



Wingecarribee Biodiversity Strategy

Phase 1

**Vegetation Mapping
Threatened Species Database
Habitat Corridors
Conservation Assessment**

**Consultants report prepared by Eco Logical Australia Pty Ltd for the
Wingecarribee our Future Environment Program
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- Atlas of NSW Wildlife
- Royal Botanic Gardens Hawkesbury Nepean Vegetation Mapping Series
- Southern Comprehensive Regional Assessment
- Native Vegetation of the Woronora, O'Hares and Metropolitan Catchments, joint project between the NPWS and the Sydney Catchment Authority, September 2002

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1 Introduction

Wingecaribee Shire exhibits a wealth of biodiversity values. This is largely due to the variations in climatic and geographic characteristics across the Shire, from the warm temperate rainforest on the edge of the Illawarra Escarpment to the tall forests and woodlands of the Southern Highlands and the spectacular sandstone gorge country of the Nattai Plateau.

The vegetation within Wingecaribee Shire has evolved over time into the diverse range of communities present today. Many of these communities have evolved on soils and under climatic conditions that are not found outside the Shire. Consequently, there are several vegetation communities that are endemic to the Southern Highlands area. Of these a number are located on fertile basalt or shale based soils. These same soils are also the most productive for agriculture and in many locations the vegetation has been substantially cleared. In some instances clearing has occurred to such an extent that the vegetation communities are at risk of extinction and have been listed as 'Endangered Ecological Communities' under the Threatened Species Conservation Act (1995).

In addition, these communities are often host to a number of plants and animals that rely on them for habitat. Consequently, the Shire is home to a number of species that are under threat of extinction, are restricted in distribution or are at the limit of their known range.

This project, through a scientifically robust methodology, has identified the type and location of species and communities and has interpreted this information into a series of maps designed to help planners and landholders manage their land for optimal biodiversity. It provides a blueprint for ecologically sustainable development (ESD) and environmental management in the Shire. It also provides opportunities to increase the biodiversity values of the Shire through targeted habitat improvement initiatives and to contribute to the maintenance of the wealth of biodiversity within Australia.

This report accompanies a series of Geographic Information System (GIS) layers that will be utilised by Council for future planning and management. Specifically, the following information has been provided to Council:

- Pre 1750 Vegetation Community Map
- Extant Vegetation Community Map
- Threatened Species Database
- Threatened Species Habitat Association Models
- Habitat Corridors
- Conservation Significance Assessment

2 Project Aims

The overall aim of the project is:

'To establish and implement measures to effectively conserve, protect, enhance and rehabilitate the biodiversity within our Shire'.

This project fulfils Phase 1 of the overall biodiversity strategy, whose specific goal is:

'To provide quality, reliable and practical information, as required, on the distribution of significant flora and fauna within the Shire for the purposes of Local environmental planning, biodiversity conservation and enhancement'.

The specific objectives of Phase 1 are:

- To develop a Vegetation Map of Wingecarribee Shire at an appropriate scale incorporating data on regionally and locally significant species, and significant plant associations, including vegetation types and corridors in report and digital format incorporated onto Council's Geographic Information System (GIS).
- To develop a series of indicative qualitative maps at an appropriate scale showing the locations and potential habitat of threatened species of flora and fauna, significant plant associations and areas important for regionally and locally significant flora and fauna species. Records provided in report and digital format to be incorporated onto Council's GIS.
- To use the vegetation map, in association with other information, to provide indicative qualitative information on the likely distribution of flora and fauna species. This information can be used for local environmental planning, biodiversity conservation and enhancement, preparation of Threatened Species management plans, State of the Environment Reporting and other specialised management plans (eg. riparian zone, habitat, wildlife corridor protection or weed control).
- To develop a prioritised program, which will effectively define and guide the implementation of related "on the ground" works to be completed under the Wingecarribee Our Future Environment (WOFE) Program.
- To structure Phase 1 of the project logically and effectively within the bounds of available resources, and in such a manner as to maximise potential for future project funding opportunities, and for the further development of the flora and fauna qualitative distributional maps, threatened species information and a Biodiversity Strategy.

3 Vegetation Mapping

The vegetation mapping component of this project uses mapping techniques developed by the New South Wales National Parks and Wildlife Service (NPWS) (Keith and Bedward, 1999; NPWS, 2000). The technique combines mapped landscape variables (eg. soils, rainfall, and topography) with statistical analysis of species recorded at vegetation survey sites to identify vegetation communities. The distribution of the vegetation communities is then modeled using the landscape variables. This technique has been used in a number of high profile projects including:

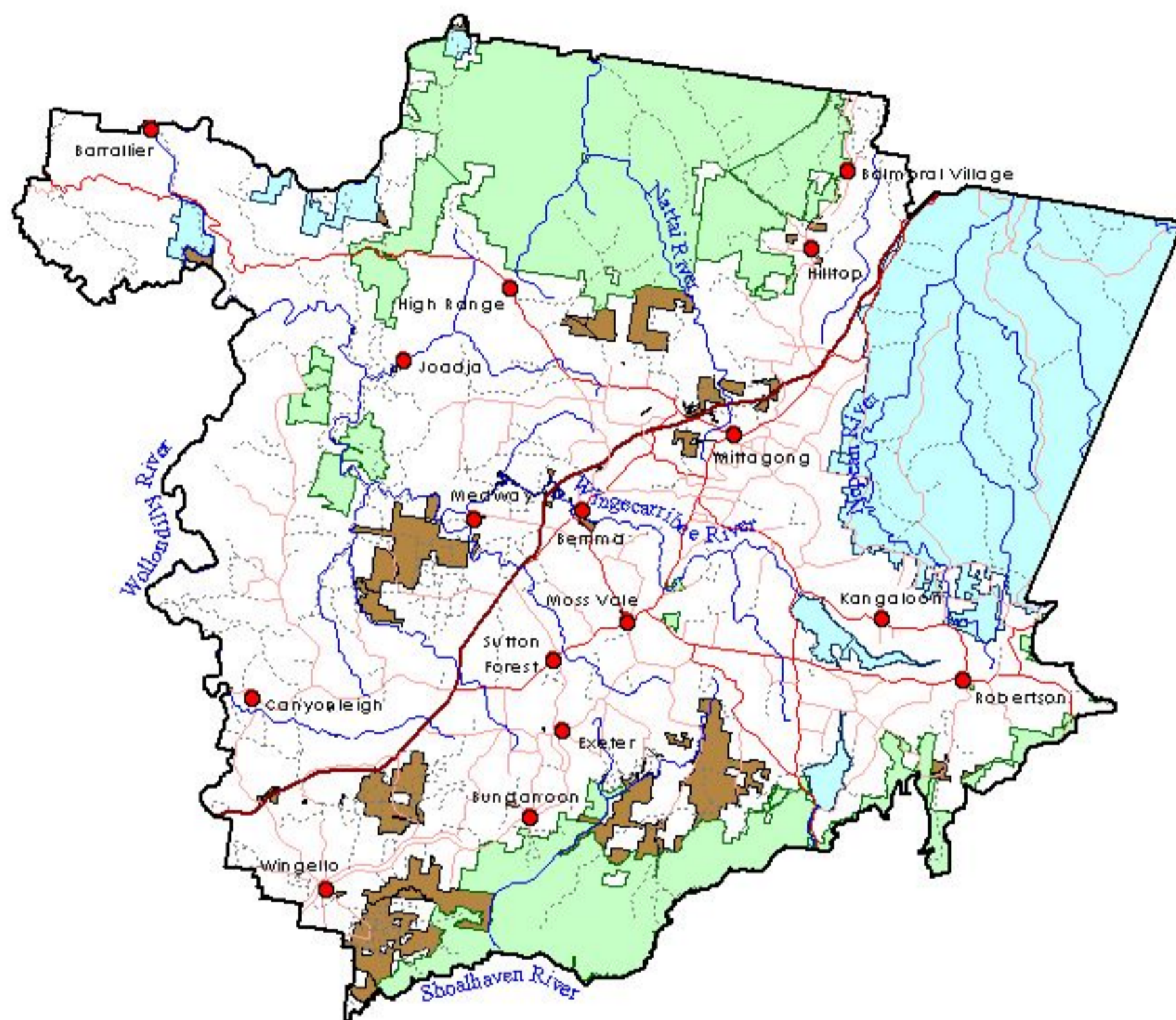
- Eden Vegetation Mapping (Keith and Bedward, 1999)
- Native Vegetation Maps of the Cumberland Plain, Western Sydney (NPWS, 2000a)
- Vegetation Mapping of the Lower Hunter and Central Coast (NPWS, LHCCREMS, 2000b)
- Southern CRA Forest Ecosystems Mapping Project (NPWS, 2000c)
- Native Vegetation of the Woronora, O'Hares and Metropolitan Catchments, joint project between the NPWS and the Sydney Catchment Authority, September 2002

3.1 Review of Existing Information

An audit of existing data was undertaken. This was to ensure that previous survey effort was not replicated, thus maximising the benefit of this projects' survey program, and to ensure consistency with existing vegetation datasets. The following key data sources were reviewed:

- Royal Botanic Gardens Hawkesbury Nepean Series Vegetation Mapping
- NPWS Vegetation Survey Database (this included existing NPWS and RBG survey sites)
- Sydney Catchment Authority Vegetation Surveys
- Comprehensive Regional Assessment (CRA) Mapping

The survey program was undertaken in close consultation with the NPWS, NSW Department of Land and Water Conservation (DLWC) and Sydney Catchment Authority (SCA) who were all undertaking various survey programs within the Shire. Effective integration of this project with these other survey programs has facilitated maximum data availability between all projects.



- Wingecarribee Shire
- Rivers
- WSC road signing
- Motorway
- Highway / Major Road
- Major Road
- Minor Road
- Other Roads
- NPWS Reserves
- Sydney Catchment Authority
- Other Crown land

Wingecarribee Reserves

Wingecarribee Biodiversity Study

Client: Wingecarribee Shire Council

Figure No.: 1 Project No.: 16-01

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3.2 Preparation of Modelling Database

A spatial database was prepared within the Arcview GIS system to provide the basis for the stratification of field sites and to undertake predictive modelling of vegetation communities and priority species habitat. The information was collated from existing NPWS data sources that had been prepared for the Comprehensive Regional Assessment (CRA) process. As Wingecarribee Shire sits across 2 of the CRA study areas (Southern and Sydney Basin), data had to be collated from both of these areas and 'stitched' together to provide single layers covering the entire Shire. The following information was collated:

- Geology
- Soil landscapes
- Mean Annual Rainfall
- Mean Annual Temperature
- Digital Elevation Model (DEM)
- Wetness
- Slope
- Aspect
- Hillshade
- Existing Vegetation Mapping

3.3 Mapping of Extant Vegetation

Extant (remaining) vegetation was mapped within the Arcview GIS system from 1:40,000 scale digital aerial photos flown in late 2001. These photos were provided by the Sydney Catchment Authority. Digitising was performed manually 'on-screen' to delineate vegetation remnants 0.5 hectares or larger, cleared land, water bodies, pine plantations, swamps and mined swamps. Vegetation remnants were only mapped if the crown canopy coverage of a remnant was at least 10%.

Vegetation condition has not been mapped and there is no discrimination between thinned and natural cover. Consequently vegetation in poor condition is included in the vegetation map and will contribute to extant figures shown in Table 2. The result is that areas comprised merely of remnant canopy trees, often with poor condition or no understorey have been mapped and included in subsequent analysis.

3.4 Floristic Surveys

A stratified systematic floristic survey program was undertaken which identified the cover-abundance of all species recorded within a 20 x 20 metre plot (0.04 hectares). Plot locations were determined through an environmental stratification of the study area. The stratification process combined rainfall, soil and temperature information to produce a total of 36 environmental units, or strata, that broadly reflect the environmental variations likely to influence vegetation.

To ensure that the full range of environmental variation across the Shire was surveyed, sites were selected across strata and included variations in aspect and terrain (eg. ridge top, hill slope, valley floor).

Survey locations were intentionally biased away from National Parks and Sydney Catchment Authority land as Council has little input into the planning and management of these areas. In particular extensive areas of bushland on the Nattai Plateau, Woronora Plateau and the Shoalhaven Gorge were not sampled during this study (some sites were available from other studies) and hence the strata occurring in these areas are likely to be under sampled.

Table 1 below indicates the number of sites, relative to the area of each strata unit. The three digit strata code relates to soil, rainfall and temperature as follows:

First Digit (substrate)

- 1 = Alluvium/Colluvium
- 2 = Volcanics
- 3 = Limestone
- 4 = Low Quartz Sedimentary
- 5 = High Quartz Sedimentary

Second Digit (mean annual rainfall)

- 1 = 860mm or less
- 2 = 861 – 1005 mm
- 3 = Greater than 1005mm

Third Digit (mean annual temperature)

- 1 = 12.8 degrees or less
- 2 = 12.9 – 13.2 degrees
- 3 = Greater than 13.2 degrees

Table 1. Surveys by strata

'Strata Proportion of LGA' refers to the proportion of the LGA occupied by strata. 'Proportion of Samples' refers to the total proportion of survey sites across the LGA undertaken within strata. 'Relative Proportion' is the proportion of samples undertaken within strata relative to the size of the strata and the mean across the Shire. Those strata that have a negative 'Relative Proportion' are those that have been under sampled relative to the average level of sampling across the shire.

Strata Code	No Sites	Extant Ha	Ha/Site	Strata Proportion of LGA	Proportion of Samples	Relative Proportion
111	0	27	0	0.01	0.00	-0.01
112	0	181	0	0.05	0.00	-0.05
113	3	750	250	0.19	0.71	0.52
121	0	133	0	0.03	0.00	-0.03
122	0	14	0	0.00	0.00	0.00
123	2	730	365	0.19	0.48	0.29
131	1	144	144	0.04	0.24	0.20
132	0	705	0	0.18	0.00	-0.18
133	3	12290	4097	3.15	0.71	-2.43
211	17	19375	1140	4.96	4.05	-0.91
212	13	12480	960	3.19	3.10	-0.10

Strata Code	No Sites	Extant Ha	Ha/Site	Strata Proportion of LGA	Proportion of Samples	Relative Proportion
213	36	31429	873	8.05	8.57	0.53
221	6	8023	1337	2.05	1.43	-0.63
222	0	325	0	0.08	0.00	-0.08
223	0	365	0	0.09	0.00	-0.09
231	22	1340	61	0.34	5.24	4.89
232	5	385	77	0.10	1.19	1.09
233	3	15415	5138	3.95	0.71	-3.23
311	0	165	0	0.04	0.00	-0.04
312	2	124	62	0.03	0.48	0.44
313	0	79	0	0.02	0.00	-0.02
411	22	30119	1369	7.71	5.24	-2.47
412	17	14182	834	3.63	4.05	0.42
413	37	23405	633	5.99	8.81	2.82
421	12	13077	1090	3.35	2.86	-0.49
422	5	2196	439	0.56	1.19	0.63
423	25	22474	899	5.75	5.95	0.20
431	2	1625	812	0.42	0.48	0.06
432	13	3907	301	1.00	3.10	2.10
433	33	31399	951	8.04	7.86	-0.18
511	11	5692	517	1.46	2.62	1.16
512	12	8713	726	2.23	2.86	0.63
513	3	13827	4609	3.54	0.71	-2.83
521	16	9691	606	2.48	3.81	1.33
522	13	9657	743	2.47	3.10	0.62
523	15	27149	1810	6.95	3.57	-3.38
531	3	1049	350	0.27	0.71	0.45
532	16	8862	554	2.27	3.81	1.54
533	52	59135	1137	15.14	12.38	-2.76
Total	420	390634		100	100	0
Average			930			

Additional information collected at each site included location (AMG coordinates, using AGD 66 datum), terrain, stratum height, dominant species, disturbance, drainage, geology and soils.

The methodology used was identical to that implemented by the NPWS. All data obtained during the course of the surveys was entered into the NPWS systematic survey database. By using a consistent methodology and including this information on a central database, the future use of this data will be maximised and the NPWS will be responsible for maintaining taxonomic changes. Field surveys were carried out by NPWS botanists in conjunction with Eco Logical Australia staff. Thus ensuring

high quality, reliable data that is directly compatible with other NPWS datasets and the joint NPWS/DLWC Priority 5 Management Area (P5MA) mapping was recorded.

A total of 135 new sites were surveyed by this project, that when added to existing sites collated during the data audit process yielded a total of 420 sites for the Shire. The location of sites has been provided as an Arcview Shapefile to Council. The contribution of individual studies to the total number of sites is indicated by Table 2, below.

Table 2. Origin of Systematic Survey Sites

Organisation	Survey Name	No. Sites Surveyed
NPWS	P5MA	71
NPWS/SCA	WARRAGAMBA	65
Royal Botanic Gardens	BURRAG	15
Royal Botanic Gardens	ILLAWARRA	1
Royal Botanic Gardens	KIAMA	1
Royal Botanic Gardens	MOSS	13
Royal Botanic Gardens	WOLL	20
SCA	WORONORA	99
Wingecarribee Shire Council	WINGECARRIBEE	135
Total		420

3.5 Vegetation Classification and Modelling

Vegetation communities were classified through statistical analysis of the species recorded at each site. The process used PATN software developed by the CSIRO (Belbin 1994). This analysed the presence and absence of all species across all sites to identify those sites that exhibited similar patterns in floristic composition. A group of sites with similar floristics represents a vegetation community.

The modelling process sought to extrapolate the vegetation community recorded at each individual site across the entire shire. This was done by assessing the relationship of vegetation communities to their natural environment. Specifically, communities were grouped based on their preferred substrate (eg. Basalt soils) and their distribution was then split based on relationships with other environmental variables (eg. Basalt soils with high rainfall = Robertson Basalt Rainforest, Basalt soils with lower rainfall = Robertson Basalt Tall Forest). In this way a map was produced that identifies the likely distribution of vegetation communities across the Shire. As this was produced by modelling the relationship with abiotic variables it was possible to predict likely vegetation communities prior to European settlement and clearing. This map is referred to as the Pre-1750 Vegetation map.

As a result of the low survey effort applied to the Nattai Plateau and Shoalhaven Gorge, there are extensive areas of bushland that have had no systematic surveys undertaken. Consequently the vegetation communities in these areas could not be identified through the PATN analysis. However, previous mapping undertaken by the Comprehensive Regional Assessment (CRA) and the Royal Botanic Gardens has mapped the vegetation communities in these areas. In the absence of other data, it was considered prudent to include this existing mapping in these areas.

Additionally, the SCA and NPWS were concurrently undertaking a joint mapping project of the Woronora Plateau using a combination of systematic surveys and high resolution aerial photo interpretation. Rather than re-map the same area it was considered to be of far greater benefit to incorporate this information directly into the Wingecarribee mapping. As a result a consistent map of the Woronora Plateau will be used by Council, NPWS and the SCA.

3.6 Discussion

The Pre-1750 vegetation map was combined with the current vegetation presence/absence map to produce an extant vegetation community map. A total of 49 vegetation communities have been identified and mapped, including 5 Endangered Ecological Communities (EEC's), listed under the *Threatened Species Conservation Act, 1995*;

- Robertson Basalt Rainforest
- Robertson Basalt Tall Open Forest
- Southern Highlands Shale Woodland
- Mount Gibraltar Forest
- Shale/Sandstone Transition Forest

Based on similarity of floristic composition, Southern Highlands Shale Woodland has been divided into two sub-communities:

- Southern Highlands Shale Woodland
- Joadja Tall Open Forest

Whilst Shale/Sandstone Transition Forest has been divided into the following two sub-communities by the NPWS (2002):

- Transitional Shale Stringybark Forest
- Bargo Brush Forest

An additional 4 map units have been identified:

- Water
- Mined Peat Swamp
- Regenerating Vegetation
- Weeds/exotics/pine plantations

All vegetation communities have been given a unique identifying code. Communities identified by the PATN analysis are coded 1 – 21. Communities mapped by the NPWS/SCA Woronora mapping (NPWS 2002) range from 604 – 648, the second 2 digits corresponding to those allocated by the NPWS. Communities 701 – 707 are from the Royal Botanic Gardens Burragorang 1 : 100 000 sheet (Fisher et. al., 1995), whilst map units 821 and 853 are from the Southern CRA mapping (NPWS 2000c). Detailed vegetation community descriptions are included as Appendix 1.

By mapping both the Pre-1750 and current (extant) vegetation it is possible to assess the level of clearing and thus vulnerability of each vegetation community. This information can be related to Commonwealth and State policies such as JANIS which states that a minimum of 15% of the pre-1750 distribution of a vegetation community must be reserved. In this manner the conservation priority of individual vegetation communities can be assessed and resources efficiently allocated. Map 2 indicates the extant distribution of vegetation communities in the Shire. Unsurprisingly, most clearing has taken place on flat lands with highly fertile soils and thus the communities that occur in these landscapes are the most extensively cleared. Table 3, identifies the remaining levels of individual vegetation communities within the Shire.

IMPORTANT NOTE: The extant figures identified in Table 3 do not take into consideration the condition of mapped remnants. Thus, substantially modified and poor condition vegetation (eg. a thinned canopy and no understorey) will contribute to the extant figures.

Table 3. Pre-1750 and extant distribution of vegetation communities

Map Unit	Community	Pre 1750 Ha	Extant Ha	Extant %
1	Hawkesbury Sandstone Woodland	12380	11108	90
2	Bundanoon Sandstone Woodland	14137	10087	71
3	Sydney Sandstone Gully Forest	4427	3273	74
4	Mittagong Sandstone Woodland	38702	28354	73
5	Wingecarribee Mallee	287	274	95
6	Scribbly Gum Open Woodland	2003	1955	98
7	Sandstone Wet Heath/Sedge	667	650	97
8	Swamp (including Peat Swamp)	4075	588	14
9	Riparian Casuarina Forest	2252	1757	78
10	Wingecarribee Woodland	29134	18225	63
11	Burraborang Ironbark Woodland	4106	4089	100
12	Bindook Porphyry Moist Woodland	3193	2135	67
13	Bindook Porphyry Dry Woodland	25833	17784	69
14	Robertson Basalt Rainforest	3224	451	14
15	Shoalhaven Gorge Tall Open Forest	8935	8764	98
16	Robertson Basalt Tall Open Forest	10978	1338	12
17	Southern Highlands Shale Woodland	53833	10791	20
18	Joadja Tall Open Forest	4394	4047	92
19	Upper Shoalhaven Tall Open Forest	253	242	96
20	Mt Gibraltar Forest	970	536	55
21	Warm Temperate Rainforest	1322	1317	100
604	Sandstone Riparian Scrub	140	140	100
608	Moist Gully Gum Forest	47	47	100
609	Nepean Gorge Moist Forest	411	411	100

Map Unit	Community	Pre 1750 Ha	Extant Ha	Extant %
619	Transitional Shale Open Blue Gum Forest	9	9	100
613	Tall Open Gully Gum Forest	108	59	55
623	Transitional Shale Stringybark Forest	327	327	100
627	Nepean Sandstone Gully Forest	6105	6105	100
629	Exposed Sandstone Scribbly Gum Woodland	12406	12406	100
630	Nepean Enriched Sandstone Woodland	5238	5238	100
632	Escarpment Edge Silvertop Ash Forest	117	117	100
635	Upper Georges River Sandstone Woodland	31	31	100
636	Budawang Ash Mallee Scrub	10	10	100
638	Rock Pavement Heath	38	38	100
639	Rock Plate Heath-Mallee	373	373	100
641	Highlands Sandstone Allocasuarina Heath	59	59	100
642	Upland Swamps: Banksia Thicket	78	78	100
643	Upland Swamps: Tea Tree Thicket	6	6	100
644	Upland Swamps: Sedgeland-Heath Complex	264	264	100
645	Upland Swamps: Fringing Eucalypt Woodland	94	94	100
646	Upland Swamps: Mallee-Heath	17	17	100
647	Highlands Sandstone Swamp Woodland	430	430	100
648	Highlands Swamp Gum-Melaleuca Woodland	139	139	100
650	Regenerating Vegetation		82	NA
702	Bargo Brush Forest	1696	937	55
703	Nattai Sandstone Gully Forest	8152	8023	98
706	Dry Nattai Escarpment Complex	3616	3612	100
707	Moist Nattai Escarpment Complex	1231	1231	100
821	Shoalhaven Gorge Moist Shrub Forest	2622	2567	98
853	Shoalhaven Gorge Riparian Shrub Forest	91	91	100
9997	Mined Peat Swamp		168	NA
9998	Weeds/exotics/pine plantations		3254	NA
9999	Water		2095	NA

title: Extant Vegetation

Figure No.: 2

client: Wingecarribee Shire Council

Project: Biodiversity Study

Project No.: 16-01

Wingecarribee Shire

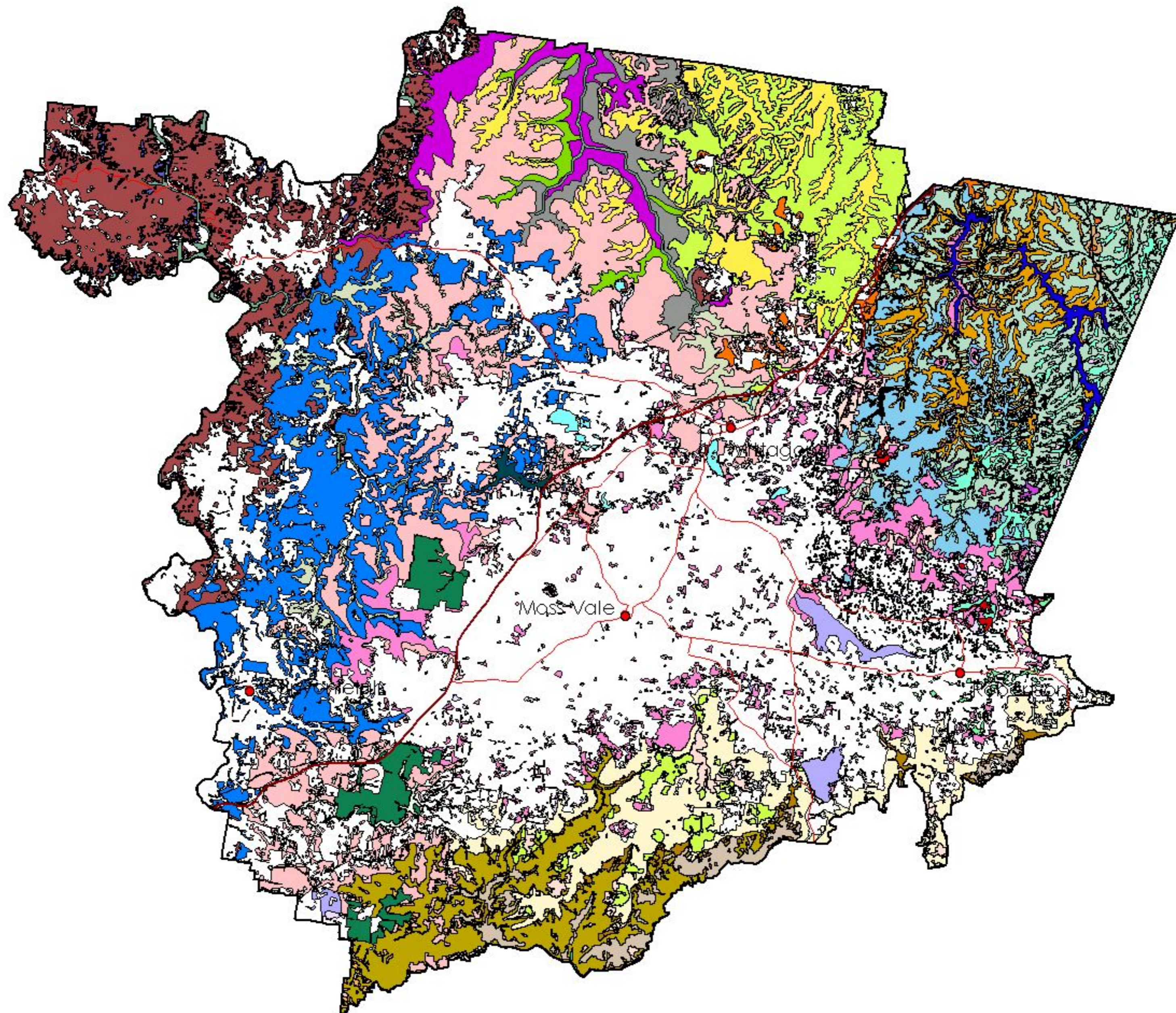
Motorway
Highway / Major Road
Major Road
Minor Road

Endangered Ecological Communities

Mr Clarabur Forest
Southern Highlands Shale Woodland
Southern Highlands Shale Woodland
Joadja Tall Open Forest
Basalt Communities
Parrington Basalt Rainforest
Parrington Basalt Tall Open Forest
Shale Sandstone Transition Forest
Transitional Shale Springyart Forest
Bargo Brush Forest

Other Communities

Bindaat Parrity Dry Woodland
Bindaat Parrity Moist Woodland
Bundawong Ash Mallee Scrub
Bundawong Sandstone Woodland
Burragorang Sandstone Woodland
Dry Narra Escarpment Complex
Escarpment Edge Silvanus Ash Forest
Exposed Sandstone Scribbly Gum Woodland
Hawkesbury Sandstone Woodland
Highland Sandstone Allocasuarina Heath
Highland Sandstone Swamp Woodland
Highland Swamp Gum-Melaleuca Woodland
Murrumbidgee Sandstone Woodland
Moist Cully Gum Forest
Moist Narra Escarpment Complex
Narra Sandstone Cully Forest
Negeran Enticed Sandstone Woodland
Negeran Crag Moist Forest
Negeran Sandstone Cully Forest
Riparian Casuarina Forest
Rock Pavement Heath
Rock Plate Heath-Mallee
Sandstone Riparian Scrub
Sandstone Wet Heath/Sedge
Scribbly Gum Open Woodland
Shoalhaven Crag Moist Shrub Forest
Shoalhaven Crag Riparian Shrub Forest
Shoalhaven Crag Tall Open Forest
Swamp
Sydney Sandstone Cully Forest
Tall Open Cully Gum Forest
Transitional Shale Open Blue Gum Forest
Upland Swamps: Banksia Thicket
Upland Swamps: Ringing Eucalypt Woodland
Upland Swamps: Mallee-Heath
Upland Swamps: Seagelands-Heath Complex
Upland Swamps: Tea Tree Thicket
Upper Georges River Sandstone Woodland
Upper Shoalhaven Tall Open Forest
Warm Temperate Rainforest
Wingecarribee Mallee
Wingecarribee Woodland
Regenerating Vegetation
Weeds/exotics/grass plantations
Water



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Approved by: SH
Date: 05 June 2003
Status: Final
Projection: AMG Zone 56



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3.7 Vegetation Mapping Limitations

Although this project has used the most up-to-date techniques and data available to produce both the pre-1750 and extant vegetation maps, there will always be degrees of error in the mapping and subsequent limitations in how it can be used.

The identification of extant vegetation from digital orthorectified aerial photographs has reduced many of the errors associated with distortion and topographic variation traditionally encountered during aerial photo interpretation. Additionally, having used photos that were flown in 2001 reduces many of the potential temporal problems associated with using old or inconsistently dated photos.

However, the data is limited by:

- The accuracy of the aerial photographs
- Potential observer bias in identifying remnant vegetation. This has been reduced by using a single observer to identify all vegetation and subsequent cross checking, thereby producing consistent information
- Lack of information on vegetation condition. There has been no discrimination between good condition vegetation and vegetation that may only comprise canopy trees and an exotic or non-existent understorey
- Mistaken identification of non-native vegetation. The photos used were at a scale of 1:40,000, making it difficult to discriminate between native remnants and exotic plantings

The modelling of vegetation communities is limited by:

- Producing a map based on a limited sample of sites across a very large area. The result is reduced reliability in areas where sites are restricted (typically sandstone plateaus within protected tenures) and a greater mapping reliability in environments with a greater site density (the Basalt and Shale areas of the Southern Highlands)
- Producing a pre1750 map based on extant vegetation. It is possible that some communities which existed prior to European settlement have been completely cleared and thus are not identified
- The accuracy of other data used to base the model on, for example the resolution of the soils landscapes layer is 1:100 000
- Defining a distinct linear boundary between vegetation communities when, on the ground, there is usually a gradual transition between communities
- Extrapolating samples across areas that have not been surveyed

It must be noted that comprehensive survey of every remnant of vegetation was not undertaken for this project. The mapping provides sufficient detail for strategic planning and assessment works, but cannot replace individual site inspection as part of the development assessment process.

The community descriptions in this report (Appendix 1) contain information that will assist developers, consultants, Council and the public to identify vegetation communities in the field.

4 Threatened Species Database

A key component of this study is the production of a database of threatened species locations for inclusion into Council's GIS. Data from the following databases were examined:

- NPWS Atlas of NSW Wildlife
- NPWS Systematic Vegetation Survey Database (YETI)
- Royal Botanic Gardens
- Australian Museum

Records from these databases were readily available in digital format and importantly included map grid references for easy inclusion in a GIS. In conjunction with the audit of existing databases, hardcopy reports held by Council were reviewed and information on threatened species recorded into a tabular database.

Flora and fauna records have been provided to Council as an Arcview Shapefile, suitable for inclusion in Council's GIS.

The current legal status (under the TSC Act) (eg. Threatened, Protected, Vulnerable) has also been included, although this status can change over time. It is recommended that this information is regularly reviewed and updated as required.

The audit of existing information revealed a paucity of rare flora and fauna information within the Shire. Data has been collected in an ad-hoc manner with limited information on technique, spatial accuracy and the reliability of species identification. This problem is particularly prevalent for fauna data where it is clear that very limited survey work has been undertaken within the Shire. This lack of work combined with no clear standards for data recording resulted in the data audit program being limited in its effectiveness. This could be improved in the future through the adoption of flora and fauna assessment guidelines and the incorporation of resultant information into a central database such as the Atlas of NSW Wildlife.

Of the databases assessed, there was significant overlap between the Atlas of NSW Wildlife and the RBG and Museum records as this information had been transferred between the databases previously. To avoid duplication only records from the Wildlife Atlas were used as they already contained the information available in the RBG and Museum databases. Additionally, the accuracy and currency of records was often poor. In many cases the accuracy was to within 1km or was a species list for an entire map sheet. Many of the records were historic species lists dating back to the late 1800s or early 1900s. Whilst such data paints a valuable historical picture of species distribution, its contemporary uses are limited.

5 Flora and Fauna Habitat Models

5.1 Methods

All flora and fauna species recorded were assessed in relation to legal status (under the TSC Act), regional significance, habitat preference, number of records and degree of vulnerability within the Shire. This produced a list of priority species for developing habitat models. This list was assessed by officers from the NPWS Southern Directorate Threatened Species Unit and their comments incorporated. Of all species identified as being of high priority, only *Telopea mongaensis* is not currently listed on the TSC Act. This species was included as Wingecarribee Shire is the northern limit of this species distribution.

The project sought to use current statistical modelling techniques, in particular Generalised Additive Models (GAMs) to produce quantitative distributional maps of species habitat across the Shire. GAMs require a minimum of 10 positive observations and require data to be spread across the study area to reduce errors associated with spatial autocorrelation. However, due to a lack of appropriate data for the vast majority of species and spatial bias in the distribution of these records it was not possible to produce reliable models using this technique. Consequently qualitative expert models were prepared for priority species, with the exception of bats, where information was insufficient to prepare reliable models.

These models identify species habitat associations, based on the habitat potential of different vegetation types. This information has been subject to peer review, in particular by NPWS Southern Directorate officers.

5.2 Results

As little threatened species survey work has been undertaken within the Shire there was a limited amount of data upon which to base the development of habitat association models. However, the high quality descriptive information on vegetation communities produced by this project was sufficient to identify those communities likely to contain habitat for the species indicated in the table below. These habitat association models show the potential for the occurrence of a species and should be used to flag potential issues at a site and as the basis for targeted survey work.

It must be highlighted that potential habitat is subject to a number of factors including condition, size and connectivity of a remnant. Consequently field survey should be undertaken with any development assessment process to validate the habitat models.

With regards to fauna habitat, the nature of the models indicates that there is potential for the occurrence of at least 2 threatened species in every vegetation community. Dry Nattai Escarpment Forest has been identified as having potential habitat for as many as 15 of the fauna species listed below.

Rare flora species tend to have a much tighter range than fauna. Interestingly, no rare flora species are believed to be associated with the Endangered Ecological Communities occurring within the Shire. All rare flora species are associated with either sandstone or swamp vegetation.

Rules for individual species models are included as Appendix 2 (fauna) and 3 (flora).

