea triquetra, Acacia longifolia, Breynia oblongifolia* |
| Ground Covers | 1.2 m ±0.7 <br> 0.2-2.5 | 53% ±30 <br> 5-90 | *Pteridium esculentum, Entolasia marginata, Imperata cylindrica* var. *major, Calochlaena dubia, Hydrocotyle peduncularis, Gahnia clarkei, Oplismenus imbecillis, Pratia purpurascens, Pseuderanthemum variabile, Pomax umbellata* |
| Vines & Climbers | N/A | N/A | *Eustrephus latifolius, Smilax glyciphylla, Kennedia rubicunda, Cissus hypoglauca, Glycine clandestina, Stephania japonica* |

*Compiled from 13 sites with structural data recorded.

## Threats

This community has been extensively depleted by coastal development within the Sydney area. Long term threats are acute due to predicted sea level rise associated with climate change. Immediate local impacts include weed invasion, water pollution, alterations to drainage and water flow patterns and frequent fire. Lantana (*Lantana camara*) is commonly recorded in this community.

## Conservation Status

Coastal Alluvial Bangalay Forest is a component of River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act.

This vegetation community is represented in Garigal and Royal national parks.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 45.0 +6.3 hectares<br>46% of extant area | Not available |
| Total reserved | 82.0 +8.9 hectares<br>83% of extant area | Not available |
| Total non-reserved | 16.9 +6.4 hectares | Not available |
| Total extant | 98.9 hectares | Not available |



## Example Locations

o   Deep Creek, Garigal NP, Warringah LGA

o   Jamieson Park, Warringah LGA

o   Adjoining Yarmouth Swamp, Bundeena, Sutherland LGA

## Species Richness

| Number of sites | 21 |
|---|---|
| Total native species | 174 |
| Average no. native species per site | 29.7 ±8.8 |

## Variations and Dynamics

Small areas may feature a local dominance of paperbark trees, palms or casuarinas.

## Relationship to Other Communities

This community shares many species with mesic eucalypt forests including S_WSF36 and S_WSF02. Wetter sites grade into Coastal Flats Swamp Mahogany Forest (S_FoW02) where swamp mahogany (*Eucalyptus robusta*) replaces bangalay and the ground cover is replaced by an abundance of sedges and rushes.

## Accuracy

Sampling density is high, though concentrated in the northern beaches area where remnants are more extensive. Map unit boundaries were delineated by interpretation of tall eucalypt forests with a ferny ground cover on coastal riverflats that drain Hawkesbury sandstone catchments.

A 0.04 hectare site located in this map unit is expected to contain at least 8 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 23 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 1 | 43% | 2 | 21% | Constant |
| *Acmena smithii* | 1 | 14% | 2 | 6% | Uninformative |
| *Allocasuarina littoralis* | 2 | 24% | 2 | 27% | Uninformative |
| *Allocasuarina torulosa* | 2 | 48% | 2 | 10% | Positive diagnostic |
| *Angophora costata* | 2 | 38% | 3 | 37% | Constant |
| *Baloskion tetraphyllum* | 2 | 38% | 2 | 1% | Positive diagnostic |
| *Banksia integrifolia* | 1 | 19% | 2 | 9% | Uninformative |
| *Baumea juncea* | 2 | 14% | 2 | 4% | Uninformative |
| *Billardiera scandens* | 1 | 24% | 1 | 37% | Uninformative |
| *Blechnum cartilagineum* | 1 | 14% | 2 | 7% | Uninformative |
| *Blechnum indicum* | 2 | 14% | 2 | 1% | Uninformative |
| *Breynia oblongifolia* | 1 | 43% | 1 | 16% | Positive diagnostic |
| *Callicoma serratifolia* | 1 | 24% | 2 | 5% | Positive diagnostic |
| *Calochlaena dubia* | 4 | 81% | 2 | 16% | Positive diagnostic |
| *Cassytha pubescens* | 1 | 14% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 1 | 19% | 2 | 7% | Uninformative |
| *Ceratopetalum apetalum* | 2 | 14% | 2 | 5% | Uninformative |
| *Cissus hypoglauca* | 2 | 48% | 2 | 7% | Positive diagnostic |
| *Clematis aristata* | 1 | 24% | 1 | 7% | Uninformative |
| *Clematis glycinoides* | 1 | 14% | 2 | 6% | Uninformative |
| *Clerodendrum tomentosum* | 2 | 19% | 1 | 5% | Uninformative |
| *Dodonaea triquetra* | 2 | 57% | 2 | 23% | Positive diagnostic |
| *Elaeocarpus reticulatus* | 1 | 29% | 1 | 20% | Uninformative |
| *Entolasia marginata* | 2 | 71% | 2 | 22% | Positive diagnostic |
| *Entolasia stricta* | 2 | 38% | 2 | 59% | Constant |
| *Eucalyptus botryoides* | 3 | 90% | 2 | 4% | Positive diagnostic |
| *Eucalyptus piperita* | 1 | 14% | 3 | 20% | Uninformative |
| *Eustrephus latifolius* | 1 | 57% | 2 | 15% | Positive diagnostic |
| *Gahnia clarkei* | 2 | 48% | 2 | 3% | Positive diagnostic |
| *Gahnia sieberiana* | 3 | 24% | 2 | 7% | Uninformative |
| *Geitonoplesium cymosum* | 1 | 19% | 2 | 9% | Uninformative |
| *Glochidion ferdinandi* | 2 | 29% | 1 | 13% | Uninformative |
| *Glycine clandestina* | 2 | 19% | 2 | 18% | Uninformative |
| *Gonocarpus tetragynus* | 1 | 14% | 2 | 8% | Uninformative |
| *Goodenia ovata* | 1 | 14% | 2 | 2% | Uninformative |
| *Hakea dactyloides* | 2 | 14% | 2 | 24% | Uninformative |
| *Hemarthria uncinata* | 2 | 14% | 2 | 1% | Uninformative |
| *Hibbertia dentata* | 1 | 14% | 2 | 8% | Uninformative |
| *Hibbertia scandens* | 2 | 19% | 2 | 7% | Uninformative |
| *Hydrocotyle peduncularis* | 2 | 29% | 2 | 6% | Positive diagnostic |
| *Hypolepis muelleri* | 3 | 29% | 2 | 5% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 2 | 62% | 2 | 20% | Positive diagnostic |
| *Kennedia rubicunda* | 1 | 19% | 1 | 9% | Uninformative |
| *Leptospermum polygalifolium* | 1 | 24% | 2 | 14% | Uninformative |
| *Leucopogon lanceolatus* | 1 | 14% | 1 | 8% | Uninformative |
| *Livistona australis* | 1 | 81% | 2 | 10% | Positive diagnostic |
| *Melaleuca linariifolia* | 2 | 29% | 2 | 3% | Positive diagnostic |
| *Morinda jasminoides* | 2 | 33% | 2 | 6% | Positive diagnostic |
| *Myrsine variabilis* | 1 | 14% | 1 | 8% | Uninformative |
| *Notelaea longifolia* | 1 | 29% | 1 | 21% | Uninformative |
| *Omalanthus nutans* | 1 | 24% | 1 | 9% | Uninformative |
| *Opercularia aspera* | 1 | 14% | 1 | 8% | Uninformative |
| *Oplismenus aemulus* | 3 | 14% | 2 | 10% | Uninformative |
| *Oplismenus imbecillis* | 3 | 57% | 2 | 12% | Positive diagnostic |
| *Oxalis exilis* | 1 | 14% | 1 | 3% | Uninformative |
| *Ozothamnus diosmifolius* | 2 | 14% | 1 | 12% | Uninformative |
| *Pandorea pandorana* | 1 | 33% | 2 | 16% | Uninformative |
| *Persoonia linearis* | 2 | 19% | 1 | 20% | Uninformative |
| *Pittosporum revolutum* | 1 | 14% | 1 | 9% | Uninformative |
| *Pomax umbellata* | 1 | 14% | 2 | 15% | Uninformative |
| *Pratia purpurascens* | 2 | 48% | 2 | 17% | Positive diagnostic |
| *Pseuderanthemum variabile* | 2 | 52% | 2 | 12% | Positive diagnostic |
| *Pteridium esculentum* | 3 | 95% | 2 | 40% | Positive diagnostic |
| *Pultenaea flexilis* | 2 | 19% | 2 | 6% | Uninformative |
| *Schelhammera undulata* | 1 | 19% | 2 | 3% | Uninformative |
| *Smilax glyciphylla* | 2 | 57% | 2 | 32% | Constant |
| *Stephania japonica* | 1 | 43% | 1 | 6% | Positive diagnostic |
| *Synoum glandulosum* subsp. *glandulosum* | 2 | 52% | 2 | 5% | Positive diagnostic |
| *Trema tomentosa* var. *aspera* | 1 | 19% | 1 | 2% | Uninformative |
| *Viola hederacea* | 2 | 24% | 2 | 6% | Uninformative |

# COASTAL FLATS SWAMP MAHOGANY FOREST

# S_FoW02

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Coastal Swamp Forests**
923: *Melaleuca linariifolia*-Swamp Mahogany Swamp Forest in Drainage Lines of the Edges of the Cumberland Plain, Sydney Basin
HN551; ME040



## Description

Coastal Flats Swamp Mahogany Forest is found in areas of impeded drainage near coastal swamps, lagoons and along low-lying drainage flats. This open forest is dominated by swamp mahogany (*Eucalyptus robusta*) with a smaller tree layer of swamp oak (*Casuarina glauca*) and paperbarks (*Melaleuca linariifolia, Melaleuca styphelioides*). A distinct mesic element is present in the understorey, with cheese tree (*Glochidion ferdinandi*) and cabbage tree palm (*Livistona australis*) most prominent. Climbers such as snake vine (*Stephania japonica*) and common silkpod (*Parsonsia straminea*) may be found winding around tree trunks and fallen branches. The ground cover is periodically wet, with standing water rarely persistent throughout the year. While some sedges do occur amongst the ground cover, ferns, grasses and herbs are the most abundant.

In the Sydney area this community is restricted to elevations between one and 6 metres above sea level. It appears to be more common on low-lying alluvium rather than marine sediments (NPWS 2000c, NPWS 2002c, Bell 2004) although there is considerable gradation between the two. The largest remnants within the Sydney metropolitan area are in the Warriewood Wetlands. This community is more extensively distributed on the Central Coast to Port Stephens, with tiny remnants persisting near Wollongong.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 28 m ±4 <br> 25-30 | 33% ±4 <br> 30-35 | *Eucalyptus robusta* |
| Small Trees | 12 m ±6 <br> 8-20 | 27% ±18 <br> 5-55 | *Glochidion ferdinandi, Casuarina glauca, Livistona australis, Melaleuca linariifolia, Elaeocarpus reticulatus, Pittosporum undulatum, Melaleuca styphelioides* |
| Shrubs | 4.5 m ±0.7 <br> 4.0-5.0 | 20% ±21 <br> 5-35 | *Homalanthus populifolius, Acacia longifolia, Dodonaea triquetra* |
| Ground Covers | 1.8m ±1.0 <br> 0.5-3.0 | 29% ±18 <br> 5-55 | *Entolasia marginata, Hypolepis muelleri, Commelina cyanea, Gahnia clarkei, Viola hederacea, Hydrocotyle peduncularis, Pteridium esculentum, Alternanthera denticulata, Calochlaena dubia, Oplismenus aemulus, Oplismenus imbecillis, Phragmites australis, Blechnum camfieldii, Centella asiatica* |
| Vines & Climbers | N/A | N/A | *Stephania japonica* |

*Compiled from 4 sites with structural data recorded.

## Threats

Clearing has removed a large proportion of the original extent of this community in the Sydney area and elsewhere across its range. Threats are considered to be high as all remnants are enclosed by urban and industrial development. This presents significant issues associated with stormwater pollution, altered drainage, rubbish dumping and weed invasion. Sample sites commonly included invasive species such as lantana (*Lantana camara*) and Crofton weed (*Ageratina adenophora*). Evidence of disturbance is present in all remaining stands.

## Conservation Status

Coastal Flats Swamp Mahogany Forest is a component of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act.

Small areas of this community occur in Georges River NP.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 27,000-63,000 hectares |
| Estimated percentage cleared | Not available | 75-90% |
| Total NPWS reserves | 1.2 +0.3 hectares<br>3% of extant area | 895 hectares<br>10-15% of extant area<br>1-3% of pre-clearing area |
| Total reserved | 16.3 +0.5 hectares<br>40% of extant area | Not available |
| Total non-reserved | 24.1 +9.7 hectares | Not available |
| Total extant | 40.4 hectares | 7100 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate its regional extent.



## Example Locations

o   Warriewood Wetlands, Warringah LGA

o   Jamieson Park, Warringah LGA

## Species Richness

| Number of sites | 13 |
|---|---|
| Total native species | 120 |
| Average no. native species per site | 25.8 ±8.8 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community in the study area. On the Central Coast broad-leaved paperbark (*Melaleuca quinquenervia*) is a prominent component of the assemblage.

## Relationship to Other Communities

Floristically this community is closely related to other swamp forests (S_FoW03 and S_FoW04). Spatially the community may grade into surrounding alluvial forests (S_FrW01) as elevation or distance from the coast increases.

## Accuracy

Sampling density is high. Map unit boundaries were drawn from interpretation of digital imagery by identifying swamp mahogany stands on coastal alluvium.

A 0.04 hectare site located in this map unit is expected to contain at least 8 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 19 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 1 | 23% | 2 | 21% | Uninformative |
| *Allocasuarina torulosa* | 1 | 23% | 2 | 10% | Uninformative |
| *Alternanthera denticulata* | 2 | 54% | 2 | 1% | Positive diagnostic |
| *Banksia integrifolia* | 2 | 15% | 2 | 9% | Uninformative |
| *Baumea juncea* | 1 | 15% | 2 | 4% | Uninformative |
| *Blechnum camfieldii* | 3 | 31% | 2 | 0% | Positive diagnostic |
| *Blechnum indicum* | 2 | 23% | 2 | 1% | Positive diagnostic |
| *Calochlaena dubia* | 2 | 46% | 2 | 16% | Constant |
| *Cardamine paucijuga* | 2 | 15% | 1 | 0% | Uninformative |
| *Casuarina glauca* | 3 | 46% | 2 | 7% | Positive diagnostic |
| *Cayratia clematidea* | 1 | 23% | 2 | 4% | Uninformative |
| *Centella asiatica* | 2 | 15% | 2 | 6% | Uninformative |
| *Cissus hypoglauca* | 1 | 15% | 2 | 8% | Uninformative |
| *Commelina cyanea* | 2 | 54% | 2 | 8% | Positive diagnostic |
| *Cyathea australis* | 2 | 15% | 1 | 2% | Uninformative |
| *Dodonaea triquetra* | 1 | 23% | 2 | 23% | Uninformative |
| *Elaeocarpus reticulatus* | 1 | 23% | 1 | 20% | Uninformative |
| *Entolasia marginata* | 3 | 69% | 2 | 22% | Positive diagnostic |
| *Eucalyptus botryoides* | 3 | 38% | 3 | 5% | Positive diagnostic |
| *Eucalyptus piperita* | 1 | 15% | 3 | 20% | Uninformative |
| *Eucalyptus robusta* | 4 | 62% | 2 | 1% | Positive diagnostic |
| *Eupomatia laurina* | 2 | 15% | 2 | 2% | Uninformative |
| *Eustrephus latifolius* | 2 | 31% | 2 | 15% | Uninformative |
| *Gahnia clarkei* | 2 | 77% | 2 | 3% | Positive diagnostic |
| *Geitonoplesium cymosum* | 1 | 31% | 2 | 9% | Uninformative |
| *Gleichenia dicarpa* | 2 | 23% | 2 | 7% | Uninformative |
| *Glochidion ferdinandi* | 2 | 77% | 1 | 13% | Positive diagnostic |
| *Glycine clandestina* | 1 | 38% | 2 | 18% | Constant |
| *Gonocarpus teucrioides* | 1 | 15% | 2 | 24% | Uninformative |
| *Hibbertia dentata* | 2 | 15% | 2 | 8% | Uninformative |
| *Hibbertia scandens* | 2 | 15% | 2 | 7% | Uninformative |
| *Hibiscus diversifolius* | 1 | 15% | 1 | 0% | Uninformative |
| *Hydrocotyle peduncularis* | 2 | 62% | 2 | 6% | Positive diagnostic |
| *Hypolepis muelleri* | 2 | 92% | 2 | 5% | Positive diagnostic |
| *Juncus usitatus* | 1 | 15% | 1 | 3% | Uninformative |
| *Kennedia rubicunda* | 1 | 38% | 1 | 9% | Positive diagnostic |
| *Livistona australis* | 3 | 69% | 2 | 10% | Positive diagnostic |
| *Lobelia anceps* | 2 | 15% | 2 | 2% | Uninformative |
| *Melaleuca linariifolia* | 2 | 46% | 2 | 3% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 23% | 1 | 21% | Uninformative |
| *Omalanthus nutans* | 1 | 69% | 1 | 9% | Positive diagnostic |
| *Opercularia aspera* | 1 | 15% | 1 | 8% | Uninformative |
| *Oplismenus aemulus* | 2 | 38% | 2 | 10% | Positive diagnostic |
| *Oplismenus imbecillis* | 2 | 62% | 2 | 12% | Positive diagnostic |
| *Oxalis exilis* | 1 | 23% | 1 | 3% | Positive diagnostic |
| *Parsonsia straminea* | 3 | 23% | 1 | 5% | Uninformative |
| *Persicaria decipiens* | 1 | 23% | 2 | 1% | Positive diagnostic |
| *Persicaria hydropiper* | 2 | 15% | 2 | 0% | Uninformative |
| *Persicaria strigosa* | 2 | 46% | 2 | 1% | Positive diagnostic |
| *Phragmites australis* | 3 | 38% | 3 | 3% | Positive diagnostic |
| *Pittosporum undulatum* | 2 | 31% | 2 | 25% | Uninformative |
| *Polyscias sambucifolia* | 1 | 31% | 1 | 15% | Uninformative |
| *Pomax umbellata* | 1 | 15% | 2 | 15% | Uninformative |
| *Pratia purpurascens* | 2 | 15% | 2 | 18% | Uninformative |
| *Pteridium esculentum* | 2 | 54% | 2 | 40% | Constant |
| *Sigesbeckia orientalis* subsp. *orientalis* | 1 | 23% | 2 | 2% | Positive diagnostic |
| *Smilax australis* | 1 | 15% | 2 | 4% | Uninformative |
| *Smilax glyciphylla* | 2 | 15% | 2 | 33% | Uninformative |
| *Solanum americanum* | 1 | 15% | 1 | 1% | Uninformative |
| *Stephania japonica* | 1 | 54% | 1 | 6% | Positive diagnostic |
| *Synoum glandulosum* subsp. *glandulosum* | 1 | 15% | 2 | 5% | Uninformative |
| *Viola hederacea* | 2 | 54% | 2 | 6% | Positive diagnostic |

# COASTAL FRESHWATER SWAMP FOREST

# S_FoW03

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Coastal Swamp Forests**
1232: Swamp Oak-Prickly Tea-tree-Swamp Paperbark Swamp Forest on Coastal Floodplains, Sydney Basin and South East Corner
HN594; ME026; SR649; HU942



## Description

Coastal Freshwater Swamp Forest occupies poorly drained substrates that are periodically inundated by fresh or brackish water. Swamp oak (*Casuarina glauca*) forms an open to dense canopy. Tall paperbarks (*Melaleuca* spp.*)* may also be present in the upper stratum, although more frequently they are found as small trees in the sub-canopy layer. The shrub layer is very sparse. Instead there is a prominent cover of water-loving plants found beside open boggy ground and standing water. A diverse range of plant species can occur in response to the prevailing conditions. Herbs, ferns, grasses, rushes and sedges may be found in various combinations at any given site. Distinctly freshwater conditions may feature slender knotweed (*Persicaria decipiens*), tall sedge (*Carex appressa*) and red-fruit saw-sedge (*Gahnia sieberiana*). Sites that have a brackish influence commonly include sea rush (*Juncus kraussii*) amongst the ground layer.