Table 4. Priority Fauna Species

Common name	Scientific Name	Legal Status
Australasian Bittern	<i>Botaurus poiciloptilus</i>	V
Barking Owl	<i>Ninox connivens</i>	V
Blue-billed Duck	<i>Oxyura australis</i>	V
Broad-headed Snake	<i>Hoplocephalus bungaroides</i>	E1
Brown Treecreeper	<i>Climacteris picumnus</i>	V
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	V
Common Bent-wing Bat	<i>Miniopterus schreibersii</i>	V
Diamond Firetail	<i>Stagonopleura guttata</i>	V
Eastern Freetail Bat	<i>Mormopterus norfolkensis</i>	V
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V
Eastern Pygmy Possum	<i>Cercartetus nanus</i>	V
Freckled Duck	<i>Stictonetta naevosa</i>	V
Giant Dragonfly	<i>Petalura gigantea</i>	E1
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V
Hooded Robin	<i>Melanodryas cucullata</i>	V
Koala	<i>Phascolarctos cinereus</i>	V
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V
Large-footed Myotis	<i>Myotis adversus</i>	V
Long-nosed Potoroo	<i>Potorous tridactylus</i>	V
Powerful Owl	<i>Ninox strenua</i>	V
Red-crowned Toadlet	<i>Pseudophryne australis</i>	V
Regent Honeyeater	<i>Xanthomyza phrygia</i>	E1
Sooty Owl	<i>Tyto tenebricosa</i>	V
Southern Brown Bandicoot	<i>Isodon obesulus</i>	E1
Speckled Warbler	<i>Pyrrholaemus sagittatus</i>	V
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V
Squirrel Glider	<i>Petaurus norfolcensis</i>	V
Turquoise Parrot	<i>Neophema pulchella</i>	V
Yellow-bellied Glider	<i>Petaurus australis</i>	V

* Legal Status Codes are explained in Table 6.

Table 5. Priority Flora Species

Scientific Name	Legal Status (TSC Act 1995) *
<i>Acacia bynoeana</i>	E1
<i>Baloskion longipes</i>	V
<i>Boronia deanei</i>	V
<i>Carex klaphakei</i>	E1
<i>Eucalyptus aquatica</i>	V
<i>Gentiana wingecarribiensis</i>	E1
<i>Grevillea molyneuxii</i>	V
<i>Grevillea rivularis</i>	E1
<i>Kunzea cambagei</i>	V
<i>Persoonia acerosa</i>	V
<i>Persoonia bargoensis</i>	E1
<i>Persoonia glaucescens</i>	V
<i>Persoonia hirsuta</i>	E1
<i>Phyllota humifusa</i>	V
<i>Pomaderris cotoneaster</i>	E1
<i>Pomaderris sericea</i>	E1
<i>Prasophyllum uroglossum</i>	E1
<i>Pterostylis pulchella</i>	V
<i>Zieria murphyi</i>	V
<i>Rulingia prostrata</i>	E1
<i>Pomaderris brunea</i>	V
<i>Persicaria elatior</i>	V
<i>Telopea mungaensis</i>	P13
<i>Prostanthera rugosa</i>	U
<i>Lysimachia vulgaris</i>	E1
<i>Pultenea parrisiae</i>	E1

* Legal Status Codes are explained in Table 6.

Table 6. Legal status codes

Code	Description	Definition under the National Parks and Wildlife Act (NPW Act 1974) and the Threatened Species Conservation Act 1995 (TSC Act 1995)
U	Unprotected	Refers to fauna and flora listed in Schedule 11 of the NPW Act 1974
P	Protected	Refers to fauna not listed in Schedule 11 of the NPW Act 1974
P13	Protected	Protected from 'picking' under the NPW Act 1974
V	Vulnerable	Refers to fauna and flora species that are likely to become endangered unless the circumstances & factors threatening its survival or evolutionary development cease to operate (Schedule 2, TSC Act 1995).
E1	Endangered	Refers to fauna and flora species that are likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival or evolutionary developments cease to operate; or, Its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction; or, it might already be extinct, but it is not presumed extinct (Schedule 1, part 1, TSC Act 1995).

5.3 Habitat Model Limitations

As explained above, the habitat models are directly associated with mapped vegetation communities. Consequently they exhibit the same limitations as the vegetation mapping outlined in Section 3.7. Additionally the actual occurrence of species may be influenced by a number of other factors including remnant size, condition and connectivity.

As with the vegetation mapping the habitat models should be used to raise questions in an area and to identify the type of fauna surveys required to assess if the area under question is significant for any threatened species. They are not a substitute for field assessment.

6 Conservation Assessment

There have been a number of projects undertaken at national, state, regional and local levels that have assessed biodiversity conservation values with a view to identifying conservation priorities. Such information can be useful in setting goals or targets for conservation and can provide context to landuse planning decisions as well as providing an indication of areas that should be targeted for management or rehabilitation.

6.1 Policy Framework for Conservation Assessment

There are many documents and policies that refer to principles and objectives for biodiversity management but few have set concrete measurable targets. The relevant Commonwealth and State frameworks for the development of biodiversity conservation targets are outlined below. Wingecarribee Council should, as a minimum, adopt the targets identified in the Commonwealth and State frameworks.

Commonwealth

In June 2001 Environment Australia published a comprehensive set of 'National Objectives and Targets for Biodiversity Conservation' that were endorsed by State and Territory Governments.

Of particular note for Wingecarribee Shire are the targets provided for native vegetation and terrestrial ecosystems. These state that by 2003 Australia will have:

"Clearing controls in place that prevent clearance of ecological communities with an extent below 30% of that present pre-1750",
and

"Native vegetation restoration programs to recover ecological communities that are below 10% of that present pre-1750 or are nationally listed as critically endangered".

The Commonwealth Government, in their National Forest Policy Statement (NFPS), provides an undertaking to manage Australia's forests to conserve biological diversity. In order to achieve this it was agreed that a comprehensive, adequate and representative reserve (CAR) system be created (JANIS).

Relevant numerical targets for a CAR system include in reserves:

- 15% of pre-1750 distribution of forest ecosystems;
- at least 60% of vulnerable ecosystems, and;
- 100% of rare and endangered forest ecosystems.

A vulnerable ecosystem is defined as one "approaching a reduction in spatial extent of 70% within a bioregional context and which remains subject to threatening processes; or not depleted but subject to continuing and significant threatening processes which may reduce its extent".

A **rare** ecosystem is defined as having:

- a total range generally less than 10,000 hectares,
- a total area of generally less than 1,000 hectares, or
- patch sizes of generally less than 100 hectares (where such patches do not aggregate to form significant areas).

An **endangered** ecosystem is described as one where:

- its distribution has contracted to less than 10% of the pre-1750 distribution (former range),
- the total area has contracted to less than 10% of its former area, or
- 90% of its area is in small patches which are subject to threatening processes and unlikely to persist.

Other criteria raised in the JANIS process that could be considered relevant to this project include:

- Reserved areas should be representative of the entire geographic range.
- Maximise the area of high quality habitat for all known elements of biodiversity.
- Reserves should be large enough to sustain the viability, quality and integrity of populations.
- Sample the full range of biological variation within each forest ecosystem.
- In fragmented landscapes, remnants that contribute to sampling the full range of biodiversity are vital parts of a forest reserve system.

The NFPS recognises the need to promote the management of forests on private land to meet the conservation goals. It is important to stress that its focus is on forests and not other communities such as heath, grassland, wetlands etc.

State

The principles of a CAR system have been endorsed at both the Commonwealth and State level.

The NSW Biodiversity Strategy provides a considerable list of 'strategic goals', 'core objectives', principles and targets which can be used to establish a framework for biodiversity conservation.

The recent government initiative, 'Plan First' aims to provide opportunities to consolidate many regional plans and strategies to provide a single instrument. Areas identified through a targeted regional conservation assessment process may be identified in a revised regional instrument.

The NSW *Threatened Species Conservation Act, 1995* (TSC Act) contains provisions for the preparation of Recovery Plans for threatened species, endangered populations and endangered ecological communities. Recovery plans may develop specific numerical targets. The NPWS Southern Directorate Office is currently producing recovery plans for the endangered ecological communities found within Wingecarribee Shire.

The *Native Vegetation Conservation Act, 1997* (NVC Act) provides for the development of Regional Vegetation Management Plans (RVMPs). The process may

incorporate targets in the conservation assessment and specify clearing controls for various categories of land in the instrument, eg. Lands of high environmental significance.

There are a wide range of other documents and instruments (plans, strategies and reports) available to Council that can assist in biodiversity conservation. These include Catchment Management Plans, Regional Environment Plans (REPs), State Environmental Planning Policies (SEPPs), Local Environment Plans (LEPs), Development Control Plans (DCPs), State of Environment Reports and community land Plans of Management.

The habitat values within Wingecarribee Shire have been assessed using principles adopted by the Western Sydney Recovery Plan (NPWS, in prep.). This process seeks to identify:

- areas of core habitat;
- areas that play an important role in supporting core habitat;
- areas that play a role in connecting habitat, and;
- areas that have reduced biodiversity value.

In a planning sense this information can be used to identify the level of assessment required for developments, to identify priority areas for conservation works and to identify options for innovative planning mechanisms. Such options and mechanisms include tradeable development rights and offsets as well as identifying key “no go” areas where removal of vegetation is likely to result in a significant reduction in biodiversity.

6.2 Assessing the Conservation Values of Wingecarribee Shire

A key component of this project is to assess the conservation values of remaining vegetation within the Shire. This has been undertaken by:

- Ranking vegetation communities in a manner consistent with current National policy, and;
- Applying the Western Sydney Recovery Plan (NPWS in prep.) principles to identify the conservation value of individual remnants

1. Conservation status of vegetation communities

Vegetation communities have been classified according to JANIS policy as:

- Vulnerable,
- Rare,
- Endangered, or
- Other.

2. Conservation status of remnant vegetation

This section of the assessment identifies the conservation value of each vegetation remnant, based on the community present, the size and connectivity to other

Title:
Conservation Assessment

Figure No.:
3

Client:
Wingecarribee Shire Council

Project:
Wingecarribee Biodiversity Study

Project No.:
16-01

-  Wingecarribee Shire
 -  Motorway
 -  Highway / Major Road
 -  Major Road
 -  Dams
 -  Rivers
- Conservation Assessment**
-  Core
 -  High
 -  Medium
 -  Moderate
 -  Low

Approved by: SH

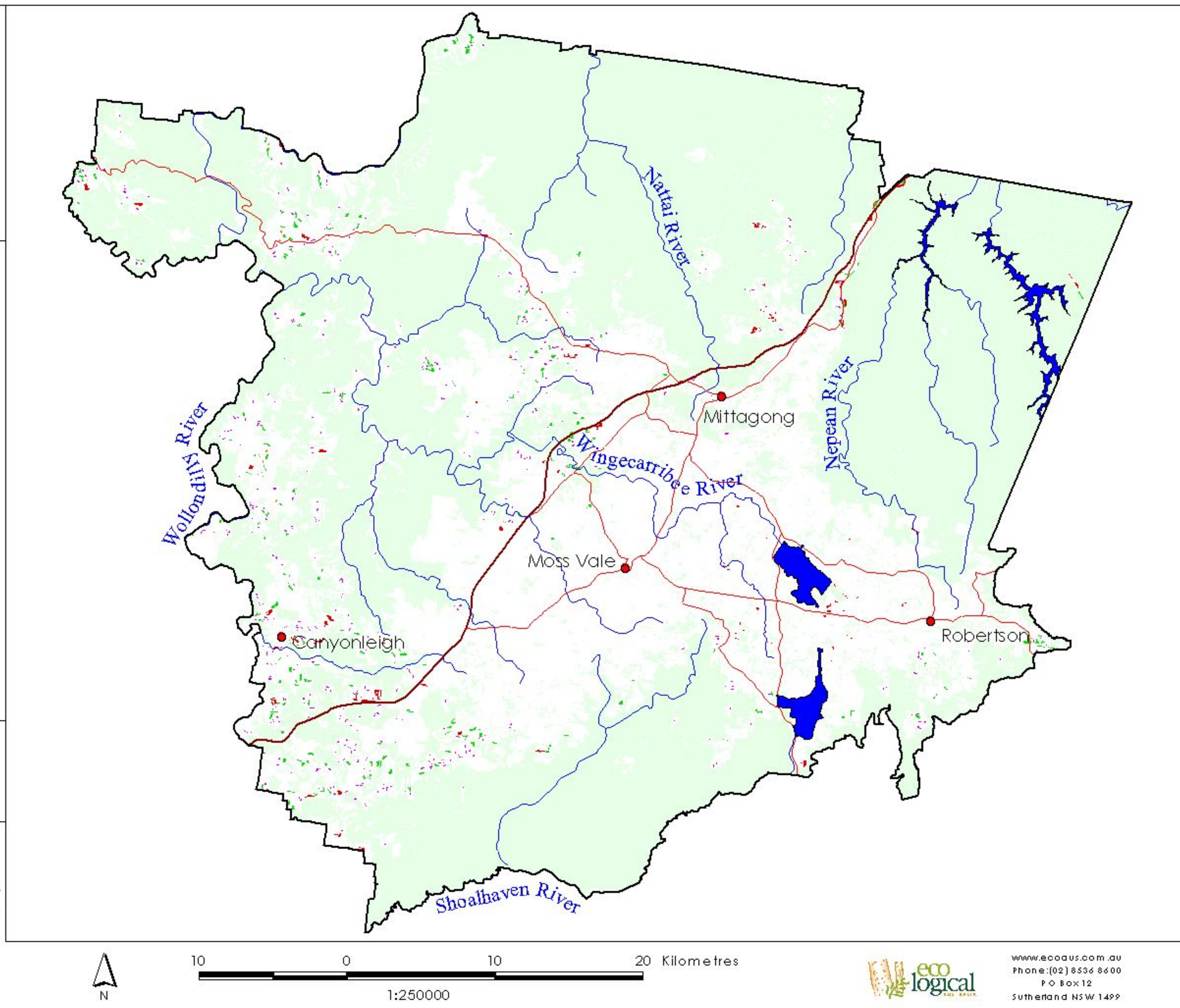
Date: 06 June 2003

Status: Final

Projection: AMG Zone 56

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remnants. It is based on the principles used in the Western Sydney Recovery Plan (NPWS, in prep.) and adjusted to take into consideration the lack of vegetation condition information for Wingecarribee Shire. The decision rules for the process are outlined below.

Core Habitat

- Remnants \geq 10 hectares
- Endangered ecosystems (JANIS Definition)

Core Support

All remnants less than 10 hectares in size are categorised as core support. However, it is appropriate to rank this remaining vegetation as there is considerable variation in conservation value. This has been undertaken through examining the vegetation community present, size and connectivity of the remnant. Four categories of core support have been identified:

- High
- Moderate
- Medium
- Low

The basis for inclusion in one of these categories is identified in the matrix below. Additionally, all remnants, regardless of size or connectivity, containing rare or vulnerable communities as identified by JANIS have been classified as 'high' value.

		Size		
		< 2 ha	2-6 ha	6-10 ha
Connectivity	0-500m	Medium	Moderate	High
	500 - 1.0km	Low	Moderate	High
	1.0 -1.5km	Low	Medium	Moderate
	> 1.5 km	Low	Medium	Medium

6.3 Results of Conservation Assessment

Some 63.6% of the Shire is presently vegetated. The main vegetation communities present are Mittagong Sandstone Woodland, Hawkesbury Sandstone Woodland, Wingecarribee Woodland and Bindook Porphyry Dry Woodland and communities of the Woronora Plateau. These communities account for over half of the remnant vegetation in the Shire and cover more than a third of the Shire.

The five Endangered Ecological Communities found in the Shire are Mt Gibraltar Forest, Robertson Basalt Rainforest, Robertson Basalt Tall Open Forest, Southern Highlands Shale Woodland and Shale/Sandstone Transition Forest. Between them they cover nearly 11,000 hectares. However, they are highly fragmented, making up 21% of the vegetation patches but only 6% of the area of the Shire, as shown in Table 7.

Table 7. Proportion of Communities by patch and area

	No. Patches	% of patches	Total Area	% of Area
Endangered Ecological Communities	2188	21%	10805.88	6%
Other vegetation communities	8167	79%	160290.60	94%

Of the mapped vegetation, 99% of the area and 83% of the patches are classified as core. High, medium, moderate and low habitat values make up only 0.93% of the vegetated area and 17% of the patches.

Outcomes of the habitat assessment are shown map 3.

7 Habitat Corridors

Corridors are landscape features that connect two or more large patches, allowing movement and gene-flow among native flora and fauna, thereby contributing to maintenance of biodiversity. Increased size of habitat area enhances available resources and allows more ecosystem niches and may support more species and larger populations.

Corridors may range in structure from remnant patches of intact vegetation to standing remnant canopy. Animals often rely upon corridors because they have an obligate relationship with natural vegetation and cannot move through inhospitable degraded environments. Partial linking of large habitat patches can also occur through 'stepping stones' of habitat, which can facilitate movement of more mobile species. Stepping stone linkages occur where a number of remnants are closely located providing a pathway between two or more larger remnants.

Corridor provision is a very important component of biodiversity enhancement. Corridors promote opportunities for species movement and long-term viability in an urban or rural bushland setting. There is also more chance of species surviving events that might otherwise lead to local extinction, such as land clearing, wildfires, fluctuating food supply, changes in birth and death rates, or human-induced habitat changes. If an event causes local extinction or reduction of the population, complete or partial (stepping stone) connectivity of patches will facilitate replenishment and re-establishment of the species. Connections between fragmented habitats can also allow for restoration of the heterogeneity that was present in the landscape but which has been lost from small, isolated fragments. The establishment of corridors and the reduced isolation of habitat patches are hence crucial to successful long-term management of remnant bushland.

The process whereby plant and animal species gain access to areas of suitable habitat through corridors can be referred to as corridor movement. Corridor movement is important because it allows species to range through different areas. This encourages diversity and sustainability within ecosystems. Small remnants of bushland are difficult to manage in a landscape where the bushland is exposed along its edges to other land uses. Remnant size can be assessed in relation to the "edge to area" ratio, and it is best to minimise this so that there is less edge habitat and more quality core habitat available for flora and fauna. Linking adjacent remnants with corridors can increase the effective size of remnants. Furthermore, broad short corridors will themselves have a lower edge to area ratio than narrow, long corridors, and will hence be more effective in facilitating corridor movement.

The design of corridors should be dependant upon which species the corridor aims to assist, otherwise it could fail to achieve its goals. For example small birds may prefer a corridor dominated by shrub species whereas larger birds may prefer canopy species.

7.1 Mapping Corridors within Wingecarribee Shire

There are a range of available styles and approaches to map corridors within Wingecarribee Shire. The chosen approach gives preference to corridors through higher quality vegetation, even if they are longer. The rationale being that areas of good condition vegetation provide little impediment to the movement of species whereas substantially cleared areas provide significant barriers to movement.

This analysis was undertaken within the Arcview GIS using the 'cost distance' and 'least cost path' algorithms. The output is a map indicating the relative ease for fauna movement across the Shire. This information has then been used to produce the 'stylised' corridor system shown in Figure 4.

Additionally the following important regional corridors have been identified:

- Nattai – Woronora
- Blue Mountains
- Wollondilly
- Joadja
- Shoalhaven

These corridors play an important role in linking large areas of contiguous vegetation and are of particular importance to migratory and nomadic species and during times where environmental pressures (eg. drought, fire) prompt the movement of species. Generally they represent extensive areas of vegetation that have not been subject to disturbances such as clearing or grazing.

The stylised corridor system is a more localised version of corridors and identifies important small scale links. Such links can have a pronounced influence on the effectiveness of regional corridors as they often occur in heavily fragmented country or operate as stepping stones between regional corridors.

These local corridors have been classified as either primary or secondary in order to focus conservation works so as to maximise the benefits to biodiversity (see chapter 8). Additionally, the condition of these corridors varies. In some cases a corridor may be a linear feature following a creek line, ridge top or significant roadside verge. In other cases a corridor may be composed of a series of stepping stones that are not directly linked. In such cases rehabilitation or regeneration of bushland to provide linkage between these stepping stones must be seen as a high priority.

The location of regional corridors within Wingecarribee Shire is indicated by Map 4. Map 5 indicates the location of local corridors.

Title: Regional Corridors

Figure No.: 4

Client: Wingecarribee Shire Council

Project: Wingecarribee Biodiversity Study

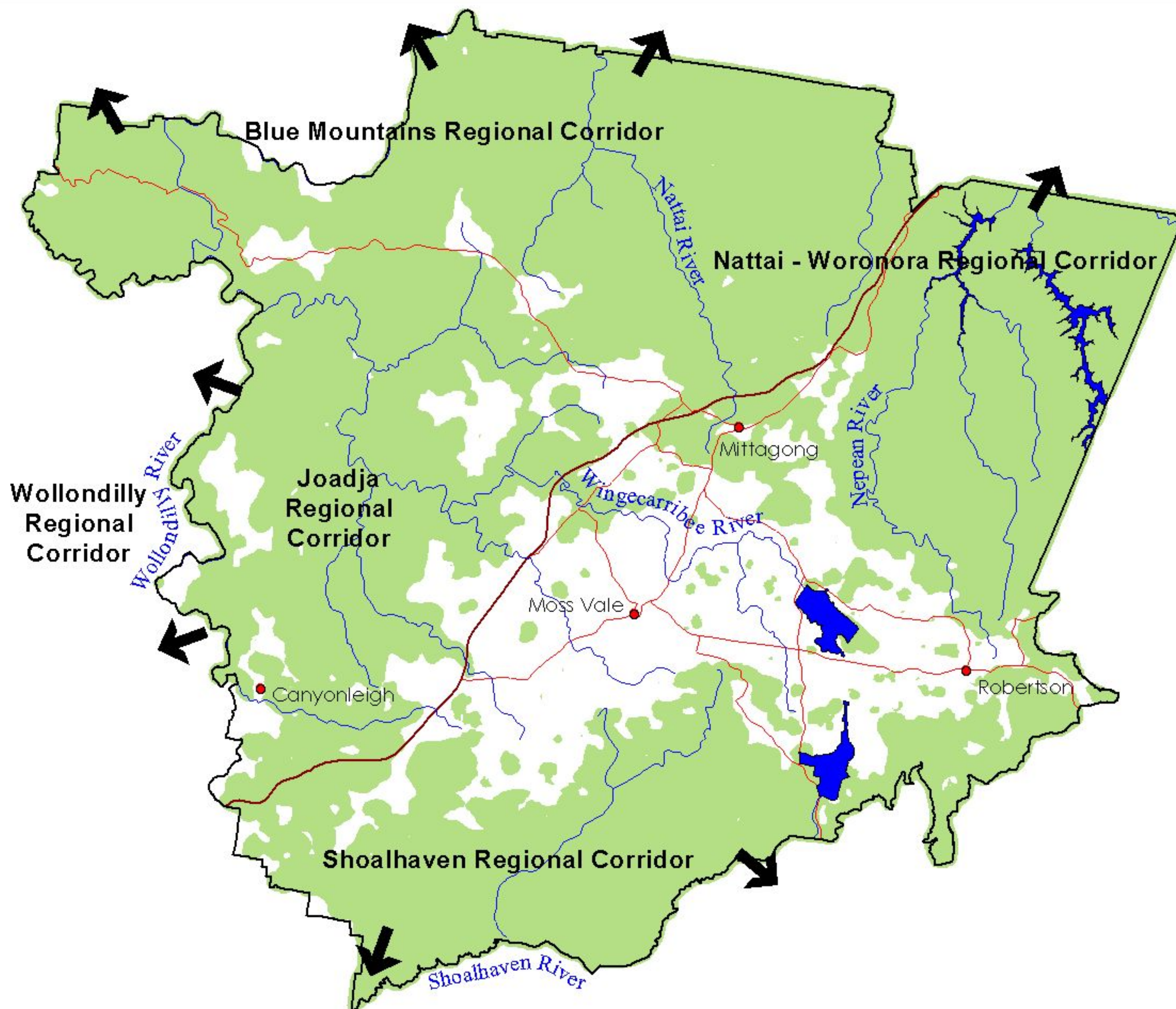
Project No.: 16-01

-  Wingecarribee Shire
-  Motorway
-  Highway / Major Road
-  Rivers
-  Dams
-  Vegetation

Prepared by:
Approved by: SH
Date: 06 June 2003
Status: Final
Projection: AMG Zone 56

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Title:

Local Corridors

Figure No.:

5

Client:

Wingecarribee Shire Council

Project:

Wingecarribee Biodiversity Study

Project No.:

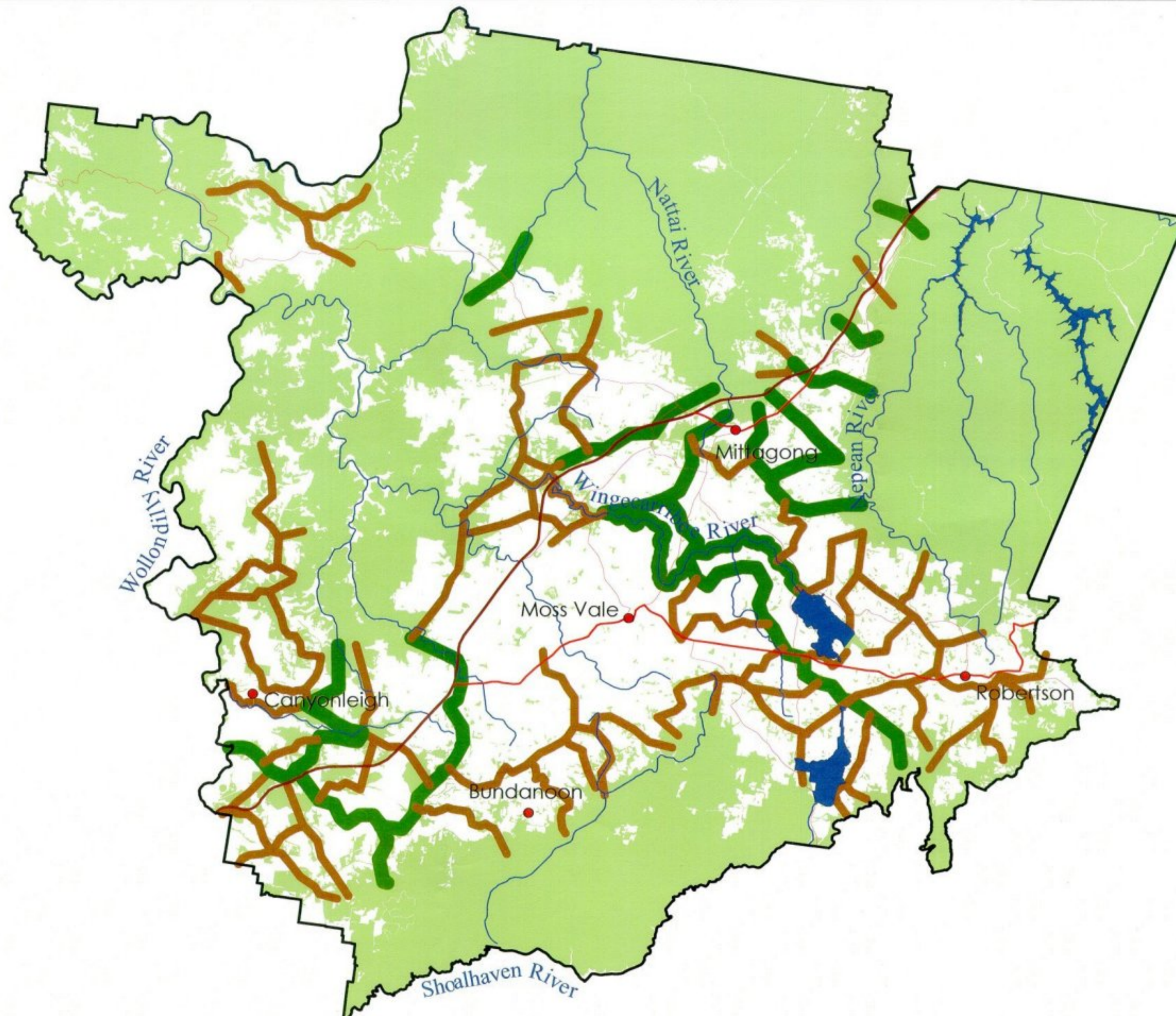
16-01

-  Wingecarribee Shire
-  Motorway
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8 Prioritisation of Conservation Works

Wingecarribee Shire is faced with many challenges to maintain and enhance the biodiversity of its unique environs. As is generally the case with environmental initiatives, there is an insufficient level of funding to undertake all conservation works at the one time.

Consequently, it is necessary to prioritise works based on cost-benefit principles. This involves assessment of the key conservation values within the Shire and identification of areas where maximum benefits can be achieved at minimal cost.

Additionally, the implementation of biodiversity conservation works will have considerable influences on other components of the environment including:

- Improved water quality
- Soil stability and maintenance of soils processes
- Reducing salinity threats
- Wind breaks
- Reduction of greenhouse gases
- Improving visual amenity
- Recreation and educational opportunities

The format of this chapter of the study includes two distinct, yet complimentary components:

- Principles for undertaking biodiversity conservation works
- Priority areas for implementing biodiversity conservation works

8.1 *Principles for Undertaking Biodiversity Conservation Works*

To maximise biodiversity conservation benefits, consideration should be given to the following:

- When carrying out rehabilitation or regeneration works, use species that are consistent with vegetation communities that would have existed prior to clearing – these can be identified from pre-1750 vegetation mapping and the vegetation community profiles in Appendix 1
- Ensuring that a variety of species are used including trees, shrubs, grasses and groundcovers
- Using locally sourced native plant species – species that are genetically adapted to Southern Highlands conditions and that would benefit local native fauna
- Consideration should be given to establishing a community nursery or contracting local nurseries to harvest local seed and propagate local plants. Use of non-local plant stock should be avoided
- Focusing on augmenting, buffering or connecting existing bushland rather than revegetation in historically cleared areas – there is a greater chance of a native seed bank existing and of increasing the viability of existing vegetation

- Fencing of key remnants, particularly Endangered Ecological Communities in rural areas
- The establishment and support of new and existing Bushcare and Landcare groups
- The use of trained bush regeneration supervisors with such groups
- The encouragement of landholder and community participation in biodiversity conservation works
- The identification of landholders that are amenable to undertaking revegetation works on their property
- Implementation of a landholder incentive scheme such as rate relief for landholders undertaking biodiversity conservation works
- Maximising the links at State and Federal Government levels, in particular the NPWS through their recovery plans and DLWC through Regional Vegetation Management Plans (RVMPs)
- Identifying and applying for external grants and funding
- Monitoring performance
- Research of conservation works

8.2 Priority Areas for Implementing Biodiversity Conservation Works

The main priority areas for biodiversity conservation works are those associated with the heavily cleared basalt and shale areas of the Southern Highlands. This region was once predominantly covered by vegetation communities that are now listed as Endangered Ecological Communities (EECs) under the TSC Act. These communities are at risk of extinction as they have been so extensively cleared that remaining vegetation remnants may be too small to be viable in the long term, are heavily fragmented or isolated or are at risk of further reduction in their extent through continued clearing. Additionally, the bulk of land that once supported these vegetation communities is under private ownership and is used for either agricultural or residential purposes.

A well directed landholder survey is seen as paramount to the success of biodiversity conservation works. As key areas are generally under private ownership, considerable community support will be required to achieve effective biodiversity conservation works. It is recommended that a study be conducted in key areas to identify landholders interested in undertaking biodiversity conservation works on their property. In conjunction with this, a range of incentives including provision of expertise and support should be introduced. Financial incentives are likely to significantly increase the level of interest in private land biodiversity conservation and should be seriously considered.

Additionally, there are a number of landholdings that are owned by Council or other government agencies. These areas represent the simplest locations for initiation of biodiversity conservation works, and action should be undertaken immediately where the locations are consistent with priority areas.

Key areas that have been identified as potential areas for Endangered Ecological Community restoration and that would increase habitat connectivity include:

- Wingecarribee River downstream from Wingecarribee Reservoir
- Cockatoo Hill – Gibbergunyah Creek to Nattai River. An extensive corridor that would provide both north-south and east-west movement and could be undertaken in a number of stages
- Nattai – Woronora Corridors. A major fauna movement area with significant barriers formed by clearing and the Southern Freeway
- High Range Corridor. Only one corridor has been marked, ideally two corridors could be constructed either side of the cleared High Range area
- Joadja – Nattai. An eastern version of the High Range Corridor will have the additional benefit of linking EEC remnants
- Robertson Corridor. An important corridor linking the EECs of the Robertson area. Currently composed of a series of island remnants, this corridor would benefit from buffering and linking remnants
- Canyonleigh – Penrose Corridors. This area is a major north-south fauna corridor; however some significant barriers to fauna movement have been constructed near the Hume Highway and Canyonleigh Road. Further clearing in this area should be avoided and the impacts of fauna movement barriers ameliorated

Generally, any revegetation works undertaken on the extensively cleared Highlands are likely to benefit biodiversity in the long term. However the greatest short term benefits will be through consolidating or buffering existing areas of value by either increasing the area of vegetation, the quality of the vegetation (fencing and weed removal) or the connectivity of the vegetation (revegetation in identified corridor areas). Priorities for conservation works are identified in Map 6.

Additionally there are a number of projects being undertaken by State Government agencies that could augment any works being undertaken by Council. These include:

- Sydney Catchment Authority – currently undertaking Strategic Land and Water Capability Assessments. Regional Action Plans identifying on ground management practices should be developed following the Assessments. It is likely that the SCA would be amenable to a catchment based approach or the buffering of riparian areas, particularly where there is a tangible link between works and the quality of drinking water catchments.
- The NPWS (Southern Directorate) – currently preparing recovery plans for the Endangered Ecological Communities of the Southern Highlands. It is likely that there will be recommendations for revegetation. Specific target areas may be identified and State Government support may be available.
- The Department of Land and Water Conservation – are required to prepare Regional Vegetation Management Plans (RVMPs). Under the Native Vegetation Conservation Act these will outline permissible clearing and set targets for protection and retention of vegetation. They may also include targets for revegetation of critical communities.

Title: Priority Habitat and Corridors for Conservation

Figure No.: 6

Client: Wingecarribee Shire Council

Project: Wingecarribee Biodiversity Study

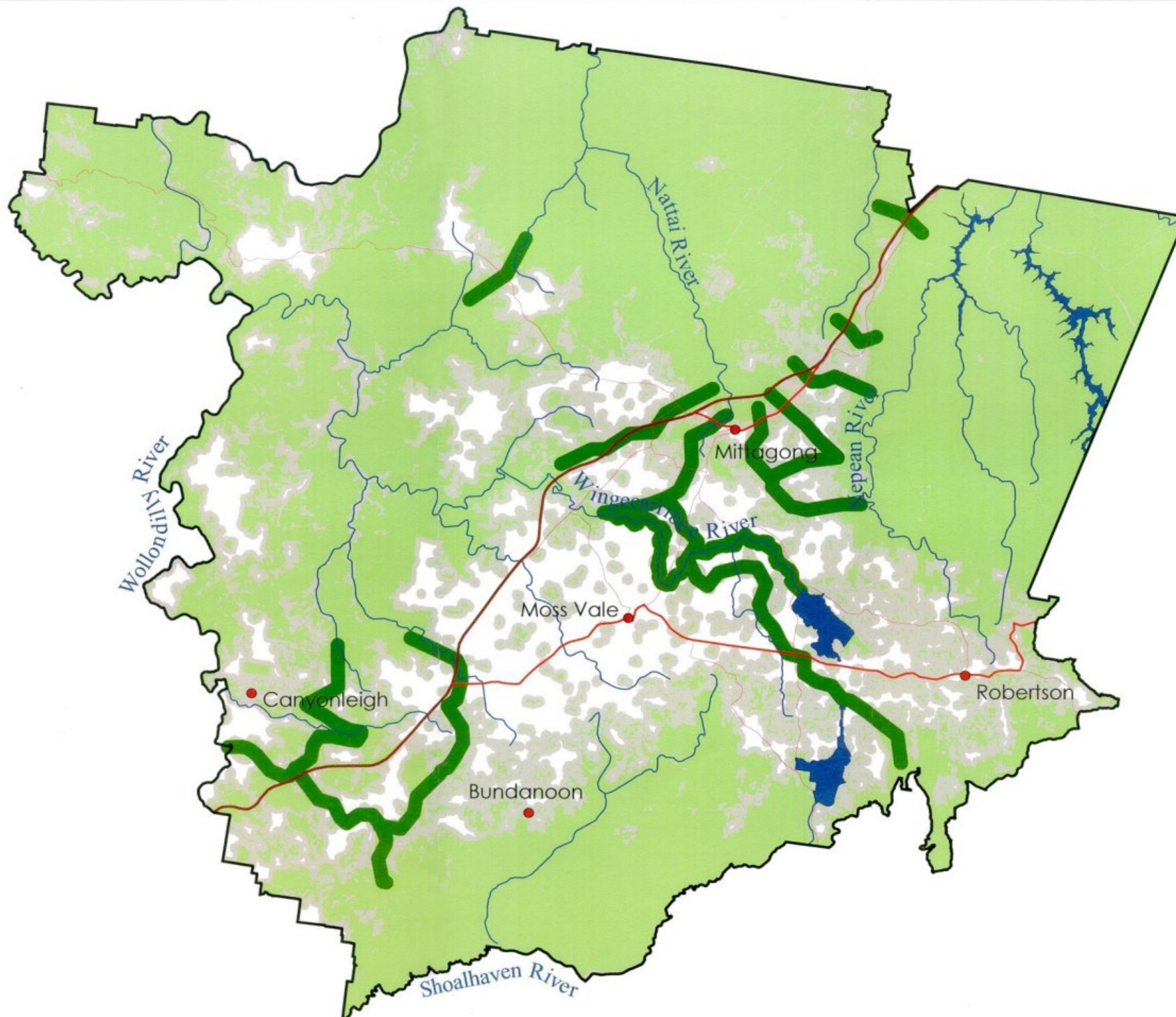
Project No.: 16-01

-  Wingecarribee Shire
-  Motorway
-  Highway / Major Road
-  Major Road
-  Rivers
-  Dams
-  High Priority
-  Existing Vegetation
-  High Recovery Potential

Approved by: SH
Date: 06 June 2003
Status: Final
Projection: AMG Zone 56

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9 Glossary

CAR	Comprehensive, Adequate and Representative reserve system
CRA	Comprehensive Regional Assessment. Forestry assessments undertaken by State and Federal Governments to develop Regional Forestry Agreements (RFAs)
DCP	Development Control Plan
DLWC	New South Wales Department of Land and Water Conservation
EEC	Endangered Ecological Community listed under the NSW TSC Act
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act, 1999
ESD	Ecologically Sustainable Development
Extant	Remaining vegetation
GAM	Generalised Additive Model – Statistical application for distribution modelling
GIS	Geographic Information System
JANIS	A report by the Joint ANZECC / MCFFA National Forest Policy Statement Implementation Sub-committee
LEP	Local Environment Plan
NFPS	National Forest Policy Statement
NPWS	New South Wales National Parks and Wildlife Service
NVC Act	NSW Native Vegetation Conservation Act, 1997. Administered by DLWC
P5MA	Priority 5 Management Area. Part of the DLWC state-wide vegetation mapping project. The priority 5 area covers the NSW South Coast and Southern Highlands
Pre1750	Nominal date for measuring vegetation distribution prior to European settlements
RBG	New South Wales Royal Botanic Gardens
REP	Regional Environment Plan
RVMP	Regional Vegetation Management Plan. Prepared and administered by DLWC
SCA	Sydney Catchment Authority
SEPP	State Environmental Planning Policy
TSC Act	NSW Threatened Species Conservation Act, 1995
WOFE	“Wingecarribee Our Future Environment” Program

10 References

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Appendix 1 – Vegetation Community Profiles

Profiles for individual vegetation communities have been prepared for all communities identified through the PATN analysis and mapped by Eco Logical Australia. Additionally, those communities that have been mapped through other projects, notably the Woronora Vegetation Mapping project undertaken jointly by the NPWS and SCA and the Southern CRA Vegetation Mapping project have been included.

An explanation of some of the terms used follows:

Sites: eg., AVN08, BRG03

These are the unique site codes allocated for each systematic survey site. A variety of standards have been implemented by the different survey projects that have taken place. Some examples are as follows:

AVN07 – AVN relates to the Avon Catchment Survey undertaken by the SCA. 07 is the seventh site in this survey

MITT01 – MITT relates to the Mittagong 1 : 100 000 survey sheet. These surveys were undertaken by the Royal Botanic Gardens. 01 is the first site in this survey

Bun001hq – This is the coding used by the Wingecarribee and P5MA surveys. The first three letters relate to the 1 : 25 000 map sheet that this survey occurred on (in this case 'Bundanoon'). 001 is the first site on this map sheet. The last letter relate to the substrate at the site:

hq = high quartz sedimentary

lq = low quartz sedimentary

b = basalt

a = alluvium

Diagnostic Species:

Stratum	The layer or stratum in which the species is most likely to occur
Scientific Name	Species scientific name
Group score	Average presence or absence of the species in the community
Group frequency	The frequency of recordings for surveys sites undertaken within the community
Non-group score	Average presence or absence of the species in all other communities
Non-group frequency	The frequency of recordings for survey sites undertaken in all other communities
Fidelity Class	The contribution the species makes towards delineating the community

Wingecarribee Shire

Motorway

Highway / Major Road

Major Road

Endangered Ecological Communities

Mt Gibraltar Forest

Southern Highlands Shale Woodland

Southern Highlands Shale Woodland

Joadja Tall Open Forest

Basalt Communities

Robertson Basalt Rainforest

Robertson Basalt Tall Open Forest

Shale Sandstone Transition Forest

Transitional Shale Stringybark Forest

Bargo Brush Forest

Other Communities

Bindook Porphyry Dry Woodland

Bindook Porphyry Moist Woodland

Budawang Ash Mallee Scrub

Bundanoon Sandstone Woodland

Burraborang Ironbark Woodland

Dry Nattai Escarpment Complex

Escarpment Edge Silvertop Ash Forest

Exposed Sandstone Scribbly Gum Woodland

Hawkesbury Sandstone Woodland

Highlands Sandstone Allocasuarina Heath

Highlands Sandstone Swamp Woodland

Highlands Swamp Gum-Melaleuca Woodland

Mittagong Sandstone Woodland

Moist Gully Gum Forest

Moist Nattai Escarpment Complex

Nattai Sandstone Gully Forest

Nepean Enriched Sandstone Woodland

Nepean Gorge Moist Forest

Nepean Sandstone Gully Forest

Riparian Casuarina Forest

Rock Pavement Heath

Rock Plate Heath-Mallee

Sandstone Riparian Scrub

Sandstone Wet Heath/Sedge

Scribbly Gum Open Woodland

Shoalhaven Gorge Moist Shrub Forest

Shoalhaven Gorge Riparian Shrub Forest

Shoalhaven Gorge Tall Open Forest

Swamp

Sydney Sandstone Gully Forest

Tall Open Gully Gum Forest

Transitional Shale Open Blue Gum Forest

Upland Swamps: Banksia Thicket

Upland Swamps: Fringing Eucalypt Woodland

Upland Swamps: Mallee-Heath

Upland Swamps: Sedgeland-Heath Complex

Upland Swamps: Tea Tree Thicket

Upper Georges River Sandstone Woodland

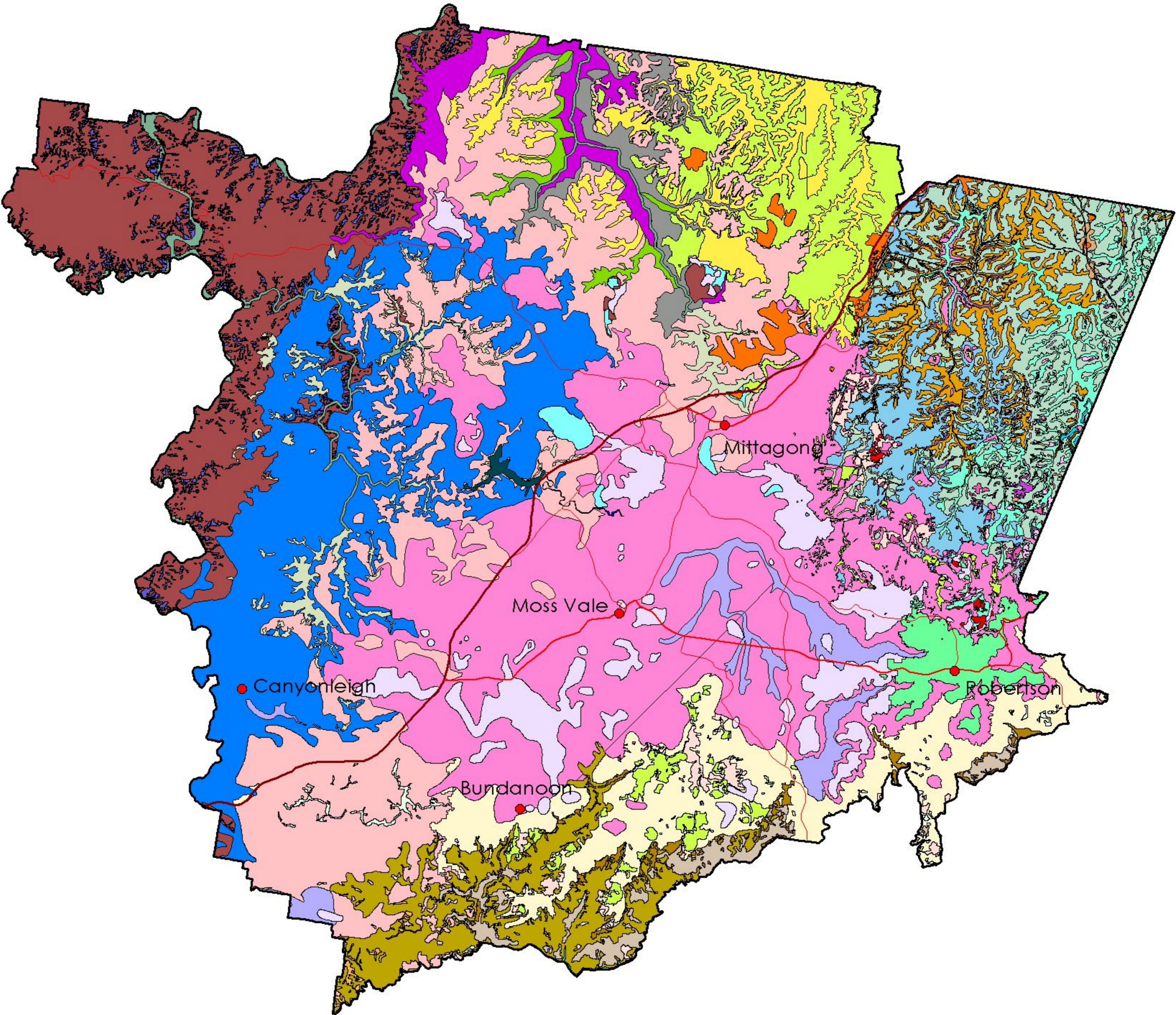
Upper Shoalhaven Tall Open Forest

Warm Temperate Rainforest

Wingecarribee Mallee

Wingecarribee Woodland

Water



1. Hawkesbury Sandstone Woodland

Sites: AVN07, AVN08, BRG03, AVN15, WOLL040, AVN49, BRG19, BRG17, AVN51, AVN61, AVN79, BRG39, AVN63, AVN88, RBR34, AVN73, AVN91, AVN85, BRG40, BRG52, BRG53, AVN80, WOLL038, WOLL039, BRG48, WOLL013, HILL01, HILL02, HILL05, AVN09, AVN17, AVN40, AVN13, WOLL029, BUN030HQ, AVN74, RBR29, AVN56, AVN57, AVN67, RBR37, AVN65, BRG46, AVN68, AVN70, AVN69, BRG49, AVN78, BRG44, BRG54, AVN81, AVN76, AVN90, RBR31

Area (ha, 2001/1750): 11108/12380 **Proportion Extant (%)** 90.00
No. Taxa (total): 328 **No. Taxa per Plot:** 43.74

Description

Hawkesbury Sandstone Woodland is dominated by *Corymbia gummifera*, *Eucalyptus piperita* and *E. sieberi*. These species in conjunction with several other Eucalypt species including a number of stringybarks form a relative sparse canopy with a mean height of approximately 15 metres. An often dense mid storey of sclerohyllous shrubs including *Banksia spinulosa*, *Acacia terminalis*, *Persoonia leavis*, *Petrophile pulchella*, *Bossiaea obcordata*, *Leptospermum trinervium* and *Lambertia Formosa* occurs. Common ground covers include *Lomandra obliqua*, *Caustis flexuosa*, *Cyathochaeta diandra* and *Patersonia sericea*.

Hawkesbury Sandstone Woodland is widely distributed across the Nattai and Woronora Plateaus and occurs extensively outside of Wingecarribee Shire. It is confined to dissected Hawkesbury sandstone country, primarily on ridgetops and upper slopes. The species composition can be quite variable and is closely related to soil depth, aspect, slope, topography and fire history.

Previous Floristic Classifications

This community has previously been classified as Sydney Sandstone Ridgetop Woodland by Fisher, Ryan & Lembit (1995), map unit 10ar.

Description

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	85	14.81	15.63
Mid	85	6.75	30.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non-group freq	Fidelity class
Tree	<i>Corymbia gummifera</i>	1	0.85	1	0.07	positive
	<i>Eucalyptus sieberi</i>	1	0.57	1	0.14	positive
Shrub	<i>Eucalyptus piperita</i>	1	0.52	1	0.21	positive
	<i>Persoonia levis</i>	1	0.89	1	0.19	positive
	<i>Banksia spinulosa</i>	1	0.87	1	0.24	positive
	<i>Leptospermum trinervium</i>	1	0.78	1	0.19	positive
	<i>Lomatia silaifolia</i>	1	0.74	1	0.19	positive
	<i>Lambertia formosa</i>	1	0.70	1	0.05	positive
	<i>Bossiaea obcordata</i>	1	0.69	1	0.15	positive
	<i>Petrophile pulchella</i>	1	0.65	1	0.01	positive

	<i>Pimelea linifolia</i>	1	0.63	1	0.13	positive
	<i>Isopogon anemonifolius</i>	1	0.59	1	0.10	positive
	<i>Acacia terminalis</i>	1	0.57	1	0.15	positive
	<i>Hakea dactyloides</i>	1	0.52	1	0.23	positive
	<i>Platysace linearifolia</i>	1	0.50	1	0.07	positive
	<i>Eriostemon australasius</i>	1	0.43	0	0.00	positive
	<i>Philotheca salsolifolia</i> subsp	1	0.11	0	0.00	positive
	<i>Acacia echinula</i>	1	0.07	0	0.00	positive
	<i>Dillwynia elegans</i>	1	0.06	0	0.00	positive
	<i>Ricinocarpos pinifolius</i>	1	0.06	0	0.00	positive
	<i>Boronia pinnata</i>	1	0.04	0	0.00	positive
	<i>Cassinia denticulata</i>	1	0.04	0	0.00	positive
	<i>Dillwynia parvifolia</i>	1	0.04	0	0.00	positive
	<i>Hibbertia circumdans</i>	1	0.04	0	0.00	positive
	<i>Leptospermum rotundifolium</i>	1	0.04	0	0.00	positive
	<i>Choretrum species A</i>	1	0.02	0	0.00	positive
	<i>Crocea exalata</i> subsp exalata	1	0.02	0	0.00	positive
	<i>Cryptandra propinqua</i>	1	0.02	0	0.00	positive
	<i>Dodonaea camfieldii</i>	1	0.02	0	0.00	positive
	<i>Epacris crassifolia</i>	1	0.02	0	0.00	positive
	<i>Grevillea phyllioides</i>	1	0.02	0	0.00	positive
	<i>Hakea gibbosa</i>	1	0.02	0	0.00	positive
	<i>Hibbertia virgata</i> ssp virgata	1	0.02	0	0.00	positive
	<i>Leptospermum sphaerocarpum</i>	1	0.02	0	0.00	positive
	<i>Leucopogon amplexicaulis</i>	1	0.02	0	0.00	positive
	<i>Lissanthe sapida</i>	1	0.02	0	0.00	positive
	<i>Mirbelia speciosa</i>	1	0.02	0	0.00	positive
	<i>Monotoca ledifolia</i>	1	0.02	0	0.00	positive
	<i>Myoporum acuminatum</i>	1	0.02	0	0.00	positive
	<i>Persoonia oblongata</i>	1	0.02	0	0.00	positive
	<i>Pimelea glauca</i>	1	0.02	0	0.00	positive
	<i>Pultenaea stipularis</i>	1	0.02	0	0.00	positive
	<i>Styphelia tubiflora</i>	1	0.02	0	0.00	positive
	<i>Woolisia pungens</i>	1	0.02	0	0.00	positive
	<i>Zieria laevigata</i>	1	0.02	0	0.00	positive
Ground	<i>Lomandra obliqua</i>	1	0.80	1	0.21	positive
	<i>Cyathochaeta diandra</i>	1	0.63	1	0.06	positive
	<i>Patersonia sericea</i>	1	0.52	1	0.14	positive
	<i>Caustis flexuosa</i>	1	0.50	1	0.05	positive
	<i>Schizaea dichotoma</i>	1	0.07	0	0.00	positive
	<i>Stylidium productum</i>	1	0.07	0	0.00	positive
	<i>Schizaea bifida</i>	1	0.04	0	0.00	positive
Ground	<i>Xanthosia dissecta</i>	1	0.04	0	0.00	positive
	<i>Baumea acuta</i>	1	0.02	0	0.00	positive
	<i>Baumea nuda</i>	1	0.02	0	0.00	positive
	<i>Baumea teretifolia</i>	1	0.02	0	0.00	positive
	<i>Centrolepis fascicularis</i>	1	0.02	0	0.00	positive
	<i>Laxmannia compacta</i>	1	0.02	0	0.00	positive
	<i>Lobelia dentata</i>	1	0.02	0	0.00	positive
	<i>Schoenus turbinatus</i>	1	0.02	0	0.00	positive
	<i>Stackhousia nuda</i>	1	0.02	0	0.00	positive
Tree	<i>Banksia serrata</i>	1	0.43	1	0.07	uninformative
	<i>Eucalyptus racemosa</i>	1	0.41	1	0.02	uninformative
	<i>Eucalyptus oblonga</i>	1	0.33	1	0.01	uninformative
	<i>Acacia longifolia</i>	1	0.30	1	0.17	uninformative
	<i>Eucalyptus globoidea</i>	1	0.24	1	0.18	uninformative
	<i>Eucalyptus sclerophylla</i>	1	0.19	1	0.11	uninformative
	<i>Allocasuarina littoralis</i>	1	0.11	1	0.17	uninformative
	<i>Acacia falciformis</i>	1	0.06	1	0.13	uninformative
	<i>Eucalyptus agglomerata</i>	1	0.06	1	0.16	uninformative
	<i>Eucalyptus punctata</i>	1	0.06	1	0.22	uninformative
	<i>Eucalyptus eugenioides</i>	1	0.04	1	0.08	uninformative
	<i>Acacia mearnsii</i>	1	0.02	1	0.04	uninformative
	<i>Callicoma serratifolia</i>	1	0.02	1	0.01	uninformative
	<i>Elaeocarpus reticulatus</i>	1	0.02	1	0.11	uninformative
	<i>Eucalyptus consideniana</i>	1	0.02	1	0.01	uninformative
	<i>Melaleuca linariifolia</i>	1	0.02	1	0.02	uninformative
	<i>Polyosma cunninghamii</i>	1	0.02	1	0.01	uninformative
	<i>Quintinia sieberi</i>	1	0.02	1	0.01	uninformative
Tree/Shrub	<i>Xylomelum pyriforme</i>	1	0.37	1	0.05	uninformative
	<i>Acacia linearifolia</i>	1	0.04	1	0.01	uninformative

2. Bundanoon Sandstone Woodland

Sites: BUN001HQ, BUN002HQ, BUN012HQ, BUN026HQ, BUN027HQ,
BUN017LQ, BUN013HQ, BUN016HQ, BUN021HQ, BUN025HQ,
ROB036HQ, BUN011HQ, BUN014LQ, BUN015HQ

Area (ha, 2001/1750): 10081/14137 **Proportion Extant (%)** 71.31
No. Taxa (total): 171 **No. Taxa per Plot:** 47.29

Description

Bundanoon Sandstone Woodland is dominated by *Eucalyptus sieberi*, *E. piperita*, *Corymbia gummifera*, *E. sclerophylla* and *Banksia serrata*. The tree stratum averages close to 23 metres and has an average foliage cover of around 29%. The often dense mid stratum is composed of small trees and a variety of shrubs, the most frequently occurring include *Petrophile pedunculata*, *Tetratheca thymifolia*, *Lambertia Formosa*, *Hakea dactyloides* and *Leptospermum trinervium*. The ground stratum is often diverse and is dominated by *Billardiera scandens*, *Lomandra obliqua*, *Lomatia ilicifolia*, *Patersonia glabrata* and *Pteridium esculentum*.

Bundanoon Sandstone Woodland occurs on the extensive sandstone escarpment area in the south of the Shire and extends east from approximately Bundanoon to the eastern most edge of the Shire. This community occupies a similar habitat as Map Unit 1, Sydney Sandstone Woodland, however the floristics of this community are sufficiently unique to warrant its identification as a separate community.

Previous Floristic Classifications

The Southern CRA Forest Ecosystems Mapping (NPWS, 2000c) has previously classified this community as Coastal Escarpment Moist Shrub/Fern Forest, map unit 137.

Description

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	100	22.75	29.29
Mid	100	2.56	33.21
Lower Mid	29	1.08	20.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Tree	Eucalyptus sieberi	1	0.93	1	0.17	positive
Shrub	Lambertia formosa	1	0.93	1	0.11	positive
	Persoonia levis	1	0.93	1	0.26	positive
	Petrophile pedunculata	1	0.93	1	0.11	positive
	Tetralochea thymifolia	1	0.93	1	0.17	positive
	Leptospermum trinervium	1	0.86	1	0.25	positive
	Platysace linearifolia	1	0.86	1	0.10	positive
	Amperea xiphoclada	1	0.79	1	0.13	positive
	Hakea dactyloides	1	0.79	1	0.25	positive
	Hibbertia empetrifolia subsp	1	0.79	1	0.20	positive
	Banksia spinulosa	1	0.71	1	0.31	positive
	Persoonia mollis	1	0.71	1	0.06	positive
	Pimelea linifolia	1	0.71	1	0.17	positive
	Acacia obtusifolia	1	0.64	1	0.11	positive
	Monotoca scoparia	1	0.64	1	0.14	positive
	Pultenaea daphnoides	1	0.64	1	0.03	positive
	Aotus ericoides	1	0.57	1	0.04	positive
	Bossiaea obcordata	1	0.57	1	0.21	positive
	Acacia terminalis	1	0.50	1	0.19	positive
	Epacris longiflora	1	0.14	0	0.00	positive
	Boronia thujona	1	0.07	0	0.00	positive
	Grevillea linearifolia	1	0.07	0	0.00	positive
	Melaleuca capitata	1	0.07	0	0.00	positive
	Xanthosia spp.	1	0.07	0	0.00	positive
Ground	Billardiera scandens	1	0.86	1	0.40	positive
	Lomandra obliqua	1	0.86	1	0.26	positive
	Lomatia ilicifolia	1	0.86	1	0.07	positive
	Patersonia glabrata	1	0.86	1	0.20	positive
	Pteridium esculentum	1	0.79	1	0.34	positive
	Dianella caerulea	1	0.64	1	0.31	positive
	Lomandra filiformis ssp filiformis	1	0.64	1	0.19	positive
	Cyathochaeta diandra	1	0.57	1	0.12	positive
	Entolasia stricta	1	0.57	1	0.38	positive
	Cryptostylis spp.	1	0.50	1	0.02	positive
	Hybanthus monopetalus	1	0.50	1	0.05	positive
	Isotoma anethifolia	1	0.07	0	0.00	positive
Tree	Banksia serrata	1	0.43	1	0.10	uninformative
	Eucalyptus piperita	1	0.43	1	0.24	uninformative
	Corymbia gummifera	1	0.36	1	0.16	uninformative
	Eucalyptus sclerophylla	1	0.36	1	0.11	uninformative
	Acacia longifolia	1	0.29	1	0.18	uninformative
	Allocasuarina littoralis	1	0.21	1	0.16	uninformative
	Eucalyptus dives	1	0.21	1	0.05	uninformative
	Eucalyptus globoidea	1	0.21	1	0.18	uninformative
	Ceratopetalum gummiferum	1	0.14	1	0.01	uninformative
	Elaeocarpus reticulatus	1	0.14	1	0.10	uninformative
	Eucalyptus agglomerata	1	0.14	1	0.14	uninformative
	Callicoma serratifolia	1	0.07	1	0.01	uninformative
	Ceratopetalum apetalum	1	0.07	1	0.02	uninformative
	Eucalyptus radiata	1	0.07	1	0.07	uninformative
	Stenocarpus salignus	1	0.07	1	0.01	uninformative
	Syncarpia glomulifera	1	0.07	1	0.02	uninformative
Tree/Shrub	Hakea salicifolia	1	0.07	1	0.02	uninformative

3. Sydney Sandstone Gully Forest

Sites: BRG01, BRG08, BRG41, WOLL059, BRR59P5U, WOLL037, BRG21, BRG38, MITT10

Area (ha, 2001/1750):	3273/4427	Proportion Extant (%):	74
No. Taxa (total):	169	No. Taxa per Plot:	34.00

Description

Sydney Sandstone Gully Forest is dominated by *Eucalyptus agglomerata*, *E. piperita*, *E. punctata*, *E. elata* and *Allocasuarina littoralis*. The canopy averages around 18 metres in height with a foliage cover of approximately 30%. The mid stratum is composed of small trees and a large variety of shrubs, the most frequent of which are *Persoonia linearis*, *Monotoca scoparia*, *Leptospermum trinervium*, *Leptospermum polygalifolium* and *Pultenaea flexilis*. Ground species include *Lomandra longifolia*, *Lomandra fluvialis* and *Correa reflexa*.

Sydney Sandstone Gully Forest occurs in the dissected valleys of Hawkesbury Sandstone, primarily on the Woronora Plateau.

Previous Floristic Classifications

Sydney Sandstone Gully Forest has previously been classified as Sydney Sandstone Gully by Fisher, Ryan & Lembit (1995), map unit 10ag.

Description

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	67	17.75	30.00
Mid	67	4.70	26.67

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Tree	Eucalyptus agglomerata	1	0.67	1	0.13	positive
	Eucalyptus piperita	1	0.56	1	0.24	positive
	Eucalyptus oreades	1	0.11	0	0.00	positive
	Eucalyptus sparsifolia	1	0.11	0	0.00	positive
Shrub	Persoonia linearis	1	0.67	1	0.37	positive
	Leptospermum trinervium	1	0.56	1	0.26	positive
	Monotoca scoparia	1	0.56	1	0.15	positive
	Prostanthera rhombea	1	0.22	0	0.00	positive
	Austromyrtus tenuifolia	1	0.11	0	0.00	positive
	Hibbertia nitida	1	0.11	0	0.00	positive
	Hovea longifolia	1	0.11	0	0.00	positive
	Hovea pannosa	1	0.11	0	0.00	positive
	Pomaderris eriocephala	1	0.11	0	0.00	positive
	Tristania neriifolia	1	0.11	0	0.00	positive
	Lomandra longifolia	1	0.56	1	0.51	positive
	Lomandra fluviatilis	1	0.22	0	0.00	positive
Ground	Calotis dentex	1	0.11	0	0.00	positive
	Gonocarpus longifolius	1	0.11	0	0.00	positive
	Sporadanthus gracilis	1	0.11	0	0.00	positive
	Allocasuarina littoralis	1	0.44	1	0.15	uninformative
Tree	Elaeocarpus reticulatus	1	0.44	1	0.09	uninformative
	Acacia elata	1	0.33	1	0.00	uninformative
	Acacia floribunda	1	0.33	1	0.01	uninformative
	Acacia longifolia	1	0.33	1	0.18	uninformative
	Backhousia myrtifolia	1	0.33	1	0.04	uninformative
	Eucalyptus elata	1	0.33	1	0.07	uninformative
	Eucalyptus punctata	1	0.33	1	0.20	uninformative
	Acacia binervata	1	0.22	1	0.05	uninformative
	Alphitonia excelsa	1	0.22	1	0.00	uninformative
	Banksia serrata	1	0.22	1	0.11	uninformative
	Callicoma serratifolia	1	0.22	1	0.01	uninformative
	Ceratopetalum gummiferum	1	0.22	1	0.01	uninformative
	Corymbia gummifera	1	0.22	1	0.17	uninformative
	Allocasuarina torulosa	1	0.11	1	0.01	uninformative
	Ceratopetalum apetalum	1	0.11	1	0.02	uninformative
	Eucalyptus globoidea	1	0.11	1	0.19	uninformative
	Eucalyptus racemosa	1	0.11	1	0.07	uninformative
	Eucalyptus sieberi	1	0.11	1	0.20	uninformative
	Stenocarpus salignus	1	0.11	1	0.01	uninformative
Tree/Shrub	Acacia parvipinnula	1	0.22	1	0.01	uninformative
	Hakea salicifolia	1	0.22	1	0.01	uninformative
	Lomatia myricoides	1	0.22	1	0.04	uninformative
	Notelaea venosa	1	0.22	1	0.06	uninformative
	Tristaniopsis laurina	1	0.22	1	0.00	uninformative
	Xylomelum pyriforme	1	0.22	1	0.09	uninformative
	Acacia rubida	1	0.11	1	0.01	uninformative
	Exocarpos cupressiformis	1	0.11	1	0.04	uninformative
	Notelaea longifolia	1	0.11	1	0.04	uninformative

4. Mittagong Sandstone Woodland

Sites: BAR001HQ, HAN007LQ, HAN005HQ, BRR06H8C, BRR21P1M, BRR20P3U, MIT017HQ, MIT030HQ, HAN008HQ, HIL020HQ, HIL015LQ, HIL009HQ, HIL013HQ, HLL01N1U, HLL06W6M, HLL07H1U, HIL017LQ, HLL03H3U, HLL04H8M, HAN013HQ, HLL10H2L, BRG02, CAN006LQ, WIN001LQ, WIN004HQ, BRR07H4U, HAN009HQ, MIT001HQ, MITT01, MITT02, HIL016LQ, MIT009HQ, MITT04, MITT09, HIL018HQ, HIL019HQ, HIL026HQ, MIT014HQ, MIT020HQ

Area (ha, 2001/1750):	28354/38702	Proportion Extant (%)	75.27
No. Taxa (total):	282	No. Taxa per Plot:	44.49

Description

Mittagong Sandstone Woodland is dominated by *Eucalyptus agglomerata*, *E. punctata*, *E. sieberi*, *E. piperita* and *Allocasuarina littoralis*. It has an average height of over 18 metres and a mean foliage cover of around 27%. The Mid stratum averages a height of around 4.6 metres and includes a variety of small trees and shrubs. Dominant mid stratum species include *Persoonia linearis*, *Persoonia levis*, *Tetratheca thymifolia*, *Banksia spinulosa*, *Bossiaea obcordata*, *Hibbertia empetrifolia* and *Leptospermum trinervium*. The ground stratum is variable and often gives way to a lower-mid stratum with an average height of around 1.6 metres. Common species include *Entolasia stricta*, *Goodenia hederacea*, *Patersonia glabrata*, *Phyllanthus hirtellus*, *Pomax umbellata*, *Dampiera purpurea*, *Billardiera scandens*, *Lomandra oblique* and *Lomandra cylindrical*.

Mittagong Sandstone Woodland occurs on Hawkesbury and Narrabeen Sandstone from Penrose, through Belanglo and onto the southern portion of the Nattai Plateau. There is considerable variation in the structure and species composition throughout its range related in part to variations in soil depth, slope, aspect and drainage.

Previous Floristic Classifications

Fisher, Ryan & Lembit (1995), have previously classified this community as Mittagong Sandstone Woodland. This nomenclature has been retained. The Southern CRA Forest Ecosystems Mapping (NPWS, 2000c) classified this community as Hinterland Heath Shrub Dry Forest.

Description

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	90	18.44	26.71
Mid	90	4.64	20.57
Lower Mid	33	1.66	23.08

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non-group freq	Fidelity class
Tree	Eucalyptus agglomerata	1	0.62	1	0.10	positive
	Eucalyptus punctata	1	0.59	1	0.16	positive
Shrub	Persoonia linearis	1	0.92	1	0.32	positive
	Persoonia levis	1	0.82	1	0.22	positive
	Tetradlea thymifolia	1	0.74	1	0.14	positive
	Hibbertia empetrifolia subsp	1	0.72	1	0.17	positive
	Bossiaea obcordata	1	0.69	1	0.17	positive
	Lomatia silaifolia	1	0.69	1	0.21	positive
	Leptospermum trinervium	1	0.64	1	0.23	positive
	Podolobium ilicifolium	1	0.62	1	0.08	positive
	Acacia terminalis	1	0.56	1	0.16	positive
	Banksia spinulosa	1	0.54	1	0.30	positive
	Petrophile pedunculata	1	0.54	1	0.09	positive
	Boronia algida	1	0.03	0	0.00	positive
	Crocea saligna	1	0.03	0	0.00	positive
	Hakea constablei	1	0.03	0	0.00	positive
	Leucopogon appressus	1	0.03	0	0.00	positive
	Petrophile spp.	1	0.03	0	0.00	positive
	Rhytidium prostratum	1	0.03	0	0.00	positive
Ground	Patersonia glabrata	1	0.77	1	0.16	positive
	Entolasia stricta	1	0.74	1	0.35	positive
	Goodenia hederacea	1	0.74	1	0.29	positive
	Pomax umbellata	1	0.74	1	0.16	positive
	Phyllanthus hirtellus	1	0.72	1	0.21	positive
	Lomandra obliqua	1	0.67	1	0.24	positive
	Billardiera scandens	1	0.64	1	0.39	positive
	Dampiera purpurea	1	0.62	1	0.14	positive
	Gonocarpus teucrioides	1	0.56	1	0.20	positive
	Lomandra cylindrica	1	0.54	1	0.13	positive
	Styphandra glauca	1	0.51	1	0.08	positive
	Billardiera versicolor	1	0.03	0	0.00	positive
	Glossodia major	1	0.03	0	0.00	positive
	Polycarpha corymbosa var	1	0.03	0	0.00	positive
	Pteris tremula	1	0.03	0	0.00	positive
Tree	Allocasuarina littoralis	1	0.46	1	0.13	uninformative
	Eucalyptus sieberi	1	0.46	1	0.17	uninformative
	Acacia longifolia	1	0.28	1	0.17	uninformative
	Angophora costata	1	0.28	1	0.01	uninformative
	Eucalyptus piperita	1	0.28	1	0.24	uninformative
	Elaeocarpus reticulatus	1	0.26	1	0.08	uninformative
	Eucalyptus sclerophylla	1	0.26	1	0.10	uninformative
	Eucalyptus globoidea	1	0.21	1	0.18	uninformative
	Banksia serrata	1	0.18	1	0.10	uninformative
	Corymbia gummiifera	1	0.13	1	0.17	uninformative
	Acacia falciformis	1	0.10	1	0.12	uninformative
	Acacia floribunda	1	0.03	1	0.02	uninformative
	Acacia irrorata	1	0.03	1	0.01	uninformative
	Angophora floribunda	1	0.03	1	0.02	uninformative
	Eucalyptus consideniana	1	0.03	1	0.01	uninformative
	Eucalyptus elata	1	0.03	1	0.08	uninformative
	Eucalyptus radiata	1	0.03	1	0.07	uninformative
	Eucalyptus sideroxylon	1	0.03	1	0.01	uninformative
	Eucalyptus smithii	1	0.03	1	0.04	uninformative
Tree	Pittosporum undulatum	1	0.03	1	0.10	uninformative
Tree/Shrub	Xylomelum pyrifolium	1	0.31	1	0.07	uninformative
	Acacia parvipinnula	1	0.03	1	0.02	uninformative
	Exocarpos cupressiformis	1	0.03	1	0.04	uninformative
	Lomatia myricoides	1	0.03	1	0.04	uninformative
	Notelaea venosa	1	0.03	1	0.07	uninformative

5. Wingecarribee Mallee

Sites: HIL010HQ, MIT018HQ, MIT022HQ, MIT023HQ, HIL021HQ, MITT03, MOSS002, MITT06, ROB037HQ, MITT08, MOSS003

Area (ha, 2001/1750):	274/287	Proportion Extant (%)	95.00
No. Taxa (total):	232	No. Taxa per Plot:	50.27

Description

Wingecarribee Mallee is dominated by *Eucalyptus sclerophylla*, *E. mannifera*, and *E. piperita* with *E. rossii* occurring less frequently. An often dense mid storey occurs with *Hakea dactyloides*, *Amperea xiphioclada*, *Banksia spinulosa*, *Leptospermum trinervium*, *Bossiaea heterophylla*, *Isopogon anemonifolius* and *Leptospermum polygalifolium*. The ground stratum is frequently composed of *Goodenia hederacea*, *Cheilanthes sieberi*, *Lomandra cylindrica*, *Lomandra longifolia*, *Lomandra multiflora ssp multiflora*, *Patersonia glabrata* and *Patersonia sericea*.

This community occurs adjacent to the Wingecarribee River on sandstone outcrops on the edge of the Southern Highlands. It is highly restricted in its distribution, a few small areas that were not mappable were observed during field survey occurring on sandstone outcrops in the deeply dissected Joadja country. The community is floristically diverse with an average of over 50 species per plot. This diversity also provides for a variety of habitat and food resources for animals, particularly nectar-eating birds and mammals.