Coastal Freshwater Swamp Forest is found across the coastal plain and hinterland of the Sydney metropolitan area. It is not restricted to particular substrates. While it is commonly found on floodplains it also occurs near freshwater lagoons associated with sand deposits, poorly drained shale depressions on the Cumberland Plain and freshwater fed backswamps near coastal estuaries. Sample sites within the Sydney area lie within an elevational range of two to 10 metres above sea level and a mean annual rainfall range of 850 to 1250 millimetres. Elsewhere this community is found in similar habitats along the New South Wales south coast (Tozer et al. 2010) and Central Coast (NPWS 2000c).

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 23 m ±9<br>10-30 | 35% ±20<br>5-50 | *Casuarina glauca, Melaleuca quinquenervia* |
| Small Trees | 6 m ±3<br>2-10 | 4% ±3<br>1-10 | *Pittosporum undulatum, Glochidion ferdinandi* |
| Ground Covers | 1.9 m ±1.0<br>0.5-3.0 | 33% ±16<br>5-60 | *Hypolepis muelleri, Entolasia marginata, Gahnia sieberiana, Typha orientalis, Commelina cyanea, Hemarthria uncinata, Lobelia anceps, Carex appressa, Gleichenia dicarpa, Histiopteris incisa, Isachne globosa, Persicaria decipiens, Setaria distans* |

*Compiled from 4 sites with structural data recorded.

## Threats

Past clearing is likely to have removed extensive stands of these swamp forests within the Sydney region. Clearing and land reclamation are ongoing threats. Low-lying areas are threatened by changing saline conditions due to sea level rise associated with climate change (NSW Scientific Community 2005b). Many existing remnants in Sydney are isolated or adjoin the urban interface. As a result weed infestation, pollution from storm-water runoff, recreation pressure and altered drainage all remain pervasive threats.

## Conservation Status

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 12,000-48,000 hectares |
| Estimated percentage cleared | Not available | 80-95% |
| Total NPWS reserves | 0.6 +<.1 hectares<br>1% of extant area | 480 hectares<br>20% of extant area<br><5 % of pre-clearing area |
| Total reserved | 11.7 +0 hectares<br>24% of extant area | Not available |
| Total non-reserved | 37.2 +4.3 hectares | Not available |
| Total extant | 48.9 hectares | 2400 hectares |



## Example Locations

o   Narroy Park, Warringah LGA

o   Lachlan Swamps, Centennial Parklands, Sydney LGA

## Species Richness

| | |
|---|---|
| Number of sites | 10 |
| Total native species | 69 |
| Average no. native species per site | 12.9 ±5.1 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

This community shares several wetland species with S_FoW02 into which it grades at drier sites. It may also grade into alluvial forests on the Cumberland Plain (S_FoW07, S_FoW06).

## Accuracy

Sampling density is moderate. Map unit boundaries were interpreted from digital imagery to identify stands of swamp oak or paperbark species on margins of freshwater lagoons, swales or riverflat back swamps.

A 0.04 hectare site located in this map unit is expected to contain at least 2 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 8 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 1 | 30% | 2 | 21% | Uninformative |
| *Banksia integrifolia* | 1 | 10% | 2 | 9% | Uninformative |
| *Baumea juncea* | 2 | 10% | 2 | 4% | Uninformative |
| *Baumea rubiginosa* | 1 | 10% | 2 | 1% | Uninformative |
| *Bolboschoenus fluviatilis* | 3 | 10% | 2 | 0% | Uninformative |
| *Breynia oblongifolia* | 2 | 10% | 1 | 17% | Uninformative |
| *Calochlaena dubia* | 2 | 10% | 2 | 16% | Uninformative |
| *Carex appressa* | 3 | 40% | 2 | 1% | Positive diagnostic |
| *Casuarina glauca* | 3 | 70% | 2 | 6% | Positive diagnostic |
| *Centella cordifolia* | 2 | 10% | 1 | 0% | Uninformative |
| *Cladium procerum* | 4 | 10% | 2 | 0% | Uninformative |
| *Commelina cyanea* | 2 | 20% | 2 | 9% | Uninformative |
| *Cyathea australis* | 2 | 20% | 1 | 2% | Uninformative |
| *Cyperus polystachyos* | 1 | 10% | 1 | 1% | Uninformative |
| *Eleocharis sphacelata* | 1 | 10% | 2 | 1% | Uninformative |
| *Entolasia marginata* | 3 | 40% | 2 | 22% | Constant |
| *Eucalyptus botryoides* | 1 | 20% | 3 | 5% | Uninformative |
| *Eucalyptus saligna* | 1 | 10% | 3 | 3% | Uninformative |
| *Eustrephus latifolius* | 1 | 10% | 2 | 15% | Uninformative |
| *Ficinia nodosa* | 1 | 10% | 2 | 2% | Uninformative |
| *Gahnia clarkei* | 4 | 20% | 2 | 4% | Uninformative |
| *Gahnia sieberiana* | 4 | 40% | 2 | 7% | Positive diagnostic |
| *Geitonoplesium cymosum* | 2 | 10% | 2 | 9% | Uninformative |
| *Gleichenia dicarpa* | 3 | 10% | 2 | 7% | Uninformative |
| *Glochidion ferdinandi* | 1 | 30% | 2 | 13% | Uninformative |
| *Goodenia ovata* | 1 | 10% | 2 | 2% | Uninformative |
| *Hemarthria uncinata* | 5 | 20% | 2 | 1% | Positive diagnostic |
| *Hibbertia scandens* | 2 | 10% | 2 | 7% | Uninformative |
| *Histiopteris incisa* | 4 | 20% | 1 | 1% | Positive diagnostic |
| *Hydrocotyle peduncularis* | 2 | 30% | 2 | 6% | Uninformative |
| *Hypolepis muelleri* | 2 | 70% | 2 | 5% | Positive diagnostic |
| *Isachne globosa* | 3 | 20% | 3 | 1% | Positive diagnostic |
| *Isolepis inundata* | 2 | 10% | 1 | 1% | Uninformative |
| *Juncus continuus* | 2 | 40% | 1 | 1% | Positive diagnostic |
| *Juncus holoschoenus* | 1 | 10% | 1 | 0% | Uninformative |
| *Juncus kraussii* subsp. *australiensis* | 1 | 10% | 2 | 3% | Uninformative |
| *Juncus planifolius* | 1 | 10% | 2 | 1% | Uninformative |
| *Juncus usitatus* | 2 | 40% | 1 | 3% | Positive diagnostic |
| *Leptospermum squarrosum* | 2 | 10% | 2 | 8% | Uninformative |
| *Livistona australis* | 1 | 20% | 2 | 10% | Uninformative |
| *Lobelia anceps* | 2 | 20% | 2 | 2% | Positive diagnostic |
| *Ludwigia peploides* subsp. *montevidensis* | 2 | 10% | 2 | 0% | Uninformative |
| *Melaleuca ericifolia* | 5 | 10% | 2 | 1% | Uninformative |
| *Melaleuca linariifolia* | 1 | 40% | 2 | 3% | Positive diagnostic |
| *Melaleuca quinquenervia* | 5 | 30% | 3 | 0% | Positive diagnostic |
| *Melaleuca styphelioides* | 2 | 10% | 1 | 2% | Uninformative |
| *Notelaea longifolia* | 2 | 10% | 1 | 21% | Uninformative |
| *Parsonsia straminea* | 3 | 10% | 1 | 5% | Uninformative |
| *Paspalidium distans* | 3 | 10% | 2 | 7% | Uninformative |
| *Paspalum distichum* | 1 | 10% | 2 | 0% | Uninformative |
| *Persicaria lapathifolia* | 2 | 10% | 2 | 0% | Uninformative |
| *Persicaria praetermissa* | 5 | 10% | 2 | 0% | Uninformative |
| *Persicaria strigosa* | 2 | 40% | 2 | 1% | Positive diagnostic |
| *Phragmites australis* | 2 | 30% | 3 | 3% | Positive diagnostic |
| *Pittosporum revolutum* | 2 | 10% | 1 | 9% | Uninformative |
| *Pittosporum undulatum* | 1 | 40% | 2 | 25% | Constant |
| *Platycerium bifurcatum* | 1 | 10% | 1 | 1% | Uninformative |
| *Pteris tremula* | 2 | 10% | 1 | 1% | Uninformative |
| *Ranunculus plebeius* | 1 | 10% | 2 | 0% | Uninformative |
| *Rubus parvifolius* | 2 | 10% | 2 | 1% | Uninformative |
| *Schoenoplectus validus* | 3 | 10% | 2 | 1% | Uninformative |
| *Smilax glyciphylla* | 2 | 10% | 2 | 33% | Uninformative |
| *Syzygium paniculatum* | 1 | 10% | 1 | 0% | Uninformative |
| *Tetraria capillaris* | 2 | 10% | 1 | 1% | Uninformative |
| *Typha orientalis* | 2 | 50% | 3 | 1% | Positive diagnostic |

# Coastal Sand Swamp Mahogany Forest

<div align="right">

## S_FoW04

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**Statewide Class** — Coastal Swamp Forests

NSW Plant Community Type: 1231: Swamp Mahogany Swamp Sclerophyll Forest on Coastal Lowlands of the Sydney Basin and South East Corner

Biometric Number(s): HN593; ME010; SR648; HU932
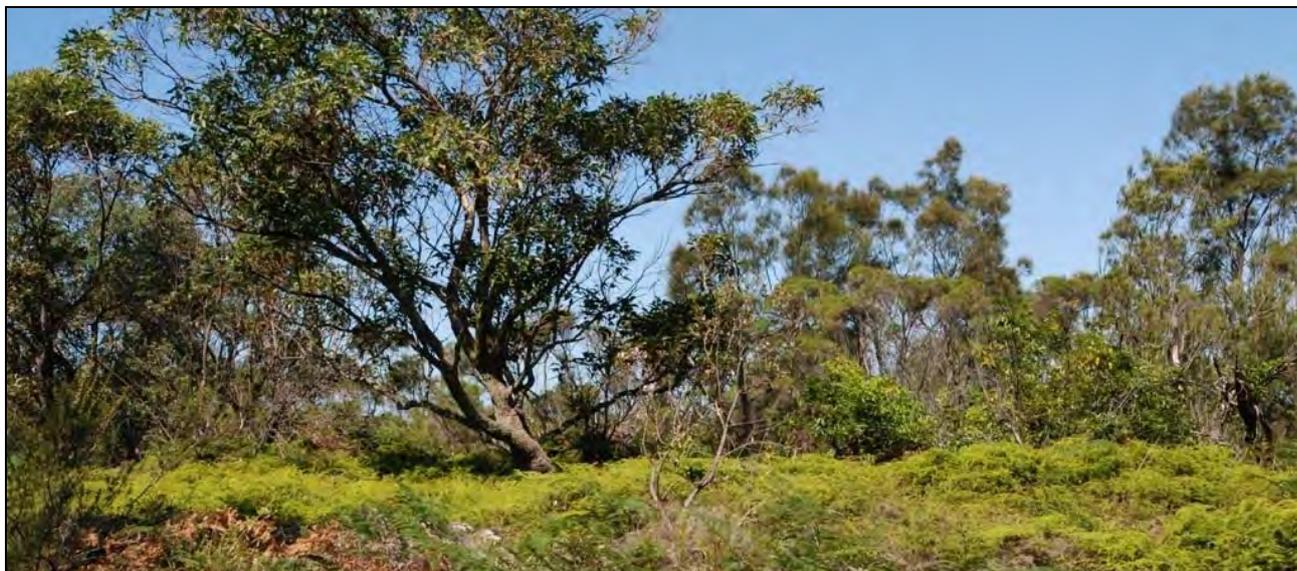


## Description

Coastal Sand Swamp Mahogany Forest occurs on low-lying coastal sandy substrates found in or adjoining dune swales, lagoons and other alluvial infill. It is a low open eucalypt forest with a sparse dry shrub layer and a very distinctive ground cover of sedges, rushes and ferns. Swamp mahogany (*Eucalyptus robusta*) dominates the canopy above a low cover of paperbarks, tea-trees, banksias and wattles. These sites are underlain by an elevated water table that saturates the peaty sand year round. This encourages a diverse and abundant layer of sedges and rushes. These include bare twig-rush (*Baumea juncea*) jointed twig-rush (*Baumea articulata*), tall saw-sedge (*Gahnia clarkei*) and zig-zag bog-rush (*Schoenus brevifolius*).

Few examples of this forest remain in the Sydney area, with Dee Why Lagoon and the Kurnell Peninsula retaining the largest areas. These landscapes are coastal barrier dunes that do not exceed 10 metres in elevation. In Sydney such swamps have been replaced by urban and industrial development. More extensive areas occur on the Central Coast (NPWS 2000c) and the NSW south coast to Jervis Bay (Tozer et al. 2010), although these too are now subject to development pressures.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 11 m ±6<br>4-18 | 20% ±17<br>5-50 | *Eucalyptus robusta, Casuarina glauca* |
| Small Trees | 5 m ±3<br>2-7 | 21% ±14<br>5-40 | *Homalanthus populifolius, Glochidion ferdinandi, Acacia longifolia, Breynia oblongifolia, Casuarina glauca, Banksia integrifolia, Melaleuca ericifolia, Monotoca elliptica, Pittosporum undulatum* |
| Ground Covers | 1.5 m ±0.9<br>0.4-3.0 | 63% ±30<br>15-100 | *Baumea juncea, Gleichenia dicarpa, Pteridium esculentum, Gahnia clarkei, Baloskion tetraphyllum, Empodisma minus, Gonocarpus teucrioides, Lobelia anceps, Lomandra longifolia, Phragmites australis, Schoenus brevifolius* |
| Vines & Climbers | N/A | N/A | *Parsonsia straminea, Hibbertia scandens* |

*Compiled from 6 sites with structural data recorded.

## Threats

Clearing has removed a large proportion of the original extent of this community in the Sydney metropolitan area and across its range. Threats are considered to be high as all remnants are enclosed by urban and industrial development. This presents significant issues associated with stormwater pollution, altered drainage, rubbish dumping and weed invasion. Evidence of disturbance is present in all remaining stands. Some localities are regenerating following past clearing.

## Conservation Status

Small areas of this vegetation community are present in Kamay Botany Bay NP and several small examples are found in local government bushlands areas.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 12,000-48,000 hectares |
| Estimated percentage cleared | Not available | 85-95% |
| Total NPWS reserves | 4.2 +1.2 hectares 18% of extant area | 480 hectares 20% of extant area <5% of pre-clearing area |
| Total reserved | 15.5 +1.2 hectares 65% of extant area | Not available |
| Total non-reserved | 8.2 +<.1 hectares | Not available |
| Total extant | 23.7 hectares | 2400 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate its regional extent.



Map unit

Study area

Extant vegetation

## Example Locations

o   Dee Why Lagoon Wildlife Refuge, Warringah LGA

## Species Richness

| Number of sites | 5 |
|---|---|
| Total native species | 77 |
| Average no. native species per site | 25.4 ±10.4 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

Floristically this community is closely related to other swamp communities associated with coastal sand deposits including the shrub and open sedgeland map units (S_FoW12, S_FrW13). It is also closely related to S_FoW02 another forest dominated by swamp mahogany. However S_FoW02 includes a mesic influence and the diversity and abundance of sedges and rushes is less pronounced. The substrates also differ between the two map units.

Spatially this community grades into open eucalypt shrub forests (S_DSF21 and S_DSF03) on better drained sandy soils. Permanently inundated sites form coastal lagoons around which sedgelands and shrub communities develop (S_FoW12, S_FrW19).

## Accuracy

Sample density is moderate. Derivation of map boundaries is based on the interpretation of swamp mahogany- and swamp oak-dominated stands situated in swales and depressions on coastal sand masses. Some overlap with S_FoW03 may occur.