Previous Floristic Classifications

Fisher, Ryan & Lembit (1995), have previously classified this community as Wingecarribee Mallee. This nomenclature has been retained.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	55	10.08	26.50
Mid	55	1.77	31.67
Lower Mid	9	1.00	40.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non-group freq	Fidelity class
Tree	Eucalyptus sclerophylla	1	0.73	1	0.10	positive
	Callitris endlicheri	1	0.09	0	0.00	positive
	Callitris muelleri	1	0.09	0	0.00	positive
Shrub	Hakea dactyloides	1	1.00	1	0.25	positive
	Amperea xiphoclada	1	0.91	1	0.13	positive
	Banksia spinulosa	1	0.82	1	0.31	positive
	Leptospermum trinervium	1	0.82	1	0.25	positive
	Bossiaea heterophylla	1	0.55	1	0.10	positive
	Isopogon anemonifolius	1	0.55	1	0.16	positive
	Leptospermum arachnoides	1	0.55	1	0.02	positive
	Leptospermum polygalifolium	1	0.55	1	0.17	positive
	Lomatia silaifolia	1	0.55	1	0.25	positive
	Kunzea parvifolia	1	0.36	0	0.00	positive
	Allocasuarina diminuta ssp mimica	1	0.18	0	0.00	positive
	Kunzea cabbagei	1	0.18	0	0.00	positive
	Leptospermum parvifolium	1	0.09	0	0.00	positive
	Leucopogon attenuatus	1	0.09	0	0.00	positive
	Leucopogon muticus	1	0.09	0	0.00	positive
	Persoonia cornifolia	1	0.09	0	0.00	positive
	Persoonia glaucescens	1	0.09	0	0.00	positive
	Persoonia myrtilloides	1	0.09	0	0.00	positive
	Pseudanthus divaricatissimus	1	0.09	0	0.00	positive
Ground	Goodenia hederacea	1	0.73	1	0.32	positive
	Cheilanthes sieberi	1	0.64	1	0.19	positive
	Lomandra cylindrica	1	0.64	1	0.15	positive
	Lomandra longifolia	1	0.64	1	0.51	positive
	Lomandra multiflora ssp multiflora	1	0.64	1	0.35	positive
	Patersonia glabrata	1	0.64	1	0.21	positive
	Patersonia sericea	1	0.64	1	0.18	positive
	Dianella revoluta	1	0.55	1	0.22	positive
	Entolasia stricta	1	0.55	1	0.38	positive
	Schoenoplectus mucronatus	1	0.18	0	0.00	positive
	Caustis pentandra	1	0.09	0	0.00	positive
	Micrantheum hexandrum	1	0.09	0	0.00	positive
	Thelionema umbellatum	1	0.09	0	0.00	positive
	Parsonia lanceolata	1	0.09	0	0.00	positive
Vine	Eucalyptus mannifera	1	0.45	1	0.04	uninformative
Tree	Eucalyptus piperita	1	0.27	1	0.25	uninformative
	Allocasuarina littoralis	1	0.18	1	0.16	uninformative
	Eucalyptus rossii	1	0.18	1	0.01	uninformative
	Acacia parramattensis	1	0.09	1	0.06	uninformative
	Banksia serrata	1	0.09	1	0.11	uninformative
	Corymbia gummifera	1	0.09	1	0.17	uninformative
	Eucalyptus agglomerata	1	0.09	1	0.15	uninformative
	Eucalyptus dives	1	0.09	1	0.06	uninformative
	Eucalyptus elata	1	0.09	1	0.07	uninformative
	Eucalyptus eugenioides	1	0.09	1	0.07	uninformative
	Eucalyptus oblonga	1	0.09	1	0.05	uninformative
	Eucalyptus radiata	1	0.09	1	0.07	uninformative
	Eucalyptus sieberi	1	0.09	1	0.20	uninformative
Tree/Shrub	Xylomelum pyrifforme	1	0.18	1	0.09	uninformative
	Acacia dealbata	1	0.09	1	0.01	uninformative
	Acacia rubida	1	0.09	1	0.01	uninformative
Tree/Shrub	Lomatia myricoides	1	0.09	1	0.04	uninformative

6. Scribbly Gum Open Woodland

Sites: AVN53, AVN77, AVN54, AVN55, AVN66, BRG32, WOLL010, AVN82, RBR49, RBR33, RBR43, MOS002LQ, RBR51, RBR52, WOLL009, WOLL064, WOLL032

Area (ha, 2001/1750):	1995/2003	Proportion Extant (%)	98.00
No. Taxa (total):	186	No. Taxa per Plot:	29.76

Description

This community is dominated by *Eucalyptus racemosa* and *E. sclerophylla* with *E. parramattensis* occurring less frequently. A sparse mid stratum is dominated by young trees and shrubs to a height of around 7 metres. The most frequently recorded species are *Hakea dactyloides*, *Banksia spinulosa*, *Banksia oblongifolia*, *Isopogon anemonifolius* and *Pultenaea elliptica*. The ground cover grades into a dense lower mid-stratum up to 1.5 metres high, the most common species include *Dampiera stricta*, *Goodenia bellidifolia*, *Lindsaea linearis*, *Mitrasacme polymorpha*, *Lepyrodia scariosa* and *Cyathochaeta diandra*.

The community occurs on relatively deep sandy soils on sandstone. It has been recorded on the Woronora Plateau and the Southern Sandstone Escarpment east from Bundanoon.

Previous Floristic Classifications

The Southern CRA Forest Ecosystems Mapping (NPWS, 2000) has previously classified this community as Northern Coastal Hinterland Heath Shrub Dry Forest, map unit 139.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	65	16.33	45.00
Mid	47	7.20	10.00
Lower Mid	6	1.50	40.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Tree	Eucalyptus parramattensis	1	0.06	0	0.00	positive
Shrub	Hakea dactyloides	1	1.00	1	0.23	positive
	Banksia spinulosa	1	0.76	1	0.30	positive
	Banksia oblongifolia	1	0.65	1	0.03	positive
	Pultenaea elliptica	1	0.65	1	0.03	positive
	Grevillea sericea	1	0.53	1	0.01	positive
	Isopogon anemonifolius	1	0.53	1	0.15	positive
	Allocasuarina diminuta ssp	1	0.12	0	0.00	positive
	Grevillea parviflora	1	0.12	0	0.00	positive
	Baeckea diosmifolia	1	0.06	0	0.00	positive
	Mirbelia pungens	1	0.06	0	0.00	positive
	Pultenaea ferruginea	1	0.06	0	0.00	positive
Ground	Dampiera stricta	1	0.94	1	0.11	positive
	Goodenia bellidifolia	1	0.82	1	0.09	positive
	Lindsaea linearis	1	0.71	1	0.06	positive
	Mitrasacme polymorpha	1	0.71	1	0.04	positive
	Lepyrodia scariosa	1	0.65	1	0.07	positive
	Cyathochaeta diandra	1	0.59	1	0.11	positive
	Entolasia stricta	1	0.59	1	0.38	positive
	Austrostipa pubescens	1	0.53	1	0.08	positive
	Patersonia sericea	1	0.53	1	0.18	positive
	Amphipogon strictus var strictus	1	0.12	0	0.00	positive
	Hybanthus vernonii	1	0.12	0	0.00	positive
	Amphibromus nervosus	1	0.06	0	0.00	positive
	Lepidosperma forsythii	1	0.06	0	0.00	positive
	Lepidosperma neesii	1	0.06	0	0.00	positive
	Mitrasacme paludosa	1	0.06	0	0.00	positive
	Tricoryne simplex	1	0.06	0	0.00	positive
	Xyris gracilis	1	0.06	0	0.00	positive
Tree	Eucalyptus racemosa	1	0.41	1	0.06	uninformative
	Eucalyptus sclerophylla	1	0.29	1	0.11	uninformative
	Eucalyptus globoidea	1	0.12	1	0.19	uninformative
	Eucalyptus oblonga	1	0.12	1	0.05	uninformative
	Acacia longifolia	1	0.06	1	0.19	uninformative
	Acacia melanoxylon	1	0.06	1	0.09	uninformative
	Eucalyptus radiata	1	0.06	1	0.07	uninformative
	Melaleuca linariifolia	1	0.06	1	0.02	uninformative

7. Sandstone Wet Heath/Sedge

Sites: BUN003SW, RBR50, MIT024SW, BUN009HQ, MOSS011, WOLL033

Area (ha, 2001/1750):	650/667	Proportion Extant (%)	97.00
No. Taxa (total):	104	No. Taxa per Plot:	27.67

Description

Sandstone Wet Heath/Sedge is dominated by *Baeckea linifolia*, *Leptospermum juniperinum*, *Leptospermum grandifolium*, *Epacris paludosa* and *Epacris microphylla*. This typically forms a dense shrub layer with an emergent sparse, tree layer comprised of *Eucalyptus camphora*, *Acacia longifolia*, *E. macarthurii*, *E. mannifera* and *E. ovata* often present. A dense lower stratum dominated by *Empodisma minus*, *Lepidosperma limicola*, *Xyris operculata*, *Gymnoschoenus sphaerocephalus* and *Gleichenia dicarpa* completes this community.

Sandstone Wet/Heath Sedge occurs along drainage lines on the upper slopes of the Woronora Plateau and the Southern Escarpment. It generally occurs on sandy soils often forming near impenetrable thickets.

Previous Floristic Classifications

The Southern CRA Forest Ecosystems Mapping (NPWS, 2000) has previously classified this community as Northern Coast (and Escarpment) Wet Heath/Sedge, map unit 141.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Upper	33	2.50	80.00
Lower	33	2.50	47.50
Emerging	17	3.50	5.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Tree	Eucalyptus camphora	1	0.17	0	0.00	positive
Shrub	Baeckea linifolia	1	0.67	1	0.02	positive
	Leptospermum juniperinum	1	0.67	1	0.03	positive
	Epacris microphylla	1	0.50	1	0.06	positive
	Epacris paludosa	1	0.50	1	0.01	positive
	Leptospermum grandifolium	1	0.50	1	0.00	positive
	Pultenaea divaricata	1	0.50	1	0.00	positive
	Boronia barkeriana	1	0.17	0	0.00	positive
	Melaleuca squarrosa	1	0.17	0	0.00	positive
	Symphionema paludosum	1	0.17	0	0.00	positive
Ground	Empodisma minus	1	1.00	1	0.02	positive
	Lepidosperma limicola	1	0.83	1	0.01	positive
	Xyris operculata	1	0.83	0	0.00	positive
	Gleichenia dicarpa	1	0.67	1	0.03	positive
	Gymnoschoenus sphaerocephalus	1	0.67	1	0.00	positive
	Baloskion fimbriatum	1	0.50	0	0.00	positive
	Chorizandra sphaerocephala	1	0.50	0	0.00	positive
	Lepyrodia anarthria	1	0.50	0	0.00	positive
	Selaginella uliginosa	1	0.50	1	0.03	positive
	Xyris ustulata	1	0.50	0	0.00	positive
	Patersonia fragilis	1	0.33	0	0.00	positive
	Sphagnum cristatum	1	0.33	0	0.00	positive
	Baloskion australe	1	0.17	0	0.00	positive
	Baumea articulata	1	0.17	0	0.00	positive
	Caladenia carnea	1	0.17	0	0.00	positive
	Goodenia paniculata	1	0.17	0	0.00	positive
	Goodenia stelligera	1	0.17	0	0.00	positive
	Lepyrodia muelleri	1	0.17	0	0.00	positive
	Lycopodiella lateralis	1	0.17	0	0.00	positive
	Plinthanthesis paradoxa	1	0.17	0	0.00	positive
	Schoenus brevifolius	1	0.17	0	0.00	positive
	Villarsia exaltata	1	0.17	0	0.00	positive
Tree	Acacia longifolia	1	0.17	1	0.18	uninformative
	Eucalyptus macarthurii	1	0.17	1	0.01	uninformative
	Eucalyptus mannifera	1	0.17	1	0.05	uninformative
	Eucalyptus ovata	1	0.17	1	0.01	uninformative
Tree/Shrub	Acacia rubida	1	0.17	1	0.01	uninformative

8. Swamp (including Peat Swamp)

Sites: CAN023LQ, MOSS012, CAN034LQ, KIAMA001

Area (ha, 2001/1750):	588/4075	Proportion Extant (%)	14.00
No. Taxa (total):	66	No. Taxa per Plot:	33.50

Description

Swamps, including Montane Peat Swamps, are dominated by *Baumea rubiginosa*, *Eleocharis sphacelata*, *Leptospermum obovatum*, *Leptospermum juniperinum*, *Blechnum minus*, *Carex fascicularis*, *Carex gaudichaudiana*, *Hydrocotyle peduncularis*, *Hypericum japonicum*, *Isachne globosa*, *Lythrum salicaria* and *Ranunculus inundatus*.

These swamps occur on areas of quaternary alluvium of low relief. Typically soils are waterlogged and they are often adjacent to wetlands. The most significant area is immediately upstream of Wingecarribee Reservoir. This once extensive area has been significantly reduced through the construction of the reservoir, peat mining and clearing. A substantial area has been identified as being severely degraded through mining activities. Another notable area is Long Swamp, much of which remains in fair condition although activities such as grazing still occur. One remaining area occurs approximately 5km south of Penrose. Although a substantial area has been cleared a large remnant of approximately 170 hectares remains.

Previous Floristic Classifications

Royal Botanic Gardens (unpub.), have previously classified this community as Montane Peat Swamps.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Mid	50	1.23	4.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Shrub	Leptospermum obovatum	1	0.75	1	0.01	positive
	Leptospermum juniperinum	1	0.50	1	0.03	positive
Ground	Baumea rubiginosa	1	1.00	1	0.02	positive
	Eleocharis sphacelata	1	1.00	1	0.01	positive
	Blechnum minus	1	0.75	0	0.00	positive
	Carex fascicularis	1	0.75	1	0.00	positive
	Carex gaudichaudiana	1	0.75	1	0.00	positive
	Hydrocotyle peduncularis	1	0.75	1	0.07	positive
	Hypericum japonicum	1	0.75	1	0.01	positive
	Isachne globosa	1	0.75	1	0.00	positive
	Lythrum salicaria	1	0.75	0	0.00	positive
	Ranunculus inundatus	1	0.75	0	0.00	positive
	Cyperus lucidus	1	0.50	1	0.01	positive
	Cyperus sanguinolentus	1	0.50	0	0.00	positive
	Epilobium pallidiflorum	1	0.50	1	0.00	positive
	Gahnia sieberiana	1	0.50	1	0.04	positive
	Geranium neglectum	1	0.50	1	0.00	positive
	Isolepis crassiuscula	1	0.50	0	0.00	positive
	Isolepis inundata	1	0.50	1	0.00	positive
	Juncus planifolius	1	0.50	1	0.01	positive
	Juncus prismatocarpus	1	0.50	1	0.00	positive
	Juncus sarophorus	1	0.50	1	0.00	positive
	Lycopus australis	1	0.50	0	0.00	positive
	Pericaria praetermissa	1	0.50	1	0.00	positive
	Phragmites australis	1	0.50	1	0.00	positive
	Poa labillardierei var labillardierei	1	0.50	1	0.17	positive
	Stellaria angustifolia	1	0.50	1	0.00	positive
	Viola caleyana	1	0.50	0	0.00	positive
	Bolboschoenus caldwellii	1	0.25	0	0.00	positive
	Carex polyantha	1	0.25	0	0.00	positive
	Cyperus sphaeroideus	1	0.25	0	0.00	positive
	Eleocharis gracilis	1	0.25	0	0.00	positive
	Eriocaulon scariosum	1	0.25	0	0.00	positive
	Isolepis habra	1	0.25	0	0.00	positive
	Lilaeopsis polyantha	1	0.25	0	0.00	positive
	Luzula modesta	1	0.25	0	0.00	positive
	Ottelia ovalifolia subsp ovalifolia	1	0.25	0	0.00	positive
	Pratia surrepens	1	0.25	0	0.00	positive
	Schizaea fistulosa	1	0.25	0	0.00	positive
	Sparganium subglobosum	1	0.25	0	0.00	positive
	Spiranthes sinensis ssp australis	1	0.25	0	0.00	positive
	Typha orientalis	1	0.25	0	0.00	positive

9. Riparian Casuarina Forest

Sites: HAN032A

Area (ha, 2001/1750):	1757/2252	Proportion Extant (%)	78.00
No. Taxa (total):	14	No. Taxa per Plot:	35.00

Description

Riparian Casuarina Forest is dominated by *Casuarina cunninghamiana* which averages a height of around 5 metres. The lower stratum is comprised of juvenile trees, shrubs and groundcovers including *Callistemon sieberi*, *Alternanthera denticulate*, *Centipeda cunninghamii*, *Eleocharis acuta*, *Glycine species A*, *Hydrocotyle peduncularis*, *Juncus usitatus*, *Persicaria decipiens*, *Persicaria hydropiper*, *Persicaria prostrata*, *Schoenoplectus validus*, *Typha domingensis* and *Xanthium italicum*.

Riparian Casuarina Forest occurs on rivers flats particularly along the Wollondilly, Nattai and Wingecarribee Rivers. The soils are derived from quaternary alluvium and range from fine sands to small, rounded boulders.

Previous Floristic Classifications

Fisher, Ryan & Lembit (1995), have previously classified this community as River Oak Forest (Map Unit 9x). The Southern CRA Forest Ecosystems Project (NPWS 2000c) classified this community as Riparian Acacia Shrub/Grass/Herb Forest (Map Unit 53).

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	100	5.00	2.00
Mid	100	1.50	30.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non-group freq	Fidelity class
Tree	<i>Casuarina cunninghamiana</i> ssp	1	1.00	1	0.02	positive
Shrub	<i>Callistemon sieberi</i>	1	1.00	1	0.00	positive
Ground	<i>Alternanthera denticulata</i>	1	1.00	1	0.00	positive
	<i>Centipeda cunninghamii</i>	1	1.00	0	0.00	positive
	<i>Eleocharis acuta</i>	1	1.00	1	0.00	positive
	<i>Glycine species A</i>	1	1.00	1	0.02	positive
	<i>Hydrocotyle peduncularis</i>	1	1.00	1	0.08	positive
	<i>Juncus usitatus</i>	1	1.00	1	0.02	positive
	<i>Persicaria decipiens</i>	1	1.00	1	0.00	positive
	<i>Persicaria hydropiper</i>	1	1.00	1	0.00	positive
	<i>Persicaria prostrata</i>	1	1.00	0	0.00	positive
	<i>Schoenoplectus validus</i>	1	1.00	0	0.00	positive
	<i>Typha domingensis</i>	1	1.00	0	0.00	positive
	<i>Xanthium italicum</i>	1	1.00	0	0.00	positive

10. Wingecarribee Woodland

Sites: BAR004HQ, CAN001LQ, CAN005HQ, CAN012LQ, CAN002HQ, HAN021LQ, BAR005LQ, MIT008HQ, HAN004HQ, BAR009LQ, HAN023HQ, CAN003HQ, MIT021HQ, HAN002HQ, HAN016HQ, HAN018HQ, WIN008HQ, WIN009HQ, BAR021LQ, HIL008LQ, CAN004HQ, CAN024HQ, CAN022LQ, CAN025LQ, CAN027LQ, CAN028LQ, AN014LQA, CAN019LQ, CAN015LQ, CAN020HQ, HAN022HQ, CAN030HQ, CAN016LQ, CAN029LQ, CAN036LQ, HIL004HQ, HLL02W5R, HIL006LQ, HIL011HQ, HLL05W7M, MIT099, CAN021LQ, WIN012HQ, WIN013HQ, CAN032LQ, HAN020LQ

Area (ha, 2001/1750):	18225/29134	Proportion Extant (%)	63.00
No. Taxa (total):	344	No. Taxa per Plot:	46.98

Description

Wingecarribee Woodland is dominated by *Eucalyptus globoidea*, *E. punctata*, *E. mannifera*, *Allocasuarina littoralis*, *Acacia longifolia* and *A. falciformis*. A wide variety of other eucalypt species are present in low frequencies which represent the variable nature of the canopy associated with this community. The shrub stratum is variable, with *Persoonia linearis*, *Hibbertia obtusifolia* and *Olearia viscidula* being the most frequently recorded species. A diverse ground stratum plays an important role in the floristic identification of this community, with *Goodenia hederacea*, *Microlaena stipoides*, *Billardiera scandens*, *Dianella revoluta*, *Lomandra multiflora* ssp *multiflora* and *Opercularia diphylla* being recorded in high frequencies.

This community occurs on moderately fertile soils derived from low quartz sedimentary geologies including Shale, Siltstone, Mudstone and Conglomerates. There is a high level of variation in this community due to the influences of the above on soil characteristics as well as topographic influences such as aspect, slope and topographic position.

This community occurs on the slopes and ridges throughout the Belanglo, Canyonleigh and Joadja areas.

Previous Floristic Classifications

Fisher, Ryan & Lembit (1995), have previously classified two communities that cover the same geographic range as this community. These communities are Wingecarribee Forest (Map Unit 9w) and Joadja Stringybark Woodland (Map Unit 10w). Floristic analysis of sites within these communities indicated that they were not sufficiently different enough to warrant classification of two separate communities. The Southern CRA Forest Ecosystems Project (NPWS 2000c) classified this community as Central and Northeast Tablelands Dry Shrub Forest (Map Unit 15).

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	98	18.71	31.27
Mid	89	3.44	14.02
Lower Mid	9	1.56	3.25

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Shrub	Persoonia linearis	1	0.70	1	0.34	positive
	Hibbertia obtusifolia	1	0.61	1	0.06	positive
	Olearia viscidula	1	0.54	1	0.27	positive
	Daviesia leptophylla	1	0.04	0	0.00	positive
	Pultenaea procumbens	1	0.04	0	0.00	positive
	Acacia obtusata	1	0.02	0	0.00	positive
	Boronia ruppia	1	0.02	0	0.00	positive
	Gompholobium uncinatum	1	0.02	0	0.00	positive
	Leptospermum multicaule	1	0.02	0	0.00	positive
	Leucopogon fraseri	1	0.02	0	0.00	positive
	Platylobium formosum	1	0.02	0	0.00	positive
Ground	Pomaderris phyllifolia ssp	1	0.02	0	0.00	positive
	Pultenaea microphylla	1	0.02	0	0.00	positive
	Goodenia hederacea	1	0.93	1	0.26	positive
	Microlaena stipoides	1	0.89	1	0.37	positive
	Gonocarpus tetragynus	1	0.85	1	0.23	positive
	Lomandra multiflora ssp multiflora	1	0.74	1	0.31	positive
	Billardiera scandens	1	0.70	1	0.38	positive
	Dianella revoluta	1	0.70	1	0.17	positive
	Lomandra filiformis ssp coriacea	1	0.65	1	0.16	positive
	Opercularia diphylla	1	0.65	1	0.07	positive
	Entolasia stricta	1	0.61	1	0.36	positive
	Hardenbergia violacea	1	0.61	1	0.14	positive
	Joycea pallida	1	0.59	1	0.05	positive
	Lomandra glauca	1	0.54	1	0.08	positive
	Wahlenbergia gracilis	1	0.54	1	0.17	positive
	Pomax umbellata	1	0.52	1	0.18	positive
	Austrostipa rudis	1	0.50	1	0.12	positive
	Poranthera microphylla	1	0.50	1	0.19	positive
	Chloris truncata	1	0.04	0	0.00	positive
	Thysanotus patersonii	1	0.04	0	0.00	positive
	Agrostis gigantea	1	0.02	0	0.00	positive
	Agrostis species A	1	0.02	0	0.00	positive
	Austrodanthonia monticola	1	0.02	0	0.00	positive
	Brachyscome multifida	1	0.02	0	0.00	positive
	Brachyscome rigidula	1	0.02	0	0.00	positive
	Caleana minor	1	0.02	0	0.00	positive
	Calotis glandulosa	1	0.02	0	0.00	positive
	Diuris sulphurea	1	0.02	0	0.00	positive
	Galium roddii	1	0.02	0	0.00	positive
	Juncus remotiflorus	1	0.02	0	0.00	positive
	Luzula meridionalis	1	0.02	0	0.00	positive
	Microtis spp.	1	0.02	0	0.00	positive
	Pelargonium australe	1	0.02	0	0.00	positive
	Phyllanthus occidentalis	1	0.02	0	0.00	positive
	Pterostylis decurva	1	0.02	0	0.00	positive
	Wahlenbergia scopulicola	1	0.02	0	0.00	positive
Tree	Eucalyptus globoidea	1	0.37	1	0.16	uninformative
	Eucalyptus punctata	1	0.37	1	0.18	uninformative
	Allocasuarina littoralis	1	0.33	1	0.14	uninformative
	Acacia longifolia	1	0.26	1	0.18	uninformative
	Acacia falciformis	1	0.24	1	0.11	uninformative
	Eucalyptus mannifera	1	0.24	1	0.03	uninformative
	Eucalyptus dives	1	0.20	1	0.04	uninformative
	Acacia decurrens	1	0.17	1	0.02	uninformative
	Eucalyptus agglomerata	1	0.17	1	0.14	uninformative
	Eucalyptus macrorhyncha	1	0.17	1	0.02	uninformative
	Eucalyptus sclerophylla	1	0.17	1	0.11	uninformative
	Eucalyptus sieberi	1	0.17	1	0.20	uninformative
	Eucalyptus eugenioides	1	0.13	1	0.07	uninformative
	Eucalyptus melliodora	1	0.13	1	0.06	uninformative
	Eucalyptus cinerea	1	0.11	1	0.02	uninformative
	Eucalyptus piperita	1	0.11	1	0.27	uninformative

Tree/Shrub	Eucalyptus tereticornis	1	0.11	1	0.11	uninformative
	Eucalyptus rossii	1	0.07	1	0.01	uninformative
	Eucalyptus smithii	1	0.07	1	0.03	uninformative
	Eucalyptus bridgesiana	1	0.04	1	0.02	uninformative
	Eucalyptus elata	1	0.04	1	0.08	uninformative
	Melaleuca linariifolia	1	0.04	1	0.02	uninformative
	Acacia floribunda	1	0.02	1	0.02	uninformative
	Acacia parramattensis	1	0.02	1	0.07	uninformative
	Eucalyptus cypellocarpa	1	0.02	1	0.06	uninformative
	Eucalyptus fibrosa	1	0.02	1	0.01	uninformative
	Eucalyptus ovata	1	0.02	1	0.01	uninformative
	Eucalyptus pauciflora	1	0.02	1	0.01	uninformative
	Eucalyptus radiata	1	0.02	1	0.07	uninformative
	Eucalyptus sideroxylon	1	0.02	1	0.01	uninformative
	Pittosporum undulatum	1	0.02	1	0.10	uninformative
	Acacia deanei	1	0.02	1	0.00	uninformative
	Acacia parvipinnula	1	0.02	1	0.02	uninformative
	Exocarpos cupressiformis	1	0.02	1	0.05	uninformative
	Lomatia myricoides	1	0.02	1	0.04	uninformative
	Notelaea longifolia	1	0.02	1	0.04	uninformative

11. Burragorang Ironbark Woodland

Sites: BAR011HQ, HLL08P8L, HLL09P7U, HIL022HQ, HILL03, BAR012HQ, BAR015HQ, HIL050B, BRR60P5U, BRR61H5M, HAN006HQ, HAN015HQ, HAN017HQ, HAN030LQ

Area (ha, 2001/1750):	4089/4106	Proportion Extant (%)	100
No. Taxa (total):	220	No. Taxa per Plot:	42.29

Description

Burragorang Ironbark Woodland is dominated by *Eucalyptus punctata*, *E. agglomerata*, and *E. fibrosa* with *E. sideroxylon* occurring less frequently. A sparse shrub layer is dominated by *Persoonia linearis*, *Olearia viscidula* and *Lissanthe strigosa*. The lowest stratum averages around 1.5 metres high and is comprised of a variety of grasses, small shrubs and herbs including *Lomandra multiflora* ssp *multiflora*, *Phyllanthus hirtellus*, *Billardiera scandens*, *Entolasia stricta* and *Dampiera purpurea*.

This community occurs on shale based substrate in the Wollondilly and Nattai Gorge areas. It is generally found on the steep slopes immediately below the sandstone plateau on drier westerly or northerly aspects.

Previous Floristic Classifications

Fisher, Ryan & Lembit (1995), have previously classified this community as Burragorang Ironbark Woodland (Map Unit 10q). This classification has been retained by this project.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	86	18.32	25.92
Mid	93	3.53	11.85
Lower Mid	21	1.58	21.67

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Tree	Eucalyptus punctata	1	0.57	1	0.19	positive
Shrub	Persoonia linearis	1	0.86	1	0.36	positive
	Olearia viscidula	1	0.64	1	0.29	positive
	Lissanthe strigosa	1	0.57	1	0.14	positive
	Cryptandra species A	1	0.07	0	0.00	positive
	Ozothamnus obcordatus	1	0.07	0	0.00	positive
	Prostanthera ovalifolia	1	0.07	0	0.00	positive
Ground	Lomandra multiflora ssp multiflora	1	0.93	1	0.34	positive
	Phyllanthus hirtellus	1	0.93	1	0.23	positive
	Billardiera scandens	1	0.71	1	0.41	positive
	Entolasia stricta	1	0.71	1	0.37	positive
	Dampiera purpurea	1	0.57	1	0.17	positive
	Lomandra longifolia	1	0.57	1	0.51	positive
	Pomax umbellata	1	0.57	1	0.21	positive
	Microlaena stipoides	1	0.50	1	0.43	positive
	Notodanthonia longifolia	1	0.50	1	0.08	positive
	Stypandra glauca	1	0.50	1	0.11	positive
	Cleistochloa rigida	1	0.14	0	0.00	positive
	Cassinia spp.	1	0.07	0	0.00	positive
	Chiloglottis trilabra	1	0.07	0	0.00	positive
	Echinopogon mckiei	1	0.07	0	0.00	positive
	Paspalidium distans	1	0.07	0	0.00	positive
	Senecio vagus	1	0.07	0	0.00	positive
Vine	Pandorea pandorana	1	0.50	1	0.15	positive
Tree	Eucalyptus agglomerata	1	0.36	1	0.14	uninformative
	Allocasuarina littoralis	1	0.29	1	0.15	uninformative
	Brachychiton populneus	1	0.29	1	0.08	uninformative
	Eucalyptus fibrosa	1	0.29	1	0.00	uninformative
	Acacia falciformis	1	0.21	1	0.12	uninformative
	Allocasuarina verticillata	1	0.21	1	0.02	uninformative
	Acacia implexa	1	0.14	1	0.05	uninformative
	Angophora costata	1	0.14	1	0.03	uninformative
	Eucalyptus elata	1	0.14	1	0.07	uninformative
	Eucalyptus globoidea	1	0.14	1	0.19	uninformative
	Eucalyptus sideroxylon	1	0.14	1	0.00	uninformative
	Eucalyptus sieberi	1	0.14	1	0.20	uninformative
	Acacia decurrens	1	0.07	1	0.04	uninformative
	Acacia longifolia	1	0.07	1	0.19	uninformative
	Acacia mearnsii	1	0.07	1	0.03	uninformative
	Allocasuarina torulosa	1	0.07	1	0.01	uninformative
	Elaeocarpus reticulatus	1	0.07	1	0.10	uninformative
	Eucalyptus blaxlandii	1	0.07	1	0.01	uninformative
	Eucalyptus moluccana	1	0.07	1	0.04	uninformative
	Eucalyptus radiata	1	0.07	1	0.07	uninformative
Tree/Shrub	Acacia fimbriata	1	0.36	1	0.01	uninformative
	Notelaea longifolia	1	0.21	1	0.03	uninformative
	Lomatia myricoides	1	0.14	1	0.04	uninformative
	Melaleuca styphelioides	1	0.14	1	0.01	uninformative
	Acacia linearifolia	1	0.07	1	0.01	uninformative
	Exocarpos cupressiformis	1	0.07	1	0.04	uninformative
	Notelaea venosa	1	0.07	1	0.06	uninformative

12. Bindook Porphyry Moist Woodland

Sites: BAR016AV, HAN029LQ, BAR020B, HIL002B, IL007BLQ, BRR38D3V, BRR49D1V, BRR08A1V, BRR17A0F, BRR54D8V, BRR69Q8V, HILL04, WOLL017

Area (ha, 2001/1750):	2135/3193	Proportion Extant (%)	67.00
No. Taxa (total):	197	No. Taxa per Plot:	45.83

Description

Bindook Porphyry Moist Woodland is comprised of a low tree layer that is dominated by *Pittosporum undulatum*, *Brachychiton populneus*, *Backhousia myrtifolia* and *Acacia parramattensis*. *Eucalyptus tereticornis* often occurs with the low tree layer or as an emergent, as do *E. moluccana* and *E. punctata*, although in lower frequencies. A shrub stratum regularly occurs with the most frequent species including *Hymenanthera dentata*, *Olearia viscidula* and juvenile individuals of the upper stratum. Although the mean foliage cover of the upper stratum averages around 33% isolated patches can form a closed canopy, particularly in the more sheltered areas where a dense canopy of *Backhousia myrtifolia* takes on a rainforest appearance. In addition a number of rainforest species are often found including *Ficus rubiginosa*, *Acacia melanoxylon*, *Ficus coronata*, *Rapanea howittiana* and *Pandorea pandorana*.

This community occurs along creeklines and sheltered aspects on soils associated with the Bindook Porphyries. It comprises the moister end of the spectrum of the Bindook Porphyry complex.

Previous Floristic Classifications

Fisher, Ryan & Lembit (1995), have previously classified this community as 'Porphyry Box Woodland' (Map Unit 10pw) although no discrimination was made between the moist and dry communities in this area.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	77	13.80	33.00
Mid	62	4.53	28.13
Emerging	8	25.00	2.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non-group freq	Fidelity class
Tree	Pittosporum undulatum	1	0.54	1	0.08	positive
	Eucalyptus hypostomatica	1	0.08	0	0.00	positive
	Notelaea microcarpa	1	0.08	0	0.00	positive
Shrub	Hymenanthera dentata	1	0.69	1	0.09	positive
	Olearia viscidula	1	0.54	1	0.29	positive
	Deeringia amaranthoides	1	0.08	0	0.00	positive
Ground	Myoporum floribundum	1	0.08	0	0.00	positive
	Swainsona galegifolia	1	0.08	0	0.00	positive
	Microlaena stipoides	1	0.85	1	0.42	positive
	Dichondra repens	1	0.69	1	0.31	positive
	Geitonoplesium cymosum	1	0.69	1	0.13	positive
	Lomandra longifolia	1	0.69	1	0.51	positive
	Sigesbeckia orientalis ssp orientalis	1	0.69	1	0.02	positive
	Urtica incisa	1	0.69	1	0.05	positive
	Asplenium flabellifolium	1	0.54	1	0.15	positive
	Pellaea falcata	1	0.54	1	0.07	positive
	Bromus molliformis	1	0.08	0	0.00	positive
	Doodia australis	1	0.08	0	0.00	positive
	Euphorbia spp.	1	0.08	0	0.00	positive
	Parietaria debilis	1	0.08	0	0.00	positive
	Sicyos australis	1	0.08	0	0.00	positive
	Sisymbrium irio	1	0.08	0	0.00	positive
Vine	Pandorea pandorana	1	0.54	1	0.15	positive
Epiphyte	Cymbidium suave	1	0.08	0	0.00	positive
Tree	Eucalyptus tereticornis	1	0.46	1	0.10	uninformative
	Brachychiton populneus	1	0.38	1	0.08	uninformative
	Backhousia myrtifolia	1	0.31	1	0.03	uninformative
	Acacia parramattensis	1	0.23	1	0.06	uninformative
	Casuarina cunninghamiana ssp	1	0.23	1	0.02	uninformative
	Ficus rubiginosa	1	0.23	1	0.01	uninformative
	Acacia implexa	1	0.15	1	0.05	uninformative
	Acacia longifolia	1	0.15	1	0.19	uninformative
	Acacia melanoxylon	1	0.15	1	0.09	uninformative
	Clerodendrum tomentosum	1	0.15	1	0.00	uninformative
	Eucalyptus moluccana	1	0.15	1	0.03	uninformative
	Eucalyptus punctata	1	0.15	1	0.20	uninformative
	Ficus coronata	1	0.15	1	0.01	uninformative
	Acacia decurrens	1	0.08	1	0.04	uninformative
	Acacia falciformis	1	0.08	1	0.12	uninformative
	Acacia floribunda	1	0.08	1	0.02	uninformative
	Acacia mearnsii	1	0.08	1	0.03	uninformative
	Allocasuarina verticillata	1	0.08	1	0.03	uninformative
	Angophora floribunda	1	0.08	1	0.02	uninformative
	Melaleuca linariifolia	1	0.08	1	0.02	uninformative
	Stenocarpus salignus	1	0.08	1	0.01	uninformative
Tree/Shrub	Melaleuca styphelioides	1	0.23	1	0.01	uninformative
	Claoxylon australe	1	0.15	1	0.00	uninformative
	Rapanea howittiana	1	0.15	1	0.04	uninformative
	Acacia penninervis	1	0.08	1	0.00	uninformative
	Hedycarya angustifolia	1	0.08	1	0.02	uninformative
	Notelaea longifolia	1	0.08	1	0.04	uninformative

13. Bindook Porphyry Dry Woodland

Sites: BRR09D1M, BRR19D7L, BRR39C5L, BRR10D5M, BRR13D1M, BRR12D7M, BRR55D5U, BRR24D8M, BRR50D5M, BRR51D7U, BRR48D7M, BRR56O7L, BRR64D5L, BRR65D1L, BRR67D7M, BRR66D1M, BRR68D3M, BRR11D3M, BRR18D3M, BRR34D3M, BRR40C4V, BRR42D3M, BRR25D3M, BRR26D1M, BRR36D4M, BRR37D1M, BRR28D4U, BRR29D6M, BRR35D5M, BRR27D5U, BRR41D1M, BRR43D5M, BRR46D6M, BRR44D8L, BRR45D8U, BRR47D6M, BRR57O3L, BRR58D3U, RIC04D7M, RIC01D5M, RIC02D5U, RIC03A7V, CAN013G, HAN031LQ, HAN034LQ, HAN033LQ, HAN026HQ, HAN028HQ, HAN027HQ, HAN001LQ, MIT004LQ, MIT005B, MIT007LQ, CAN017HQ, HAN025HQ, CAN031HQ, CAN033HQ, HAN024LQ

Area (ha, 2001/1750): 17784/25833 **Proportion Extant (%)** 69.00
No. Taxa (total): 335 **No. Taxa per Plot:** 48.38

Description

The upper stratum of Bindook Porphyry Dry Woodland averages a height of around 15.5 metres and is dominated by *Eucalyptus tereticornis*, *Brachychiton populneus*, *E. melliodora* and *E. eugenioides*. *E. albens*, *E. moluccana* and *E. punctata* occur less frequently. A sparse mid stratum often occurs and a lower mid stratum is present at around 36% of sites. The most frequently occurring species in these strata are *Olearia viscidula*, *Lissanthe strigosa* and *Bursaria spinosa* with *Dichondra repens*, *Cheilanthes sieberi*, *Desmodium varians* and *Lomandra longifolia* being the most common ground species.

This community occurs on the volcanic soils of the Bindook Porphyry complex. Of the two communities identified on this geology in the study area this community is the most common occurring on ridges, upper slopes and open aspects.

Previous Floristic Classifications

Fisher, Ryan & Lembit (1995), have previously classified this community as 'Porphyry Box Woodland' (Map Unit 10pw) although no discrimination was made between the moist and dry communities in this area.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	98	15.57	20.05
Mid	93	4.34	12.74
Lower Mid	36	1.60	21.33
Emerging	2	8.50	1.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Tree	Eucalyptus tereticornis	1	0.53	1	0.04	positive
	Eucalyptus albens	1	0.05	0	0.00	positive
	Acacia binervia	1	0.02	0	0.00	positive
Tree/Shrub	Acacia chalkerii	1	0.03	0	0.00	positive
Shrub	Olearia viscidula	1	0.91	1	0.20	positive
	Lissanthe strigosa	1	0.55	1	0.10	positive
	Bursaria spinosa	1	0.53	1	0.08	positive
Ground	Myoporum montanum	1	0.21	0	0.00	positive
	Cassinia arcuata	1	0.03	0	0.00	positive
	Amyema miquelii	1	0.02	0	0.00	positive
	Eremophila debilis	1	0.02	0	0.00	positive
	Pomaderris angustifolia	1	0.02	0	0.00	positive
	Pultenaea subternata	1	0.02	0	0.00	positive
	Senna odorata	1	0.02	0	0.00	positive
	Solanum brownii	1	0.02	0	0.00	positive
	Solanum campanulatum	1	0.02	0	0.00	positive
	Dichondra repens	1	0.91	1	0.22	positive
	Cheilanthes sieberi	1	0.79	1	0.10	positive
	Desmodium varians	1	0.74	1	0.12	positive
	Lomandra longifolia	1	0.69	1	0.49	positive
	Elymus scabrus	1	0.64	1	0.03	positive
	Dichelachne micrantha	1	0.62	1	0.08	positive
	Lomandra multiflora ssp multiflora	1	0.62	1	0.31	positive
	Aristida ramosa	1	0.57	1	0.06	positive
	Veronica plebeia	1	0.55	1	0.16	positive
	Microlaena stipoides	1	0.53	1	0.41	positive
	Arthropodium milleflorum	1	0.50	1	0.02	positive
	Cheilanthes distans	1	0.50	1	0.01	positive
	Hydrocotyle laxiflora	1	0.50	1	0.14	positive
	Adiantum atroviride	1	0.10	0	0.00	positive
	Paspalidium criniforme	1	0.05	0	0.00	positive
	Arthropodium species B	1	0.03	0	0.00	positive
	Arthropodium spp.	1	0.03	0	0.00	positive
	Carex incommitata	1	0.03	0	0.00	positive
	Chamaesyce dallachyana	1	0.03	0	0.00	positive
	Cynoglossum spp.	1	0.03	0	0.00	positive
	Dichanthium sericeum	1	0.03	0	0.00	positive
	Digitaria brownii	1	0.03	0	0.00	positive
	Luzula densiflora	1	0.03	0	0.00	positive
	Plectranthus graveolens	1	0.03	0	0.00	positive
	Pleurosorus rufifolius	1	0.03	0	0.00	positive
	Rhodanthe anthemoides	1	0.03	0	0.00	positive
	Schoenus maschalinus	1	0.03	0	0.00	positive
	Sigesbeckia australiensis	1	0.03	0	0.00	positive
	Sporobolus africanus	1	0.03	0	0.00	positive
	Austrostipa semibarbata	1	0.02	0	0.00	positive
	Austrostipa setacea	1	0.02	0	0.00	positive
	Calotis hispidula	1	0.02	0	0.00	positive
	Calotis spp.	1	0.02	0	0.00	positive
	Capillipedium parviflorum	1	0.02	0	0.00	positive
	Chenopodium pumilio	1	0.02	0	0.00	positive
	Cymbonotus spp.	1	0.02	0	0.00	positive
	Dendrobium linguiforme	1	0.02	0	0.00	positive
	Dichanthium spp.	1	0.02	0	0.00	positive
	Doodia caudata	1	0.02	0	0.00	positive
	Echinopogon spp.	1	0.02	0	0.00	positive
	Enneapogon gracilis	1	0.02	0	0.00	positive
	Gastrodia sesamoides	1	0.02	0	0.00	positive
	Leptinella filicula	1	0.02	0	0.00	positive
	Mentha satereioides	1	0.02	0	0.00	positive
	Microtis unifolia	1	0.02	0	0.00	positive
	Pellaea paradoxa	1	0.02	0	0.00	positive

	Picris angustifolia	1	0.02	0	0.00	positive
	Plantago hispida	1	0.02	0	0.00	positive
	Pseuderanthemum variabile	1	0.02	0	0.00	positive
	Schoenus spp.	1	0.02	0	0.00	positive
	Sporobolus elongatus	1	0.02	0	0.00	positive
	Triglochin striatum	1	0.02	0	0.00	positive
	Verbena spp.	1	0.02	0	0.00	positive
Vine/Ground	Clematis aristata	1	0.52	1	0.28	positive
	Clematis microphylla	1	0.05	0	0.00	positive
Vine	Passiflora cinnabarina	1	0.03	0	0.00	positive
Tree	Brachychiton populneus	1	0.45	1	0.03	uninformative
	Eucalyptus melliodora	1	0.38	1	0.02	uninformative
	Eucalyptus eugenioides	1	0.34	1	0.03	uninformative
	Acacia implexa	1	0.28	1	0.01	uninformative
	Acacia falciformis	1	0.26	1	0.10	uninformative
	Eucalyptus moluccana	1	0.22	1	0.01	uninformative
	Acacia parramattensis	1	0.19	1	0.04	uninformative
	Eucalyptus punctata	1	0.17	1	0.21	uninformative
	Allocasuarina verticillata	1	0.16	1	0.01	uninformative
	Backhousia myrtifolia	1	0.16	1	0.02	uninformative
	Pittosporum undulatum	1	0.16	1	0.08	uninformative
	Eucalyptus bridgesiana	1	0.09	1	0.01	uninformative
	Eucalyptus macrorhyncha	1	0.09	1	0.03	uninformative
	Ficus rubiginosa	1	0.09	1	0.01	uninformative
	Eucalyptus cypellocarpa	1	0.07	1	0.05	uninformative
	Eucalyptus agglomerata	1	0.05	1	0.16	uninformative
	Eucalyptus bosistoana	1	0.05	1	0.00	uninformative
	Acacia decurrens	1	0.03	1	0.04	uninformative
	Allocasuarina littoralis	1	0.03	1	0.18	uninformative
	Angophora floribunda	1	0.03	1	0.02	uninformative
	Eucalyptus globoidea	1	0.03	1	0.21	uninformative
	Acacia longifolia	1	0.02	1	0.21	uninformative
	Casuarina cunninghamiana ssp	1	0.02	1	0.02	uninformative
	Eucalyptus elata	1	0.02	1	0.08	uninformative
	Eucalyptus fibrosa	1	0.02	1	0.01	uninformative
	Eucalyptus mannifera	1	0.02	1	0.05	uninformative
Tree/Shrub	Acacia fimbriata	1	0.09	1	0.01	uninformative
	Notelaea neglecta	1	0.09	1	0.02	uninformative
	Exocarpos cupressiformis	1	0.05	1	0.04	uninformative
	Acacia dealbata	1	0.03	1	0.01	uninformative
	Acacia penninervis	1	0.02	1	0.00	uninformative
	Lomatia myricoides	1	0.02	1	0.04	uninformative
	Melaleuca styphelioides	1	0.02	1	0.02	uninformative
	Notelaea longifolia	1	0.02	1	0.04	uninformative

14. Robertson Basalt Rainforest

Sites: ROB001B, ROB006B, ROB024B, ROB002B, ROB011B, ROB003B, ROB012B, ROB007B, ROB004B, ROB010B, ROB013B, ROB014B, ROB021LQ, RBR54B2U, ROB009B, ROB023B

Area (ha, 2001/1750):	451/3224	Proportion Extant	14.00
No. Taxa (total):	103	No. Taxa per Plot:	49.33

Description

Robertson Basalt Rainforest is an endangered ecological community listed under the TSC Act. A dense, often closed canopy is dominated by *Pittosporum undulatum*, *Acacia melanoxylon*, *Acmena smithii*, *Alectryon subcinereus*, *Backhousia myrtifolia* and *Diospyros australis*. Emergents were recorded at approximately 13% of sites and regularly included *Syncarpia glomulifera*, *Eucalyptus fastigata* and *Eucalyptus smithii*. An often sparse mid stratum occurs, comprised of juveniles of the canopy species and a number of shrubs including *Breynia oblongifolia*, *Coprosma quadrifida*, *Goodenia ovata* and *Pittosporum multiflorum*. The ground cover includes a variety of species, most frequently *Eustrephus latifolius*, *Tylophora barbata*, *Adiantum formosum* and *Blechnum cartilagineum*. A number of vines were frequently recorded including *Smilax australis*, *Marsdenia rostrata* and *Pandorea pandorana*.

This community occurs on Robertson Basalt in areas of high rainfall (generally over 1800 millimetres per year). It is closely associated with and floristically similar to Robertson Basalt Tall Open Forest. The similar floristics are due largely to many of the rainforest diagnostic species occurring as juveniles in the Tall Open Forest community. Although the two communities are structurally quite different, it is likely that over time areas of Tall Open Forest will convert to rainforest should natural processes, in particular fire, be excluded.

Previous Floristic Classifications

The Royal Botanic Gardens (unpub.), have previously classified this community as 'Warm Temperate Rainforest' (Map Unit 8d). The scientific committee lists this community as Robertson Basalt Rainforest, this classification has been retained.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	100	25.31	64.38
Mid	94	6.80	21.87
Lower Mid	25	2.21	15.00
Emerging	13	31.00	30.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non-group freq	Fidelity class
Tree	Pittosporum undulatum	1	1.00	1	0.09	positive
	Acacia melanoxylon	1	0.67	1	0.09	positive
	Acmena smithii	1	0.67	1	0.03	positive
	Alectryon subcinereus	1	0.67	1	0.01	positive
	Backhousia myrtifolia	1	0.67	1	0.04	positive
	Clerodendrum tomentosum	1	0.67	1	0.00	positive
	Diospyros australis	1	0.67	1	0.00	positive
	Ficus coronata	1	0.67	1	0.01	positive
	Livistona australis	1	0.67	1	0.00	positive
	Syncarpia glomulifera	1	0.67	1	0.02	positive
	Acacia maidenii	1	0.33	0	0.00	positive
	Cryptocarya glaucescens	1	0.33	0	0.00	positive
	Guioa semiglauc	1	0.33	0	0.00	positive
	Toona ciliata	1	0.33	0	0.00	positive
Tree/Shrub	Abrophyllum ornans	1	0.67	0	0.00	positive
	Notelaea venosa	1	0.67	1	0.06	positive
	Melicope micrococca	1	0.33	0	0.00	positive
Shrub	Breynia oblongifolia	1	0.67	1	0.03	positive
	Coprosma quadrifida	1	0.67	1	0.06	positive
	Goodenia ovata	1	0.67	1	0.03	positive
	Pittosporum multiflorum	1	0.67	1	0.03	positive
	Rubus moluccanus var trilobus	1	0.67	1	0.01	positive
Ground	Celastrus subspicata	1	0.33	0	0.00	positive
	Eustrephus latifolius	1	1.00	1	0.14	positive
	Tylophora barbata	1	1.00	1	0.12	positive
	Adiantum formosum	1	0.67	1	0.01	positive
	Blechnum cartilagineum	1	0.67	1	0.12	positive
	Geitonoplesium cymosum	1	0.67	1	0.15	positive
	Hydrocotyle peduncularis	1	0.67	1	0.08	positive
	Lastreopsis acuminata	1	0.67	1	0.00	positive
	Lastreopsis decomposita	1	0.67	0	0.00	positive
	Oplismenus imbecillis	1	0.67	1	0.03	positive
	Sarcopetalum harveyanum	1	0.67	1	0.02	positive
	Carex brunnea	1	0.33	0	0.00	positive
	Clematis aristata	1	0.67	1	0.31	positive
	Marsdenia rostrata	1	1.00	1	0.09	positive
Vine	Pandorea pandorana	1	1.00	1	0.15	positive
	Smilax australis	1	1.00	1	0.07	positive
	Cissus antarctica	1	0.67	1	0.00	positive
	Cissus hypoglauca	1	0.67	1	0.03	positive
	Morinda jasminoides	1	0.67	1	0.02	positive
Tree	Parsonsia straminea	1	0.67	1	0.03	positive
	Ceratopetalum apetalum	1	0.33	1	0.02	uninformative
	Cyathea leichhardtiana	1	0.33	1	0.00	uninformative
	Dicksonia antarctica	1	0.33	1	0.02	uninformative
	Doryphora sassafras	1	0.33	1	0.04	uninformative
	Eucalyptus agglomerata	1	0.33	1	0.14	uninformative
	Eucalyptus fastigata	1	0.33	1	0.04	uninformative
	Eucalyptus piperita	1	0.33	1	0.25	uninformative
	Eucalyptus quadrangulata	1	0.33	1	0.02	uninformative
	Eucalyptus smithii	1	0.33	1	0.04	uninformative
	Eucalyptus viminalis	1	0.33	1	0.02	uninformative
	Claoxylon australe	1	0.33	1	0.00	uninformative
	Exocarpos cupressiformis	1	0.33	1	0.04	uninformative
	Rapanea howittiana	1	0.33	1	0.04	uninformative
Tree/Shrub	Sambucus australasica	1	0.33	1	0.02	uninformative

15. Shoalhaven Gorge Tall Open Forest

This community has been identified in the Southern CRA Forest Ecosystems Mapping (NPWS, 2000c). The following community profile has been directly extracted from the appendices of the associated report.

Description

Shoalhaven Gorge Tall Open Forest is over 20 metres in height dominated by *Corymbia gummifera*, sometimes with *E. globoidea*, *E. consideriana*, and *Syncarpia glomulifera* and *E. piperita* in the Clyde and Shoalhaven catchments. It has a diverse dry shrub understorey, including *Persoonia linearis*, *Banksia spinulosa*, *Acacia obtusifolia*, *Tetratheca thymifolia*, *Leucopogon lanceolatus*, *Lomatia ilicifolia*, *Acacia terminalis*, *Platysace lanceolata*, *Bossia obcordata*, and *Gompholobium latifolium*. The ground cover contains grasses *Entolasia stricta*, and herbs *Patersonia glabrata*, *Dianella caerulea* var *caerulea*, and *Gonocarpus teucriodes*.

Shoalhaven Gorge Tall Open Forest occurs on shallow sandy soils on low lying ridges and moderately dry slopes in the foothills and on ridges and benches on the tops of the northern sandstone plateau areas. Austin (1978) refers to a similar type in his study of the South Coast. This forest ecosystem is equivalent to a similar type, unit 46B: Lowland Dry Shrub Forest, which is found in the Eden CRA Region (Keith and Bedward 1999).

Previous Floristic Classifications

The Southern CRA Forest Ecosystems Mapping Project (NPWS 2000c) previously classified this community as 'FOREST ECOSYSTEM 2: Lowland Dry Shrub Forest - *Corymbia gummifera* / *Syncarpia glomulifera*'.

Diagnostic Plant Species

Species	Group cover	Group freq	Non-group cover	Non-group freq	Fidelity class
<i>Persoonia linearis</i>	2	0.843	1	0.170	positive
<i>Entolasia stricta</i>	2	0.814	2	0.137	positive
<i>Corymbia gummifera</i>	3	0.771	3	0.038	positive
<i>Acacia obtusifolia</i>	2	0.700	2	0.079	positive
<i>Banksia spinulosa</i> var <i>spinulosa</i>	2	0.700	2	0.042	positive
<i>Tetratheca thymifolia</i>	2	0.671	1	0.045	positive
<i>Pteridium esculentum</i>	2	0.614	2	0.303	positive
<i>Patersonia glabrata</i>	2	0.500	1	0.034	positive
<i>Dianella caerulea</i> var <i>caerulea</i>	1	0.743	1	0.154	uninformative
<i>Lomatia ilicifolia</i>	1	0.586	1	0.034	uninformative
<i>Leucopogon lanceolatus</i> var <i>lanceolatus</i>	1	0.543	1	0.163	uninformative
<i>Billardiera scandens</i> var <i>scandens</i>	1	0.500	1	0.129	uninformative
<i>Lepidosperma urophorum</i>	2	0.486	2	0.068	uninformative
<i>Gonocarpus teucriodes</i>	2	0.471	2	0.087	uninformative
<i>Lomandra obliqua</i>	2	0.457	1	0.027	uninformative
<i>Syncarpia glomulifera</i>	3	0.443	3	0.015	uninformative
<i>Acacia terminalis</i>	1	0.414	1	0.037	uninformative
<i>Allocasuarina littoralis</i>	2	0.386	2	0.097	uninformative
<i>Eucalyptus globoidea</i>	2	0.386	2	0.075	uninformative
<i>Eucalyptus piperita</i>	3	0.386	3	0.014	uninformative
<i>Phyllanthus hirtellus</i>	1	0.386	1	0.034	uninformative
<i>Oxylobium ilicifolium</i>	2	0.371	2	0.071	uninformative
<i>Pomax umbellata</i>	1	0.371	1	0.060	uninformative
<i>Bossiaea obcordata</i>	2	0.343	2	0.020	uninformative
<i>Gompholobium latifolium</i>	2	0.343	2	0.007	uninformative
<i>Pimelea linifolia</i> ssp <i>linifolia</i>	1	0.329	1	0.054	uninformative
<i>Eucalyptus consideriana</i>	3	0.314	3	0.011	uninformative
<i>Marsdenia suaveolens</i>	1	0.314	1	0.017	uninformative
<i>Macrozamia communis</i>	1	0.300	2	0.059	uninformative
<i>Amperea xiphoclada</i> var <i>xiphoclada</i>	1	0.286	1	0.032	uninformative
<i>Imperata cylindrica</i> var <i>major</i>	2	0.286	2	0.058	uninformative
<i>Hibbertia empetrifolia</i>	2	0.271	1	0.020	uninformative
<i>Patersonia sericea</i>	2	0.271	1	0.027	uninformative
<i>Eucalyptus sieberi</i>	3	0.257	3	0.107	uninformative

16. Robertson Basalt Tall Open Forest

Sites: BUN007LQ, MIT097B, ROB017B, ROB016B, ROB018LQ, BUN028B, MOS001B, RBR42

Area (ha, 2001/1750):	1338/10978	Proportion Extant (%)	12.00
No. Taxa (total):	138	No. Taxa per Plot:	45.00

Description

Robertson Basalt Tall Open Forest is an Endangered Ecological Communities listed under the TSC Act. As its name suggest it is the upper stratum is quite tall, averaging close to 30 metres. Dominant canopy species include *Eucalyptus cypellocarpa*, *E. fastigata* and *Acacia melanoxylon*. A distinct mid stratum occurs and averages close to 6 metres in height. The most frequent species include *Rubus parvifolius*, *Coprosma quadrifida* and *Senecio linearifolius*. Occasionally a dense lower mid stratum of ferns dominated by *Pteridium esculentum* occurs. Other species frequently recorded in either the ground or lower mid stratum include *Eustrephus latifolius*, *Microlaena stipoides*, *Stellaria flaccida*, *Tylophora barbata* and *Smilax australis*.

This community occurs on Robertson Basalt in lower rainfall areas (generally below 1800 millimetres per year) or on exposed aspects. Many of the species contained in the lower stratum are consistent with Robertson Basalt Rainforest with which this community is closely associated.

Previous Floristic Classifications

The Royal Botanic Gardens (unpub.), have previously classified this community as 'Robertson Basalt Tall Forest' (Map Unit 6k). The scientific committee lists this community as Robertson Basalt Tall Forest, this classification has been retained.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	100	28.54	34.29
Mid	100	5.73	23.14
Lower Mid	25	2.45	8.50

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Tree	Acacia melanoxylon	1	0.75	1	0.08	positive
	Eucalyptus cypellocarpa	1	0.50	1	0.04	positive
	Eucalyptus muelleriana	1	0.13	0	0.00	positive
Shrub	Rubus parvifolius	1	0.63	1	0.07	positive
	Coprosma quadrifida	1	0.50	1	0.06	positive
	Senecio linearifolius	1	0.50	1	0.04	positive
Ground	Eustrephus latifolius	1	0.88	1	0.13	positive
	Microlaena stipoides	1	0.88	1	0.42	positive
	Pteridium esculentum	1	0.88	1	0.35	positive
	Stellaria flaccida	1	0.88	1	0.04	positive
	Tylophora barbata	1	0.88	1	0.12	positive
	Dichondra repens	1	0.75	1	0.31	positive
	Hydrocotyle peduncularis	1	0.75	1	0.07	positive
	Lomandra longifolia	1	0.75	1	0.51	positive
	Hibbertia scandens	1	0.63	1	0.07	positive
	Poa labillardierei var labillardierei	1	0.63	1	0.17	positive
	Viola hederacea	1	0.63	1	0.27	positive
	Asperula conferta	1	0.50	1	0.04	positive
	Echinopogon ovatus	1	0.50	1	0.20	positive
	Glycine clandestina	1	0.50	1	0.19	positive
	Glycine species A	1	0.50	1	0.01	positive
	Poa affinis	1	0.50	1	0.01	positive
	Austrocynoglossum latifolium	1	0.38	0	0.00	positive
	Baloskion tetraphyllum subsp	1	0.13	0	0.00	positive
	Dennstaedtia davallioides	1	0.13	0	0.00	positive
	Deyeuxia decipiens	1	0.13	0	0.00	positive
	Pterostylis curta	1	0.13	0	0.00	positive
Vine/Ground	Clematis aristata	1	0.63	1	0.30	positive
Vine	Smilax australis	1	0.75	1	0.07	positive
Tree	Eucalyptus fastigata	1	0.38	1	0.03	uninformative
	Cyathea australis	1	0.25	1	0.03	uninformative
	Melaleuca linariifolia	1	0.25	1	0.02	uninformative
	Pittosporum undulatum	1	0.25	1	0.09	uninformative
	Acacia irrorata	1	0.13	1	0.01	uninformative
	Alphitonia excelsa	1	0.13	1	0.00	uninformative
	Eucalyptus obliqua	1	0.13	1	0.02	uninformative
	Eucalyptus quadrangulata	1	0.13	1	0.02	uninformative
	Eucalyptus radiata	1	0.13	1	0.07	uninformative
	Eucalyptus tereticornis	1	0.13	1	0.11	uninformative
	Hedycarya angustifolia	1	0.38	1	0.01	uninformative
	Synoum glandulosum subsp	1	0.38	1	0.02	uninformative
Tree/Shrub	Notelaea ovata	1	0.13	1	0.00	uninformative
	Notelaea venosa	1	0.13	1	0.06	uninformative
	Rapanea howittiana	1	0.13	1	0.04	uninformative

17. Southern Highlands Shale Woodland

Sites: MIT002HQ, MIT003B, ROB030LQ, ROB031LQ, ROB033HQ, ROB034LQ, BRG50, ROB015LQ

Area (ha, 2001/1750):	10791/53833	Proportion Extant (%)	20.00
No. Taxa (total):	138	No. Taxa per Plot:	38.63

Description

Southern Highlands Shale Woodland is an Endangered Ecological Community listed under the TSC Act. The upper canopy averages a height of around 30 metres and is dominated by *Eucalyptus dives*, *E. elata*, *E. piperita*, *E. cypellocarpa*, *E. fastigata*, *Elaeocarpus reticulatus* and *Acacia melanoxylon*. A mid stratum of approximately 3.5 metres was recorded at all sites, dominant shrub species including *Leucopogon lanceolatus*, *Notelaea venosa*, *Coprosma quadrifida*, *Helichrysum elatum* and *Tristaniopsis collina*. A lower mid or Ground stratum typically includes *Dianella caerulea*, *Pteridium esculentum*, *Billardiera scandens*, *Lomandra longifolia* and *Tylophora barbata*.

This community occurs on Bringelly Shale and extends across the Southern Highlands from Robertson to the Belanglo and Joadja areas. It has been significantly cleared and many of the remnants identified in the mapping are only composed of remnant trees with little or no understorey. It is likely that there is considerable variation in this community given the rainfall gradient across which it has been mapped. Floristically this community is closely related to Robertson Basalt Tall Forest and Mount Gibraltar Forest.

Previous Floristic Classifications

Fisher, Ryan & Lembit (1995), have previously classified this community as 'Southern Highlands Shale Woodlands' (Map Unit 10x). The Scientific Committee has listed this community as 'Southern Highlands Shale Woodlands' and this terminology has been retained for this report.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	100	30.19	34.71
Mid	100	3.56	23.71
Lower Mid	13	1.25	15.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Tree	Elaeocarpus reticulatus	1	0.75	1	0.09	positive
	Endiandra sieberi	1	0.13	0	0.00	positive
Tree/Shrub	Notelaea venosa	1	0.63	1	0.05	positive
Shrub	Leucopogon lanceolatus	1	0.88	1	0.27	positive
	Coprosma quadrifida	1	0.63	1	0.05	positive
Ground	Helichrysum elatum	1	0.50	1	0.04	positive
	Tristaniopsis collina	1	0.50	1	0.01	positive
	Pultenaea blakelyi	1	0.25	0	0.00	positive
	Dianella caerulea	1	1.00	1	0.31	positive
	Pteridium esculentum	1	1.00	1	0.35	positive
	Billardiera scandens	1	0.88	1	0.41	positive
	Lomandra longifolia	1	0.88	1	0.51	positive
	Tylophora barbata	1	0.88	1	0.12	positive
	Blechnum cartilagineum	1	0.75	1	0.11	positive
	Eustrephus latifolius	1	0.75	1	0.13	positive
	Microlaena stipoides	1	0.75	1	0.42	positive
	Viola hederacea	1	0.75	1	0.27	positive
	Gonocarpus teucrioides	1	0.63	1	0.22	positive
	Hibbertia scandens	1	0.63	1	0.07	positive
	Lepidosperma laterale	1	0.63	1	0.21	positive
	Poa labillardierei var labillardierei	1	0.50	1	0.17	positive
	Stellaria flaccida	1	0.50	1	0.05	positive
Vine/Ground	Clematis aristata	1	0.50	1	0.31	positive
Tree	Acacia melanoxylon	1	0.38	1	0.08	uninformative
	Cyathea australis	1	0.38	1	0.02	uninformative
	Eucalyptus dives	1	0.38	1	0.05	uninformative
	Eucalyptus elata	1	0.38	1	0.07	uninformative
	Eucalyptus piperita	1	0.38	1	0.25	uninformative
	Eucalyptus cypellocarpa	1	0.25	1	0.05	uninformative
	Eucalyptus fastigata	1	0.25	1	0.03	uninformative
	Acacia binervata	1	0.13	1	0.05	uninformative
	Acacia elata	1	0.13	1	0.01	uninformative
	Acacia longifolia	1	0.13	1	0.19	uninformative
	Allocasuarina littoralis	1	0.13	1	0.16	uninformative
	Ceratopetalum apetalum	1	0.13	1	0.02	uninformative
	Ceratopetalum gummiferum	1	0.13	1	0.02	uninformative
	Dicksonia antarctica	1	0.13	1	0.02	uninformative
	Eucalyptus obliqua	1	0.13	1	0.02	uninformative
	Eucalyptus quadrangulata	1	0.13	1	0.02	uninformative
	Eucalyptus sieberi	1	0.13	1	0.20	uninformative
	Eucalyptus smithii	1	0.13	1	0.04	uninformative
	Syncarpia glomulifera	1	0.13	1	0.02	uninformative
Tree/Shrub	Synoum glandulosum subsp	1	0.38	1	0.02	uninformative
	Notelaea longifolia	1	0.13	1	0.04	uninformative
	Rapanea howittiana	1	0.13	1	0.04	uninformative

18. Joadja Tall Open Forest

Sites: BAR003LQ, CAN009HQ, HAN010HQ, HAN011HQ, BAR006HQ, BAR008LQ, BAR007HQ, CAN011A, HAN003HQ, CAN018HQ, BAR002LQ, HIL014HQ, HIL025LQ

Area (ha, 2001/1750): 3539/3886 **Proportion Extant (%)** 91.07
No. Taxa (total): 229 **No. Taxa per Plot:** 57.92

Description

Joadja Tall Open Forest reaches an average height of around 24.5 metres. The canopy is dominated by *Eucalyptus elata* and *Acacia falciformis* with *E. punctata* and *E. viminalis* occurring at approximately 30% of sites. A mid stratum was recorded at all sites with a lower mid stratum occurring at approximately one quarter of sites. The most frequently recorded species in these strata include *Cassinia aculeata*, *Olearia viscidula*, *Persoonia linearis*, *Rubus parvifolius* and *Leucopogon lanceolatus*. Groundcovers and grasses often include *Microlaena stipoides*, *Viola hederacea*, *Billardiera scandens*, *Dianella caerulea*, *Dichondra repens* and *Echinopogon ovatus*.

This community occurs on deep sandy soils in sheltered valleys in the Joadja area. Some small areas have also been recorded in the upper Nattai Gorge.

Previous Floristic Classifications

Joadja Tall Open Forest is floristically very similar to Southern Highlands Shale Woodland (Map Unit 17), such that this community can be considered a sub-association of Southern Highlands Shale Woodland. Fisher, Ryan & Lembit (1995), have previously classified this community as 'Southern Highlands Shale Woodlands' (Map Unit 10x). The Scientific Committee has listed this community as 'Southern Highlands Shale Woodlands'.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	92	24.54	37.08
Mid	100	4.41	18.62
Lower Mid	23	1.55	20.00
Emerging	8	27.50	33.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non-group freq	Fidelity class
Tree	<i>Eucalyptus elata</i>	1	0.69	1	0.05	positive
Shrub	<i>Cassinia aculeata</i>	1	0.69	1	0.12	positive
	<i>Olearia viscidula</i>	1	0.69	1	0.29	positive
	<i>Persoonia linearis</i>	1	0.62	1	0.37	positive
	<i>Rubus parvifolius</i>	1	0.62	1	0.06	positive
	<i>Leucopogon lanceolatus</i>	1	0.54	1	0.27	positive
	<i>Gonocarpus elatus</i>	1	0.08	0	0.00	positive
Ground	<i>Microlaena stipoides</i>	1	1.00	1	0.41	positive
	<i>Viola hederacea</i>	1	0.92	1	0.25	positive
	<i>Billardiera scandens</i>	1	0.85	1	0.40	positive

	Dianella caerulea	1	0.85	1	0.30	positive
	Dichondra repens	1	0.85	1	0.30	positive
	Echinopogon ovatus	1	0.85	1	0.18	positive
	Lomandra longifolia	1	0.85	1	0.50	positive
	Euchiton gymnocephalus	1	0.77	1	0.06	positive
	Poranthera microphylla	1	0.77	1	0.20	positive
	Pteridium esculentum	1	0.77	1	0.35	positive
	Veronica plebeia	1	0.77	1	0.20	positive
	Glycine clandestina	1	0.69	1	0.18	positive
	Oxalis perennans	1	0.69	1	0.16	positive
	Wahlenbergia gracilis	1	0.69	1	0.19	positive
	Galium propinquum	1	0.62	1	0.08	positive
	Acaena novae-zelandiae	1	0.54	1	0.07	positive
	Austrostipa rudis	1	0.54	1	0.15	positive
	Hypericum gramineum	1	0.54	1	0.20	positive
	Lepidosperma laterale	1	0.54	1	0.21	positive
	Plantago debilis	1	0.54	1	0.09	positive
	Poa meionectes	1	0.54	1	0.07	positive
	Stellaria pungens	1	0.54	1	0.08	positive
	Brachyscome aculeata	1	0.15	0	0.00	positive
	Cymbonotus preissianus	1	0.15	0	0.00	positive
	Senecio bipinnatisectus	1	0.15	0	0.00	positive
	Corybas pruinosus	1	0.08	0	0.00	positive
	Dichelachne spp.	1	0.08	0	0.00	positive
	Eriochilus autumnalis	1	0.08	0	0.00	positive
	Hymenophyllum cupressiforme	1	0.08	0	0.00	positive
	Luzula ovata	1	0.08	0	0.00	positive
	Oreomyrrhis eriopoda	1	0.08	0	0.00	positive
	Plantago gaudichaudii	1	0.08	0	0.00	positive
	Ranunculus collinus	1	0.08	0	0.00	positive
Vine/Ground	Clematis aristata	1	0.77	1	0.30	positive
Tree	Acacia falciformis	1	0.46	1	0.11	uninformative
	Acacia longifolia	1	0.31	1	0.18	uninformative
	Eucalyptus punctata	1	0.31	1	0.20	uninformative
	Eucalyptus viminalis	1	0.31	1	0.02	uninformative
	Acacia parramattensis	1	0.23	1	0.06	uninformative
	Angophora costata	1	0.23	1	0.03	uninformative
	Eucalyptus cinerea	1	0.23	1	0.02	uninformative
	Elaeocarpus reticulatus	1	0.15	1	0.10	uninformative
	Eucalyptus agglomerata	1	0.15	1	0.14	uninformative
	Eucalyptus cypellocarpa	1	0.15	1	0.05	uninformative
	Eucalyptus dives	1	0.15	1	0.06	uninformative
	Eucalyptus piperita	1	0.15	1	0.25	uninformative
	Eucalyptus radiata	1	0.15	1	0.06	uninformative
	Acacia implexa	1	0.08	1	0.05	uninformative
	Acacia mearnsii	1	0.08	1	0.03	uninformative
	Cyathea australis	1	0.08	1	0.03	uninformative
	Eucalyptus bridgesiana	1	0.08	1	0.02	uninformative
	Eucalyptus macrorhyncha	1	0.08	1	0.03	uninformative
	Eucalyptus mannifera	1	0.08	1	0.05	uninformative
Tree/Shrub	Eucalyptus tereticornis	1	0.08	1	0.11	uninformative
	Notelaea neglecta	1	0.38	1	0.01	uninformative
	Lomatia myricoides	1	0.15	1	0.04	uninformative
	Notelaea longifolia	1	0.15	1	0.04	uninformative
	Exocarpos cupressiformis	1	0.08	1	0.04	uninformative
	Rapanea howittiana	1	0.08	1	0.04	uninformative

19. Upper Shoalhaven Tall Open Forest

Sites: HAN012HQ, WIN010LQ, WIN006HQ, WIN007HQ

Area (ha, 2001/1750):	242/253	Proportion Extant (%)	96.00
No. Taxa (total):	111	No. Taxa per Plot:	54.50

Description

Upper Shoalhaven Tall Open Forest is dominated by *Eucalyptus globoidea*, *Acacia longifolia*, *E. punctata*, *E. elata* and *E. paniculata*. A sparse mid stratum was recorded at all sites and was dominated by *Exocarpos strictus*, *Leucopogon lanceolatus*, *Persoonia linearis* and *Olearia viscidula*. A lower mid stratum often comprised of grasses and juvenile shrubs was identified. The most frequent species including *Billardiera scandens*, *Dianella caerulea* and *Lomandra longifolia*.