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 2 | 40% | 2 | 21% | Constant |
| *Acacia parramattensis* | 3 | 20% | 1 | 5% | Uninformative |
| *Acacia suaveolens* | 1 | 20% | 1 | 28% | Uninformative |
| *Acacia terminalis* | 1 | 20% | 1 | 20% | Uninformative |
| *Angophora costata* | 3 | 60% | 3 | 37% | Constant |
| *Baloskion tetraphyllum* | 3 | 60% | 2 | 1% | Positive diagnostic |
| *Banksia aemula* | 3 | 20% | 3 | 1% | Uninformative |
| *Banksia integrifolia* | 2 | 40% | 2 | 9% | Constant |
| *Banksia robur* | 2 | 20% | 2 | 1% | Uninformative |
| *Baumea juncea* | 3 | 40% | 2 | 4% | Positive diagnostic |
| *Baumea rubiginosa* | 3 | 20% | 2 | 1% | Uninformative |
| *Billardiera scandens* | 2 | 40% | 1 | 37% | Constant |
| *Blechnum indicum* | 3 | 40% | 2 | 1% | Positive diagnostic |
| *Breynia oblongifolia* | 2 | 60% | 1 | 17% | Constant |
| *Callistemon citrinus* | 2 | 40% | 2 | 3% | Positive diagnostic |
| *Calochlaena dubia* | 3 | 20% | 2 | 16% | Uninformative |
| *Cassytha pubescens* | 2 | 20% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 3 | 40% | 2 | 7% | Constant |
| *Cissus hypoglauca* | 1 | 20% | 2 | 8% | Uninformative |
| *Cupaniopsis anacardioides* | 1 | 20% | 2 | 2% | Uninformative |
| *Cyclosorus interruptus* | 1 | 20% | 3 | 0% | Positive diagnostic |
| *Dodonaea triquetra* | 1 | 20% | 2 | 23% | Uninformative |
| *Elaeocarpus reticulatus* | 2 | 60% | 1 | 20% | Constant |
| *Entolasia marginata* | 2 | 40% | 2 | 22% | Constant |
| *Entolasia stricta* | 3 | 40% | 2 | 59% | Constant |
| *Eucalyptus botryoides* | 3 | 20% | 3 | 5% | Uninformative |
| *Eucalyptus haemastoma* | 1 | 20% | 2 | 12% | Uninformative |
| *Eucalyptus robusta* | 3 | 100% | 3 | 2% | Positive diagnostic |
| *Ficinia nodosa* | 1 | 20% | 2 | 2% | Uninformative |
| *Gahnia clarkei* | 3 | 60% | 1 | 4% | Positive diagnostic |
| *Gahnia sieberiana* | 2 | 40% | 2 | 7% | Constant |
| *Geitonoplesium cymosum* | 1 | 20% | 2 | 9% | Uninformative |
| *Gleichenia dicarpa* | 3 | 20% | 2 | 7% | Uninformative |
| *Gleichenia microphylla* | 2 | 40% | 2 | 2% | Positive diagnostic |
| *Glochidion ferdinandi* | 4 | 80% | 1 | 13% | Positive diagnostic |
| *Gonocarpus teucrioides* | 2 | 40% | 2 | 23% | Constant |
| *Hibbertia empetrifolia* subsp. *empetrifolia* | 1 | 20% | 1 | 6% | Uninformative |
| *Hibbertia scandens* | 2 | 60% | 2 | 7% | Positive diagnostic |
| *Hypolaena fastigiata* | 1 | 20% | 2 | 3% | Uninformative |
| *Hypolepis muelleri* | 2 | 20% | 2 | 5% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 40% | 2 | 20% | Constant |
| *Juncus continuus* | 1 | 20% | 1 | 1% | Uninformative |
| *Kennedia rubicunda* | 1 | 20% | 1 | 9% | Uninformative |
| *Kunzea ambigua* | 3 | 40% | 2 | 15% | Constant |
| *Lepidosperma gunnii* | 2 | 20% | 2 | 2% | Uninformative |
| *Lepyrodia scariosa* | 2 | 20% | 2 | 21% | Uninformative |
| *Livistona australis* | 1 | 20% | 2 | 10% | Uninformative |
| *Lomandra cylindrica* | 3 | 20% | 2 | 11% | Uninformative |
| *Lomandra longifolia* | 2 | 60% | 2 | 47% | Constant |
| *Lomandra multiflora* subsp. *multiflora* | 2 | 20% | 2 | 24% | Uninformative |
| *Lophostemon confertus* | 3 | 20% | 1 | 0% | Positive diagnostic |
| *Maclura cochinchinensis* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Melaleuca ericifolia* | 4 | 20% | 2 | 1% | Uninformative |
| *Melaleuca nodosa* | 3 | 40% | 2 | 5% | Constant |
| *Melaleuca styphelioides* | 2 | 20% | 1 | 2% | Uninformative |
| *Melaleuca thymifolia* | 2 | 20% | 2 | 1% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 3 | 40% | 2 | 36% | Constant |
| *Monotoca elliptica* | 2 | 40% | 2 | 7% | Constant |
| *Myoporum acuminatum* | 1 | 20% | 1 | 0% | Positive diagnostic |
| *Notelaea longifolia* | 2 | 20% | 1 | 21% | Uninformative |
| *Omalanthus nutans* | 2 | 100% | 1 | 9% | Positive diagnostic |
| *Opercularia aspera* | 2 | 20% | 1 | 8% | Uninformative |
| *Parsonsia straminea* | 3 | 20% | 1 | 5% | Uninformative |
| *Paspalidium distans* | 1 | 20% | 2 | 7% | Uninformative |
| *Persoonia lanceolata* | 1 | 20% | 1 | 11% | Uninformative |
| *Phragmites australis* | 2 | 20% | 3 | 3% | Uninformative |
| *Pittosporum undulatum* | 2 | 60% | 2 | 25% | Constant |
| *Pteridium esculentum* | 4 | 60% | 2 | 40% | Constant |
| *Selaginella uliginosa* | 1 | 20% | 2 | 4% | Uninformative |
| *Smilax glyciphylla* | 3 | 40% | 2 | 33% | Constant |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Stephania japonica* | 1 | 20% | 1 | 6% | Uninformative |
| *Syncarpia glomulifera* | 1 | 20% | 3 | 13% | Uninformative |
| *Triglochin procera* | 1 | 20% | 1 | 1% | Positive diagnostic |
| *Typha orientalis* | 1 | 20% | 3 | 2% | Uninformative |
| *Xanthorrhoea resinosa* | 1 | 20% | 2 | 10% | Uninformative |

# RIVERFLAT PAPERBARK SWAMP FOREST

<div align="right">

## S_FoW05

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## Description

This community is found on low-lying alluvial flats of the Hawkesbury-Nepean, Parramatta and Georges river systems. Only small stands remain in Sydney, with more extensive areas situated near the Hawkesbury River. It is an open to closed forest of tall paperbarks (*Melaleuca linariifolia*/*Melaleuca styphelioides*). The paperbarks are joined by a range of hardy mesic small trees such as black wattle (*Callicoma serratifolia*), cheese tree (*Glochidion ferdinandi)* and grey myrtle *(Backhousia myrtifolia)*. A sparse cover of emergent eucalypts is common though not ubiquitous. Sample sites near Holsworthy contain bangalay (*Eucalyptus botryoides*) though more commonly it is the closely related swamp mahogany (*Eucalyptus robusta*) that occurs, sometimes with cabbage gum (*Eucalyptus amplifolia*). Light is mostly excluded from the forest floor and as result there is only a sparse cover of sedges, ferns and grasses. Local swampy depressions may favour sedge species over grasses and ferns.

This riverflat forest is most frequently found near backswamps in the narrow headwaters and inlets of alluvial flats not far from major waterways. Most remnants are situated at the interface with sandstone escarpments and as a result species typical of the surrounding community may be included. This community is restricted to the Sydney region where it extends from the rim of the Cumberland Plain near Kurrajong to the coast. It is known from a narrow elevational gradient between three and 50 metres above sea level. Remnant patches are small and isolated.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Emergent | 20<br>20-20 | 5%<br>5-5 | *Eucalyptus botryoides <--> saligna* |
| Small Trees | 15 m ±3<br>12-18 | 57% ±23<br>30-70 | *Melaleuca linariifolia, Glochidion ferdinandi, Leptospermum juniperinum* |
| Shrubs | 5.0 m ±4.2<br>2.0-8.0 | 35% ±21<br>20-50 | *Callistemon citrinus* |
| Ground Covers | 0.9 m ±0.8<br>0.1-2.0 | 38% ±19<br>10-60 | *Gahnia sieberiana, Hydrocotyle laxiflora, Hypolepis muelleri, Pteridium esculentum, Calochlaena dubia, Entolasia marginata, Microlaena stipoides* var. *stipoides, Viola hederacea, Imperata cylindrica* var. *major, Isolepis cernua, Pratia purpurascens* |
| Vines & Climbers | N/A | N/A | *Cayratia clematidea* |

*Compiled from 3 sites with structural data recorded.

## Threats

Clearing has depleted much of the original extent of this community in the study area and across its range. Remnants occur in the study area in a highly urbanised environment. This presents significant issues associated with storm-water pollution, altered drainage, rubbish dumping and weed invasion. Evidence of disturbance is present in all remaining stands.

## Conservation Status

Riverflat Paperbark Swamp Forest is a component of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act. Small areas occur in Lane Cove, Garigal and Georges River and Royal national parks.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 190-230 hectares |
| Estimated percentage cleared | Not available | 15-30% |
| Total NPWS reserves | 5.6 +1.0 hectares<br>32% of extant area | 20 hectares<br>10-15% of extant area<br><10% of pre-clearing area |
| Total reserved | 9.9 +1.0 hectares<br>56% of extant area | Not available |
| Total non-reserved | 7.7 +0.8 hectares | Not available |
| Total extant | 17.6 hectares | 160 hectares |



Map unit
Study area
Extant vegetation

## Example Locations

o   Alfords Point, Georges River NP, Liverpool LGA

o   Deep Creek, Garigal NP, Warringah LGA

o   The Glen Reserve, Bonnet Bay, Sutherland LGA

## Species Richness

| | |
|---|---|
| Number of sites | 10 |
| Total native species | 119 |
| Average no. native species per site | 22.8 ±9.7 |

## Variations and Dynamics

Several structural variations are recognised. The upper stratum may be dominated by eucalypts while at other locations eucalypts may be absent with the community characterised by a lower growing open to closed stand of paperbark species. Several variations in the composition of the eucalypt canopy are also recognised, with swamp mahogany, bangalay, Sydney blue gum (*Eucalyptus saligna*), the hybrid *Eucalyptus botryoides <--> saligna,* cabbage gum and blackbutt (*Eucalyptus pilularis*) recorded in different locations.

## Relationship to Other Communities

Floristically this community is closely related to other swamp forests (S_FoW02). It grades into riverflat eucalypt forests (S_FoW09, S_FoW06) where drainage improves.

## Accuracy

Sampling density is moderate. Mapping and the identification of map unit boundaries relied on the interpretation of stands of swamp mahogany and *Eucalyptus botryoides <--> saligna* complexes on backswamps associated with the riverflats of the Georges, Parramatta and Hacking rivers and Deep Creek. A mean annual rainfall threshold of 1000 millimetres was used to distinguish coastal swamp forests and hinterland swamp forests.

A 0.04 hectare site located in this map unit is expected to contain at least 3 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 17 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia decurrens* | 1 | 10% | 2 | 5% | Uninformative |
| *Acacia falcata* | 1 | 10% | 1 | 3% | Uninformative |
| *Acacia floribunda* | 2 | 10% | 1 | 4% | Uninformative |
| *Acacia implexa* | 1 | 10% | 1 | 5% | Uninformative |
| *Acacia linifolia* | 1 | 10% | 2 | 20% | Uninformative |
| *Acacia longifolia* | 2 | 40% | 2 | 21% | Constant |
| *Acacia parramattensis* | 2 | 20% | 1 | 5% | Uninformative |
| *Acacia schinoides* | 1 | 10% | 2 | 0% | Uninformative |
| *Acacia suaveolens* | 1 | 10% | 1 | 28% | Uninformative |
| *Acacia terminalis* | 1 | 10% | 1 | 20% | Uninformative |
| *Acacia ulicifolia* | 1 | 10% | 1 | 26% | Uninformative |
| *Adiantum aethiopicum* | 2 | 20% | 2 | 7% | Uninformative |
| *Amperea xiphoclada* | 1 | 10% | 1 | 6% | Uninformative |
| *Banksia integrifolia* | 1 | 30% | 2 | 9% | Uninformative |
| *Banksia oblongifolia* | 2 | 10% | 2 | 14% | Uninformative |
| *Banksia serrata* | 1 | 10% | 2 | 33% | Uninformative |
| *Baumea juncea* | 2 | 20% | 2 | 4% | Uninformative |
| *Baumea rubiginosa* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Billardiera scandens* | 1 | 10% | 1 | 37% | Uninformative |
| *Blechnum cartilagineum* | 1 | 20% | 2 | 7% | Uninformative |
| *Blechnum indicum* | 2 | 10% | 2 | 1% | Uninformative |
| *Bursaria spinosa* | 1 | 20% | 2 | 12% | Uninformative |
| *Callicoma serratifolia* | 1 | 20% | 2 | 5% | Uninformative |
| *Callistemon citrinus* | 2 | 30% | 2 | 3% | Positive diagnostic |
| *Calochlaena dubia* | 2 | 30% | 2 | 16% | Uninformative |
| *Casuarina glauca* | 3 | 20% | 2 | 7% | Uninformative |
| *Centella asiatica* | 1 | 10% | 2 | 6% | Uninformative |
| *Chorizandra cymbaria* | 2 | 10% | 2 | 1% | Uninformative |
| *Christella dentata* | 1 | 10% | 1 | 1% | Uninformative |
| *Clematis glycinoides* | 1 | 10% | 2 | 6% | Uninformative |
| *Commelina cyanea* | 1 | 30% | 2 | 9% | Uninformative |
| *Cyathea australis* | 1 | 10% | 1 | 2% | Uninformative |
| *Dampiera purpurea* | 1 | 10% | 1 | 4% | Uninformative |
| *Dichelachne micrantha* | 3 | 10% | 2 | 9% | Uninformative |
| *Dodonaea triquetra* | 1 | 20% | 2 | 23% | Uninformative |
| *Echinopogon caespitosus* | 1 | 10% | 2 | 11% | Uninformative |
| *Echinopogon ovatus* | 3 | 10% | 2 | 6% | Uninformative |
| *Eleocharis sphacelata* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Entolasia marginata* | 2 | 30% | 2 | 22% | Uninformative |
| *Eucalyptus botryoides <--> saligna* | 2 | 20% | 3 | 0% | Positive diagnostic |
| *Eucalyptus piperita* | 2 | 20% | 3 | 20% | Uninformative |
| *Eucalyptus punctata* | 1 | 10% | 2 | 11% | Uninformative |
| *Eucalyptus robusta* | 1 | 20% | 3 | 2% | Positive diagnostic |
| *Ficus rubiginosa* | 1 | 20% | 1 | 4% | Uninformative |
| *Gahnia sieberiana* | 2 | 80% | 2 | 7% | Positive diagnostic |
| *Geranium homeanum* | 1 | 30% | 2 | 2% | Positive diagnostic |
| *Gleichenia dicarpa* | 1 | 20% | 2 | 7% | Uninformative |
| *Gleichenia microphylla* | 1 | 10% | 2 | 2% | Uninformative |
| *Glochidion ferdinandi* | 1 | 20% | 2 | 13% | Uninformative |
| *Glycine microphylla* | 1 | 10% | 2 | 9% | Uninformative |
| *Glycine tabacina* | 2 | 10% | 2 | 8% | Uninformative |
| *Gonocarpus micranthus* | 1 | 10% | 2 | 1% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 10% | 2 | 24% | Uninformative |
| *Grevillea longifolia* | 1 | 10% | 2 | 1% | Uninformative |
| *Grevillea sericea* | 1 | 10% | 2 | 15% | Uninformative |
| *Hakea dactyloides* | 1 | 10% | 2 | 24% | Uninformative |
| *Hakea salicifolia* | 2 | 10% | 2 | 2% | Uninformative |
| *Hakea sericea* | 1 | 20% | 2 | 21% | Uninformative |
| *Hakea teretifolia* | 1 | 20% | 2 | 16% | Uninformative |
| *Hardenbergia violacea* | 1 | 10% | 1 | 16% | Uninformative |
| *Hibbertia aspera* | 1 | 10% | 2 | 11% | Uninformative |
| *Hydrocotyle laxiflora* | 3 | 40% | 2 | 2% | Positive diagnostic |
| *Hydrocotyle peduncularis* | 2 | 10% | 2 | 6% | Uninformative |
| *Hypolepis muelleri* | 3 | 50% | 2 | 5% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 1 | 50% | 2 | 20% | Constant |
| *Isolepis cernua* | 4 | 40% | 1 | 0% | Positive diagnostic |
| *Isolepis inundata* | 2 | 10% | 1 | 1% | Uninformative |
| *Jacksonia scoparia* | 1 | 10% | 2 | 2% | Uninformative |
| *Juncus continuus* | 2 | 40% | 1 | 1% | Positive diagnostic |
| *Kennedia rubicunda* | 2 | 20% | 1 | 9% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Kunzea ambigua* | 1 | 40% | 2 | 15% | Constant |
| *Lasiopetalum ferrugineum* | 1 | 10% | 2 | 11% | Uninformative |
| *Leionema dentatum* | 1 | 10% | 1 | 2% | Uninformative |
| *Lepironia articulata* | 1 | 10% | 0 | 0% | Uninformative |
| *Leptospermum juniperinum* | 2 | 30% | 2 | 2% | Positive diagnostic |
| *Leptospermum polygalifolium* | 1 | 10% | 2 | 14% | Uninformative |
| *Leucopogon ericoides* | 1 | 10% | 1 | 9% | Uninformative |
| *Lobelia anceps* | 2 | 10% | 2 | 2% | Uninformative |
| *Marsdenia suaveolens* | 1 | 10% | 1 | 3% | Uninformative |
| *Melaleuca linariifolia* | 4 | 100% | 2 | 3% | Positive diagnostic |
| *Melaleuca quinquenervia* | 1 | 10% | 3 | 0% | Uninformative |
| *Melaleuca styphelioides* | 1 | 10% | 1 | 2% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 2 | 60% | 2 | 36% | Constant |
| *Notelaea longifolia* | 1 | 10% | 1 | 21% | Uninformative |
| *Omalanthus nutans* | 1 | 30% | 1 | 9% | Uninformative |
| *Opercularia aspera* | 1 | 10% | 1 | 8% | Uninformative |
| *Opercularia varia* | 2 | 10% | 1 | 1% | Uninformative |
| *Oplismenus aemulus* | 3 | 20% | 2 | 10% | Uninformative |
| *Oplismenus imbecillis* | 3 | 20% | 2 | 13% | Uninformative |
| *Oxalis radicosa* | 1 | 10% | 2 | 0% | Uninformative |
| *Ozothamnus diosmifolius* | 1 | 10% | 1 | 12% | Uninformative |
| *Persicaria decipiens* | 2 | 20% | 2 | 1% | Positive diagnostic |
| *Persicaria praetermissa* | 2 | 20% | 3 | 0% | Positive diagnostic |
| *Persicaria strigosa* | 2 | 10% | 2 | 1% | Uninformative |
| *Persoonia linearis* | 1 | 10% | 1 | 20% | Uninformative |
| *Phragmites australis* | 3 | 20% | 3 | 3% | Uninformative |
| *Pimelea linifolia* | 1 | 10% | 2 | 27% | Uninformative |
| *Pittosporum undulatum* | 2 | 20% | 2 | 25% | Uninformative |
| *Platysace lanceolata* | 1 | 10% | 2 | 8% | Uninformative |
| *Poa affinis* | 2 | 10% | 2 | 11% | Uninformative |
| *Poa labillardierei* var. *labillardierei* | 1 | 10% | 2 | 6% | Uninformative |
| *Polyscias sambucifolia* | 1 | 10% | 1 | 15% | Uninformative |
| *Pomaderris discolor* | 1 | 10% | 1 | 1% | Uninformative |
| *Pratia purpurascens* | 2 | 40% | 2 | 18% | Constant |
| *Pteridium esculentum* | 2 | 70% | 2 | 40% | Constant |
| *Pultenaea daphnoides* | 1 | 10% | 2 | 8% | Uninformative |
| *Schoenus brevifolius* | 2 | 10% | 2 | 4% | Uninformative |
| *Selaginella uliginosa* | 1 | 10% | 2 | 4% | Uninformative |
| *Solanum pungetium* | 1 | 10% | 2 | 0% | Uninformative |
| *Stellaria flaccida* | 1 | 10% | 2 | 0% | Uninformative |
| *Tetragonia tetragonioides* | 1 | 10% | 2 | 2% | Uninformative |
| *Themeda australis* | 3 | 10% | 2 | 23% | Uninformative |
| *Tricostularia pauciflora* | 2 | 10% | 1 | 1% | Uninformative |
| *Typha orientalis* | 1 | 20% | 3 | 2% | Positive diagnostic |
| *Viola hederacea* | 2 | 50% | 2 | 6% | Positive diagnostic |

# CUMBERLAND RIVERFLAT FOREST

## S_FoW06

**Statewide Class**

NSW Plant Community Type:

Biometric Number(s):

**Coastal Floodplain Wetlands**

835: Forest Red Gum-Rough-barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin

HN526; ME018



## Description

Cumberland Riverflat Forest (Benson and Howell 1990) is an open eucalypt forest situated on broad alluvial flats of the Hawkesbury and Nepean river systems. It also forms narrower ribbons alongside streams and creeks that drain the Cumberland Plain. Typically the canopy includes one of either rough-barked apple (*Angophora floribunda*) or broad-leaved apple (*Angophora subvelutina*) and one or both of forest red gum (*Eucalyptus tereticornis*) and cabbage gum (*Eucalyptus amplifolia*). However there are a wide variety of other interesting eucalypts that are highly localised. On the Georges River near Bankstown and on Cabramatta and Prospect creeks blue box (*Eucalyptus baueriana*) is commonly encountered, sometimes as a smaller tree beneath the canopy. Further north and east Sydney blue gum (*Eucalyptus saligna)* and blackbutt (*Eucalyptus pilularis)* occurs. Near Hoxton Park spotted gum (*Corymbia maculata*) forms a minor component of the canopy.

The understorey within this riverflat forest is characterised by an occasional sparse to open small tree stratum of paperbark (*Melaleuca* spp.) and wattles (*Acacia* spp.). A sparse lower shrub layer features blackthorn (*Bursaria spinosa*) at most sites. The ground layer is characterised by an abundant cover of grasses with small herbs and ferns. Cumberland Riverflat Forest occurs at altitudes between one and 160 metres above sea level and with a mean annual rainfall of 750-1000 millimetres. Within the study area the largest remaining areas are situated on the Georges River. Highly disturbed examples occur on Prospect and Orphan School creeks.

## Floristic Summary*

|  | **Average Height & Height Range (m)** | **Average Cover & Cover Range (%)** | **Typical Species** |
|---|---|---|---|
| Trees | 21 m ±4 <br> 15-30 | 28% ±12 <br> 10-50 | *Eucalyptus tereticornis, Angophora floribunda, Eucalyptus baueriana, Eucalyptus amplifolia, Eucalyptus saligna* |
| Small Trees | 8 m ±4 <br> 3-15 | 18% ±18 <br> 3-60 | *Bursaria spinosa* |
| Shrubs | 2.9 m ±0.6 <br> 2.0-4.0 | 16% ±13 <br> 5-40 | *Bursaria spinosa, Acacia decurrens, Ozothamnus diosmifolius* |
| Ground Covers | 0.8 m ±0.6 <br> 0.2-2.0 | 61% ±24 <br> 10-95 | *Microlaena stipoides* var. *stipoides, Dichondra repens, Einadia hastata, Entolasia marginata, Solanum prinophyllum, Dianella longifolia, Echinopogon ovatus, Brunoniella australis, Oplismenus aemulus, Veronica plebeia, Cheilanthes sieberi* subsp. *sieberi, Desmodium varians, Commelina cyanea, Digitaria parviflora* |
| Vines & Climbers | N/A | N/A | *Glycine tabacina, Glycine microphylla, Clematis glycinoides* var. *glycinoides, Glycine clandestina* |

*Compiled from 15 sites with structural data recorded.

## Threats

Threats are severe. The community has been extensively cleared in the past for agriculture, with subsequent urban consolidation now adjoining most remnants in the study area. Most stands are threatened by a diverse and abundant cover of invasive weeds of which small-leaved privet (*Ligustrum sinense*) and bridal creeper (*Asparagus asparagoides*) are very common. While the threat of urban clearing is minimised by the occurrence of remnants within flood zones, alteration of drainage patterns, water pollutants and increased sedimentation remain threats.

## Conservation Status

Cumberland Riverflat Forest is a component of River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the NSW TSC Act.

This vegetation community is represented in Georges River NP.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 26,500-106,000 hectares |
| Estimated percentage cleared | Not available | 80-95% |
| Total NPWS reserves | 3.7 +6.4 hectares<br>0.6% of extant area | 150 hectares<br>3% of extant area<br><2% of pre-clearing area |
| Total reserved | 102 +15.2 hectares<br>16% of extant area | Not available |
| Total non-reserved | 538 +97.8 hectares | Not available |
| Total extant | 640 hectares | 5300 hectares |
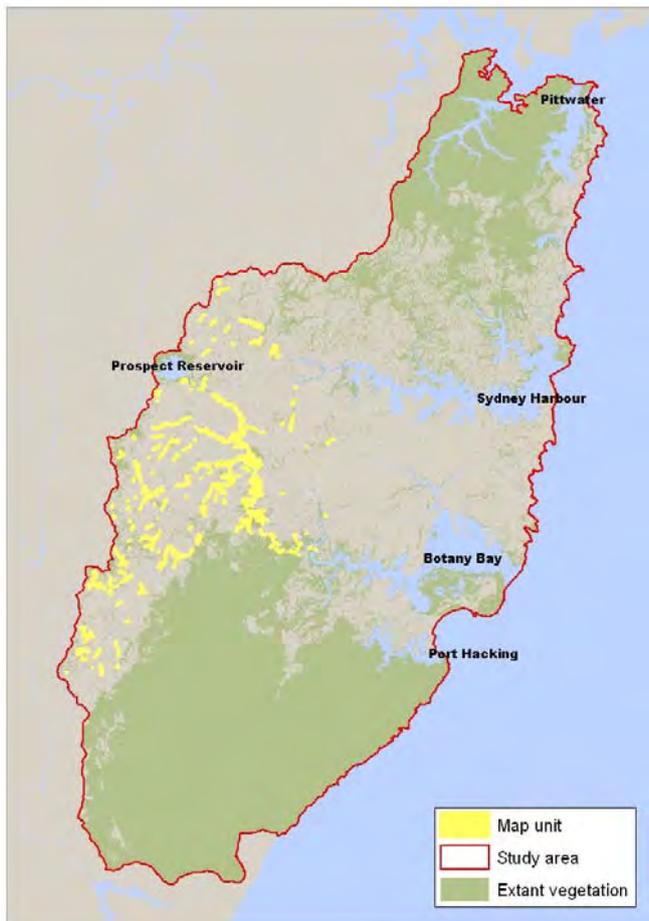


## Example Locations

o   Lieutenant Cantello Reserve, Voyager Point, Liverpool LGA

o   Cabramatta Creek, Warwick Farm

## Species Richness

| | |
|---|---|
| Number of sites | 23 |
| Total native species | 173 |
| Average no. native species per site | 28.9 ±9.6 |

## Variations and Dynamics

Several floristic variations in canopy species are recognised within this map unit. Low-lying floodplains and riverflats in the study area tend to include rough-barked apple and blue box in the canopy. Minor creeklines which drain the Cumberland Plain may be only narrow and tend to exclude these species; they are dominated by forest red gum or cabbage gum. In these situations the understorey may also include a higher proportion of paperbark, mesic shrubs and herbs than stands on the floodplain.

## Relationship to Other Communities

Several structural and floristic characteristics are shared with S_FoW07 and S_FoW09. S_FoW06 grades into S_FoW09 near sites of high disturbance or where saline soils occur on the floodplain. It grades into S_FoW07 where the floodplain narrows toward sandstone valley headwaters. Elsewhere this community grades into grassy woodlands (S_GW03) as elevation or distance from streams increases away from the floodplain.

## Accuracy

Sampling density is high though not evenly spread due to disturbance. Map unit boundaries were drawn from the interpretation of forests on riverflats and creeks that drain the shale environments of the Cumberland Plain.

A 0.04 hectare site located in this map unit is expected to contain at least 10 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 22 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia decurrens* | 2 | 61% | 1 | 5% | Positive diagnostic |
| *Adiantum aethiopicum* | 2 | 26% | 2 | 7% | Positive diagnostic |
| *Angophora floribunda* | 2 | 48% | 2 | 4% | Positive diagnostic |
| *Arthropodium milleflorum* | 1 | 17% | 2 | 3% | Uninformative |
| *Austrodanthonia tenuior* | 2 | 17% | 2 | 4% | Uninformative |
| *Billardiera scandens* | 2 | 22% | 1 | 37% | Uninformative |
| *Breynia oblongifolia* | 2 | 26% | 1 | 17% | Uninformative |
| *Brunoniella australis* | 2 | 48% | 2 | 6% | Positive diagnostic |
| *Bursaria spinosa* | 2 | 78% | 2 | 11% | Positive diagnostic |
| *Calotis dentex* | 2 | 13% | 2 | 1% | Uninformative |
| *Cassytha pubescens* | 1 | 13% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 2 | 22% | 2 | 7% | Uninformative |
| *Cayratia clematidea* | 2 | 17% | 2 | 4% | Uninformative |
| *Centella asiatica* | 2 | 17% | 2 | 6% | Uninformative |
| *Cheilanthes sieberi* subsp. *sieberi* | 2 | 43% | 2 | 12% | Positive diagnostic |
| *Clematis glycinoides* | 2 | 35% | 2 | 6% | Positive diagnostic |
| *Commelina cyanea* | 2 | 52% | 2 | 8% | Positive diagnostic |
| *Cymbopogon refractus* | 1 | 13% | 2 | 4% | Uninformative |
| *Cyperus laevis* | 2 | 17% | 2 | 1% | Uninformative |
| *Desmodium varians* | 2 | 26% | 2 | 8% | Uninformative |
| *Dianella longifolia* | 1 | 52% | 2 | 5% | Positive diagnostic |
| *Dianella revoluta* | 2 | 13% | 1 | 17% | Uninformative |
| *Dichelachne micrantha* | 2 | 22% | 2 | 9% | Uninformative |
| *Dichondra repens* | 2 | 70% | 2 | 14% | Positive diagnostic |
| *Digitaria parviflora* | 2 | 26% | 2 | 5% | Positive diagnostic |
| *Echinopogon caespitosus* | 2 | 39% | 2 | 10% | Positive diagnostic |
| *Echinopogon ovatus* | 2 | 57% | 2 | 5% | Positive diagnostic |
| *Einadia hastata* | 2 | 57% | 1 | 3% | Positive diagnostic |
| *Einadia nutans* | 2 | 13% | 1 | 1% | Uninformative |
| *Einadia trigonos* | 2 | 13% | 2 | 1% | Uninformative |
| *Entolasia marginata* | 2 | 83% | 2 | 22% | Positive diagnostic |
| *Eragrostis leptostachya* | 2 | 13% | 2 | 4% | Uninformative |
| *Eucalyptus amplifolia* subsp. *amplifolia* | 3 | 26% | 3 | 0% | Positive diagnostic |
| *Eucalyptus baueriana* | 3 | 48% | 3 | 0% | Positive diagnostic |
| *Eucalyptus crebra* | 3 | 13% | 2 | 3% | Uninformative |
| *Eucalyptus moluccana* | 4 | 26% | 3 | 4% | Positive diagnostic |
| *Eucalyptus saligna* | 3 | 13% | 3 | 3% | Uninformative |
| *Eucalyptus tereticornis* | 3 | 48% | 2 | 5% | Positive diagnostic |
| *Exocarpos cupressiformis* | 1 | 22% | 1 | 4% | Positive diagnostic |
| *Gahnia aspera* | 1 | 13% | 1 | 3% | Uninformative |
| *Galium propinquum* | 1 | 13% | 2 | 2% | Uninformative |
| *Glycine clandestina* | 1 | 30% | 2 | 18% | Uninformative |
| *Glycine microphylla* | 2 | 52% | 2 | 8% | Positive diagnostic |
| *Glycine tabacina* | 2 | 57% | 2 | 7% | Positive diagnostic |
| *Hibbertia diffusa* | 2 | 26% | 2 | 2% | Positive diagnostic |
| *Hydrocotyle peduncularis* | 2 | 13% | 2 | 6% | Uninformative |
| *Hypericum gramineum* | 2 | 13% | 2 | 3% | Uninformative |
| *Imperata cylindrica* var. *major* | 3 | 13% | 2 | 20% | Uninformative |
| *Jacksonia scoparia* | 2 | 17% | 2 | 2% | Uninformative |
| *Juncus usitatus* | 2 | 17% | 1 | 3% | Uninformative |
| *Leucopogon juniperinus* | 2 | 26% | 2 | 10% | Uninformative |
| *Lomandra multiflora* subsp. *multiflora* | 1 | 13% | 2 | 24% | Uninformative |
| *Maytenus silvestris* | 2 | 22% | 1 | 3% | Positive diagnostic |
| *Melaleuca decora* | 2 | 30% | 2 | 3% | Positive diagnostic |
| *Melaleuca nodosa* | 2 | 22% | 2 | 5% | Uninformative |
| *Melaleuca styphelioides* | 2 | 17% | 1 | 1% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 3 | 96% | 2 | 35% | Positive diagnostic |
| *Notelaea longifolia* | 1 | 22% | 1 | 21% | Uninformative |
| *Oplismenus aemulus* | 2 | 43% | 2 | 9% | Positive diagnostic |
| *Oxalis exilis* | 2 | 13% | 1 | 3% | Uninformative |
| *Oxalis perennans* | 2 | 30% | 2 | 7% | Positive diagnostic |
| *Ozothamnus diosmifolius* | 2 | 48% | 1 | 11% | Positive diagnostic |
| *Paspalidium distans* | 2 | 26% | 2 | 7% | Positive diagnostic |
| *Persoonia linearis* | 2 | 17% | 1 | 20% | Uninformative |
| *Pittosporum undulatum* | 1 | 17% | 2 | 25% | Uninformative |
| *Plectranthus parviflorus* | 2 | 26% | 2 | 3% | Positive diagnostic |
| *Polyscias sambucifolia* | 2 | 17% | 1 | 15% | Uninformative |
| *Poranthera microphylla* | 2 | 17% | 2 | 7% | Uninformative |
| *Pratia purpurascens* | 2 | 39% | 2 | 17% | Constant |
| *Pseuderanthemum variabile* | 2 | 17% | 2 | 12% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Solanum prinophyllum* | 2 | 57% | 1 | 5% | Positive diagnostic |
| *Trema tomentosa* var. *aspera* | 1 | 17% | 1 | 2% | Uninformative |
| *Tylophora barbata* | 1 | 17% | 2 | 5% | Uninformative |
| *Veronica plebeia* | 2 | 43% | 1 | 7% | Positive diagnostic |
| *Wahlenbergia gracilis* | 1 | 22% | 1 | 8% | Uninformative |

# CUMBERLAND SWAMP OAK RIPARIAN FOREST

<div align="right">

## S_FoW07

</div>

## Description

Cumberland Swamp Oak Riparian Forest (NPWS 2002, Tozer 2003) is found on the riverflats of the Cumberland Plain in western Sydney and in the Hunter Valley (NPWS 2000c). The distinguishing feature is the prominent stands of swamp oak (*Casuarina glauca*) found along or near streams. Often these are relatively young trees, swarming amongst a mix of old and young eucalypts such as rough-barked apple (*Angophora floribunda*), forest red gum (*Eucalyptus tereticornis*) and grey box (*Eucalyptus moluccana*). This community features an open grassy and herbaceous understorey, as is typical of riverflat forests.

It may be that this is a pioneering community that is re-establishing following clearing. It is known that many creeklines in western Sydney are slightly saline, particularly during drought (Benson and Howell 1990). Water tables are likely to rise following clearing, bringing salt water closer to the surface. This may explain why the salt tolerant swamp oak is so prolific in these environments and in many instances appears to survive where the eucalypt species do not. Similar dynamics appear to occur in the Hunter Valley (Williams 1993).

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 18 m ±4<br>15-25 | 33% ±14<br>10-50 | *Casuarina glauca, Eucalyptus moluccana, Angophora floribunda, Eucalyptus baueriana, Eucalyptus tereticornis* |
| Small Trees | 6 m ±3<br>2-10 | 19% ±26<br>5-70 | *Casuarina glauca, Bursaria spinosa, Melaleuca decora, Melaleuca nodosa, Melaleuca styphelioides* |
| Shrubs | 2.6 m ±1.5<br>1.2-5.0 | 32% ±28<br>5-70 | *Acacia decurrens, Bursaria spinosa, Melaleuca nodosa, Brunoniella australis, Dianella longifolia, Dichondra repens, Lomandra longifolia, Maytenus silvestris, Ozothamnus diosmifolius Polyscias sambucifolia* |
| Ground Covers | 0.6 m ±0.3<br>0.3-1.0 | 68% ±19<br>40-90 | *Entolasia marginata, Einadia hastate, Microlaena stipoides* var. *stipoides, Echinopogon ovatus, Pratia purpurascens, Commelina cyanea, Senecio hispidulus, Veronica plebeia, Wahlenbergia gracilis* |
| Vines & Climbers | N/A | N/A | *Glycine tabacina, Tetragonia tetragonioides, Billardiera scandens, Clematis glycinoides* var. *glycinoides, Glycine microphylla* |

*Compiled from 10 sites with structural data recorded.

## Threats

This community has been extensively cleared in the past for agriculture, with subsequent urban consolidation now adjoining most remnants in the Sydney area. While the threat of urban clearing is minimised by the occurence of within flood zones, the alteration of drainage patterns, water pollutants and increased sedimentation remain threats. Most stands are threatened by a diverse and abundant cover of invasive weeds of which small-leaved privet (*Ligustrum sinense*) and bridal creeper (*Asparagus asparagoides*) are very common.

## Conservation Status

Cumberland Swamp Oak Riparian Forest is a component of River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 28,000-107,500 hectares |
| Estimated percentage cleared | Not available | 75-95% |
| Total NPWS reserves | 1.4 +<.1 hectares<br>0.6% of extant area | 155 hectares<br>2% of extant area<br><2% of pre-clearing area |
| Total reserved | 59.0 +1.6 hectares<br>27% of extant area | Not available |
| Total non-reserved | 159 +6.3 hectares | Not available |
| Total extant | 218 hectares | 6500 hectares |



Map unit
Study area
Extant vegetation

## Example Locations

o   Hinchinbrook Creek, Hinchinbrook, Fairfield LGA

o   Cabramatta Creek Park, Warwick Farm. Liverpool LGA

## Species Richness

| Number of sites | 3 |
|---|---|
| Total native species | 52 |
| Average no. native species per site | 22.0 ±3.6 |

## Variations and Dynamics

No structural or floristic variations are recognised.