This community occurs in valley and sheltered aspects of the Upper Shoalhaven Gorge. It is floristically similar to a number of other forest and woodland communities including Southern Highlands Shale Woodland, Mount Gibraltar Forest and Joadja Tall Open Forest.

Previous Floristic Classifications

The Southern CRA Forest Ecosystems Mapping Project (NPWS 2000c) previously classified this community as 'FOREST ECOSYSTEM 181: North-eastern Tablelands Gully Fern Forest.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	100	21.63	41.25
Mid	100	4.23	6.25
Lower Mid	25	1.90	15.00

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non-group freq	Fidelity class
Tree	Eucalyptus globoidea	1	1.00	1	0.18	positive
	Acacia longifolia	1	0.75	1	0.18	positive
	Eucalyptus punctata	1	0.75	1	0.20	positive
	Allocasuarina littoralis	1	0.50	1	0.16	positive
	Eucalyptus elata	1	0.50	1	0.07	positive
	Eucalyptus paniculata	1	0.50	1	0.01	positive
Tree/Shrub	Notelaea venosa	1	0.50	1	0.06	positive
Shrub	Exocarpos strictus	1	1.00	1	0.11	positive
	Leucopogon lanceolatus	1	1.00	1	0.27	positive
Ground	Persoonia linearis	1	1.00	1	0.37	positive
	Olearia viscidula	1	0.75	1	0.30	positive
	Cassinia aculeata	1	0.50	1	0.13	positive
	Correa reflexa	1	0.50	1	0.04	positive
	Dodonaea triquetra	1	0.50	1	0.07	positive
	Goodenia ovata	1	0.50	1	0.03	positive
	Hibbertia empetrifolia subsp	1	0.50	1	0.22	positive
	Leptospermum polygalifolium	1	0.50	1	0.18	positive
	Billardiera scandens	1	1.00	1	0.41	positive
	Dianella caerulea	1	1.00	1	0.31	positive
	Dichondra repens	1	1.00	1	0.31	positive
	Glycine clandestina	1	1.00	1	0.19	positive
	Hydrocotyle peduncularis	1	1.00	1	0.07	positive
	Lomandra longifolia	1	1.00	1	0.51	positive
	Microlaena stipoides	1	1.00	1	0.42	positive
	Echinopogon ovatus	1	0.75	1	0.20	positive
	Entolasia stricta	1	0.75	1	0.38	positive
	Eustrephus latifolius	1	0.75	1	0.14	positive
	Gonocarpus humilis	1	0.75	1	0.03	positive
	Helichrysum scorpioides	1	0.75	1	0.10	positive
	Lagenifera gracilis	1	0.75	1	0.09	positive
	Lepidosperma gunnii	1	0.75	1	0.09	positive
	Lomandra filiformis ssp filiformis	1	0.75	1	0.20	positive
	Plantago debilis	1	0.75	1	0.10	positive
	Pomax umbellata	1	0.75	1	0.21	positive
	Poranthera microphylla	1	0.75	1	0.21	positive
	Pratia purpurascens	1	0.75	1	0.16	positive
	Pterostylis acuminata	1	0.75	0	0.00	positive
	Tylophora barbata	1	0.75	1	0.12	positive
	Veronica plebeia	1	0.75	1	0.21	positive
	Viola hederacea	1	0.75	1	0.27	positive
	Wahlenbergia gracilis	1	0.75	1	0.20	positive
	Adiantum aethiopicum	1	0.50	1	0.12	positive
	Austrostipa rudis	1	0.50	1	0.16	positive
	Dampiera purpurea	1	0.50	1	0.18	positive
	Galium binifolium	1	0.50	1	0.06	positive
	Hypericum gramineum	1	0.50	1	0.21	positive
	Lepidosperma laterale	1	0.50	1	0.22	positive
	Lomandra multiflora ssp multiflora	1	0.50	1	0.35	positive
	Opercularia diphylla	1	0.50	1	0.13	positive
	Oxalis perennans	1	0.50	1	0.17	positive
	Phyllanthus hirtellus	1	0.50	1	0.26	positive
	Pteridium esculentum	1	0.50	1	0.36	positive
	Goodia lotifolia	1	0.25	0	0.00	positive
Vine/Ground	Clematis aristata	1	1.00	1	0.30	positive
Tree	Eucalyptus piperita	1	0.25	1	0.25	uninformative
	Eucalyptus smithii	1	0.25	1	0.04	uninformative
	Pittosporum undulatum	1	0.25	1	0.09	uninformative
Tree/Shrub	Syncarpia glomulifera	1	0.25	1	0.02	uninformative
	Notelaea longifolia	1	0.25	1	0.04	uninformative

20. Mt Gibraltar Forest

Sites: CAN037HQ, MIT010HQ, MIT026B, MIT006HQ, MIT011G, MIT028B, MIT029B, MIT027B

Area (ha, 2001/1750):	536/970	Proportion Extant (%)	55.26
No. Taxa (total):	144	No. Taxa per Plot:	48.25

Description

Mount Gibraltar Forest is an Endangered Ecological Community listed under the TSC Act. It is a tall community averaging close to 26 metres in height. The upper stratum is dominated by *Eucalyptus piperita*, *E. radiata*, *E. fastigata* and *E. smithii*. The midstratum is composed of juvenile trees with *Leucopogon lanceolatus*, *Hibbertia empetrifolia*, *Olearia viscidula*, *Persoonia linearis* and *Rubus parvifolius* being amongst the most common shrub species. In addition *Exocarpos cupressiformis*, *Acacia falciformis* and *Pittosporum undulatum* often form a low tree layer. Ground species commonly include *Dianella caerulea*, *Lomandra longifolia*, *Pteridium esculentum*, *Adiantum aethiopicum* and *Viola hederacea*.

Key locations include Mount Gibraltar, Mount Misery, Mount Flora, Cockatoo Hill and Mount Jellore. The variable nature of this community is generally a function of topography with the drier sclerophyllous form dominant on ridges, upper slopes and exposed aspects and the moister mesic form occurring in sheltered areas on deeper soils. This community has similar floristics to Robertson Basalt Tall Forest and Southern Highlands Shale Woodland, both Endangered Ecological Communities.

Previous Floristic Classifications

Fisher, Ryan & Lembit (1995), have previously classified this community as 'Mount Gibraltar Forest' (Map Unit 9w). The Scientific Committee has listed this community as 'Mount Gibraltar Forest' and this terminology has been retained for this report.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	100	25.94	36.88
Mid	100	6.38	12.75
Lower Mid	50	1.24	11.75

Diagnostic Species:

Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non-group freq	Fidelity class
Tree	Eucalyptus piperita	1	0.75	1	0.24	positive
	Eucalyptus radiata	1	0.50	1	0.06	positive
Tree/Shrub	Exocarpos cupressiformis	1	0.50	1	0.03	positive
Shrub	Leucopogon lanceolatus	1	0.75	1	0.27	positive
	Polyscias sambucifolia	1	0.75	1	0.03	positive
	Hibbertia empetrifolia	1	0.50	1	0.22	positive
	Olearia viscidula	1	0.50	1	0.30	positive
	Persoonia linearis	1	0.50	1	0.38	positive
	Rubus parvifolius	1	0.50	1	0.07	positive
Ground	Berberis aristata	1	0.13	0	0.00	positive
	Dianella caerulea	1	1.00	1	0.31	positive
	Lomandra longifolia	1	1.00	1	0.51	positive
	Pteridium esculentum	1	1.00	1	0.35	positive
	Adiantum aethiopicum	1	0.88	1	0.11	positive
	Viola hederacea	1	0.88	1	0.26	positive
	Dichondra repens	1	0.75	1	0.31	positive
	Eustrephus latifolius	1	0.75	1	0.13	positive
	Glycine clandestina	1	0.75	1	0.19	positive
	Gonocarpus tetragynus	1	0.75	1	0.28	positive
	Hardenbergia violacea	1	0.75	1	0.18	positive
	Helichrysum scorpioides	1	0.75	1	0.09	positive
	Poa labillardierei var labillardierei	1	0.75	1	0.16	positive
	Pratia purpurascens	1	0.75	1	0.15	positive
	Styphandra glauca	1	0.75	1	0.11	positive
	Tylophora barbata	1	0.75	1	0.12	positive
	Microlaena stipoides	1	0.63	1	0.43	positive
	Asperula conferta	1	0.50	1	0.04	positive
	Austrostipa rudis	1	0.50	1	0.16	positive
	Billardiera scandens	1	0.50	1	0.41	positive
	Blechnum cartilagineum	1	0.50	1	0.12	positive
	Doodia aspera	1	0.50	1	0.03	positive
	Echinopogon ovatus	1	0.50	1	0.20	positive
	Geitonoplesium cymosum	1	0.50	1	0.14	positive
	Veronica plebeia	1	0.50	1	0.21	positive
	Senecio biserratus	1	0.13	0	0.00	positive
Vine/Ground	Clematis aristata	1	1.00	1	0.30	positive
Tree	Acacia falciformis	1	0.38	1	0.12	uninformative
	Eucalyptus fastigata	1	0.38	1	0.03	uninformative
	Pittosporum undulatum	1	0.38	1	0.09	uninformative
	Acacia mearnsii	1	0.25	1	0.03	uninformative
	Acacia melanoxylon	1	0.25	1	0.09	uninformative
	Eucalyptus smithii	1	0.25	1	0.03	uninformative
	Acacia falcata	1	0.13	1	0.00	uninformative
	Acacia floribunda	1	0.13	1	0.02	uninformative
	Acacia longifolia	1	0.13	1	0.19	uninformative
	Acacia parramattensis	1	0.13	1	0.06	uninformative
	Allocasuarina littoralis	1	0.13	1	0.16	uninformative
	Angophora floribunda	1	0.13	1	0.02	uninformative
	Elaeocarpus reticulatus	1	0.13	1	0.10	uninformative
	Eucalyptus cypellocarpa	1	0.13	1	0.05	uninformative
	Eucalyptus elata	1	0.13	1	0.07	uninformative
	Eucalyptus eugenioides	1	0.13	1	0.07	uninformative
	Eucalyptus globoides	1	0.13	1	0.19	uninformative
Tree	Eucalyptus tereticornis	1	0.13	1	0.11	uninformative
	Eucalyptus viminalis	1	0.13	1	0.02	uninformative
Tree/Shrub	Notelaea venosa	1	0.25	1	0.06	uninformative
	Hedycarya angustifolia	1	0.13	1	0.02	uninformative

21. Warm Temperate Rainforest

Sites: BUN006LQ, ROB022LQ, BUN018HQ

Area (ha, 2001/1750):	571/3296	Proportion Extant (%)	17.32
No. Taxa (total):	103	No. Taxa per Plot:	49.33

Description

Warm Temperate Rainforest is dominated by *Acacia melanoxylon*, *Doryphora sassafras*, *Acmena smithii* and *Pittosporum undulatum*. Small trees and shrubs occur in two distinctive mid layers. Species include *Rapanea howittiana*, *Notelaea venosa*, *Hymenanthera dentata*, *Celastrus australis*, *Coprosma quadrifida* and *Pittosporum multiflorum*. A number of ground covers and vines occur including *Eustrephus latifolius*, *Pyrrosia rupestris*, *Geitonoplesium cymosum*, *Pandorea pandorana*, *Smilax australis* and *Marsdenia rostrata*.

Not suprisingly this community is floristically and structurally similar to Robertson Basalt Rainforest. However the slightly different floristics combined with the significantly different habitat of this community are sufficient to warrant its identification as a separate community. This community occurs along creeklines and sheltered aspects in the Shoalhaven Gorge, immediately below the sandstone escarpment. The substrate is typically shale based although it may occur on colluvium.

Previous Floristic Classifications

The Southern CRA Forest Ecosystems Mapping Project (NPWS 2000c) previously classified this community as 'FOREST ECOSYSTEM 169: Coastal Hinterland Sub Tropical Warm Temperate Rainforest.

Structure

Stratum	Frequency (%)	Mean Height (m)	Mean Foliage Cover (%)
Tree	100	25.00	41.67
Mid	100	7.50	21.67
Lower Mid	67	2.33	39.00
Emerging	33	20.00	

Diagnostic Species:

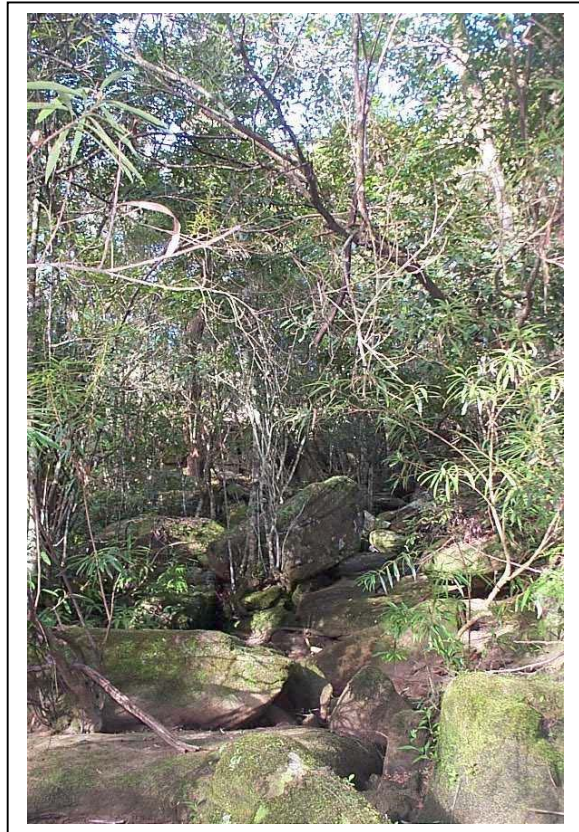
Stratum	Scientific Name	Group score (50 percentile)	Group freq	Non-group score (50 percentile)	Non- group freq	Fidelity class
Tree	Acacia melanoxylon	1	0.94	1	0.06	positive
	Doryphora sassafras	1	0.94	1	0.00	positive
	Acmena smithii	1	0.63	1	0.01	positive
	Pittosporum undulatum	1	0.56	1	0.08	positive
	Pennantia cunninghamii	1	0.31	0	0.00	positive
Tree/Shrub	Rapanea howittiana	1	0.69	1	0.02	positive
	Notelaea venosa	1	0.50	1	0.04	positive
	Eucryphia moorei	1	0.06	0	0.00	positive
Shrub	Hymenanthera dentata	1	0.94	1	0.08	positive
	Celastrus australis	1	0.69	1	0.01	positive
	Coprosma quadrifida	1	0.69	1	0.04	positive
	Pittosporum multiflorum	1	0.69	1	0.01	positive
	Palmeria scandens	1	0.06	0	0.00	positive
Palm	Hedyscepe canterburyana	1	0.06	0	0.00	positive
Ground	Eustrephus latifolius	1	1.00	1	0.11	positive
	Pyrrosia rupestris	1	0.88	1	0.02	positive
	Geitonoplesium cymosum	1	0.81	1	0.13	positive
	Asplenium flabellifolium	1	0.56	1	0.15	positive
	Gymnostachys anceps	1	0.50	1	0.01	positive
	Lastreopsis microsora subsp	1	0.50	1	0.01	positive
	Urtica incisa	1	0.50	1	0.05	positive
	Viola hederacea	1	0.50	1	0.27	positive
	Arthropteris tenella	1	0.25	0	0.00	positive
	Microsorium scandens	1	0.25	0	0.00	positive
	Australina pusilla	1	0.13	0	0.00	positive
	Elatostema reticulatum	1	0.13	0	0.00	positive
	Microsorium pustulatum	1	0.13	0	0.00	positive
	Polystichum proliferum	1	0.13	0	0.00	positive
	Diplazium australe	1	0.06	0	0.00	positive
	Pteris umbrosa	1	0.06	0	0.00	positive
	Clematis aristata	1	0.50	1	0.30	positive
	Pandorea pandorana	1	0.88	1	0.13	positive
	Smilax australis	1	0.88	1	0.05	positive
	Marsdenia rostrata	1	0.81	1	0.07	positive
Vine/Ground Vine	Parsonsia brownii	1	0.69	1	0.01	positive
	Marsdenia australis	1	0.06	0	0.00	positive
	Dicksonia antarctica	1	0.38	1	0.01	uninformative
	Alectryon subcinereus	1	0.31	1	0.00	uninformative
	Eucalyptus fastigata	1	0.31	1	0.03	uninformative
	Polyosma cunninghamii	1	0.31	1	0.00	uninformative
	Ceratopetalum apetalum	1	0.25	1	0.01	uninformative
	Cyathea australis	1	0.19	1	0.02	uninformative
	Quintinia sieberi	1	0.13	1	0.00	uninformative
	Cyathea leichhardtiana	1	0.06	1	0.00	uninformative
Tree	Diospyros australis	1	0.06	1	0.00	uninformative
	Eucalyptus smithii	1	0.06	1	0.04	uninformative
	Sambucus australasica	1	0.44	1	0.00	uninformative
	Hedycarya angustifolia	1	0.25	1	0.01	uninformative
	Synoum glandulosum subsp	1	0.19	1	0.02	uninformative
Tree/Shrub						

604. Sandstone Riparian Scrub

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

A low mesic scrub less than five metres tall occurs along deeply incised creeklines on Hawkesbury Sandstones across the Woronora Plateau. The Riparian Scrub features a variable cover of shrubs that include *Tristaniopsis laurina*, *Tristania neriifolia*, *Leptospermum morrisonii*, *Allocasuarina littoralis*, *Ceratopetalum apetalum* and *Backhousia myrtifolia*. The latter two species tend to be more prominent amongst stream boulders (Keith, 1994) and around minor waterfalls. The smaller shrub layer is dominated by *Lomatia myricoides*, with *Acacia obtusifolia*, *Grevillea oleoides*, *Bauera rubioides*, *Micrantheum hexandrum* and *Pseudanthus pimeleoides*. The ground cover supports an abundant cover of moisture loving ferns such as *Sticherus flabellatus* var. *flabellatus* and *Gleichenia microphylla*. The fern cover is often broken by a series of rock pools, recent sandy alluvial deposits and rock pavements. Branches of the surrounding Eucalypt forest form an occasional shade



cover across the gully line. Tree species are variable depending on location but frequently are *Eucalyptus piperita*, *E. agglomerata* or *Angophora costata*.

Sandstone Riparian Scrub occurs in Woronora, O'Hares, Cataract, Cordeaux and Nepean Catchments. In many instances this community occurs in narrow bands which are too small to map. This is particularly the case with minor streams that are confluent with major creeks. Sandstone Riparian Scrub is also found in Holsworthy Military Area (French et al., 2000) and Royal National Park (Keith, 1994). Elsewhere in the Sydney Basin Bioregion it has been recorded in Wollemi and Yengo National Park (Bell, 1998) and would be expected to occur in several additional sandstone reserves to the south and east.

□ FLORISTIC SUMMARY

Number of Sites: 4

Trees: 20-30m tall. Mean Projected Canopy Cover 5%

Angophora costata, *Eucalyptus piperita*, *Eucalyptus punctata*, *Eucalyptus pilularis*

Taller Shrubs: 2-5m tall. Mean Projected Canopy Cover 40%

Tristaniopsis laurina, *Tristania neriifolia*, *Ceratopetalum apetalum*, *Leptospermum morrisonii*, *Allocasuarina littoralis*, *Dodonaea triquetra*, *Acacia irrorata* subsp. *irrorata*, *Callicoma serratifolia*

Shrubs: 0.5-1.5 m tall. Mean Projected Canopy Cover 30%

Lomatia myricoides, *Acacia obtusifolia*, *Grevillea oleoides*, *Bauera rubioides*, *Micrantheum hexandrum*, *Prostanthera linearis*, *Hakea salicifolia*

Ground covers: 0.5-1m tall. Mean Projected Canopy Cover 35%

Sticherus flabellatus var. *flabellatus*, *Gleichenia microphylla*, *Schoenus melanostachys*, *Lepidosperma laterale*, *Lomandra fluviatilis*, *Lomandra longifolia*, *Entolasia stricta*

□ KEY IDENTIFYING FEATURES**Easily recognisable features to assist in identifying this map unit are:**

- Gully line habitat on Hawkesbury Sandstone. Rock pools, waterfalls, rock platforms and sandy banks are regularly observed along creek lines.
- Water gums (*Tristaniopsis laurina*, *Tristania neriifolia*) are the prominent feature of this community. They are generally low in height although where there is greater shelter, the community is slightly taller and includes Coachwood (*Ceratopetalum apetalum*) and Grey myrtle (*Backhousia myrtifolia*).
- Dense cover of ferns including the Umbrella fern (*Sticherus flabellatus* var. *flabellatus*) and the Scrambling coral fern (*Gleichenia microphylla*).

□ EXAMPLE LOCATIONS

O'Hares Creek, Stokes Creek (O'Hares Catchment); Cataract Creek (Cataract Catchment), Flat Rock Crossing (Woronora Catchment)

□ CONSERVATION STATUS**BIOREGIONAL STATUS**

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>1500	65	531.01	35.4

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	530.58	99.9
B Moderate	0	0
C Heavy	0.43	0.1
Scattered trees	0	0
Total	531.01	100

□ THREATENED PLANT SPECIES

Grevillea longifolia (2R)

□ **DIAGNOSTIC SPECIES**

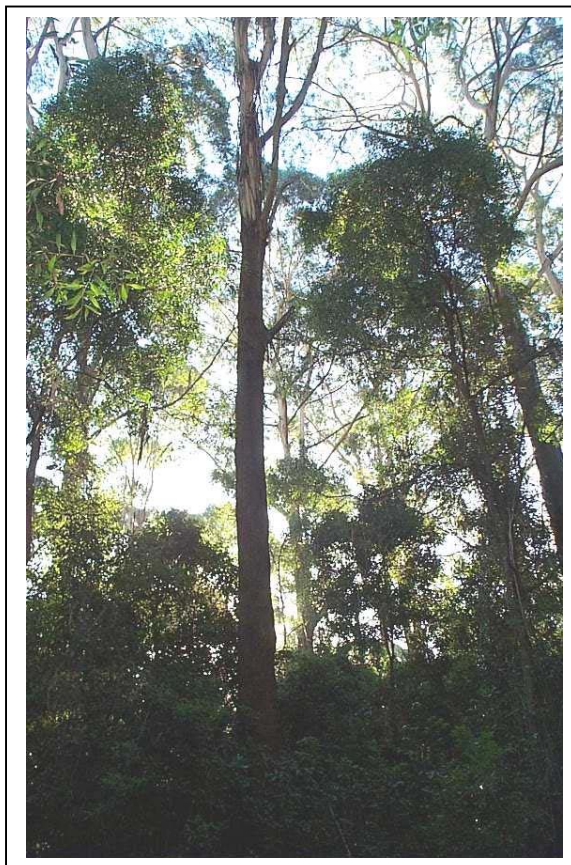
Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Acacia obtusifolia	4	1.00	2	0.12	positive
Allocasuarina littoralis	2	0.50	1	0.14	positive
Austromyrtus tenuifolia	2	0.17	0	0.00	positive
Bauera rubioides	2	0.67	2	0.07	positive
Beyeria lasiocarpa	1	0.17	0	0.00	positive
Dodonaea triquetra	3	0.50	2	0.12	positive
Gleichenia microphylla	4	0.50	3	0.04	positive
Grevillea oleoides	2	0.83	2	0.24	positive
Guringalia dimorpha	2	0.83	2	0.07	positive
Leptospermum morrisonii	2	0.83	1	0.01	positive
Lomandra fluviatilis	3	0.83	1	0.02	positive
Lomatia myricoides	3	1.00	1	0.03	positive
Ludwigia peploides subsp. montevidensis	1	0.17	0	0.00	positive
Micrantheum hexandrum	4	0.50	0	0.00	positive
Philydrum lanuginosum	1	0.17	0	0.00	positive
Pseudanthus pimeleoides	2	0.83	1	0.01	positive
Sticherus flabellatus var. flabellatus	4	0.67	2	0.04	positive
Tristania neriifolia	3	0.83	1	0.01	positive
Tristaniopsis laurina	3	0.83	3	0.02	positive
Corymbia gummifera	0	0.00	2	0.52	negative
Entolasia stricta	2	0.67	2	0.53	constant

608. Moist Gully Gum Forest

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Moist Gully Gum Forest is a very tall (to 35 metres) forest occurring in the high rainfall zone on upper escarpment slopes and shale soils of the plateau south from Mount Brisbane. The canopy is variable although *Eucalyptus smithii* is most frequently recorded. On the escarpment, associated species include *Eucalyptus muelleriana* and *E. quadrangulata* and with less frequency *E. cypellocarpa*, *E. elata*, *E. pilularis* and *E. saligna* X *botryoides*. On the plateau, *Eucalyptus cypellocarpa*, *E. elata* and *E. piperita* are more common. The rainforest subcanopy is less complex than other escarpment moist forests. Species include *Doryphora sassafras*, *Livistona australis*, *Cryptocarya* spp., *Acmena smithii* and *Eupomatia laurina*. The understorey supports a number of ferns and twiners common to moist forests of the escarpment including *Tylophora barbata*, *Smilax australis* and *Marsdenia rostrata*. *Acacia binervata* is often present within this community on the plateau and appears to signal areas of previous disturbance.



Moist Gully Gum Forest occurs above 300 metres in elevation on Narrabeen geologies of both the upper escarpment slopes and on protected slopes and gullies of the adjoining plateau. The community appears to extend south into Shellharbour and Kiama LGA's although the relationship with existing mapping is not precise. Mills (2000) refers to two similar communities for the Shellharbour LGA. Both White Box-Brown Barrel Forest and White Box-Yellow Stringybark Tall Forest share similarities with Moist Gully Gum Forest. Less clear is the relationship with broader regional communities defined by NPWS (2000a). Forest Ecosystem 18: Southern Coastal Hinterland Moist-Shrub-Vine-Grass Forest shares overlap with some canopy and shrub species and is likely to be closely related to Moist Gully Gum Forest at the northern extent of its distribution. NPWS (2000a) considers it to be an extensively distributed and well reserved ecosystem.

□ FLORISTIC SUMMARY

Number of sites: 14

Trees: 15-55m tall. Mean Projected Canopy Cover 43%

Eucalyptus smithii, *Eucalyptus muelleriana*, *Eucalyptus quadrangulata* and less commonly *Eucalyptus piperita*, *Eucalyptus elata*, *Eucalyptus cypellocarpa*

Subcanopy Trees and shrubs: 2-20m tall. Mean Projected Canopy Cover 32%

Synoum glandulosum subsp. *glandulosum*, *Livistona australis*, *Acacia binervata*, *Acmena smithii*, *Cryptocarya glaucescens*, *Doryphora sassafras*, *Clerodendrum tomentosum*, *Notelaea venosa*

Ground Covers: 0-1m tall. Mean Projected Canopy Cover 37%

Lomandra longifolia, *Hibbertia dentata*, *Oplismenus imbecillis*, *Pteridium esculentum*, *Microlaena stipoides* var. *stipoides*, *Pseuderanthemum variabile*, *Goodenia ovata*, *Dianella caerulea*

Vines & Climbers:

Eustrephus latifolius, *Smilax australis*, *Tylophora barbata*, *Pandorea pandorana* subsp. *pandorana*, *Morinda jasminoides*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- A tall forest canopy and the presence of Gully gum (*Eucalyptus smithii*) and Yellow stringybark (*E. muelleriana*).
- A mesic subcanopy tree-layer including Scentless rosewood (*Synoum glandulosum* subsp. *glandulosum*), Sassafras (*Doryphora sassafras*), Two-veined hickory (*Acacia binervata*), Lilly pilly (*Acmena smithii*), Jackwood (*Cryptocarya glaucescens*) and Smooth mock olive (*Notelaea venosa*).
- An understorey containing species such as Spiny matt-rush (*Lomandra longifolia*), *Hibbertia dentata*, Bracken fern (*Pteridium esculentum*) and *Goodenia ovata*.

□ EXAMPLE LOCATIONS

Mount Brisbane; Kembla Heights; Kembla State Forest; Bong Bong Pass; Macquarie Pass.

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>2736	46	1202.29	43.9

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	821.49	68.3
B Moderate	291.04	24.2
C Heavy	61.40	5.1
Scattered trees	28.36	2.4
Total	1202.29	100

❑ **THREATENED PLANT SPECIES**

None recorded

❑ **DIAGNOSTIC SPECIES**

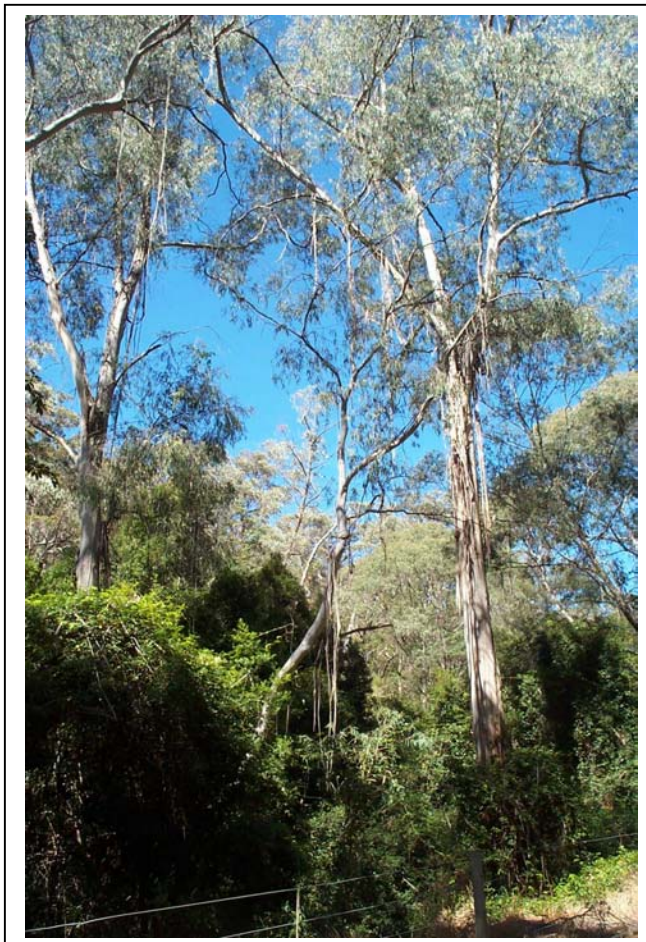
Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
<i>Acmena smithii</i>	4	1.00	2	0.44	positive
<i>Asplenium flabellifolium</i>	2	0.63	2	0.36	positive
<i>Beyeria lasiocarpa</i>	1	0.13	0	0.00	positive
<i>Cissus hypoglauca</i>	3	0.75	2	0.17	positive
<i>Clerodendrum tomentosum</i>	2	1.00	1	0.40	positive
<i>Cryptocarya glaucescens</i>	4	0.88	4	0.25	positive
<i>Cryptocarya microneura</i>	4	0.50	3	0.29	positive
<i>Doodia aspera</i>	3	0.63	3	0.46	positive
<i>Doryphora sassafras</i>	4	0.63	4	0.28	positive
<i>Eucalyptus muelleriana</i>	5	0.50	5	0.03	positive
<i>Eucalyptus quadrangulata</i>	4	0.75	4	0.21	positive
<i>Eucalyptus smithii</i>	4	0.88	4	0.02	positive
<i>Eupomatia laurina</i>	2	1.00	2	0.30	positive
<i>Lastreopsis decomposita</i>	3	0.88	3	0.18	positive
<i>Livistona australis</i>	2	1.00	3	0.46	positive
<i>Morinda jasminoides</i>	3	0.88	2	0.33	positive
<i>Palmeria scandens</i>	3	0.63	2	0.17	positive
<i>Poa labillardieri</i> var. <i>labillardieri</i>	2	0.50	3	0.27	positive
<i>Sarcochilus olivaceus</i>	1	0.13	0	0.00	positive
<i>Smilax australis</i>	2	0.88	2	0.44	positive
<i>Synoum glandulosum</i> subsp. <i>glandulosum</i>	4	0.88	2	0.38	positive
<i>Tylophora barbata</i>	2	0.88	2	0.32	positive
<i>Geitonoplesium cymosum</i>	1	0.75	2	0.63	negative
<i>Eustrephus latifolius</i>	2	0.75	2	0.66	constant
<i>Marsdenia rostrata</i>	2	0.88	2	0.54	constant
<i>Pandorea pandorana</i> subsp. <i>pandorana</i>	2	0.81	2	0.62	constant
<i>Pseuderanthemum variabile</i>	2	0.88	3	0.58	constant

609. Nepean Gorge Moist Forest

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

The Nepean Catchment is characterised by a number of deeply dissected Hawkesbury sandstone gorges and valleys. A tall forest with a moist subcanopy occupies sheltered aspects in these environments. Tall *Eucalyptus elata* are a feature of the canopy. Other canopy species include *Eucalyptus agglomerata*, *E. punctata* and *E. piperita*. The understorey can be a moderately tall small tree and shrub layer. In the most protected sites *Ceratopetalum apetalum*, *Acacia elata*, *C. gummiferum* and *Backhousia myrtifolia* can grow up to around twelve metres in height. The smaller shrub stratum is less dense. It includes ferns, such as *Cyathea australis*, and shrubs, such as *Elaeocarpus reticulatus* and *Notelaea longifolia* f. *longifolia*. The shady habitat provides sufficient shelter for an abundant ground cover of ferns such as *Calochlaena dubia*, *Pteridium esculentum*, *Sticherus flabellatus* var. *flabellatus*, *Adiantum formosum* and *Blechnum cartilagineum*. Small succulent climbers such as *Tylophora barbata* and *Cissus hypoglauca* are also abundant.



Deep gorges that run east-west provide sufficient shelter for narrow ribbons of this moist forest. The composition of the moist understorey is less diverse than other moist forests found in the eastern catchment. Nepean Gorge Moist Forest more closely resembles moist Blue Gum Forests found in similar habitats in Nattai National Park in the Warragamba Special Area.

□ FLORISTIC SUMMARY

Number of Sites: 1

Trees: 25-35m tall. Projected Cover 40%

Eucalyptus elata, *Eucalyptus agglomerata*, *Eucalyptus punctata*, *Eucalyptus piperita*, *Corymbia gummifera*

Tall Shrubs: 6-12m. Mean Projected Cover 35%

Acacia elata, *Ceratopetalum apetalum*, *Ceratopetalum gummiferum*, *Backhousia myrtifolia*

Small Shrubs: 2-5m. Projected Cover 15%

Cyathea australis, *Breynia oblongifolia*, *Elaeocarpus reticulatus*, *Persoonia linearis*, *Pultenaea flexilis*, *Leptospermum polygalifolium* subsp. *polygalifolium*, *Leucopogon lanceolatus* var. *lanceolatus*, *Tristaniopsis collina*

Ground covers: 0-0.5 m tall. Mean Projected Canopy Cover 70%

Calochlaena dubia, *Pteridium esculentum*, *Dianella caerulea*, *Lomandra longifolia*, *Lepidosperma laterale*, *Entolasia marginata*, *Billardiera scandens*, *Viola hederacea*, *Clematis aristata*

❑ **KEY IDENTIFYING FEATURES**

Easily recognisable features to assist in identifying this map unit are:

- Deeply dissected gorges and valleys of the Mittagong and Hawkesbury Sandstones in the western Metropolitan Catchment.
- A tall forest supporting River peppermint (*Eucalyptus elata*), Grey gum (*E. punctata*) and Blue-leaved stringybark (*E. agglomerata*).
- Small trees such as Mountain cedar wattle (*Acacia elata*), Christmas bush (*Ceratopetalum gummiferum*), Coachwood (*C. apetalum*) and Grey myrtle (*Backhousia myrtifolia*).
- A shrubby understorey of Blueberry ash (*Elaeocarpus reticulatus*), Tea-tree (*Leptospermum polygalifolium* subsp. *polygalifolium*), Bearded heath (*Leucopogon lanceolatus* var. *lanceolatus*) and Native olive (*Notelaea longifolia* f. *longifolia*).
- The groundcover has a prominent cover of Common ground fern (*Calochlaena dubia*) Bracken (*Pteridium esculentum*), Spiny-headed mat-rush (*Lomandra longifolia*) and Snowgrass (*Poa sieberiana* var. *sieberiana*).