## Relationship to Other Communities

Many floristic characteristics overlap with S_FoW06 which grades into this community on broader floodplains. This community adjoins the grassy woodlands of the Cumberland Plain (S_GW02, S_GW03).

## Accuracy

Sampling density is low. Map unit boundaries were identified from digital imagery using floodplains and swamp oak-dominated stands as primary indicators.

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia decurrens* | 1 | 33% | 2 | 5% | Uninformative |
| *Alternanthera denticulata* | 1 | 33% | 2 | 1% | Positive diagnostic |
| *Angophora floribunda* | 1 | 33% | 2 | 4% | Uninformative |
| *Billardiera scandens* | 1 | 33% | 1 | 37% | Uninformative |
| *Bolboschoenus caldwellii* | 1 | 33% | 2 | 0% | Positive diagnostic |
| *Brunoniella australis* | 1 | 67% | 2 | 7% | Positive diagnostic |
| *Bursaria spinosa* | 1 | 67% | 2 | 12% | Constant |
| *Calotis dentex* | 2 | 33% | 2 | 1% | Positive diagnostic |
| *Carex appressa* | 1 | 33% | 2 | 1% | Positive diagnostic |
| *Casuarina glauca* | 4 | 100% | 2 | 7% | Positive diagnostic |
| *Centella asiatica* | 3 | 67% | 2 | 6% | Positive diagnostic |
| *Commelina cyanea* | 2 | 100% | 2 | 9% | Positive diagnostic |
| *Correa reflexa* | 1 | 33% | 1 | 5% | Uninformative |
| *Damasonium minus* | 2 | 33% | 0 | 0% | Positive diagnostic |
| *Dianella longifolia* | 2 | 33% | 2 | 5% | Uninformative |
| *Dianella revoluta* | 2 | 33% | 1 | 17% | Uninformative |
| *Dichondra repens* | 2 | 33% | 2 | 14% | Uninformative |
| *Echinopogon ovatus* | 2 | 33% | 2 | 6% | Uninformative |
| *Eclipta platyglossa* | 2 | 33% | 1 | 0% | Positive diagnostic |
| *Einadia hastata* | 3 | 67% | 1 | 4% | Positive diagnostic |
| *Einadia polygonoides* | 1 | 33% | 2 | 1% | Positive diagnostic |
| *Eleocharis cylindrostachys* | 1 | 33% | 0 | 0% | Positive diagnostic |
| *Entolasia marginata* | 2 | 67% | 2 | 22% | Constant |
| *Eragrostis leptostachya* | 2 | 33% | 2 | 4% | Uninformative |
| *Eriochloa pseudoacrotricha* | 1 | 67% | 1 | 0% | Positive diagnostic |
| *Eucalyptus amplifolia* subsp. *amplifolia* | 3 | 33% | 3 | 0% | Positive diagnostic |
| *Eucalyptus moluccana* | 3 | 33% | 3 | 4% | Uninformative |
| *Glycine tabacina* | 1 | 33% | 2 | 8% | Uninformative |
| *Goodenia ovata* | 2 | 33% | 1 | 2% | Uninformative |
| *Hardenbergia violacea* | 1 | 33% | 1 | 16% | Uninformative |
| *Isolepis inundata* | 1 | 33% | 1 | 1% | Positive diagnostic |
| *Juncus usitatus* | 2 | 67% | 1 | 3% | Positive diagnostic |
| *Lachnagrostis filiformis* | 1 | 33% | 1 | 2% | Uninformative |
| *Lythrum hyssopifolia* | 1 | 33% | 1 | 0% | Positive diagnostic |
| *Marsilea hirsuta* | 1 | 33% | 0 | 0% | Positive diagnostic |
| *Melaleuca decora* | 3 | 33% | 2 | 3% | Uninformative |
| *Melaleuca nodosa* | 3 | 33% | 2 | 5% | Uninformative |
| *Melaleuca styphelioides* | 1 | 33% | 1 | 2% | Positive diagnostic |
| *Microlaena stipoides* var. *stipoides* | 3 | 100% | 2 | 36% | Positive diagnostic |
| *Oxalis exilis* | 1 | 33% | 1 | 4% | Uninformative |
| *Ozothamnus diosmifolius* | 1 | 33% | 1 | 12% | Uninformative |
| *Parsonsia straminea* | 1 | 33% | 1 | 5% | Uninformative |
| *Persicaria decipiens* | 3 | 33% | 2 | 1% | Positive diagnostic |
| *Plectranthus parviflorus* | 2 | 33% | 2 | 3% | Uninformative |
| *Polyscias sambucifolia* | 2 | 33% | 1 | 15% | Uninformative |
| *Pratia purpurascens* | 2 | 67% | 2 | 18% | Constant |
| *Senecio hispidulus* | 2 | 33% | 1 | 2% | Uninformative |
| *Tetragonia tetragonioides* | 1 | 33% | 2 | 2% | Positive diagnostic |
| *Triglochin striata* | 4 | 33% | 2 | 0% | Positive diagnostic |
| *Typha orientalis* | 2 | 33% | 3 | 2% | Positive diagnostic |

# ESTUARINE SWAMP OAK FOREST

# S_FoW08

**Statewide Class**
NSW Plant Community Type:

**Biometric Number(s):**

**Coastal Floodplain Wetlands**
1234: Swamp Oak Swamp Forest Fringing Estuaries, Sydney Basin and South East Corner
HN595; HU635; ME023; SR650; HU941



## Description

In the zonation from mangroves to terrestrial sclerophyll and mesophyll forests and woodlands, Estuarine Swamp Oak Forest occurs immediately above tidal influence. It fringes the margins of saline waterbodies that include rivers, lagoons and tidal lakes. Swamp oak (*Casuarina glauca*) forms dense monospecific stands above a thick ground cover of salt-tolerant herbs, rushes and sedges. The shrub layer is low-growing and sparse, comprising a mix of terrestrial species while others typical of wetlands. It is a community of relatively low species diversity.

Estuarine Swamp Oak Forest is widespread along the coast of the Sydney basin where it is rarely found at more than two meters above sea level.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 15 m ±3<br>10-22 | 36% ±14<br>5-55 | *Casuarina glauca* |
| Small Trees | 6 m ±4<br>2-12 | 23% ±23<br>5-60 | *Casuarina glauca, Avicennia marina, Goodenia ovata, Suaeda australis* |
| Ground Covers | 0.9 m ±0.5<br>0.3-2.0 | 40% ±21<br>5-70 | *Juncus kraussii, Baumea juncea, Samolus repens, Phragmites australis, Sporobolus virginicus, Atriplex australasica* |
| Vines & Climbers | N/A | N/A | *Tetragonia tetragonioides* |

*Compiled from 12 sites with structural data recorded.

*The Native Vegetation of the Sydney Metropolitan Area*

## Threats

Waterfront urban and industrial development has occurred on and around areas once occupied by this community. Typically land infill has been used to reclaim estuarine environments and make use of flat accessible lands. This has led to a reduction in area. Threats continue to impinge on this forest through the proliferation of exotic species such as the spiny rush (*Juncus acutus*), lantana (*Lantana camara*) and buffalo grass (*Stenotaphrum secundatum*). In Georges River NP patches of pampas grass (*Cortaderia selloana*) have established. Urban development has altered drainage regimes which can alter the composition of flora associated with this community. Sea level rise associated with climate change also threatens this low-lying community.

## Conservation Status

Estuarine Swamp Oak Forest is a component of Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community listed under the TSC Act.

This vegetation community is represented in Towra Point NR, Georges River NP and Lane Cove NP. Small areas are included within Ku-ring-gai Chase NP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 4200-16,800 hectares |
| Estimated percentage cleared | Not available | 80-95% |
| Total NPWS reserves | 100 +1.2 hectares<br>32% of extant area | 140 hectares<br>15-20% of extant area<br><5% of pre-clearing area |
| Total reserved | 160 +1.4 hectares<br>51% of extant area | Not available |
| Total non-reserved | 151 +12.3 hectares | Not available |
| Total extant | 311 hectares | 840 hectares |



Map unit
Study area
Extant vegetation
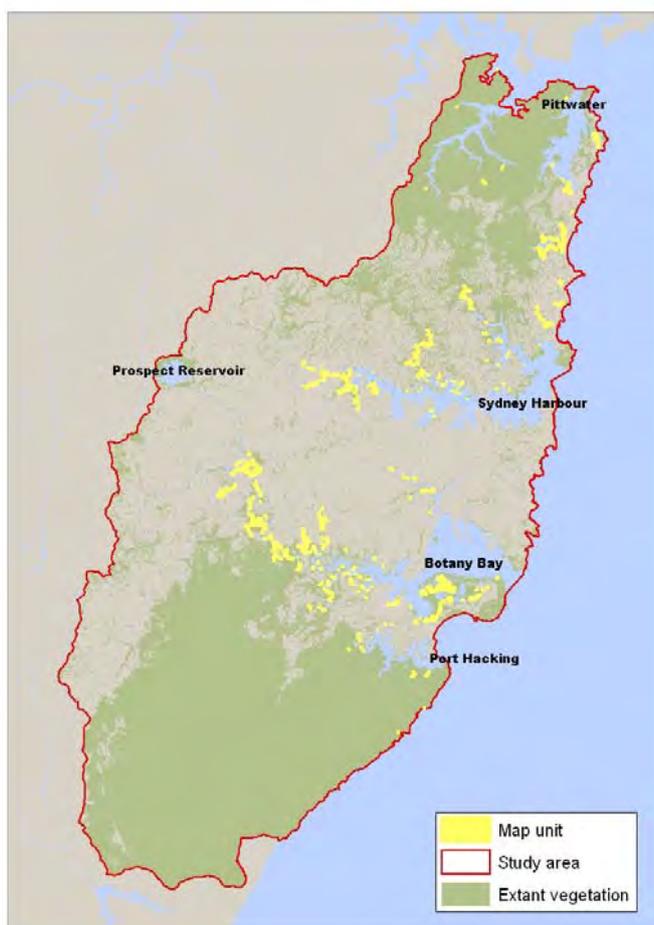
## Example Locations

o   Eastern shoreline of Jamieson Park, Narrabeen Lakes, Warringah LGA

o   Newington NR, Homebush Bay

o   Lieutenant Cantello Reserve, Voyager Point, Liverpool LGA

## Species Richness

| Number of sites | 28 |
|---|---|
| Total native species | 70 |
| Average no. native species per site | 8.7 ±4.8 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

Floristically and spatially this community is related to Estuarine Mangrove Forest (S_SW01), Estuarine Saltmarsh (S_SW02) and Estuarine Reedland (S_FrW06). Where saline influence diminishes, this forest grades into freshwater swamp forests (S_FoW03, S_FoW02), scrubs (S_FoW12) and riverflat eucalypt forest (S_FoW06).

## Accuracy

Sampling density is high. Estuarine Swamp Oak Forest is confidently identified using aerial photography. The influence of saline water on vegetation composition has been inferred from the location of survey sites and distance from the coastline, elevation and proximity of mangrove species.

A 0.04 hectare site located in this map unit is expected to contain at least one positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is five or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 1 | 14% | 2 | 21% | Uninformative |
| *Aegiceras corniculatum* | 1 | 14% | 2 | 1% | Uninformative |
| *Apium prostratum* | 2 | 18% | 2 | 1% | Uninformative |
| *Atriplex australasica* | 1 | 18% | 2 | 0% | Uninformative |
| *Avicennia marina* subsp. *australasica* | 2 | 32% | 4 | 1% | Positive diagnostic |
| *Banksia integrifolia* | 1 | 11% | 2 | 9% | Uninformative |
| *Baumea juncea* | 2 | 46% | 2 | 3% | Positive diagnostic |
| *Casuarina glauca* | 4 | 93% | 2 | 6% | Positive diagnostic |
| *Commelina cyanea* | 1 | 21% | 2 | 8% | Uninformative |
| *Dodonaea triquetra* | 1 | 11% | 2 | 23% | Uninformative |
| *Ficinia nodosa* | 2 | 25% | 2 | 2% | Positive diagnostic |
| *Glochidion ferdinandi* | 1 | 11% | 2 | 13% | Uninformative |
| *Goodenia ovata* | 1 | 11% | 2 | 2% | Uninformative |
| *Juncus kraussii* subsp. *australiensis* | 2 | 82% | 2 | 2% | Positive diagnostic |
| *Livistona australis* | 1 | 11% | 2 | 10% | Uninformative |
| *Lobelia anceps* | 1 | 18% | 2 | 2% | Uninformative |
| *Parsonsia straminea* | 1 | 14% | 1 | 5% | Uninformative |
| *Phragmites australis* | 2 | 25% | 3 | 3% | Positive diagnostic |
| *Pittosporum undulatum* | 2 | 18% | 2 | 25% | Uninformative |
| *Samolus repens* | 2 | 36% | 2 | 1% | Positive diagnostic |
| *Sarcocornia quinqueflora* subsp. *quinqueflora* | 1 | 18% | 2 | 1% | Uninformative |
| *Suaeda australis* | 2 | 39% | 3 | 0% | Positive diagnostic |
| *Tetragonia tetragonioides* | 2 | 39% | 2 | 1% | Positive diagnostic |

# HINTERLAND RIVERFLAT EUCALYPT FOREST <span style="float:right">S_FOW09</span>

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Coastal Floodplain Wetlands**
941: Mountain Blue Gum-Thin-leaved Stringybark Open Forest on River Flat Alluvium in the Burragorang Valley, Sydney Basin
HN553



## Description

Hinterland Riverflat Eucalypt Forest is a tall open eucalypt forest with a scattered mesic shrub layer and a grassy and herbaceous ground cover. It predominantly occurs along the sandy riverbanks of the Georges River and its tributaries. It also occurs on gentle, narrowly incised valleys that drain the north-west Woronora Plateau west from the Woronora River. It is dominated by both bangalay (*Eucalyptus botryoides*) and its hybrid with Sydney blue gum (*Eucalyptus botryoides <--> saligna)* and at its tallest may reach over 35 metres in height. Outside of the Sydney metropolitan area it includes a higher number of tree species such as river peppermint (*Eucalyptus elata*). An open layer of small trees features a number of wattles of which coast myall (*Acacia binervia*) is most common. The hardy rainforest trees grey myrtle (*Backhousia myrtifolia*) and sweet pittosporum also occur. On the banks of the Georges River the small tree layer may include dense stands of the exotic small-leaved privet (*Ligustrum sinense*); smaller shrubs may have a reduced cover and diversity as a result. Invariably however, bracken fern (*Pteridium esculentum*) occurs above an abundant cover of grasses.

Hinterland Riverflat Eucalypt Forest is situated in gullies that are slightly protected by the incised drainage channel; these are elevated alluvial systems with a greater proportion of sandy material in the soil than the true broad floodplains of the Georges River and western Sydney. This community is restricted to elevations between 9 and 15 metres above sea level and mean annual rainfall between 850 and 950 millimetres. It is also known to occur on the Nepean River (Benson and Howell 1990), although regional classifications include it as part of the Cumberland Riverflat Forests.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Trees | 26 m ±4 <br> 20-30 | 30% ±11 <br> 15-50 | *Angophora floribunda, Eucalyptus botryoides <--> saligna* |
| Small Trees | 8 m ±3 <br> 2-12 | 23% ±12 <br> 5-45 | *Acacia binervia, Bursaria spinosa, Backhousia myrtifolia* |
| Shrubs | 4.0 m ±1.0 <br> 3.0-5.0 | 19% ±7 <br> 10-30 | *Phebalium squamulosum, Dodonaea triquetra, Polyscias sambucifolia, Acacia parramattensis, Melaleuca linariifolia, Phyllanthus gunnii* |
| Ground Covers | 0.9 m ±0.5 <br> 0.4-2.0 | 66% ±26 <br> 30-90 | *Microlaena stipoides* var. *stipoides, Pteridium esculentum, Lomandra longifolia, Pratia purpurascens, Austrostipa ramosissima, Entolasia marginata, Imperata cylindrica* var. *major, Poa affinis, Oplismenus aemulus, Adiantum aethiopicum, Centella asiatica, Dichondra repens, Lepidosperma laterale* |
| Vines & Climbers | N/A | N/A | *Billardiera scandens, Sigesbeckia orientalis, Cassytha pubescens, Glycine microphylla, Smilax glyciphylla* |

*Compiled from 9 sites with structural data recorded.

## Threats

Threats are high. Clearing is unlikely to have depleted this forest as extensively as other riverflat forests given the narrow areas of habitat and less fertile soils. However urban and industrial land use surrounds most stands and a large proportion of remnants are now characterised by a cover of invasive weeds. Altered drainage patterns, water pollution, increased sedimentation and frequent fire remain pervasive threats.

## Conservation Status

Hinterland Riverflat Eucalypt Forest is a component of River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 26,500-106,000 hectares |
| Estimated percentage cleared | Not available | 80-95% |
| Total NPWS reserves | 8.2 +<.1 hectares<br>3% of extant area | 150 hectares<br>3% of extant area<br><2% of pre-clearing area |
| Total reserved | 26.0 +0.3 hectares<br>10% of extant area | Not available |
| Total non-reserved | 233 +4.8 hectares | Not available |
| Total extant | 259 hectares | 5300 hectares |

*As this forest is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o   Banks of the Georges River, Cambridge Street, Glenfield, Campbelltown LGA

## Species Richness

| Number of sites | 16 |
|---|---|
| Total native species | 175 |
| Average no. native species per site | 31.3 ±7.1 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

This forest is closely related to riverflat forests found on the Cumberland Plain and nearby on the Georges River (S_FoW06). However the Cumberland forests (S_FoW06) have fewer mesic small trees and shrubs and a different combination of tree species. On riverflat communities near the coast rainfall is higher and this supports a suite of mesic species such as cabbage tree palm (*Livistona australis*) (S_FoW01)

Hinterland Riverflat Eucalypt Forest grades into Cumberland Riverflat Forest (S_FoW06) at elevations below eight metres above sea level and on broader floodplains.

## Accuracy

Sampling density is moderate. Map unit boundaries were interpreted from digital imagery to identify eucalypt-dominated forests on hinterland flats and gullies.

A 0.04 hectare site located in this map unit is expected to contain at least 7 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 24 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia binervia* | 3 | 38% | 2 | 1% | Positive diagnostic |
| *Acacia floribunda* | 2 | 13% | 1 | 4% | Uninformative |
| *Acacia longifolia* | 2 | 25% | 2 | 21% | Uninformative |
| *Acacia parramattensis* | 2 | 25% | 1 | 5% | Positive diagnostic |
| *Acacia parvipinnula* | 3 | 13% | 2 | 1% | Uninformative |
| *Adiantum aethiopicum* | 3 | 38% | 2 | 7% | Positive diagnostic |
| *Angophora floribunda* | 2 | 19% | 2 | 4% | Uninformative |
| *Astrotricha latifolia* | 1 | 13% | 2 | 1% | Uninformative |
| *Austrostipa ramosissima* | 2 | 44% | 1 | 0% | Positive diagnostic |
| *Backhousia myrtifolia* | 3 | 25% | 2 | 2% | Positive diagnostic |
| *Banksia spinulosa* | 1 | 13% | 2 | 26% | Uninformative |
| *Baumea juncea* | 2 | 13% | 2 | 4% | Uninformative |
| *Beyeria viscosa* | 1 | 13% | 2 | 0% | Uninformative |
| *Billardiera scandens* | 2 | 50% | 1 | 37% | Constant |
| *Breynia oblongifolia* | 2 | 25% | 1 | 17% | Uninformative |
| *Bursaria spinosa* | 1 | 25% | 2 | 12% | Uninformative |
| *Callistemon salignus* | 3 | 13% | 1 | 1% | Uninformative |
| *Calochlaena dubia* | 2 | 31% | 2 | 16% | Uninformative |
| *Cassytha glabella* | 2 | 19% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 1 | 25% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 1 | 19% | 2 | 7% | Uninformative |
| *Centella asiatica* | 2 | 38% | 2 | 6% | Positive diagnostic |
| *Clematis aristata* | 2 | 19% | 1 | 7% | Uninformative |
| *Clematis glycinoides* | 1 | 25% | 2 | 6% | Uninformative |
| *Commelina cyanea* | 2 | 19% | 2 | 9% | Uninformative |
| *Convolvulus erubescens* | 2 | 13% | 2 | 1% | Uninformative |
| *Correa reflexa* | 1 | 19% | 1 | 5% | Uninformative |
| *Desmodium varians* | 2 | 13% | 2 | 9% | Uninformative |
| *Dianella caerulea* | 2 | 50% | 2 | 45% | Constant |
| *Dichelachne crinita* | 2 | 13% | 1 | 0% | Uninformative |
| *Dichelachne micrantha* | 2 | 13% | 2 | 9% | Uninformative |
| *Dichondra repens* | 2 | 38% | 2 | 14% | Constant |
| *Dodonaea triquetra* | 2 | 56% | 2 | 23% | Positive diagnostic |
| *Echinopogon caespitosus* | 2 | 31% | 2 | 11% | Uninformative |
| *Echinopogon ovatus* | 2 | 31% | 2 | 6% | Positive diagnostic |
| *Einadia hastata* | 1 | 25% | 2 | 4% | Positive diagnostic |
| *Entolasia marginata* | 2 | 63% | 2 | 22% | Positive diagnostic |
| *Entolasia stricta* | 2 | 38% | 2 | 59% | Constant |
| *Eucalyptus amplifolia* subsp. *amplifolia* | 4 | 13% | 3 | 0% | Uninformative |
| *Eucalyptus botryoides* | 4 | 19% | 3 | 5% | Uninformative |
| *Eucalyptus botryoides <--> saligna* | 4 | 25% | 3 | 0% | Positive diagnostic |
| *Eucalyptus piperita* | 1 | 19% | 3 | 20% | Uninformative |
| *Eucalyptus punctata* | 3 | 13% | 2 | 11% | Uninformative |
| *Eucalyptus resinifera* subsp. *resinifera* | 2 | 31% | 1 | 5% | Positive diagnostic |
| *Eucalyptus tereticornis* | 3 | 19% | 2 | 5% | Uninformative |
| *Ficinia nodosa* | 3 | 13% | 2 | 2% | Uninformative |
| *Gahnia aspera* | 2 | 13% | 1 | 3% | Uninformative |
| *Gahnia sieberiana* | 2 | 13% | 2 | 7% | Uninformative |
| *Glycine clandestina* | 2 | 19% | 2 | 18% | Uninformative |
| *Glycine microphylla* | 2 | 38% | 2 | 9% | Positive diagnostic |
| *Glycine tabacina* | 2 | 19% | 2 | 8% | Uninformative |
| *Gonocarpus longifolius* | 2 | 13% | 1 | 0% | Uninformative |
| *Gonocarpus teucrioides* | 2 | 19% | 2 | 23% | Uninformative |
| *Goodenia ovata* | 3 | 13% | 2 | 2% | Uninformative |
| *Hemarthria uncinata* | 6 | 13% | 2 | 1% | Uninformative |
| *Hibbertia aspera* | 2 | 13% | 2 | 11% | Uninformative |
| *Hibbertia diffusa* | 2 | 13% | 2 | 3% | Uninformative |
| *Hydrocotyle peduncularis* | 3 | 13% | 2 | 6% | Uninformative |
| *Imperata cylindrica* var. *major* | 2 | 75% | 2 | 20% | Positive diagnostic |
| *Kennedia rubicunda* | 1 | 19% | 1 | 9% | Uninformative |
| *Lepidosperma laterale* | 2 | 50% | 2 | 42% | Constant |
| *Leptomeria acida* | 2 | 13% | 1 | 6% | Uninformative |
| *Leptospermum polygalifolium* | 2 | 19% | 2 | 14% | Uninformative |
| *Lomandra longifolia* | 2 | 63% | 2 | 47% | Constant |
| *Lomatia myricoides* | 2 | 19% | 2 | 3% | Uninformative |
| *Melaleuca linariifolia* | 3 | 44% | 2 | 3% | Positive diagnostic |
| *Melicytus dentatus* | 2 | 19% | 1 | 0% | Uninformative |
| *Microlaena stipoides* var. *stipoides* | 3 | 94% | 2 | 35% | Positive diagnostic |
| *Myrsine variabilis* | 2 | 13% | 1 | 8% | Uninformative |
| *Notelaea longifolia* | 2 | 25% | 1 | 21% | Uninformative |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Oplismenus aemulus* | 2 | 56% | 2 | 9% | Positive diagnostic |
| *Oxalis perennans* | 2 | 25% | 2 | 7% | Uninformative |
| *Pandorea pandorana* | 1 | 19% | 2 | 16% | Uninformative |
| *Pelargonium inodorum* | 1 | 13% | 1 | 1% | Uninformative |
| *Persoonia linearis* | 2 | 19% | 1 | 20% | Uninformative |
| *Phebalium squamulosum* | 2 | 38% | 2 | 2% | Positive diagnostic |
| *Phragmites australis* | 2 | 19% | 3 | 3% | Uninformative |
| *Phyllanthus gunnii* | 2 | 25% | 1 | 1% | Positive diagnostic |
| *Pittosporum revolutum* | 2 | 13% | 1 | 9% | Uninformative |
| *Pittosporum undulatum* | 2 | 19% | 2 | 25% | Uninformative |
| *Poa affinis* | 2 | 81% | 2 | 10% | Positive diagnostic |
| *Polyscias sambucifolia* | 2 | 31% | 1 | 15% | Uninformative |
| *Pomaderris ferruginea* | 2 | 19% | 1 | 2% | Uninformative |
| *Pomaderris intermedia* | 1 | 13% | 1 | 1% | Uninformative |
| *Poranthera microphylla* | 2 | 25% | 2 | 7% | Uninformative |
| *Pratia purpurascens* | 2 | 75% | 2 | 17% | Positive diagnostic |
| *Pseuderanthemum variabile* | 2 | 13% | 2 | 12% | Uninformative |
| *Pteridium esculentum* | 3 | 94% | 2 | 40% | Positive diagnostic |
| *Pultenaea retusa* | 1 | 13% | 2 | 2% | Uninformative |
| *Schoenus melanostachys* | 2 | 31% | 2 | 6% | Positive diagnostic |
| *Senecio hispidulus* | 1 | 38% | 1 | 2% | Positive diagnostic |
| *Sigesbeckia orientalis* subsp. *orientalis* | 2 | 31% | 2 | 2% | Positive diagnostic |
| *Smilax glyciphylla* | 2 | 38% | 2 | 33% | Constant |
| *Solanum prinophyllum* | 2 | 19% | 1 | 5% | Uninformative |
| *Stenocarpus salignus* | 1 | 19% | 2 | 1% | Uninformative |
| *Themeda australis* | 2 | 19% | 2 | 23% | Uninformative |
| *Tristaniopsis laurina* | 1 | 13% | 2 | 3% | Uninformative |
| *Veronica plebeia* | 2 | 25% | 1 | 7% | Uninformative |
| *Wahlenbergia gracilis* | 2 | 19% | 1 | 8% | Uninformative |

# COASTAL SWAMP PAPERBARK-SWAMP OAK SCRUB <span style="float:right">S_FoW12</span>

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Coastal Floodplain Wetlands**
1236: Swamp Paperbark-Swamp Oak Tall Shrubland on Estuarine Flats, Sydney Basin and South East Corner
ME051; SR651; HU944



## Description

Dense stands of swamp paperbark (*Melaleuca ericifolia*) form a low open to closed wet scrub on coastal estuarine flats and on the margins of lagoons. Swamp oak (*Casuarina glauca*) may form a component of the scrub layer, or appear as an emergent layer as isolated individuals or as clumps of trees. These low-lying sites are periodically flooded by brackish and/or freshwater. The ground layer has a very diverse and abundant cover of sedges, rushes and taller reeds. Most common are twig-rushes (*Baumea* spp.) and common reed (*Phragmites australis*). These are species that can tolerate water with saline influence.

In the Sydney area the community is concentrated in proximity to the estuarine systems of the Georges River and the margins of Narrabeen Lakes. All sample sites are situated at elevations less than five metres above sea level. Small areas are found near brackish lagoons such as Martons Swamp in Kurnell. It occurs elsewhere along the central (NPWS 2000c) and south coasts (Tozer et al. 2010) of New South Wales.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Emergent | 11 m ±6<br>4-20 | 26% ±22<br>5-60 | *Casuarina glauca* |
| Shrubs | 4.9 m ±2.6<br>2.0-10.0 | 50% ±26<br>5-70 | *Melaleuca ericifolia, Homalanthus populifolius, Glochidion ferdinandi, Acacia longifolia, Banksia integrifolia* |
| Ground Covers | 1.1 m ±0.9<br>0.3-3.0 | 48% ±32<br>2-95 | *Baumea juncea, Phragmites australis, Entolasia marginata, Imperata cylindrica* var. *major, Triglochin procera, Viola hederacea, Baumea articulata, Blechnum indicum, Gahnia sieberiana, Gonocarpus micranthus, Hypolepis muelleri, Lobelia anceps* |
| Vines & Climbers | N/A | N/A | *Parsonsia straminea, Stephania japonica* |

*Compiled from 8 sites with structural data recorded.

## Threats

Coastal sand flats have been extensively cleared and modified at the Kurnell Peninsula, Botany, Sans Souci and around the lagoon systems of the northern beaches. The NSW Scientific Committee (2001) consider these threats will continue to persist. Habitat degradation resulting from altered hydrology/nutrient levels, weed invasion, off-road vehicles, illegal waste dumping and sand extraction continue to threaten this community (NSW Scientific Committee 2001).

## Conservation Status

Coastal Swamp Paperbark-Swamp Oak Scrub is a component of Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act.

This vegetation community is represented in Royal NP and Kamay Botany Bay NP.

|  | Within Study Area | Within Sydney Basin* |
|---|---|---|
| Estimate of pre-clearing area | Not available | 5300-12,000 hectares |
| Estimated percentage cleared | Not available | 30-70% |
| Total NPWS reserves | 6.7 +0.1 hectares<br>15% of extant area | 480 hectares<br>13% of extant area<br><15% of pre-clearing area |
| Total reserved | 21.5 +0.1 hectares<br>49% of extant area | Not available |
| Total non-reserved | 22.8 +0.7 hectares | Not available |
| Total extant | 44.3 hectares | Est. 3700 hectares |

*As this scrub is only a component of the equivalent regional community, these figures overestimate the regional extent.



## Example Locations

o  Dee Why Lagoon Wildlife Refuge, Warringah LGA

o  Deep Creek, Narrabeen, Warringah LGA

o  Yarmouth Swamp, Bundeena, Sutherland LGA

## Species Richness

| | |
|---|---|
| Number of sites | 22 |
| Total native species | 139 |
| Average no. native species per site | 17.7 ±8.6 |

## Variations and Dynamics

Some sites support a prominent component of swamp oak with a dense understorey of swamp paperbark.

## Relationship to Other Communities

This community is related to other forested and freshwater wetlands found on coastal floodplains. These include forests (S_FoW08) and wetlands (S_FrW19).

## Accuracy

Sampling density is high. Map boundaries relied on the identification of alluvial flats and lagoons below 10 metres above sea level. Low scrubs and swamp oak forests fringing lagoons and swales were used to identify candidate areas. Presence or absence of woody vegetation was used to separate open sedgelands from scrubs and forests.

A 0.04 hectare site located in this map unit is expected to contain at least 3 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 12 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia longifolia* | 1 | 27% | 2 | 21% | Uninformative |
| *Apium prostratum* | 2 | 23% | 2 | 1% | Positive diagnostic |
| *Banksia integrifolia* | 2 | 18% | 2 | 9% | Uninformative |
| *Baumea articulata* | 2 | 14% | 2 | 1% | Uninformative |
| *Baumea juncea* | 4 | 95% | 2 | 3% | Positive diagnostic |
| *Cassytha pubescens* | 2 | 27% | 2 | 27% | Uninformative |
| *Casuarina glauca* | 3 | 91% | 2 | 6% | Positive diagnostic |
| *Centella asiatica* | 1 | 18% | 2 | 6% | Uninformative |
| *Commelina cyanea* | 1 | 23% | 2 | 8% | Uninformative |
| *Dodonaea triquetra* | 1 | 18% | 2 | 23% | Uninformative |
| *Eleocharis sphacelata* | 2 | 14% | 2 | 1% | Uninformative |
| *Entolasia marginata* | 2 | 45% | 2 | 22% | Constant |
| *Gahnia clarkei* | 2 | 23% | 2 | 3% | Positive diagnostic |
| *Gahnia sieberiana* | 2 | 18% | 2 | 7% | Uninformative |
| *Glochidion ferdinandi* | 2 | 27% | 1 | 13% | Uninformative |
| *Goodenia ovata* | 1 | 32% | 2 | 2% | Positive diagnostic |
| *Hakea teretifolia* | 1 | 14% | 2 | 16% | Uninformative |
| *Hemarthria uncinata* | 2 | 27% | 2 | 1% | Positive diagnostic |
| *Hydrocotyle peduncularis* | 1 | 14% | 2 | 6% | Uninformative |
| *Hypolepis muelleri* | 2 | 36% | 2 | 5% | Positive diagnostic |
| *Imperata cylindrica* var. *major* | 1 | 27% | 2 | 20% | Uninformative |
| *Juncus kraussii* subsp. *australiensis* | 2 | 36% | 2 | 2% | Positive diagnostic |
| *Kunzea ambigua* | 3 | 18% | 2 | 15% | Uninformative |
| *Leptospermum juniperinum* | 2 | 23% | 2 | 2% | Positive diagnostic |
| *Lobelia anceps* | 1 | 36% | 2 | 2% | Positive diagnostic |
| *Melaleuca ericifolia* | 3 | 64% | 2 | 1% | Positive diagnostic |
| *Melaleuca linariifolia* | 2 | 18% | 2 | 3% | Uninformative |
| *Melaleuca nodosa* | 1 | 14% | 2 | 5% | Uninformative |
| *Omalanthus nutans* | 1 | 32% | 1 | 9% | Positive diagnostic |
| *Opercularia aspera* | 1 | 14% | 1 | 8% | Uninformative |
| *Parsonsia straminea* | 2 | 36% | 1 | 4% | Positive diagnostic |
| *Phragmites australis* | 3 | 73% | 3 | 2% | Positive diagnostic |
| *Pittosporum undulatum* | 1 | 14% | 2 | 25% | Uninformative |
| *Samolus repens* | 2 | 23% | 2 | 2% | Positive diagnostic |
| *Schoenus brevifolius* | 1 | 14% | 2 | 4% | Uninformative |
| *Selaginella uliginosa* | 1 | 14% | 2 | 4% | Uninformative |
| *Stephania japonica* | 1 | 27% | 1 | 6% | Positive diagnostic |
| *Tetragonia tetragonioides* | 2 | 18% | 2 | 2% | Uninformative |
| *Triglochin procera* | 2 | 18% | 1 | 1% | Uninformative |
| *Viola hederacea* | 2 | 27% | 2 | 6% | Positive diagnostic |

# COASTAL SANDSTONE RIPARIAN SCRUB

## S_FoW20

**Statewide Class**
NSW Plant Community Type:

Biometric Number(s):

**Eastern Riverine Forests**
1292: Water Gum-Coachwood Riparian Scrub Along Sandstone Streams, Sydney Basin
HN607; ME035; SR660



## Description

This low scrub comprises a mix of hardy shrubs growing on rocky creek lines or shallow alluvial soils at the base of deep sandstone gully systems. The vegetation cover is highly variable as it is interspersed by rock pools, rock pavements and open sandy banks. It is a zone of occasional flooding and plants must survive fast-moving waters to persist. Water gums (*Tristaniopsis laurina*, *Tristania neriifolia*) are invariably present, often in combination with wattles, hakeas, grevilleas, tea-trees and casuarinas. Two shrub species, river lomatia (*Lomatia myricoides*) and blunt-leaved wattle (*Acacia obtusifolia*), are particularly common in this community; both are easily distinguished by their long leaves. Small moisture-loving ferns and sedges may form dense clumps on or near stream banks. A sparse cover of overhanging eucalypts may also be present, though these are often rooted in the adjoining slopes rather than the creek line itself.

These narrow strips of riparian vegetation are widespread across the Sydney Basin Bioregion but are naturally restricted in area.

## Floristic Summary*

|  | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Small Trees | 8 m ±3<br>6-10 | 31% ±42<br>1-60 | *Tristaniopsis laurina, Acacia obtusifolia, Allocasuarina littoralis, Ceratopetalum apetalum, Stenocarpus salignus, Tristania neriifolia* |
| Shrubs | 2.5 m ±0.7<br>2.0-3.0 | 10% ±7<br>5-15 | *Lomatia myricoides, Grevillea oleoides, Leptospermum morrisonii, Leionema dentatum, Pseudanthus pimeleoides Dodonaea triquetra, Hakea salicifolia, Persoonia pinifolia, Daviesia corymbosa* |
| Ground Covers | 1.0 m ±0.0<br>1.0-1.0 | 7% ±5<br>3-10 | *Lomandra fluviatilis, Schoenus melanostachys, Sticherus flabellatus, Bauera rubioides, Entolasia stricta, Lomandra longifolia, Xanthosia tridentata, Gleichenia microphylla* |

*Compiled from 2 sites with structural data recorded.

## Threats

Sites situated near urban areas are threatened by weed infestation (including garden escapees) and rubbish dumping.

## Conservation Status

A large proportion of the extant area of this community is represented in the reserve system in the Sydney metropolitan area. A similar pattern exists across the Sydney Basin Bioregion.