❑ **EXAMPLE LOCATIONS**

Avon Dam Road, Nepean Catchment, Burke River Gorge

❑ **EXAMPLE LOCATIONS**

Avon Dam Road, Nepean Catchment; Gullyline below Fire Trail 3D, Nepean Catchment

❑ **CONSERVATION STATUS**

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
3000	50	417.48	13.9

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	417.48	100
B Moderate	0	0
C Heavy	0	0
Scattered Trees	0	0
Total	417.48	100

❑ **THREATENED PLANT SPECIES**

None recorded

❑ **DIAGNOSTIC SPECIES**

(Diagnostic species extracted from combined Warragamba-Woronora Dataset)

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Asplenium flabellifolium	2	0.60	2	0.21	Positive
Blechnum cartilagineum	4	1.00	3	0.11	Positive
Callicoma serratifolia	4	0.70	2	0.02	Positive
Calochlaena dubia	6	0.90	3	0.07	Positive
Ceratopetalum apetalum	5	0.70	4	0.03	Positive
Ceratopetalum gummiferum	4	0.50	4	0.03	Positive
Clematis aristata	2	0.50	2	0.35	Positive
Elaeocarpus reticulatus	3	0.70	1	0.16	Positive
Eucalyptus elata	4	0.60	4	0.06	Positive
Geitonoplesium cymosum	2	0.50	2	0.29	Positive
Hymenophyllum cupressiforme	2	0.50	2	0.02	Positive
Morinda jasminoides	2	0.60	2	0.06	Positive
Pteridium esculentum	2	0.70	2	0.36	Positive
Smilax glyciphylla	2	0.50	1	0.07	Positive
Sticherus flabellatus var. flabellatus	4	0.50	3	0.01	Positive
Todea barbara	4	0.50	2	0.01	Positive
Viola hederacea	2	0.50	2	0.24	Positive
Lomandra longifolia	2	0.60	2	0.55	Constant

613. Tall Open Gully Gum Forest

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

This community has been identified and described by the NPWS (2002) Woronora Vegetation Mapping Project. Tall Open Gully Gum Forest occurs on exposed slopes and crests on Narrabeen Shale and Sandstone in the eastern catchments of Avon and Cordeaux. *Eucalyptus smithii* and *E. piperita* form the dominant canopy species with occasional occurrences of *E. cypellocarpa* and *E. muelleriana*. A tall small tree layer comprising *Acacia binervata* is a common feature. The shrub layer is otherwise sparse with scattered individuals of *Notelaea venosa*, *Goodenia ovata*, *Synoum glandulosum* subsp. *glandulosum*, *Livistona australis* and *Elaeocarpus reticulatus* sometimes found. The ground cover is a prominent cover of *Lomandra longifolia*, *Pteridium esculentum*, *Calochlaena dubia*, *Dianella caerulea* and *Lepidosperma laterale*. Vines and twiners are common and include *Eustrephus latifolius*, *Pandorea pandorana* subsp. *pandorana* and *Smilax australis*.

Tall Open Gully Gum forest shares many species with other tall open forests located on shale derived soils of the catchments. It represents the drier end of the gradient from Moist Gully Gum Forest (Map Unit 8) as a result of its exposure to fire and drying winds.



□ FLORISTIC SUMMARY

Number of Sites: 5

Trees: 25-35m tall. Mean Projected Canopy Cover 35%

Eucalyptus smithii, *Eucalyptus piperita*, *Eucalyptus cypellocarpa*, *Eucalyptus muelleriana*, *Eucalyptus elata*

Small Trees and Shrubs: 2-5m tall. Mean Projected Shrub Cover 25%

Acacia binervata, *Notelaea venosa*, *Goodenia ovata*, *Synoum glandulosum* subsp. *glandulosum*, *Livistona australis*, *Acmena smithii*

Ground covers: 0-1 m tall. Mean Projected Ground Cover 15%

Lomandra longifolia, *Pteridium esculentum*, *Lepidosperma laterale*, *Oplismenus imbecillis*, *Dianella caerulea*, *Calochlaena dubia*

Vines and Twiners

Hibbertia dentata, *Eustrephus latifolius*, *Pandorea pandorana* subsp. *pandorana*, *Smilax australis*, *Tylophora barbata*, *Cissus hypoglauca*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- A tall open forest dominated by Gully gum (*Eucalyptus smithii*) and Sydney peppermint (*E. piperita*).
- Prominent stratum of Two-veined hickory (*Acacia binervata*).
- Open forest with dense ground cover with Spiny-headed mat-rush (*Lomandra longifolia*), Bracken (*Pteridium esculentum*) and *Calochlaena dubia*.
- A high diversity of vines and twiners that include Bearded Tylophora (*Tylophora barbata*), Twining guinea-flower (*Hibbertia dentata*) and Wonga vine (*Pandorea pandorana* subsp. *pandorana*).

□ EXAMPLE LOCATIONS

Fire Trail 15A, Avon Catchment

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
1160	0.7	1150.67	99

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	772.28	67.1
B Moderate	313.25	27.2
C Heavy	62.30	5.4
Scattered Trees	2.84	0.2
Total	1150.67	100

❑ **THREATENED PLANT SPECIES**

None recorded

❑ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Carex declinata	1	0.20	0	0.00	positive
Cissus hypoglauca	2	0.60	2	0.04	positive
Dianella caerulea	2	0.80	2	0.29	positive
Elaeocarpus reticulatus	2	0.60	1	0.08	positive
Eucalyptus piperita	3	0.80	3	0.33	positive
Eucalyptus smithii	3	1.00	3	0.01	positive
Eustrephus latifolius	2	1.00	1	0.12	positive
Gonocarpus teucroides	2	0.60	2	0.36	positive
Goodenia ovata	2	0.80	2	0.01	positive
Hibbertia dentata	2	0.80	2	0.06	positive
Hydrocotyle peduncularis	2	0.60	2	0.03	positive
Lepidosperma laterale	2	0.80	1	0.32	positive
Lomandra longifolia	3	0.80	2	0.43	positive
Microlaena stipoides var. stipoides	2	0.60	1	0.11	positive
Morinda jasminoides	2	0.60	1	0.04	positive
Notelaea venosa	2	1.00	1	0.04	positive
Notothixos subaureus	2	0.20	0	0.00	positive
Oplismenus imbecillis	2	0.80	1	0.04	positive
Pandorea pandorana subsp. pandorana	2	1.00	1	0.04	positive
Pteridium esculentum	2	0.80	2	0.40	positive
Smilax australis	2	0.80	1	0.09	positive
Synoum glandulosum subsp. glandulosum	2	0.80	1	0.05	positive
Tylophora barbata	2	0.80	2	0.10	positive
Corymbia gummifera	0	0.00	2	0.52	negative
Entolasia stricta	2	0.20	2	0.54	negative

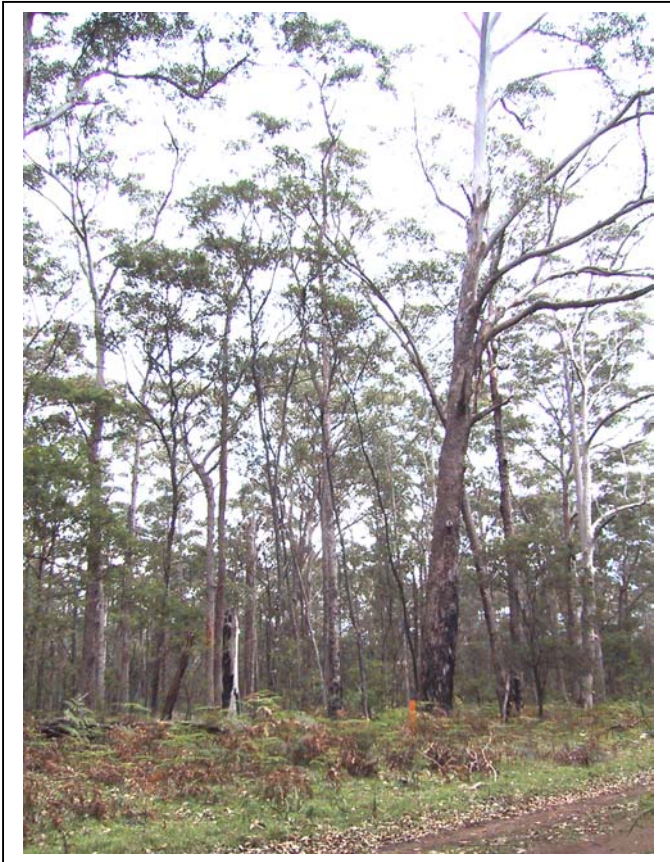
619. Transitional Shale Open Blue Gum Forest

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

In the Cataract Catchment a residual shale cap supports a tall stand of *Eucalyptus saligna* *X* *botryoides*. This forest is closely related to other tall open forest found throughout the study area. The lower rainfall in the western part of the catchment supports an understorey composition that most resembles other Shale Sandstone Transition Forests found further west and south. The ground cover includes a diverse cover of herbs such as *Dichondra repens*, *Hydrocotyle laxiflora*, and *Pratia purpurascens* along with grasses, such as *Entolasia marginata*. *Acacia irrorata* subsp. *irrorata* and *Leptospermum polygalifolium* subsp. *polygalifolium* were most prominent in the shrub stratum of the sample site.

Transitional Shale Open Blue Gum Forest form a component of Shale-Sandstone Transition Forest, an Endangered Ecological Community listed under Part 3, Schedule 1 of the Threatened Species Conservation Act, 1995.



□ FLORISTIC SUMMARY

Number of Sites: 1

Trees: 25-35m tall. Mean Projected Canopy Cover 45%

Eucalyptus saligna *X* *botryoides*

Small Trees

Acacia irrorata subsp. *irrorata*

Shrubs: 2-8m tall. Mean Projected Canopy Cover 35%

Leptospermum polygalifolium subsp. *polygalifolium*

Ground covers: 0-1 m tall. Mean Projected Canopy Cover 20%

Pteridium esculentum, *Dianella caerulea*, *Lomandra longifolia*, *Entolasia marginata*, *Viola hederacea*, *Pratia purpurascens*, *Desmodium varians*, *Dichondra repens*, *Gonocarpus teucroides*, *Hydrocotyle laxiflora*, *Hibbertia aspera*

Vines and Twiners:

Tylophora barbata, *Marsdenia rostrata*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Isolated location on Fire Trail 8.
- Tall straight trees usually Sydney blue gum (*Eucalyptus saligna*X*botyriodes*).

□ EXAMPLE LOCATIONS

Fire Trail 8 Cataract Catchment, Cataract Dam Picnic Area (now mostly cleared).

□ CONSERVATION STATUS

Listed as an Endangered Ecological Community under Part 3 of Schedule 1 of the Threatened Species Conservation Act (1995), as part of Shale-Sandstone Transition Forest.

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
3324	0.5	44.71	1.3

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	44.71	100
B Moderate	0	0
C Heavy	0	0
Scattered Trees	0	0
Total	44.71	100

□ THREATENED PLANT SPECIES

None recorded

□ **DIAGNOSTIC SPECIES**

(Note that only one sample site has been used to develop the diagnostic species list below)

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Desmodium varians	2	1	2	0.05	positive
Dianella caerulea	2	1	2	0.29	positive
Dichondra repens	3	1	2	0.07	positive
Entolasia marginata	3	1	2	0.23	positive
Eucalyptus saligna	4	1	3	0.04	positive
Galium propinquum	2	1	2	0.04	positive
Geranium homeanum	2	1	1	0.02	positive
Glycine clandestina	2	1	1	0.13	positive
Glycine tabacina	2	1	2	0.04	positive
Gonocarpus teucroides	3	1	2	0.36	positive
Helichrysum elatum	2	1	1	0.04	positive
Hibbertia diffusa	2	1	1	0.02	positive
Hydrocotyle laxiflora	2	1	2	0.04	positive
Hydrocotyle peduncularis	2	1	2	0.03	positive
Lagenifera stipitata	2	1	2	0.09	positive
Leptospermum polygalifolium subsp. polygalifolium	2	1	2	0.18	positive
Leucopogon juniperinus	2	1	1	0.02	positive
Marsdenia rostrata	2	1	2	0.05	positive
Microlaena stipoides var. stipoides	2	1	2	0.11	positive
Opercularia diphylla	2	1	2	0.07	positive
Oplismenus aemulus	2	1	2	0.01	positive
Poranthera microphylla	2	1	2	0.07	positive
Pratia purpurascens	3	1	2	0.10	positive
Pteridium esculentum	4	1	2	0.40	positive
Senecio linearifolius	2	1	1	0.01	positive
Solanum prinophyllum	2	1	1	0.02	positive
Tylophora barbata	2	1	2	0.10	positive
Veronica plebeia	2	1	1	0.02	positive
Corymbia gummifera	0	0	2	0.52	negative
Entolasia stricta	0	0	2	0.53	negative

623. Transitional Shale Stringybark Forest

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Transitional Shale Stringybark Forest forms part of the Transitional Shale Sandstone Forest and Woodland Complex in dry environments along the western boundary of the catchments. It is a moderately tall forest of *Eucalyptus globoidea* and other closely associated stringybarks (*E. eugenioides* and *E. oblonga*). *Eucalyptus punctata* is a regular associate species along with a wide variety of other Eucalypts that mark the transition with greater shale influence (eg. *E. crebra* and *E. fibrosa*) to that of greater sandstone influence (*Corymbia gummifera*, *E. piperita* and *E. sclerophylla*). Understorey is similarly variable as a result of the changes in soil. Most commonly the ground cover is a combination of grasses such as *Entolasia stricta*, *E. marginata* and *Aristida ramosa* with *Lomandra longifolia* often present. A shrubby understorey species such as *Banksia spinulosa* var. *spinulosa*, *Acacia terminalis*, *Kunzea ambigua* are found



in combination with taller species such as *Leptospermum polygalifolium* subsp. *polygalifolium*. Transitional Shale Stringybark Forest is usually distributed on the margins of residual shale caps as the forest slowly grades into open sandstone woodlands. The forest is lower in height than the adjoining shale forest (eg. Map Unit 22) and supports a less open understorey. Floristic composition may change with slight changes in elevation and rainfall. Transitional Shale Stringybark Forest forms a component of Shale Sandstone Transition Forest listed on Part 3 of Schedule 1 of the NSW Threatened Species Act (1995).

□ FLORISTIC SUMMARY

Number of Sites: 6

Trees: 18-25m tall. Mean Projected Canopy Cover 25%

Eucalyptus globoidea, *Eucalyptus eugenioides*, *Eucalyptus punctata*, *Corymbia gummifera*, *Eucalyptus crebra*, *Eucalyptus piperita*, *Eucalyptus sclerophylla*

Shrubs: 2-3m tall. Mean Projected Canopy Cover 25%

Banksia spinulosa var. *spinulosa*, *Persoonia linearis*, *Persoonia levis*, *Kunzea ambigua*, *Daviesia squarrosa*

Ground covers: 0.5-1 m tall. Mean Projected Canopy Cover 50%

Cyathochaeta diandra, *Lomandra longifolia*, *Aristida vagans*, *Aristida ramosa*, *Entolasia stricta*, *Themeda australis*, *Joycea pallida*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Small areas of Stringybarks (*Eucalyptus eugenioides* and *E. globoidea*) dominant forest that mark the transition between sandstone woodlands (Map Unit 29 and 30) and other shale forests.
- A shrubby understorey that supports a mix of Banksias, Tea-trees (*Leptospermum* spp.) and Geebung (*Persoonia* spp.).
- Drier areas of the western catchments.

□ EXAMPLE LOCATIONS

Fire Trail 8, Cataract Catchment; Intersection of 6B and 6, Avon Catchment, Old Hume Highway, Yerrinbool

□ CONSERVATION STATUS

Listed as an Endangered Ecological Community under Part 3 of Schedule 1 of the Threatened Species Conservation Act (1995) as part of Shale-Sandstone Transition Forest.

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
8706	2.5	614.92	7.1

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	604.38	98.3
B Moderate	10.54	1.7
C Heavy	0	0
Scattered Trees	0	0
Total	614.92	100

□ THREATENED PLANT SPECIES

Epacris purpurascens var. *purpurescens* (V)

□ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Aristida ramosa	2	1.00	1	0.02	positive
Aristida vagans	2	0.83	1	0.04	positive
Arthropodium minus	1	0.17	0	0.00	positive
Austrostipa pubescens	2	0.50	2	0.15	positive
Banksia spinulosa var. spinulosa	2	0.50	2	0.45	positive
Brachycome angustifolia	2	0.67	2	0.02	positive
Brachyscome angustifolia	2	0.67	2	0.02	positive
Brunoniella pumilio	2	0.50	2	0.03	positive
Cyathochaeta diandra	2	0.67	2	0.32	positive
Daviesia genistifolia	1	0.17	0	0.00	positive
Daviesia squarrosa	3	0.33	0	0.00	positive
Desmodium varians	2	0.67	2	0.04	positive
Dianella longifolia	2	1.00	2	0.06	positive
Dichondra repens	2	0.50	2	0.06	positive
Echinopogon caespitosus var. caespitosus	2	0.50	2	0.04	positive
Entolasia marginata	2	0.50	2	0.23	positive
Eucalyptus crebra	2	0.50	3	0.01	positive
Eucalyptus globoidea	3	0.67	2	0.11	positive
Glycine clandestina	2	0.83	1	0.12	positive
Gonocarpus tetragynus	2	1.00	2	0.14	positive
Goodenia hederacea subsp. hederacea	2	0.83	2	0.10	positive
Helichrysum scorpioides	2	0.50	1	0.03	positive
Hibbertia aspera subsp. aspera	2	0.50	2	0.13	positive
Hibbertia diffusa	2	0.67	2	0.01	positive
Hypericum gramineum	2	0.67	1	0.04	positive
Imperata cylindrica var. major	2	0.83	1	0.11	positive
Joycea pallida	3	0.67	2	0.03	positive
Lagenifera stipitata	2	0.67	2	0.09	positive
Lepidosperma gunnii	2	0.67	2	0.04	positive
Lepidosperma laterale	2	0.50	1	0.32	positive
Lissanthe strigosa	2	1.00	1	0.08	positive
Lomandra longifolia	2	0.50	2	0.43	positive
Lomandra multiflora subsp. multiflora	2	1.00	2	0.22	positive
Opercularia diphylla	2	1.00	2	0.06	positive
Persoonia linearis	2	0.50	2	0.23	positive
Phyllanthus hirtellus	2	0.83	2	0.22	positive
Plantago varia	2	0.17	0	0.00	positive
Poa sieberiana var. sieberiana	2	0.50	2	0.02	positive
Pratia purpurascens	2	0.50	2	0.10	positive
Themeda australis	3	0.67	2	0.08	positive
Corymbia gummifera	2	0.50	2	0.52	constant
Entolasia stricta	2	1.00	2	0.53	constant

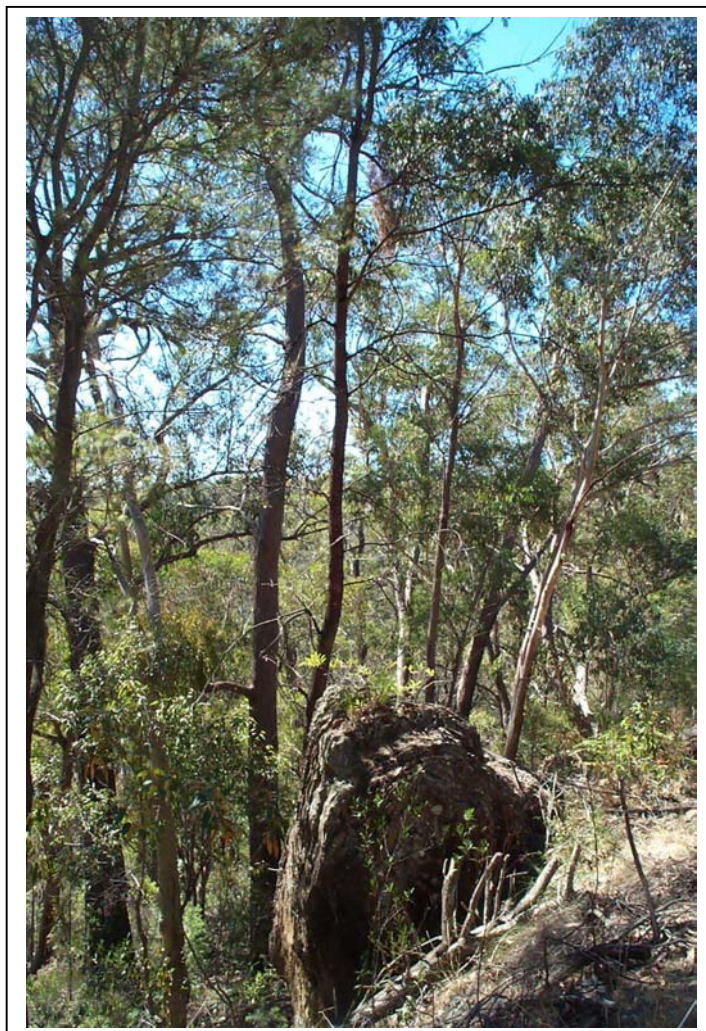
627. Nepean Sandstone Gully Forest

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

In the south west of the study area another form of sandstone forest characterises the more open gullies and slopes. The Nepean Sandstone Gully Forest features *Corymbia gummifera*, *Eucalyptus piperita*, *E. punctata* and *E. agglomerata* as the prominent canopy species. The shrub layer is moderately dense, typified by a mix of small trees and shrubs. On lower, more protected slopes typical species include *Allocasuarina torulosa*, *Persoonia linearis*, *Elaeocarpus reticulatus*, *Leucopogon lanceolatus* var. *lanceolatus*, and *Xylomelum pyriforme* and *Ceratopetalum gummiferum*. The ground cover is frequently comprises *Lomatia silaifolia*, *Pteridium esculentum*, *Entolasia stricta* and *Lepidosperma laterale*. *Banksia serrata* and *B. spinulosa* var. *spinulosa* are found in drier locations associated with upper slopes and exposed aspects. Rocky outcrops, chutes and benches are common.

Nepean Sandstone Gully Forest is mainly found within the Nepean and Avon Catchments. It is also found further west at similar elevations throughout the Nattai Plateau of the Warragamba Special Area.



□ FLORISTIC SUMMARY

Number of Sites: 6

Trees: 6-10m tall. Mean Projected Canopy Cover 10%

Corymbia gummifera, *Eucalyptus punctata*, *Eucalyptus piperita*, *Eucalyptus agglomerata*, *Eucalyptus globoidea*, *Eucalyptus oblonga*, *Eucalyptus sieberi*

Shrubs: 0.5-1.5m tall. Mean Projected Canopy Cover 16%

Allocasuarina torulosa, *Elaeocarpus reticulatus*, *Leucopogon lanceolatus* var. *lanceolatus*, *Banksia spinulosa* var. *spinulosa*, *Persoonia linearis*, *Persoonia levis*, *Ceratopetalum gummiferum*, *Astrotricha latifolia*, *Banksia ericifolia* subsp. *ericifolia*

Ground covers: 0-1 m tall. Mean Projected Canopy Cover 25%

Pteridium esculentum, *Entolasia stricta*, *Dianella caerulea*, *Lepidosperma laterale*, *Lomatia silaifolia*, *Blechnum cartilagineum*

□ **KEY IDENTIFYING FEATURES**

Easily recognisable features to assist in identifying this map unit are:

- Slopes and open gullies on sandstone in the south-west of the Metropolitan Catchment.
- Open forest dominated by Grey gum (*Eucalyptus punctata*).
- Stands of Forest oak (*Allocasuarina torulosa*) in the small tree layer. A diverse shrub layer that includes Banksias (*B. spinulosa* var. *spinulosa*), Geebung (*Persoonia linearis* and *P. levis*) and Blueberry ash (*Elaeocarpus reticulatus*).

□ **EXAMPLE LOCATIONS**

Minor gullies off the Nepean River, below Fire Trail 3a and Fire Trail No 2.

□ **CONSERVATION STATUS**

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>15000	53	7312.95	48.8

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	7288.76	99.7
B Moderate	17.18	0.2
C Heavy	0	0
Scattered trees	7.01	0.1
Total	7312.95	100

□ **THREATENED PLANT SPECIES**

Hibbertia nitida (2R), *Lissanthe sapida* (3R)

□ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Lomatia silaifolia	2	0.88	2	0.24	positive
Phyllanthus hirtellus	2	0.85	2	0.27	positive
Corymbia gummifera	4	0.81	4	0.11	positive
Gonocarpus teucroides	3	0.77	2	0.15	positive
Pteridium esculentum	3	0.77	2	0.35	positive
Elaeocarpus reticulatus	2	0.77	1	0.15	positive
Entolasia stricta	2	0.77	2	0.35	positive
Eucalyptus punctata	2	0.77	3	0.33	positive
Billardiera scandens var. scandens	1	0.77	1	0.32	uninformative
Dianella caerulea	2	0.73	2	0.34	positive
Clematis aristata	2	0.69	2	0.34	positive
Eucalyptus piperita	4	0.65	4	0.14	positive
Eucalyptus agglomerata	4	0.62	4	0.13	positive
Astrotricha latifolia	2	0.62	2	0.08	positive
Dampiera purpurea	2	0.62	2	0.16	positive
Lepidosperma laterale	2	0.62	2	0.25	positive
Leucopogon lanceolatus var. lanceolatus	2	0.62	2	0.27	positive
Xylomelum pyriforme	2	0.62	2	0.06	positive
Blechnum cartilagineum	3	0.58	3	0.10	positive
Smilax glycyphylla	2	0.54	1	0.07	positive
Banksia spinulosa var. spinulosa	2	0.50	2	0.21	positive
Pandorea pandorana subsp. pandorana	2	0.50	2	0.25	positive

629. Exposed Sandstone Scribbly Gum Woodland

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

The ridges and exposed slopes across the Hawkesbury Sandstones of the Woronora Plateau support a low open woodland complex. A combination of different Scribbly Gums (*Eucalyptus sclerophylla*, *E. racemosa*, *E. haemastoma* and hybrids between each) occurs with *E. oblonga*, *Corymbia gummifera*, *E. sieberi* and *E. piperita*. *Angophora costata* occurs within this complex north from Bulli Tops. The density of the shrub layer is variable depending on fire history. Species present can include *Banksia spinulosa* var. *spinulosa*, *Leptospermum trinervium*, *Isopogon anemonifolius*, *Acacia ulicifolia*, *Hakea dactyloides*, *Eriostemon australasius* and *Bossiaea heterophylla*. The ground cover is not dense, with species such as *Lomandra glauca* and *Entolasia stricta*, and small shrubs including *Dampiera stricta* and tangles of *Caustis flexuosa* frequently encountered.

This vegetation community occurs on skeletal sandy soils of low fertility. On exposed slopes the ground is often rocky, with large boulders outcropping on ridgetop peaks and on slope benches. These environments have been previously described and mapped by Benson & Howell (1994) as Exposed Sandstone Woodland, by Keith (1994) as Sandstone Woodland and by NPWS (2000c) as Sandstone Ridgetop Woodland. Site data described in Section 4.1.2 of this report highlighted variations within this community. These are likely to be responses to gradual changes in rainfall, elevation and fire history.



□ FLORISTIC SUMMARY

Number of Sites: 82

Trees: 10-15m tall. Mean Projected Canopy Cover 15%

Eucalyptus sclerophylla, *Eucalyptus racemosa*, *Eucalyptus haemastoma*, *Corymbia gummifera*, *Eucalyptus oblonga*, *Eucalyptus sieberi*, *Eucalyptus piperita*, *Angophora costata*

Shrubs: 2-8m tall. Mean Projected Canopy Cover 35%

Banksia spinulosa var. *spinulosa*, *Leptospermum trinervium*, *Platysace linearifolia*, *Dillwynia retorta*, *Petrophile sessilis*, *Eriostemon australasius*, *Isopogon anemonifolius*, *Phyllanthus hirtellus*, *Lambertia formosa*, *Hakea sericea*, *Persoonia levis*

Ground Covers: 0-1 m tall. Mean Projected Canopy Cover 20%

Entolasia stricta, *Lomandra obliqua*, *Cyathochaeta diandra*, *Lepyrodia scariosa*, *Dampiera stricta*, *Lepidosperma laterale*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Exposed slopes and ridgetops on sandstone plateau above escarpment.
- A low heathy woodland dominated by Scribbly gums (*Eucalyptus sclerophylla*, *E. racemosa*) with Red bloodwood (*Corymbia gummifera*), Narrow-leaved stringybark (*E. oblonga*) and Silvertop ash (*E. sieberi*).
- A diverse heath understorey marked by *Banksia* spp., Tea-tree (*Leptospermum trinervium*) and Broad-leaved hakea (*Hakea dactyloides*).

□ EXAMPLE LOCATIONS

Dharawal State Recreation Area; Bulli Tops

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
37022	9	36172.08	98

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	35852.21	99.1
B Moderate	185.71	0.5
C Heavy	18.35	0.1
Scattered trees	115.81	0.3
Total	36172.08	100

□ THREATENED PLANT SPECIES

Epacris purpurascens var. *purpurascens* (V), *Leucopogon exolasius* (V), *Pultenaea aristata* (V), *Darwinia grandiflora* (2R), *Eucalyptus luehmanniana* (2R), *Grevillea longifolia* (2R), *Hibbertia nitida* (2R), *Eucalyptus apiculata* (3R)

□ DIAGNOSTIC SPECIES

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Acacia myrtifolia	2	0.72	2	0.15	positive
Acacia suaveolens	2	0.76	2	0.26	positive
Acacia ulicifolia	2	0.52	1	0.20	positive
Actinotus minor	2	0.62	2	0.24	positive
Banksia ericifolia subsp. ericifolia	2	0.59	3	0.30	positive
Banksia serrata	2	0.76	2	0.30	positive
Banksia spinulosa var. spinulosa	2	0.66	2	0.44	positive
Boronia anethifolia	1	0.02	0	0.00	positive
Bossiaea heterophylla	2	0.79	2	0.23	positive
Bossiaea obcordata	2	0.50	2	0.13	positive
Caustis flexuosa	2	0.57	2	0.20	positive
Choretrum species A	1	0.02	0	0.00	positive
Corymbia gummifera	2	0.91	2	0.48	positive
Cryptostylis leptochila	1	0.02	0	0.00	positive
Cyathochaeta diandra	2	0.55	2	0.28	positive
Dampiera stricta	2	0.71	2	0.33	positive
Darwinia biflora	2	0.05	0	0.00	positive
Dichelachne micrantha	1	0.02	0	0.00	positive
Entolasia stricta	2	0.53	2	0.48	positive
Epacris crassifolia	2	0.02	0	0.00	positive
Eucalyptus racemosa	2	0.53	2	0.17	positive
Eucalyptus sieberi	2	0.71	2	0.21	positive
Eucalyptus sparsifolia	3	0.02	0	0.00	positive
Gompholobium pinnatum	1	0.02	0	0.00	positive
Grevillea tritenata	2	0.07	0	0.00	positive
Hakea dactyloides	2	0.88	2	0.33	positive
Hibbertia virgata subsp. virgata	1	0.02	0	0.00	positive
Isopogon anemonifolius	2	0.93	2	0.30	positive
Lambertia formosa	2	0.90	2	0.30	positive
Laxmannia compacta	1	0.02	0	0.00	positive
Leptospermum trinervium	2	0.97	2	0.37	positive
Lepyrodia scariosa	2	0.69	2	0.34	positive
Lomandra confertifolia subsp. pallida	2	0.02	0	0.00	positive

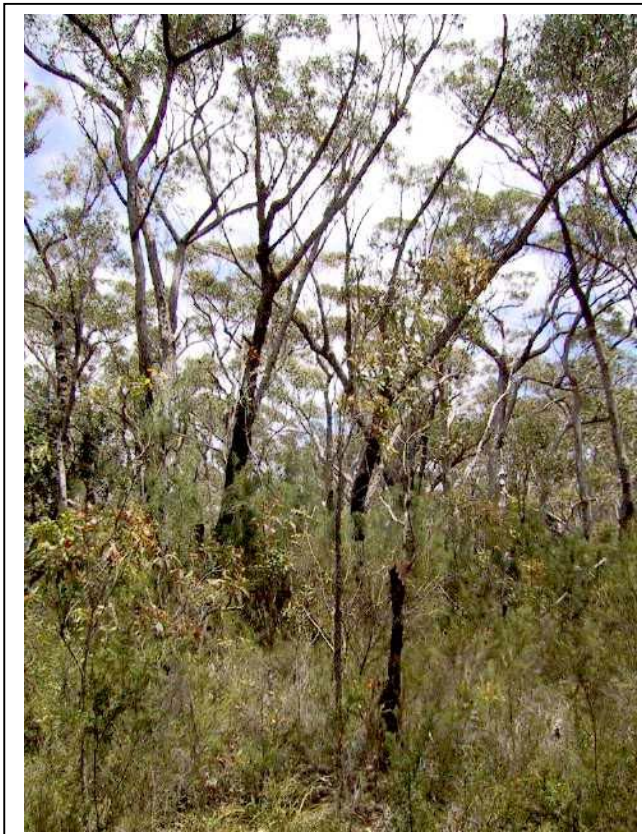
Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Lomandra obliqua	2	0.84	2	0.39	positive
Lomatia silaifolia	2	0.66	2	0.38	positive
Monotoca scoparia	2	0.64	1	0.24	positive
Ophioglossum lusitanicum	1	0.02	0	0.00	positive
Patersonia glabrata	2	0.55	2	0.22	positive
Persoonia levis	2	0.86	1	0.42	positive
Persoonia oblongata	3	0.02	0	0.00	positive
Petrophile canescens	2	0.02	0	0.00	positive
Petrophile pulchella	2	0.52	2	0.29	positive
Phyllota grandiflora	1	0.02	0	0.00	positive
Pimelea linifolia subsp. linifolia	2	0.57	2	0.24	positive
Platysace linearifolia	2	0.72	2	0.34	positive
Plinthanthesis paradoxa	1	0.02	0	0.00	positive
Sphaerolobium minus	1	0.02	0	0.00	positive

630. Nepean Enriched Sandstone Woodland

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Nepean Enriched Sandstone Woodland is a moderately tall forest-woodland occurring on enriched sandstone ridges at higher elevations in the Nepean Catchment. *Corymbia gummifera* and *Eucalyptus globoidea/oblonga* occur consistently in the canopy. Other associate tree species are less regularly observed. These include *Eucalyptus sieberi*, *E. piperita*, *E. racemosa/ sclerophylla* and *E. punctata*. The shrub layers comprise species that are common to other sandstone ridgetops such as *Banksia spinulosa* var. *spinulosa*, *Lambertia formosa*, *Petrophile pulchella*, *Hakea dactyloides* and *Leptospermum trinervium*. The diversity of the shrub layer is decreased, with *Acacia terminalis* the prominent wattle and many of the *Banksia* species occurring to the north east no longer present in this community. The ground cover is a mixture of *Cyathochaeta diandra*, *Entolasia stricta*, *E. marginata*,



Lomandra obliqua and *L. filiformis* var. *filiformis* amongst small shrubs of *Phyllanthus hirtellus* and *Goodenia heterophylla*. A number of species appear unique to this community including the small shrubs *Epacris calvertiana* var. *calvertiana*, *Cryptandra propinqua* and *Daviesia acicularis* and the ground cover *Mirbelia platylobioides*. These are likely to reflect the higher elevations and cooler climates of the western edge of the catchment. Sites describing this community are generally situated above 450 metres in elevation.

In the Nepean Catchment, Sandstones from the Mittagong Formation dominate the substrate along many of the wide ridges that extend toward Avon and Cordeaux Catchments. The Mittagong Formation alternates bands of Shale and fine grained sandstone (Herbert et al. 1980). These sandstones are also likely to provide a slightly more fertile soil along the western area of the Metropolitan Catchment. Hence, the appearance of the forest is generally taller with a less heathy understorey than those on soils of Hawkesbury Sandstone.

□ FLORISTIC SUMMARY

Number of Sites: 27

Trees: 25-35m tall. Mean Projected Canopy Cover 45%

Corymbia gummifera, *Eucalyptus globoidea*, *Eucalyptus oblonga*, (including hybrids), *Eucalyptus eugenioides*, *Eucalyptus piperita*, *Eucalyptus sieberi*, *Eucalyptus punctata* (in localised patches only)

Shrubs: 2-8m tall. Mean Projected Canopy Cover 35%

Banksia spinulosa var. *spinulosa*, *Persoonia levis*, *Lomatia silaifolia*, *Leptospermum trinervium*, *Acacia terminalis*, *Acacia myrtifolia*, *Acacia longifolia* subsp. *longifolia*, *Hakea dactyloides*, *Petrophile pulchella*, *Pimelea linifolia* subsp. *linifolia*, *Lambertia formosa*, *Hibbertia aspera*

Ground covers: 0-1 m tall. Mean Projected Canopy Cover 20%

Cyathochaeta diandra, *Patersonia sericea*, *Entolasia stricta*, *Entolasia marginata*, *Lomandra obliqua*, *Lomandra filiformis* var. *filiformis*, *Dianella longifolia*, *Phyllanthus hirtellus*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Located primarily within the Nepean Catchment on broad Sandstone ridges and exposed slopes at elevations greater than 450 metres.
- The colour of the underlying soil tends to be red-orange and rock outcrops are infrequent to absent.
- The forest canopy has Red bloodwood (*Corymbia gummifera*) and White stringybark (*Eucalyptus globoidea*) as a common thread. Several other tree species co-occur including Scribbly gum (*E. racemosa*), Silvertop ash (*E. sieberi*) and Sydney peppermint (*E. piperita*). At times the community may be dominated by White stringybark and Red bloodwood alone, indicating a slightly stronger shale influence in the soil.
- The shrub understorey has a slightly different visual appearance to other exposed sandstone vegetation. *Banksia serrata* is not present in this assemblage, while elsewhere it is conspicuous. Sunshine wattle (*Acacia terminalis*) is more commonly recorded in this community.
- the ground cover tends to be grassy with a dominance of *Entolasia marginata*, *E. stricta* and *Austrostipa pubescens*.