This vegetation community is represented in Royal NP, Heathcote NP, Garawarra SCA, Garigal, NP, Lane Cove NP and Georges River NP.

| | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | <3220 hectares |
| Estimated percentage cleared | Not available | <10% |
| Total NPWS reserves | 241 +<.1 hectares<br>41% of extant area | 1300 hectares<br>>90% of extant area<br>30-50% of pre-clearing area |
| Total reserved | 272 +0 hectares<br>46% of extant area | Not available |
| Total non-reserved | 314 +<.1 hectares | Not available |
| Total extant | 586 hectares | 2900 hectares |



## Example Locations

o   Upper Woronora River, Engadine

o   Woolwash, upper Georges River, Airds, Campbelltown LGA

## Species Richness

| | |
|---|---|
| Number of sites | 15 |
| Total native species | 203 |
| Average no. native species per site | 41.1 ±12.7 |

## Variations and Dynamics

Some subtle floristic changes occur within this community as rainfall decreases from the eastern to western sections of the sandstone plateaus. Dry rocky gorges in the upper Georges River and its tributaries may include sparse stunted stands of river oak (*Casuarina cunninghamiana*).

## Relationship to Other Communities

Floristically this community is related to other sandstone gully scrub and rainforest (S_RF02, S_DSF08). This community grades into surrounding eucalypt forests that are found in sheltered environments (S_DSF17, S_DSF09).

## Accuracy

Sampling density is moderate. This map unit has been sampled across the mapped range of the community. Mapped boundaries are drawn from new image interpretation and existing mapping for the Woronora Plateau (NPWS 2003b, Keith and Tozer unpublished, Keith 1994). This community is narrow and often hidden beneath a eucalypt canopy particularly in minor streams. As a result some small patches may have been overlooked. Some mapped sections may include examples of other riparian communities (S_RF02, S_DSF08).

A 0.04 hectare site located in this map unit is expected to contain at least 16 positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is 33 or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Acacia floribunda* | 2 | 33% | 1 | 3% | Positive diagnostic |
| *Acacia irrorata* | 2 | 13% | 1 | 3% | Uninformative |
| *Acacia linifolia* | 1 | 13% | 2 | 20% | Uninformative |
| *Acacia longifolia* | 2 | 20% | 2 | 21% | Uninformative |
| *Acacia longissima* | 1 | 20% | 2 | 2% | Positive diagnostic |
| *Acacia obtusifolia* | 2 | 80% | 2 | 1% | Positive diagnostic |
| *Acacia terminalis* | 1 | 33% | 1 | 20% | Uninformative |
| *Acacia ulicifolia* | 2 | 13% | 1 | 26% | Uninformative |
| *Actinotus minor* | 2 | 13% | 2 | 22% | Uninformative |
| *Adiantum aethiopicum* | 2 | 13% | 2 | 7% | Uninformative |
| *Allocasuarina littoralis* | 2 | 73% | 2 | 27% | Positive diagnostic |
| *Allocasuarina torulosa* | 1 | 13% | 2 | 10% | Uninformative |
| *Aotus ericoides* | 1 | 20% | 2 | 8% | Uninformative |
| *Austromyrtus tenuifolia* | 1 | 40% | 2 | 1% | Positive diagnostic |
| *Backhousia myrtifolia* | 2 | 27% | 2 | 2% | Positive diagnostic |
| *Baeckea linifolia* | 1 | 20% | 2 | 2% | Positive diagnostic |
| *Bauera rubioides* | 2 | 53% | 2 | 6% | Positive diagnostic |
| *Baumea juncea* | 2 | 13% | 2 | 4% | Uninformative |
| *Bertya pomaderroides* | 1 | 20% | 2 | 0% | Positive diagnostic |
| *Billardiera scandens* | 1 | 33% | 1 | 37% | Uninformative |
| *Bossiaea rhombifolia* subsp. *rhombifolia* | 2 | 13% | 1 | 0% | Uninformative |
| *Bursaria spinosa* | 1 | 20% | 2 | 12% | Uninformative |
| *Callistemon citrinus* | 1 | 40% | 2 | 3% | Positive diagnostic |
| *Calytrix tetragona* | 2 | 20% | 2 | 3% | Positive diagnostic |
| *Cassytha glabella* | 1 | 20% | 2 | 14% | Uninformative |
| *Cassytha pubescens* | 2 | 27% | 2 | 27% | Uninformative |
| *Caustis pentandra* | 1 | 27% | 2 | 5% | Positive diagnostic |
| *Ceratopetalum apetalum* | 2 | 73% | 3 | 5% | Positive diagnostic |
| *Ceratopetalum gummiferum* | 2 | 27% | 2 | 17% | Uninformative |
| *Chordifex dimorphus* | 2 | 33% | 2 | 4% | Positive diagnostic |
| *Chorizandra cymbaria* | 1 | 13% | 2 | 1% | Uninformative |
| *Dampiera purpurea* | 1 | 27% | 1 | 4% | Positive diagnostic |
| *Darwinia fascicularis* | 1 | 13% | 2 | 6% | Uninformative |
| *Daviesia corymbosa* | 2 | 53% | 1 | 2% | Positive diagnostic |
| *Dodonaea triquetra* | 2 | 60% | 2 | 23% | Positive diagnostic |
| *Doryanthes excelsa* | 2 | 13% | 2 | 9% | Uninformative |
| *Drosera spatulata* | 1 | 33% | 2 | 3% | Positive diagnostic |
| *Empodisma minus* | 1 | 13% | 2 | 5% | Uninformative |
| *Entolasia marginata* | 2 | 20% | 2 | 22% | Uninformative |
| *Entolasia stricta* | 2 | 53% | 2 | 59% | Constant |
| *Epacris pulchella* | 1 | 13% | 2 | 16% | Uninformative |
| *Eucalyptus agglomerata* | 1 | 13% | 2 | 1% | Uninformative |
| *Eucalyptus piperita* | 2 | 13% | 3 | 20% | Uninformative |
| *Eucalyptus punctata* | 2 | 13% | 2 | 11% | Uninformative |
| *Euryomyrtus ramosissima* subsp. *ramosissima* | 1 | 20% | 2 | 2% | Positive diagnostic |
| *Gahnia clarkei* | 2 | 27% | 1 | 4% | Positive diagnostic |
| *Gleichenia dicarpa* | 2 | 13% | 2 | 7% | Uninformative |
| *Gleichenia microphylla* | 2 | 47% | 2 | 1% | Positive diagnostic |
| *Gompholobium grandiflorum* | 1 | 20% | 1 | 9% | Uninformative |
| *Gonocarpus teucrioides* | 1 | 27% | 2 | 23% | Uninformative |
| *Grevillea longifolia* | 1 | 27% | 2 | 0% | Positive diagnostic |
| *Grevillea mucronulata* | 1 | 33% | 2 | 6% | Positive diagnostic |
| *Grevillea oleoides* | 2 | 93% | 2 | 6% | Positive diagnostic |
| *Hakea dactyloides* | 1 | 27% | 2 | 24% | Uninformative |
| *Hakea salicifolia* | 2 | 60% | 2 | 2% | Positive diagnostic |
| *Hakea sericea* | 2 | 13% | 2 | 21% | Uninformative |
| *Hibbertia nitida* | 1 | 27% | 1 | 3% | Positive diagnostic |
| *Isopogon anethifolius* | 2 | 13% | 2 | 5% | Uninformative |
| *Juncus continuus* | 1 | 13% | 1 | 1% | Uninformative |
| *Juncus planifolius* | 2 | 13% | 2 | 1% | Uninformative |
| *Kunzea ambigua* | 2 | 20% | 2 | 15% | Uninformative |
| *Lasiopetalum ferrugineum* | 1 | 20% | 2 | 11% | Uninformative |
| *Leionema dentatum* | 1 | 73% | 2 | 2% | Positive diagnostic |
| *Lepidosperma neesii* | 1 | 20% | 2 | 1% | Positive diagnostic |
| *Leptospermum morrisonii* | 2 | 80% | 1 | 0% | Positive diagnostic |
| *Leptospermum polygalifolium* | 2 | 27% | 2 | 14% | Uninformative |
| *Logania albiflora* | 2 | 13% | 1 | 2% | Uninformative |
| *Lomandra filiformis* | 1 | 13% | 2 | 23% | Uninformative |
| *Lomandra fluviatilis* | 2 | 80% | 2 | 1% | Positive diagnostic |

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Lomandra longifolia* | 2 | 47% | 2 | 47% | Constant |
| *Lomatia myricoides* | 2 | 93% | 2 | 3% | Positive diagnostic |
| *Micrantheum hexandrum* | 2 | 47% | 2 | 0% | Positive diagnostic |
| *Monotoca elliptica* | 1 | 20% | 2 | 7% | Uninformative |
| *Monotoca scoparia* | 1 | 47% | 1 | 16% | Positive diagnostic |
| *Morinda jasminoides* | 2 | 20% | 2 | 7% | Uninformative |
| *Notelaea longifolia* | 1 | 20% | 1 | 21% | Uninformative |
| *Oplismenus imbecillis* | 2 | 13% | 2 | 13% | Uninformative |
| *Persicaria decipiens* | 1 | 13% | 2 | 1% | Uninformative |
| *Persoonia levis* | 2 | 13% | 1 | 33% | Uninformative |
| *Persoonia pinifolia* | 1 | 60% | 2 | 21% | Positive diagnostic |
| *Petrophile pedunculata* | 1 | 13% | 2 | 1% | Uninformative |
| *Petrophile pulchella* | 1 | 20% | 2 | 16% | Uninformative |
| *Phebalium squamulosum* | 1 | 20% | 2 | 3% | Positive diagnostic |
| *Philydrum lanuginosum* | 1 | 13% | 2 | 0% | Uninformative |
| *Pittosporum undulatum* | 1 | 20% | 2 | 25% | Uninformative |
| *Poa affinis* | 2 | 13% | 2 | 11% | Uninformative |
| *Pomaderris elliptica* subsp. *elliptica* | 1 | 20% | 1 | 1% | Positive diagnostic |
| *Pomaderris intermedia* | 1 | 33% | 1 | 1% | Positive diagnostic |
| *Pomaderris lanigera* | 1 | 20% | 1 | 1% | Positive diagnostic |
| *Prostanthera linearis* | 2 | 13% | 2 | 1% | Uninformative |
| *Pseudanthus pimeleoides* | 2 | 67% | 2 | 0% | Positive diagnostic |
| *Pultenaea flexilis* | 1 | 40% | 2 | 6% | Positive diagnostic |
| *Santalum obtusifolium* | 1 | 13% | 1 | 0% | Uninformative |
| *Schoenus melanostachys* | 2 | 53% | 2 | 6% | Positive diagnostic |
| *Smilax glyciphylla* | 1 | 33% | 2 | 33% | Uninformative |
| *Stenocarpus salignus* | 2 | 73% | 1 | 1% | Positive diagnostic |
| *Sticherus flabellatus* var. *flabellatus* | 2 | 60% | 2 | 3% | Positive diagnostic |
| *Themeda australis* | 2 | 13% | 2 | 23% | Uninformative |
| *Todea barbara* | 1 | 13% | 2 | 2% | Uninformative |
| *Triglochin procera* | 1 | 33% | 1 | 1% | Positive diagnostic |
| *Tristania neriifolia* | 2 | 53% | 1 | 1% | Positive diagnostic |
| *Tristaniopsis laurina* | 3 | 93% | 2 | 2% | Positive diagnostic |
| *Viola hederacea* | 1 | 20% | 2 | 6% | Uninformative |
| *Wahlenbergia gracilis* | 2 | 13% | 1 | 8% | Uninformative |
| *Westringia longifolia* | 2 | 27% | 1 | 0% | Positive diagnostic |
| *Xanthosia pilosa* | 2 | 27% | 2 | 21% | Uninformative |
| *Xanthosia tridentata* | 1 | 60% | 2 | 21% | Positive diagnostic |
| *Zieria smithii* | 1 | 13% | 1 | 5% | Uninformative |

# SANDSTONE CLIFF-FACE SOAK                                      S_FoW21

**Statewide Class**                     **Eastern Riverine Forests**
NSW Plant Community Type:               1127: Sandstone Cliff Soak Moist Shrubland of the Sydney Basin
Biometric Number(s):                    HN580



## Description

Sandstone Cliff-face Soak (Tozer et al. 2010) is an open moist shrub community found amongst sandstone waterfalls and rock faces where underground seepage maintains year round moisture. It is widespread throughout the Sydney basin and has been recorded along the coast and up to 1000 metres above sea level (Tozer et al. 2010). The scattered shrub layer includes a mix of water-loving species such as flax-leaf heath myrtle (*Baeckea linifolia*) and the taller black wattle (*Callicoma serratifolia*), coachwood (*Ceratopetalum apetalum*) and water gums (*Tristaniopsis laurina, Tristania neriifolia*). One of the more distinctive shrubs is *Dracophyllum secundum,* a long slender-leaved species restricted to moist rock faces. Ferns are a feature of the rocky environment and at the two sample sites used for this project thirteen fern species were recorded. These range from the maidenhair ferns (*Adiantum* spp.) to fan ferns (*Sticherus* spp.), coral ferns (*Gleichenia* spp.), water ferns (*Blechnum* spp.) and the large king fern (*Todea barbara*). Sundews (*Drosera* spp.) are also present on the rock face.

Sandstone Cliff-face Soak is often overlooked as a unique community because it is difficult to map. It is patchy in distribution and often occupies only small areas amongst sandstone gully forests, rainforests and riparian scrub. In urban environments patches are vulnerable to weed infestation.

## Floristic Summary*

|               | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---------------|-----------------------------------|---------------------------------|-----------------|
| Trees         | Not available                     | Not available                   | *Callicoma serratifolia, Ceratopetalum apetalum, Tristania neriifolia* |
| Shrubs        | Not available                     | Not available                   | *Baeckea linifolia, Dracophyllum secundum, Todea barbara, Austromyrtus tenuifolia, Leucopogon amplexicaulis, Styphelia tubiflora* |
| Ground Covers | Not available                     | Not available                   | *Bauera rubioides, Drosera peltata, Drosera spatulata, Adiantum aethiopicum, Adiantum hispidulum, Blechnum ambiguum, Blechnum wattsii, Christella dentata, Gleichenia dicarpa, Gleichenia rupestris, Selaginella uliginosa* |

*Compiled from 0 sites with structural data recorded.

## Threats

Threats are low. Localised weed infestation occur as a result of urban runoff and adjoining clearing. Clearing is unlikely to have been extensive in this community itself due to the precipitous habitat.

## Conservation Status

This vegetation community is represented in most sandstone reserves of the Sydney metropolitan area including Lane Cove, Garigal, Royal and Sydney Harbour reserves.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 1.1 +<.1 hectares<br>92% of extant area | Not available |
| Total reserved | 1.1 +0 hectares<br>92% of extant area | Not available |
| Total non-reserved | 0.1 +<.1 hectares | Not available |
| Total extant | 1.2 hectares | Not available |



Map unit
Study area
Extant vegetation

## Example Locations

o   Deep Creek Reserve, Elanora Heights, Pittwater LGA

## Species Richness

| Number of sites | 2 |
|---|---|
| Total native species | 46 |
| Average no. native species per site | 26.5 ±4.9 |

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

This community is most similar to the sandstone riparian scrubs (S_FoW20) and rainforests (S_RF02) which it often adjoins.

## Accuracy

Sampling density is low. This community is often small in area and difficult to distinguish using aerial photography or available environmental layers. As a result it is likely that it occurs more frequently in the study area but will occupy only a small total area.

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as the number of sites used to define this map unit in the study area is too small.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Adiantum aethiopicum* | 1 | 50% | 2 | 7% | Constant |
| *Adiantum hispidulum* | 1 | 50% | 1 | 1% | Positive diagnostic |
| *Austromyrtus tenuifolia* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Baeckea linifolia* | 1 | 100% | 2 | 2% | Positive diagnostic |
| *Bauera rubioides* | 2 | 100% | 2 | 6% | Positive diagnostic |
| *Blechnum ambiguum* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Blechnum wattsii* | 2 | 50% | 2 | 0% | Positive diagnostic |
| *Callicoma serratifolia* | 1 | 100% | 2 | 5% | Positive diagnostic |
| *Ceratopetalum apetalum* | 1 | 50% | 2 | 5% | Constant |
| *Christella dentata* | 2 | 50% | 1 | 1% | Positive diagnostic |
| *Dillwynia retorta* | 1 | 50% | 2 | 26% | Constant |
| *Doodia caudata* | 1 | 50% | 2 | 1% | Positive diagnostic |
| *Dracophyllum secundum* | 2 | 100% | 2 | 1% | Positive diagnostic |
| *Drosera binata* | 1 | 50% | 1 | 1% | Positive diagnostic |
| *Drosera peltata* | 2 | 100% | 1 | 3% | Positive diagnostic |
| *Drosera spatulata* | 2 | 100% | 2 | 3% | Positive diagnostic |
| *Empodisma minus* | 1 | 50% | 2 | 5% | Constant |
| *Epacris crassifolia* | 1 | 50% | 1 | 0% | Positive diagnostic |
| *Epacris microphylla* | 1 | 50% | 2 | 10% | Constant |
| *Epacris obtusifolia* | 1 | 50% | 2 | 2% | Positive diagnostic |
| *Epacris pulchella* | 1 | 50% | 2 | 16% | Constant |
| *Eucalyptus longifolia* | 1 | 50% | 1 | 1% | Positive diagnostic |
| *Ficus rubiginosa* | 1 | 50% | 1 | 4% | Constant |
| *Gleichenia dicarpa* | 3 | 50% | 2 | 7% | Constant |
| *Gleichenia rupestris* | 3 | 50% | 2 | 1% | Positive diagnostic |
| *Gonocarpus teucrioides* | 1 | 50% | 2 | 23% | Constant |
| *Histiopteris incisa* | 1 | 50% | 1 | 1% | Positive diagnostic |
| *Hypolepis muelleri* | 1 | 50% | 2 | 5% | Constant |
| *Juncus continuus* | 1 | 50% | 1 | 1% | Positive diagnostic |
| *Kunzea ambigua* | 1 | 50% | 2 | 15% | Constant |
| *Lepidosperma filiforme* | 1 | 50% | 2 | 8% | Constant |
| *Leucopogon amplexicaulis* | 2 | 50% | 2 | 3% | Positive diagnostic |
| *Leucopogon microphyllus* | 1 | 50% | 2 | 13% | Constant |
| *Lobelia anceps* | 1 | 50% | 2 | 2% | Positive diagnostic |
| *Logania albiflora* | 1 | 50% | 1 | 2% | Positive diagnostic |
| *Psilotum nudum* | 1 | 50% | 1 | 1% | Positive diagnostic |
| *Pultenaea retusa* | 1 | 50% | 1 | 2% | Positive diagnostic |
| *Schoenus brevifolius* | 1 | 50% | 2 | 4% | Constant |
| *Selaginella uliginosa* | 2 | 50% | 2 | 4% | Constant |
| *Sprengelia incarnata* | 1 | 50% | 2 | 2% | Positive diagnostic |
| *Sticherus flabellatus* var. *flabellatus* | 1 | 50% | 2 | 4% | Constant |
| *Stylidium productum* | 1 | 50% | 2 | 5% | Constant |
| *Styphelia tubiflora* | 2 | 50% | 1 | 4% | Constant |
| *Todea barbara* | 3 | 100% | 1 | 2% | Positive diagnostic |
| *Tristania neriifolia* | 1 | 50% | 2 | 1% | Positive diagnostic |

| | |
|---|---|
| Estuarine Mangrove Forest | S_SW01 |
| Estuarine Saltmarsh | S_SW02 |
| Seagrass Meadows | S_SW03 |

# ESTUARINE MANGROVE FOREST

## S_SW01

**Statewide Class**      Mangrove Swamps

NSW Plant Community Type:      920: Mangrove Forest in Estuaries of the Sydney Basin and South East Corner

Biometric Number(s):      HN550; HU563; ME024; SR575; HU961
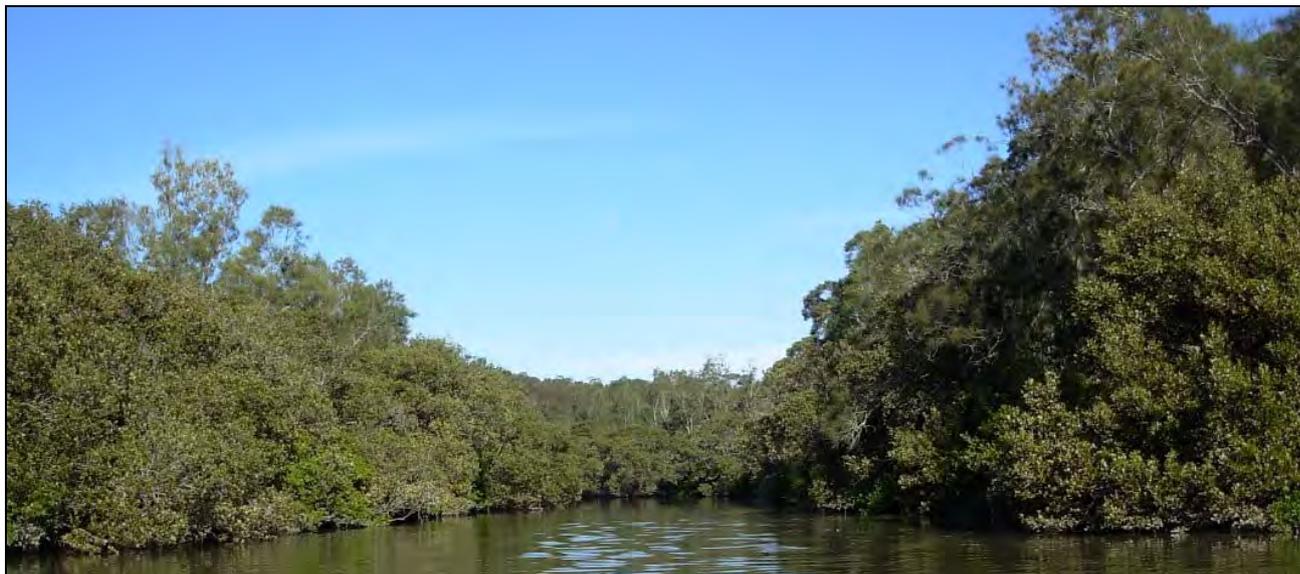


## Description

Stands of mangroves form a low closed to open forest on mudflats in Sydney's harbour, river coves and estuaries. There are two mangrove species found in Sydney. Grey mangrove (*Avicennia marina*) is the taller and more common, often seen in pure stands. Stands of grey mangrove comprise very few species other than the canopy, with the understorey mostly an open mudflat sometimes with scattered saltmarsh herbs. The second mangrove species is river mangrove (*Aegiceras corniculatum*). It is more often a small tree or shrub found scattered amongst swathes of grey mangrove or along upper reaches of coastal riverbanks. It occurs where freshwater influences from runoff or rivers cause lower salinity levels.

The distribution of mangrove appears dynamic. Estuaries have been extensively cleared and infilled for industrial and urban development. Stands of mangroves were also cleared and used to fuel lime kilns during early settlement. Since then there is evidence that mangroves have colonised areas formerly occupied by saltmarsh (Haworth 2002, Williams et al. 2004) and have established on sites of recent sediment accumulation.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Small Trees | 7 m ±3<br>3-9 | 57% ±15<br>40-70 | *Avicennia marina* var. *australasica, Aegiceras corniculatum* |
| Ground Covers | 1.0 m ±0.0<br>1.0-1.0 | 6% ±6<br>2-10 | *Sarcocornia quinqueflora* |

*Compiled from 3 sites with structural data recorded.

## Threats

Sea level rise associated with climate change poses a significant threat to the current distribution of Estuarine Mangrove Forest in the Sydney area. While grey mangrove appears to be an aggressive recoloniser, opportunities for re-establishment in Sydney are constrained by built environments and steep sandstone banks. Mangroves however, are invading adjoining areas of saltmarsh (Haworth 2002). Current threats include: ongoing recreation pressures; pollution arising from oil spills and outfalls; and reclamation (Keith 2004).

## Conservation Status

This vegetation community is represented in Newington Nature Reserve, Georges River NP and Royal NP.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | 4900-7400 hectares |
| Estimated percentage cleared | Not available | 25-50% |
| Total NPWS reserves | 253 +0.1 hectares<br>28% of extant area | 740 hectares<br>20% of extant area<br><15% of pre-clearing area |
| Total reserved | 589 +0.1 hectares<br>64% of extant area | Not available |
| Total non-reserved | 330 +1.0 hectares | Not available |
| Total extant | 919 hectares | 3700 hectares |



Map unit
Study area
Extant vegetation

## Example Locations

o   Salt Pan Creek, Padstow

o   Newington NR, Homebush Bay

## Species Richness

| Number of sites | 15 |
|---|---|
| Total native species | 10 |
| Average no. native species per site | 2.2 ±1.5 |

## Variations and Dynamics

The distribution of the two mangrove species have not been mapped separately, although they do broadly conform to patterns of water salinity. Upper reaches of rivers commonly carry a greater abundance of river mangrove.

## Relationship to Other Communities

Floristically and spatially this community is most closely related to other estuarine vegetation communities, particularly Estuarine Saltmarsh (S_SW02) and Estuarine Swamp Oak Forest (S_FoW08).

## Accuracy

Sampling density is moderate. Mapping boundaries are based on the interpretation of digital imagery. Mapping has been updated and refined to include mapping of estuarine macrophytes by DPI (2009). Small linear stands of mangrove may be obscured by overhanging eucalypt canopy and therefore not mapped.

The minimum number of positive diagnostic species expected in a site located in this community was not calculated as sites located in this community are species poor.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Aegiceras corniculatum* | 2 | 60% | 2 | 1% | Positive diagnostic |
| *Avicennia marina* subsp. *australasica* | 4 | 100% | 2 | 1% | Positive diagnostic |
| *Sarcocornia quinqueflora* subsp. *quinqueflora* | 2 | 13% | 2 | 1% | Uninformative |

# ESTUARINE SALTMARSH

<div align="right">

## S_SW02

</div>

**Statewide Class**          Saltmarshes

NSW Plant Community Type:     1126: Saltmarsh in Estuaries of the Sydney Basin and South East Corner
Biometric Number(s):           HN579; HU606; ME025; SR614



## Description

Saltmarshes consist of low succulent herbs and rushes on tidally inundated land. These marshes form plains that adjoin open water and mangroves. Throughout the marsh salinity varies greatly according to tidal influence, evaporation and fresh water accumulation. Some of the areas are flooded regularly, while at slightly higher elevations flooding is rare. After rain fresh water accumulates and adds extra water to the marsh, leaving pools of standing water when the tide recedes. Chenopod species dominate areas more frequently inundated by the tides, while sea rush (*Juncus kraussii*) occupies the more elevated terrestrial margin. Local scalds occur in small depressions where intensely saline deposits accumulate from the evaporation of tidal waters preventing the growth of any plants at all (Keith 2004).

Like many estuarine vegetation communities, large areas have been reclaimed for industrial, recreational and urban land use. Many examples that remain in Sydney are small in size, highly fragmented and patchy in distribution. Historical photographs taken in 1943 across much of the Sydney area (LPI 2013) clearly indicates that some former saltmarshes and mud flats are now colonised by dense stands of mangroves. This is particularly visible along the Georges and Parramatta rivers (Williams et al. 2004, McLoughlin 2000).

## Floristic Summary*

|  | **Average Height & Height Range (m)** | **Average Cover & Cover Range (%)** | **Typical Species** |
|---|---|---|---|
| Shrubs | 0.5 m | 4% | *Aegiceras corniculatum, Avicennia marina, Casuarina glauca, Rhagodia candolleana* |
| Ground Covers | 0.6 m ±0.3 | 58% ±21 | *Samolus repens, Sarcocornia quinqueflora, Sporobolus virginicus, Juncus kraussii* |

*Compiled from 0 sites with structural data recorded. Height and cover inferred from Tozer et al. (2010)

## Threats

Reclamation has altered the landscape of estuarine environments. Heavy recreational pressure, rubbish dumping, invasion by weeds and sedimentation are ongoing threats to this community (Keith 2004). Infestation of saltmarsh plains by the exotic sharp rush (*Juncus acutus*) is prevalent in some areas of the Georges and Parramatta rivers (Pickthall et al. 2004) as is the incursion of mangroves (Haworth 2002). Sea-level rise associated with climate change presents the greatest threat to the long term persistence of this community; small rises will permanently inundate these intertidal zones.

## Conservation Status

Estuarine Saltmarsh conforms to Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions, an Endangered Ecological Community under the TSC Act. However, patches of Estuarine Saltmarsh that occur on headlands, such as at Cape Banks, are excluded from this EEC.

This vegetation community is represented Towra Point NR, Georges River, Ku-ring-gai Chase and Royal national parks and Silverwater NR.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | >4400 hectares |
| Estimated percentage cleared | Not available | <50% |
| Total NPWS reserves | 175 +0.1 hectares<br>76% of extant area | 740 hectares<br>20% of extant area<br><15% of pre-clearing area |
| Total reserved | 199 +0.8 hectares<br>87% of extant area | Not available |
| Total non-reserved | 31.0 +0.1 hectares | Not available |
| Total extant | 230 hectares | 2200 hectares |



Map unit
Study area
Extant vegetation

## Example Locations

o   Towra Point NR, Kurnell (permission required for access)

o   Cabbage Tree Basin, Royal NP, Maianbar

o   Jamieson Park, Narrabeen Lakes, Warringah LGA

## Species Richness

| Number of sites | 24 |
|---|---|
| Total native species | 39 |
| Average no. native species per site | 5.9 ±3.2 |

## Variations and Dynamics

Small areas of saltmarsh have been recorded on sandstone headlands. This occurs in areas of high salt spray and where there is some residual soil resting above the sandstone.

## Relationship to Other Communities

Saltmarshes are species poor environments. There is considerable overlap in floristic composition with Estuarine Mangrove Forests (S_SW01). Stands of mangroves form a mosaic alongside saltmarsh in intertidal zones.

## Accuracy

Sampling density is high. Considerable endeavour has been undertaken to map saltmarsh in the Parramatta River catchment (Williams et al. 2004). This has overcome difficulties in delineating small patches of the community that are not visible from the air where they are otherwise obscured by overhanging tree canopies. Elsewhere saltmarshes observable on digital imagery have been delineated, although some misidentification may occur in areas defining Estuarine Reedland (S_FrW06). Recent work by DPI (2009) was incorporated in the mapping.

A 0.04 hectare site located in this map unit is expected to contain at least one positive diagnostic species (95 per cent confidence interval) provided the total number of native species in the site is three or greater.

| Species Name | Group Score (50 Percentile) | Group Frequency | Non-group Score (50 Percentile) | Non-group Frequency | Fidelity Class |
|---|---|---|---|---|---|
| *Aegiceras corniculatum* | 2 | 38% | 2 | 1% | Positive diagnostic |
| *Avicennia marina* subsp. *australasica* | 2 | 42% | 4 | 1% | Positive diagnostic |
| *Baumea juncea* | 2 | 17% | 2 | 4% | Uninformative |
| *Casuarina glauca* | 2 | 25% | 2 | 7% | Positive diagnostic |
| *Ficinia nodosa* | 1 | 17% | 2 | 2% | Uninformative |
| *Juncus kraussii* subsp. *australiensis* | 2 | 67% | 2 | 2% | Positive diagnostic |
| *Phragmites australis* | 3 | 13% | 3 | 3% | Uninformative |
| *Samolus repens* | 3 | 75% | 2 | 1% | Positive diagnostic |
| *Sarcocornia quinqueflora* subsp. quinqueflora | 2 | 92% | 2 | 0% | Positive diagnostic |
| *Suaeda australis* | 4 | 25% | 2 | 1% | Positive diagnostic |
| *Tetragonia tetragonioides* | 1 | 21% | 2 | 2% | Positive diagnostic |
| *Triglochin striata* | 2 | 13% | 3 | 0% | Uninformative |

Statewide Class Seagrass Meadows
NSW Plant Community Type: 1913
Biometric Number(s): ME82



## Description

Seagrass Meadows are marine vegetation in estuaries and lagoons. Seagrass meadows here cover four separate genera, each of which may dominate individual patches at discrete locations. The most widespread are eelgrass species in the family Zosteraceae. *Zostera capricorni* is most common. In the Georges River for example, eelgrass is extensive around Towra Point and the lower reaches of the river, although it is found some distance from the coast on Cabramatta Creek (Pickthall et al. 2004). Seagrass (*Posidonia australis*) is the largest of the seagrasses in the study area and has a more restricted distribution. It prefers the lower reaches of river systems where there is large tidal exchange (West et al. 1985). It was once common in Botany Bay but the original cover is smaller in area since the exposure to wave action has been increased following dredging (Watford and Williams 1998). Sea wracks (*Halophila* spp.) are less common again and have been recorded growing in combination with eelgrass at Towra Point and in Penrhyn Bay. A closely related group of species are the seatassels (*Ruppia* spp.*)* which are not associated with sea water but are recorded in lagoons and lakes that are occasionally inundated by salt water.

Seagrass Meadows are found on estuaries and lagoons of the Hacking, Georges and Parramatta rivers. Coastal lagoon systems at Dee Why and Narrabeen Lakes also support Seagrass Meadows (Smith and Smith 2005). No formal sampling of Seagrass Meadows was carried out for this project. The recent work by DPI (2009) was incorporated into the mapping.

## Floristic Summary*

| | Average Height & Height Range (m) | Average Cover & Cover Range (%) | Typical Species |
|---|---|---|---|
| Seagrasses | N/A | N/A | *Zostera capricorni, Zostera muelleri, Heterozostera tasmanica, Halophila ovalis, Halophila decipiens, Halophila australis, Posidonia australis, Ruppia polycarpa, Ruppia megacarpa* |

*Compiled from 0 sites with structural data recorded.

## Threats

Threats to Seagrass Meadows are high. Stuart and Fairfull (2007) summarise three major threats facing seagrass. Direct damage to sea beds can arise from boating, dredging, coastal development and scouring from stormwater outlets. The second threat is loss of water quality arising from sedimentation. This process clouds water and restricts sunlight reaching plant beds reducing the capacity of plants to photosynthesize. Thirdly nutrient-enriched water dispersed from storm water and sewage runoff can result in prolific growth of epiphytic algae growth on the seagrass fronds. This leads to reduced capacity to photosynthesize and eventual death of the plant.

## Conservation Status

Seagrass communities dominated by *Posidonia australis* have suffered a reduction in abundance and geographic distribution, particularly in estuaries near Sydney. Consequently, populations of *Posidonia australis* in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie have been listed as Endangered Populations under the NSW *Fisheries Management Act 1994*.

|  | Within Study Area | Within Sydney Basin |
|---|---|---|
| Estimate of pre-clearing area | Not available | Not available |
| Estimated percentage cleared | Not available | Not available |
| Total NPWS reserves | 44.8 +<.1 hectares<br>5% of extant area | Not available |
| Total reserved | 335 +0 hectares<br>35% of extant area | Not available |
| Total non-reserved | 628 +<.1 hectares | Not available |
| Total extant | 963 hectares | Not available |
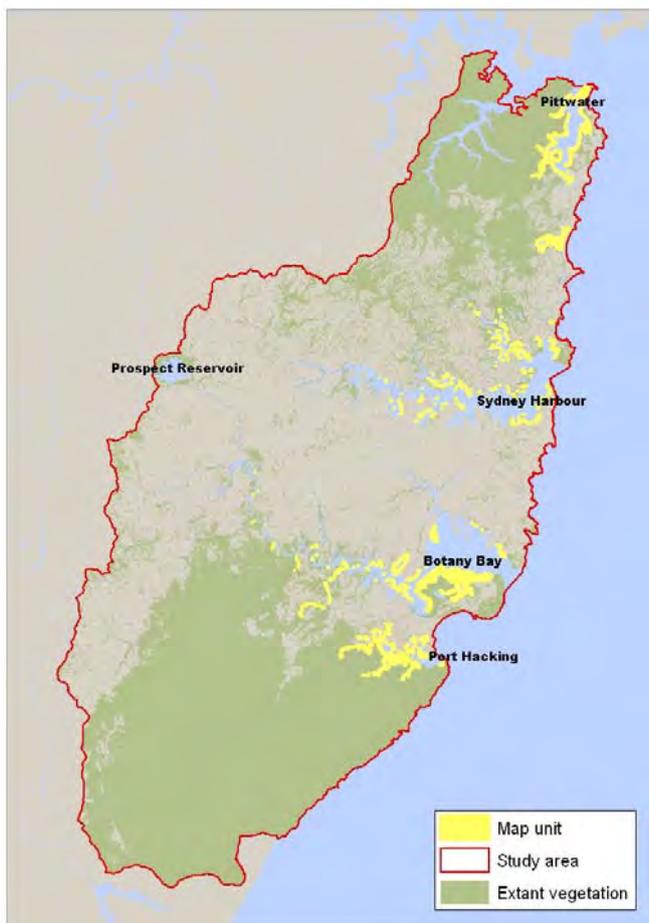


## Example Locations

o   Narrabeen Lakes estuary, Warringah LGA

o   Bonna Point Reserve, Kurnell, Sutherland LGA

## Species Richness

Number of sites                                          0

Total native species                    Not available

Average no. native species per site  Not available

## Variations and Dynamics

No floristic or structural variations are currently recognised in this community.

## Relationship to Other Communities

Seagrass Meadows are unique assemblages of halophytic plant species.

## Accuracy

Mapping is taken directly from DPI (2009).