□ EXAMPLE LOCATIONS

Fire Trail 1A, Nepean Catchment

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>5291	0	5290.97	100

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	5287.68	99.9
B Moderate	0	0
C Heavy	0	0
Scattered trees	3.29	0.1
Total	5290.97	100

❑ THREATENED PLANT SPECIES

Hibbertia nitida (2R), *Lissanthe sapida* (3R)

❑ DIAGNOSTIC SPECIES

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Austrostipa pubescens	2	0.59	2	0.13	positive
Austrostipa verticillata	1	0.11	0	0.00	positive
Banksia spinulosa var. spinulosa	2	1.00	2	0.42	positive
Billardiera scandens	2	0.56	1	0.27	positive
Bossiaea obcordata	2	0.89	2	0.10	positive
Corymbia gummifera	2	0.89	2	0.50	positive
Cryptandra propinqua	2	0.04	0	0.00	positive
Cryptandra spinescens	2	0.04	0	0.00	positive
Cyathochaeta diandra	2	0.85	2	0.30	positive
Daviesia acicularis	1	0.04	0	0.00	positive
Dianella longifolia	2	0.56	2	0.05	positive
Epacris calvertiana var. calvertiana	1	0.04	0	0.00	positive
Eucalyptus racemosa	2	0.70	2	0.28	positive
Eucalyptus sieberi	2	0.59	2	0.23	positive
Euchiton sphaericus	1	0.04	0	0.00	positive
Goodenia bellidifolia subsp. bellidifolia	2	0.59	2	0.12	positive
Goodenia hederacea subsp. hederacea	2	0.63	2	0.09	positive
Grevillea phyllicoides	1	0.04	0	0.00	positive
Hibbertia aspera subsp. aspera	2	0.56	2	0.11	positive
Lambertia formosa	2	0.56	2	0.37	positive
Leptospermum trinervium	2	0.67	2	0.47	positive
Lomandra filiformis subsp. filiformis	2	0.67	2	0.17	positive
Lomandra obliqua	2	0.78	2	0.43	positive
Lomatia silaifolia	2	0.89	1	0.38	positive
Mirbelia platylobioides	1	0.11	0	0.00	positive
Patersonia sericea	2	0.78	1	0.24	positive
Persoonia levis	2	0.81	1	0.46	positive
Petrophile pulchella	2	0.59	2	0.29	positive
Phyllanthus hirtellus	2	0.67	2	0.20	positive
Pimelea glauca	2	0.04	0	0.00	positive
Pimelea linifolia subsp. linifolia	2	0.59	2	0.19	positive
Tetralthea thymifolia	2	0.63	1	0.02	positive
Entolasia stricta	2	0.81	2	0.52	constant

632. Escarpment Edge Silvertop Ash Forest

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Escarpment Edge Silvertop Ash Forest is part of a broad complex of forests and woodlands that occur across the Hawkesbury Sandstones of the Woronora Plateau. A moderately tall, open forest comprising *Eucalyptus sieberi*, *E. piperita* and *Syncarpia glomulifera* subsp. *glomulifera* occurs along the edge of the plateau at the top of the escarpment. The shrub layer includes a mix of sclerophyllous species such as *Persoonia linearis*, *Telopea speciosissima*, *Banksia spinulosa* var. *spinulosa* and *Podolobium ilicifolium* in combination with some mesic shrubs such as *Notelaea venosa*, *Synoum glandulosum* subsp. *glandulosum* and *Elaeocarpus reticulatus*. At the summits of Mount Kembla and Mount Keira, *Allocasuarina littoralis* is abundant within this community. The ground cover maintains a profuse cover that includes *Lomandra longifolia* and *Xanthorrhoea resinifera*, ferns such as *Sticherus lobatus* and tangles of *Caustis flexuosa*.

At several locations along the southern end of the escarpment, Escarpment Edge Silvertop Ash Forest grows down the escarpment slope on eroded sandy soils originating from the plateau above. The high rainfall levels that fall on these slopes and on the plateau edge provide sufficient moisture for some hardier mesic species. Consequently, this community shares more similarities with sheltered environments in drier parts of the Woronora Plateau and is not typical of Exposed Hawkesbury Sandstone Woodlands across the catchments. Similar floristic assemblages occur on ridges and exposed slopes in south eastern Royal National Park. Escarpment Edge Silvertop Ash Forest is also likely to share some similarities with Coastal Escarpment Moist Shrub/Fern Forest (Forest Ecosystem 137) in the South Coast Region (NPWS 2000a).



□ FLORISTIC SUMMARY

Number of Sites: 3

Trees: 20-25m tall. Mean Projected Canopy Cover 30%

Eucalyptus sieberi, *Eucalyptus piperita*, *Syncarpia glomulifera* subsp. *glomulifera*, *Corymbia gummifera*

Shrubs: 2-4m tall. Mean Projected Canopy Cover 30%

Allocasuarina littoralis, *Persoonia linearis*, *Persoonia levis*, *Elaeocarpus reticulatus*, *Leptospermum rotundifolium*, *Cassinia trinerva*, *Platysace lanceolata*, *Lomatia silaifolia*

Ground Covers: 0-1m tall. Mean Projected Canopy Cover 35%

Lomandra longifolia, *Caustis flexuosa*, *Lomandra filiformis* var. *filiformis*, *Patersonia glabrata*, *Lepidosperma laterale*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Escarpment slopes and plateau edge on sandy soils.
- Moderately tall open forest dominated by Silvertop ash (*Eucalyptus sieberi*), Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*) and Sydney peppermint (*E. piperita*).
- Combinations of typical sandstone shrub species and hardy mesic species occurring in exposed locations.

□ EXAMPLE LOCATIONS

Macquarie Pass National Park; Mount Kembla and Mount Keira Summits

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
14953	60	633.01	4.2

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	486.60	98.7
B Moderate	1.80	0.4
C Heavy	4.51	0.9
Scattered trees	0	0
Total	633.01	100

❑ **THREATENED PLANT SPECIES**

None recorded

❑ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
<i>Acacia terminalis</i>	2	0.33	0	0.00	positive
<i>Allocasuarina littoralis</i>	5	0.67	1	0.03	positive
<i>Amperea xiphoclada</i> var. <i>pedicellata</i>	3	0.67	0	0.00	positive
<i>Billardiera scandens</i>	2	0.67	2	0.11	positive
<i>Cassinia denticulata</i>	1	0.33	0	0.00	positive
<i>Caustis flexuosa</i>	2	0.67	2	0.01	positive
<i>Comesperma ericinum</i> forma A	1	0.33	0	0.00	positive
<i>Cyanicula caerulea</i>	1	0.33	0	0.00	positive
<i>Elaeocarpus reticulatus</i>	4	0.67	1	0.05	positive
<i>Entolasia stricta</i>	3	1.00	3	0.14	positive
<i>Eucalyptus sieberi</i>	5	1.00	4	0.01	positive
<i>Hibbertia aspera</i> subsp. <i>aspera</i>	2	0.67	2	0.02	positive
<i>Hibbertia dentata</i>	2	0.67	2	0.14	positive
<i>Jacksonia scoparia</i>	1	0.33	0	0.00	positive
<i>Lepidosperma filiforme</i>	3	0.33	0	0.00	positive
<i>Leptospermum rotundifolium</i>	2	0.33	0	0.00	positive
<i>Leucopogon lanceolatus</i> var. <i>lanceolatus</i>	2	0.67	2	0.07	positive
<i>Logania albiflora</i>	1	0.33	0	0.00	positive
<i>Lomandra brevis</i>	1	0.33	0	0.00	positive
<i>Lomandra confertifolia</i> subsp. <i>rubiginosa</i>	1	0.33	0	0.00	positive
<i>Lomandra filiformis</i>	2	0.67	0	0.00	positive
<i>Lomandra glauca</i>	4	0.67	2	0.01	positive
<i>Lomandra longifolia</i>	3	0.67	2	0.46	positive
<i>Patersonia glabrata</i>	2	1.00	3	0.01	positive
<i>Persoonia linearis</i>	3	0.67	1	0.04	positive
<i>Platysace lanceolata</i>	3	0.67	1	0.01	positive
<i>Podolobium ilicifolium</i>	2	0.67	2	0.02	positive
<i>Poranthera ericifolia</i>	2	0.33	0	0.00	positive
<i>Pultenaea daphnoides</i>	3	0.33	0	0.00	positive
<i>Pultenaea flexilis</i>	2	0.33	0	0.00	positive
<i>Smilax glycyphylla</i>	3	1.00	2	0.08	positive
<i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i>	4	0.67	4	0.18	positive
<i>Telopea speciosissima</i>	1	0.67	0	0.00	positive
<i>Xanthorrhoea resinifera</i>	4	0.33	0	0.00	positive
<i>Xanthosia pilosa</i>	2	0.67	0	0.00	positive
<i>Xanthosia tridentata</i>	2	0.67	1	0.01	positive
<i>Zieria pilosa</i>	1	0.33	0	0.00	positive
<i>Eustrephus latifolius</i>	0	0.00	2	0.68	negative
<i>Geitonoplesium cymosum</i>	0	0.00	2	0.64	negative
<i>Marsdenia rostrata</i>	1	0.33	2	0.57	negative
<i>Oplismenus imbecillis</i>	0	0.00	3	0.60	negative
<i>Pandorea pandorana</i> subsp. <i>pandorana</i>	1	0.33	2	0.64	negative
<i>Pittosporum undulatum</i>	1	0.33	2	0.63	negative
<i>Pseuderanthemum variabile</i>	0	0.00	3	0.62	negative
<i>Notelaea venosa</i>	2	1.00	3	0.56	constant

635. Upper Georges River Sandstone Woodland

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Upper Georges River Sandstone Woodland (NPWS, 2000c) describes a community occurring in a narrow band along the western boundary of the Metropolitan Catchment. It is only a moderately tall woodland characterised by *Eucalyptus punctata* and *Corymbia gummifera*. A large number of additional tree species can co-occur including *Eucalyptus oblonga*, *Angophora costata*, *E. racemosa*, *E. pilularis*, *E. sieberi* and *E. piperita*. Small trees *Allocasuarina littoralis* and *Angophora bakeri* occur just below the canopy. Typical shrub species include *Acacia ulicifolia*, *A. terminalis*, *A. linifolia*, *Persoonia linearis*, *Leptospermum trinervium* and *Exocarpos strictus*. *Banksia spinulosa* var. *spinulosa* and *Hakea dactyloides* occur occasionally. The ground stratum is often dominated by grass species such as *Entolasia stricta*, *Themeda australis*, *Austrostipa pubescens*, *Aristida vagans* and *Danthonia linkii*. Other ground covers include *Dianella revoluta*, *Pomax umbellata*, *Lepidosperma laterale*, *Cyathochaeta diandra*, *Lomandra multiflora* subsp. *multiflora*, and *L. cylindrica*.

Both French et al. (2000) and NPWS (2000c) suggest that residual shale soils are likely to be mixing with the quartz sandstone of the Mittagong series forming a slightly richer substrate. The characteristic grass cover in combination with high frequency of *Eucalyptus punctata* and *Allocasuarina littoralis* may be indicative of higher soil fertility. These features were used wherever possible to highlight boundaries between surrounding sandstone woodlands. However, variation within this community tends to be marked by an increased composition of sandstone woodland species as distance from shale soil increases.

Outside of the Metropolitan Catchment this community occurs between Appin and Holsworthy in the Georges River Catchment (NPWS, 2000c). It is suggested that a similar community is likely to occur along the north-western boundary of the Cumberland Plain near Baulkham Hills.



□ FLORISTIC SUMMARY

Number of Sites: 45

Trees: 12-25m tall. Mean Projected Canopy Cover 20%

Eucalyptus punctata, *Corymbia gummifera*, *Eucalyptus globoidea*, *Eucalyptus oblonga* (including hybrids), *Eucalyptus racemosa*, *Angophora costata*, *Eucalyptus eugenioides*, *Eucalyptus piperita*, *Eucalyptus sieberi*, *Eucalyptus fibrosa*

Small Tree: 8-12m tall. Mean Projected Canopy Cover 10%

Allocasuarina littoralis, *Angophora bakeri*

Shrubs: 0.5-1.5m tall. Mean Projected Canopy Cover 16%

Acacia ulicifolia, *Acacia terminalis*, *Acacia linifolia*, *Persoonia linearis*, *Leptospermum trinervium*, *Exocarpos strictus*, *Banksia spinulosa* var. *spinulosa*, *Hakea dactyloides*

Ground covers: 0-1 m tall. Mean Projected Canopy Cover 25%

Entolasia stricta, *Themeda australis*, *Austrostipa pubescens*, *Aristida vagans*, *Dianella revoluta*, *Pomax umbellata*, *Lepidosperma laterale*, *Cyathochaeta diandra*, *Lomandra multiflora* subsp. *multiflora*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Broad ridges and upper slopes along the western band of the Metropolitan Catchment. Generally doesn't extend beyond one kilometre from the boundary of shale soils
- Presence of Grey gum (*Eucalyptus punctata*) and Red bloodwood (*Corymbia gummifera*) in the canopy. Stringybark (*E. oblonga*) and Scribbly gum (*E. racemosa*) are common with greater sandstone influence. Smooth-barked apple (*Angophora costata*) is more common north of Appin.
- Small tree layer that may include Black sheoak (*Allocasuarina littoralis*) and Narrow-leaved apple (*Angophora bakeri*).
- The ground cover tends to be grassy with a dominance of Wiry panic (*Entolasia stricta*), Kangaroo grass (*Themeda australis*), *Austrostipa pubescens* and Threeawn speargrass (*Aristida vagans*).

□ EXAMPLE LOCATIONS

End of Fire Trail 4, Nepean Catchment; Fire Trail 8, Wilton Area, Cataract Catchment

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
7102	1.6	1950.23	27.5

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	1806.35	92.6
B Moderate	121.33	6.2
C Heavy	19.43	1.0
Scattered trees	3.12	0.2
Total	1950.23	100

❑ THREATENED PLANT SPECIES

Epacris purpurascens var. *purpurescens* (V), *Melaleuca deanei* (V)

❑ DIAGNOSTIC SPECIES

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Acacia linifolia	2	0.65	1	0.07	positive
Acacia terminalis	2	0.72	2	0.12	positive
Acacia ulicifolia	2	0.83	1	0.13	positive
Acianthus pusillus	2	0.02	0	0.00	positive
Allocasuarina littoralis	3	0.74	2	0.21	positive
Aristida vagans	2	0.61	2	0.47	positive
Cassinia arcuata	2	0.02	0	0.00	positive
Cassytha pubescens	2	0.70	2	0.11	positive
Corymbia gummifera	3	0.83	2	0.16	positive
Cryptandra propinqua	1	0.02	0	0.00	positive
Cyathochaeta diandra	2	0.74	3	0.12	positive
Danthonia linkii	2	0.65	2	0.10	positive
Dianella revoluta var. revoluta	2	0.93	2	0.30	positive
Dillwynia retorta	2	0.50	2	0.08	positive
Entolasia stricta	3	0.98	3	0.47	positive
Eucalyptus capitellata	1	0.02	0	0.00	positive
Eucalyptus oblonga	2	0.50	2	0.03	positive
Eucalyptus punctata	4	0.87	3	0.20	positive
Exocarpos strictus	2	0.61	1	0.08	positive
Gonocarpus tetragynus	2	0.52	2	0.18	positive
Hakea sericea	2	0.59	2	0.13	positive
Kunzea ambigua	2	0.52	2	0.17	positive
Lepidosperma laterale	2	0.78	2	0.39	positive
Leptospermum trinervium	2	0.70	2	0.18	positive
Lissanthe strigosa	2	0.61	2	0.17	positive
Lomandra cylindrica	2	0.63	2	0.09	positive
Lomandra multiflora subsp. multiflora	2	0.74	2	0.49	positive
Lomandra obliqua	2	0.96	2	0.16	positive
Monotoca scoparia	2	0.57	1	0.07	positive
Persoonia linearis	2	0.72	2	0.28	positive
Phyllanthus hirtellus	2	0.93	2	0.21	positive
Pimelea linifolia subsp. linifolia	2	0.70	2	0.21	positive
Poa labillardieri	2	0.52	2	0.18	positive
Pomax umbellata	2	0.80	2	0.30	positive
Schoenus villosus	1	0.02	0	0.00	positive
Stipa pubescens	3	0.78	2	0.17	positive

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Xanthorrhoea concava	2	0.50	1	0.05	positive
Bursaria spinosa	1	0.07	3	0.63	negative
Cheilanthes sieberi subsp. sieberi	2	0.46	2	0.62	negative
Dichondra repens	1	0.02	3	0.60	negative
Microlaena stipoides var. stipoides	1	0.61	3	0.78	negative
Themeda australis	3	0.83	3	0.60	constant

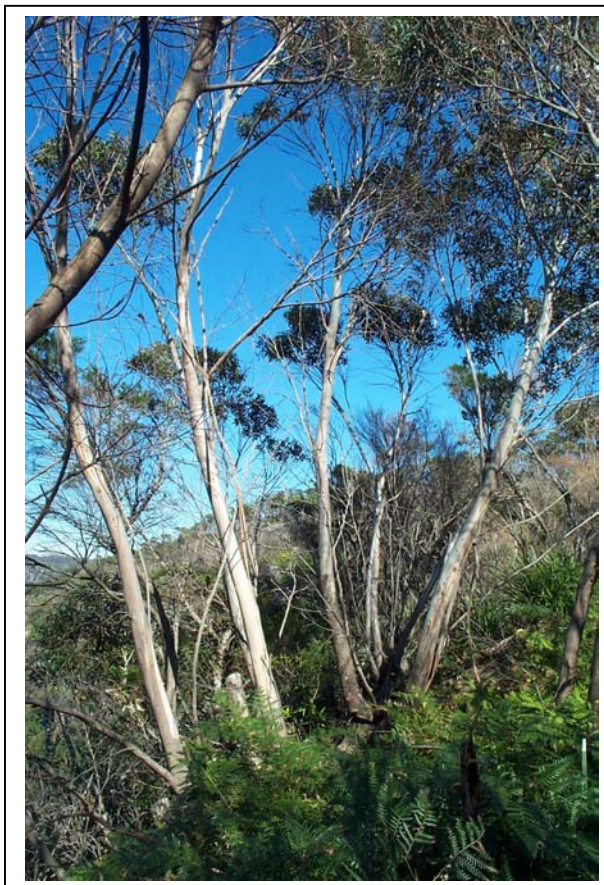
636. Budawang Ash Mallee Scrub

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Budawang Ash Mallee Scrub occurs directly above clifflines at several disjunct locations along the Illawarra escarpment cliff edge. *Eucalyptus dendromorpha* is the unique feature of a low stunted canopy that rarely grows taller than five metres. *Eucalyptus dendromorpha* adopts a mallee growth form and shares the canopy with *E. sieberi* and *Syncarpia glomulifera* subsp. *glomulifera*. A dense mesic scrub dominated by *Ceratopetalum apetalum* and *Elaeocarpus reticulatus* occurs in combination with *Melaleuca squarrosa*, *Leptospermum polygalifolium* subsp. *polygalifolium* and *Leucopogon lanceolatus* var. *lanceolatus*. Fern species such as *Calochlaena dubia* and *Sticherus flabellatus* var. *flabellatus* cover the rocky ground.

This community has been identified on the basis of the uniqueness of *Eucalyptus dendromorpha* in the Study Area. Budawang Ash Mallee Scrub shares many species with those occurring within Cliffline Coachwood Scrub (Map Unit 5) and woodlands and forests of the



Hawkesbury Sandstone Plateau. Fuller (1980) suggests that *E. dendromorpha* occurs at the crests of escarpment cliffs at Wombarra, Mt. Kembla and Bong Bong Pass and these have been mapped separately. Other patches of this community may occur within Map Unit 5. Fuller & Mills (1985) indicate that a similar vegetation complex is found outside of the study area along the edge of the escarpment to at least Kiama.

□ FLORISTIC SUMMARY

Number of Sites: 1

Small Trees: 6-10m tall. Mean Projected Canopy Cover 40%

Eucalyptus dendromorpha, *Eucalyptus sieberi*, *Syncarpia glomulifera* subsp. *glomulifera*

Shrubs: 1-4 m tall. Mean Projected Canopy Cover 50%

Ceratopetalum apetalum, *Elaeocarpus reticulatus*, *Schizomeria ovata*, *Leucopogon lanceolatus* var. *lanceolatus*, *Pultenaea blakelyi*, *Melaleuca squarrosa*, *Leptospermum polygalifolium* subsp. *polygalifolium*

Ground Covers: 0.5 m tall. Mean Projected Canopy Cover 85%

Calochlaena dubia, *Sticherus flabellatus* var. *flabellatus*, *Blechnum wattsii*, *Epacris longiflora*, *Lomandra longifolia*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Location above escarpment cliffs.
- Low stunted mallees of Budawang ash (*Eucalyptus dendromorpha*).
- Dense mesic scrub dominated by low growing Coachwood (*Ceratopetalum apetalum*).
- Dense fern cover (*Sticherus flabellatus* var. *flabellatus*, *Blechnum* spp., and *Calochlaena dubia*) between and across rocks and boulders.

□ EXAMPLE LOCATIONS

Wombarra Clifftops; Mt. Kembla Clifftops

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>25	35	12.17	48.7

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	12.17	100
B Moderate	0	0
C Heavy	0	0
Scattered trees	0	0
Total	12.17	100

□ THREATENED PLANT SPECIES

None recorded

□ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Acacia longifolia subsp. longifolia	3	1.00	4	0.04	positive
Billardiera scandens	2	1.00	2	0.11	positive
Blechnum cartilagineum	2	1.00	2	0.20	positive
Blechnum wattsii	3	1.00	3	0.02	positive
Boronia floribunda	2	1.00	0	0.00	positive
Calochlaena dubia	5	1.00	3	0.21	positive
Centella asiatica	2	1.00	2	0.12	positive
Ceratopetalum apetalum	2	1.00	4	0.16	positive
Dianella caerulea	2	1.00	1	0.26	positive
Elaeocarpus reticulatus	4	1.00	1	0.06	positive
Entolasia stricta	3	1.00	3	0.15	positive
Epacris longiflora	3	1.00	2	0.01	positive
Eucalyptus dendromorpha	5	1.00	0	0.00	positive
Eucalyptus sieberi	4	1.00	5	0.02	positive
Gahnia sieberiana	2	1.00	1	0.02	positive
Gonocarpus teucroides	3	1.00	3	0.05	positive
Goodenia ovata	2	1.00	3	0.03	positive
Hakea salicifolia	2	1.00	4	0.02	positive
Hedycarya angustifolia	2	1.00	1	0.02	positive
Hibbertia dentata	4	1.00	2	0.15	positive
Kennedia rubicunda	2	1.00	1	0.10	positive
Lepidosperma laterale	3	1.00	2	0.15	positive
Leptospermum morrisonii	1	1.00	0	0.00	positive
Leptospermum polygalifolium subsp. polygalifolium	4	1.00	4	0.03	positive
Leucopogon lanceolatus var. lanceolatus	4	1.00	2	0.07	positive
Lomandra longifolia	3	1.00	2	0.46	positive
Melaleuca hypericifolia	1	1.00	0	0.00	positive
Opercularia aspera	4	1.00	1	0.03	positive
Pteridium esculentum	2	1.00	2	0.18	positive
Pultenaea blakelyi	2	1.00	2	0.02	positive
Schizomeria ovata	4	1.00	4	0.09	positive
Smilax glycyphylla	3	1.00	2	0.09	positive
Stephania japonica var. discolor	3	1.00	1	0.26	positive
Sticherus flabellatus var. flabellatus	4	1.00	3	0.01	positive
Themeda australis	2	1.00	3	0.13	positive
Tristaniopsis collina	2	1.00	3	0.07	positive
Eustrephus latifolius	0	0.00	2	0.67	negative
Geitonoplesium cymosum	0	0.00	2	0.64	negative
Marsdenia rostrata	1	1.00	2	0.56	negative
Notelaea venosa	1	1.00	3	0.57	negative
Oplismenus imbecillis	0	0.00	3	0.59	negative
Pandorea pandorana subsp. pandorana	0	0.00	2	0.64	negative
Pittosporum undulatum	1	1.00	2	0.63	negative
Pseuderanthemum variabile	0	0.00	3	0.61	negative

638. Rock Pavement Heath

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Rock Pavement Heath (Keith, 1994) describes an often isolated community that is restricted to large exposed sandstone rock outcrops. These plates, or pavements occur on ridgetops and often feature within a broader complex of exposed rocky knolls, benches and outcrops. The low heath cover may include *Kunzea ambigua*, *Darwinia fascicularis* subsp. *fascicularis*, *Epacris microphylla* var. *microphylla* and *Leptospermum trinervium*. The patchiness of understorey vegetation cover is determined by available moisture present within minor cracks and depression in the rock. Bare rock surfaces comprise a dominant component of the habitat. Low growing *Lepidosperma viscidum*, *Thelionema umbellatum* and *Lepyrodia scariosa* are found amongst the ground cover. Rock pavements and outcrops also appear to provide shelter from intense fire to allow the persistence of *Callitris endlicheri*. This species is fire sensitive (Bell, 1998) and is only found in the study area within or adjoining rock outcrops. *Callitris endlicheri* has been recorded in O'Hares, Woronora and Avon Catchments.

Sites used to describe this community are drawn from the O'Hares Creek Catchment (Keith, 1994). However, the distribution of this community is more widespread across isolated favourable patches of habitat between Avon Catchment and Royal National Park. It is also known to occur in Nattai National Park (pers. obs.) and other sandstone reserves such as Kuring-gai Chase and Brisbane Waters National Parks and Joadja Nature Reserve.



□ FLORISTIC SUMMARY

Number of Sites: 4

Shrubs: 2-5m tall. Mean Projected Canopy Cover 35%

Kunzea ambigua, *Dillwynia fascicularis* subsp. *fascicularis*, *Leptospermum trinervium*, *Epacris microphylla* var *microphylla*, *Banksia ericifolia* subsp. *ericifolia*, *Monotoca ledifolia*, *Hakea sericea*, *Oxylobium cordifolium*

Ground covers: 0.5-1 m tall. Mean Projected Canopy Cover 9%

Lepidosperma viscidum, *Thelionema umbellatum*, *Lepyrodia scariosa*, *Hypolaena fastigata*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Large exposed sandstone rock pavements.
- Low shrub cover of Tick bush (*Kunzea ambigua*) and *Darwinia fascicularis* subsp. *fascicularis*.

□ EXAMPLE LOCATIONS

End of Fire Trail No. 9, Woronora Catchment; North East of Stockyard Swamp on Flat Plateau

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>80	5.3	78.96	98.7

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion (%)	Extant
A Light	78.96	100	
B Moderate	0	0	
C Heavy	0	0	
Scattered trees	0	0	
Total	78.96	100	

□ THREATENED PLANT SPECIES

Monotoca ledifolia (3R)

□ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
<i>Callitris endlicheri</i>	4	0.33	0	0.00	positive
<i>Darwinia fascicularis</i> subsp. <i>fascicularis</i>	4	0.67	2	0.04	positive
<i>Epacris microphylla</i> var. <i>microphylla</i>	3	1.00	2	0.20	positive
<i>Kunzea ambigua</i>	5	1.00	1	0.06	positive
<i>Lepidosperma viscidum</i>	4	0.67	1	0.02	positive
<i>Lepyrodia scariosa</i>	4	0.67	2	0.34	positive
<i>Leucopogon microphyllus</i> var. <i>microphyllus</i>	2	0.67	1	0.14	positive
<i>Monotoca ledifolia</i>	3	0.67	2	0.00	positive
<i>Oxylobium cordifolium</i>	1	0.33	0	0.00	positive
<i>Prasophyllum brevilabre</i>	1	0.33	0	0.00	positive
<i>Thelionema umbellatum</i>	2	0.67	1	0.00	positive
<i>Corymbia gummifera</i>	1	0.33	2	0.52	negative
<i>Entolasia stricta</i>	0	0.00	2	0.54	negative

639. Rock Plate Heath-Mallee

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Rock Plate Heath-Mallee occurs across the study area on massive sandstone outcrops and rock plates. These vary from sandstone tors that protrude from spiny ridges in the southern Avon Catchment to large open rocks that form broad plates or shelves below the soil surface in the Woronora Catchment. A dense heath is comprised of *Banksia ericifolia* subsp. *ericifolia*, *B. serrata*, *Petrophile pulchella*, *Hakea dactyloides* and *Leptospermum* spp. and is often impenetrable. Mallee eucalypts including *Eucalyptus stricta* and *E. apiculata* are most often found growing alongside or within the heath. North of Appin Road, mallee species may include *E. luehmanniana* and *E. multicaulis*. Very low trees of *Corymbia gummifera*, *E. sclerophylla*, *E. sieberi* and *E. oblonga* are occasionally present. The sprawling herb *Actinotus minor* is consistently part of this assemblage. Other ground covers vary depending on moisture levels of the soil. On rock plates, water seepage is slow resulting in dense covers of rushes and sedges. These include *Lepyrodia scariosa* and *Leptocarpus tenax*. Map Unit 38 Rock Pavement Heath is closely related and is often found within a complex of Rock Plate Heath-Mallee.

Rock Plate Heath-Mallee is a widely distributed community on sandstones of the Bioregion. However, the preferred habitat is restricted to small isolated outcrops, with the total area within the Bioregion relatively small. Map Unit 39 is found in Royal and Morton National Parks, and within the Warragamba Special Areas on the Nattai Plateau and Kings Tableland.



□ FLORISTIC SUMMARY

Number of Sites: 6

Small Trees: 6-10m tall. Mean Projected Canopy Cover 40%

Eucalyptus stricta, *Eucalyptus apiculata*, *Eucalyptus multicaulis*, *Eucalyptus sclerophylla*, *Eucalyptus sieberi*, *Corymbia gummifera*, *Eucalyptus oblonga*

Shrubs: 1-4 m tall. Mean Projected Canopy Cover 50%

Banksia oblongifolia, *Banksia ericifolia* subsp. *ericifolia*, *Banksia serrata*, *Acacia suaveolens*, *Hakea dactyloides*, *Angophora hispida*, *Hakea teretifolia*, *Petrophile pulchella*, *Leptospermum polygalifolium* subsp. *polygalifolium*, *Isopogon anemonifolius*, *Allocasuarina distyla*, *Acacia myrtifolia*, *Lambertia formosa*, *Grevillea sphacelata*, *Kunzea capitata*, *Platysace linearifolia*, *Darwinia fascicularis* subsp. *fascicularis*

Ground Covers: 0.5 m tall. Mean Projected Canopy Cover 85%

Leptocarpus tenax, *Lepyrodia scariosa*, *Lepidosperma filiforme*, *Lindsaea linearis*, *Lomandra obliqua*, *Patersonia sericea*, *Cassytha glabella* forma *glabella*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Low stunted thin multistemmed trees known as mallees. Typical mallee species include Mallee ash (*E. stricta*, *E. apiculata*) and Whipstick ash (*E. multicaulis*).
- Ridgetops on Sandstone Rocky outcrops, tors or broad rock plates.
- Dense heath of Banksias and Tea-trees dominated by *Banksia ericifolia* subsp. *ericifolia* and *Leptospermum polygalifolium* subsp. *polygalifolium*.
- Damp to moist ground cover supporting sedges and rush species such as *Lepyrodia scariosa* and *Leptocarpus tenax*.

□ EXAMPLE LOCATIONS

Fire Trail 1, East of Road amongst massive sandstone outcrops.

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>1530	46	822.07	53.7

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	822.07	100
B Moderate	0	0
C Heavy	0	0
Scattered trees	0	0
Total	822.07	100

❑ **THREATENED PLANT SPECIES**

Eucalyptus apiculata (3R)

❑ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
<i>Allocasuarina distyla</i>	2	0.71	1	0.04	positive
<i>Angophora hispida</i>	2	0.71	2	0.05	positive
<i>Banksia ericifolia</i> subsp. <i>ericifolia</i>	4	1.00	2	0.34	positive
<i>Darwinia fascicularis</i> subsp. <i>fascicularis</i>	2	0.71	2	0.03	positive
<i>Epacris microphylla</i> var. <i>microphylla</i>	2	0.86	2	0.20	positive
<i>Guringalia dimorpha</i>	2	0.71	2	0.07	positive
<i>Hakea dactyloides</i>	2	0.57	2	0.38	positive
<i>Hakea teretifolia</i>	2	1.00	2	0.22	positive
<i>Kunzea capitata</i>	2	0.71	2	0.06	positive
<i>Lepidosperma filiforme</i>	3	0.57	2	0.09	positive
<i>Leptospermum squarrosum</i>	2	0.71	2	0.10	positive
<i>Corymbia gummifera</i>	1	0.14	2	0.52	negative
<i>Entolasia stricta</i>	1	0.14	2	0.54	negative

641. Highlands Sandstone Allocasuarina Heath

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

At The Racecourse, in the far south west of the Nepean Catchment, a low dense heath covers an extensive area. This low heath comprises *Allocasuarina diminuta* subsp. *mimica*, *A. paludosa*, *Banksia spinulosa* var. *spinulosa*, *B. oblongifolia*, *Hakea dactyloides*, *Isopogon anemonifolius* and *Grevillea sericea*. The ground cover is a mix of *Cyathochaeta diandra*, *Lepyrodia scariosa*, *Lachnagrostis filiformis*, *Austrostipa pubescens* and *Poa labillardieri* var. *labillardieri*. Small shrubs also occupy the ground layer and these include *Gonocarpus* spp., *Hibbertia serpyllifolia* and *Pultenaea elliptica*. A low very sparse cover of *Eucalyptus racemosa* is often present on the fringe of the heath. The species composition is unchanged at sites that include the Eucalypt overstorey. This community forms a complex with Map Unit 31 and has been distinguished using the structural characteristics of the vegetation observable on aerial photographs.

Benson & Howell (1994) suggest that Highlands Sandstone *Allocasuarina* Heath is occurring on the last remnants of the Mittagong Formation Sandstones. They also note that this community is unusual in that it only occurs at isolated patches around Sydney between the coast at Kingsford and Heathcote and at higher elevations at Blackheath and Taralga. *Allocasuarina diminuta* has been recorded within Map Unit 37: Dwarf Apple Heath, although the total floristic composition of this community is poorly related.



□ FLORISTIC SUMMARY

Number of Sites: 6

Small Trees: 6-10m tall. Mean Projected Canopy Cover 5%

Eucalyptus racemosa/sclerophylla

Shrubs: 0.5-1.5 m tall. Mean Projected Canopy Cover 70%

Allocasuarina paludosa, *Banksia spinulosa* var. *spinulosa*, *Allocasuarina diminuta* subsp. *mimica*, *Banksia oblongifolia*, *Hakea dactyloides*, *Isopogon anemonifolius*, *Grevillea sericea*

Ground covers: 0.5-1m tall. Mean Projected Canopy Cover 85%

Cyathochaeta diandra, *Lepyrodis scariosa*, *Dampiera stricta*

□ **KEY IDENTIFYING FEATURES**

Easily recognisable features to assist in identifying this map unit are:

- Single location at The Racecourse in Nepean Catchment. Low Heath (less than two metres) dominated by *Allocasuarina paludosa* and *A. diminuta* subsp. *mimica*.

□ **EXAMPLE LOCATIONS**

Fire Trail 2H, Nepean Catchment

□ **CONSERVATION STATUS**

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>59	0	59.41	100

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion (%)	Extant
A Light	59.41	100	
B Moderate	0	0	
C Heavy	0	0	
Scattered trees	0	0	
Total	59.41	100	

□ **THREATENED PLANT SPECIES**

None recorded

□ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
<i>Allocasuarina paludosa</i>	3	0.80	1	0.01	positive
<i>Austrostipa pubescens</i>	2	1.00	2	0.14	positive
<i>Banksia oblongifolia</i>	2	0.80	2	0.22	positive
<i>Banksia spinulosa</i> var. <i>spinulosa</i>	3	1.00	2	0.45	positive
<i>Cyathochaeta diandra</i>	2	1.00	2	0.32	positive
<i>Dampiera stricta</i>	2	1.00	2	0.36	positive
<i>Eucalyptus racemosa</i>	2	1.00	2	0.29	positive
<i>Gonocarpus tetragynus</i>	2	1.00	2	0.14	positive
<i>Goodenia bellidifolia</i> subsp. <i>bellidifolia</i>	2	1.00	2	0.14	positive
<i>Grevillea sericea</i>	2	0.60	2	0.09	positive
<i>Hakea dactyloides</i>	3	1.00	2	0.38	positive
<i>Hibbertia serpyllifolia</i>	2	1.00	1	0.05	positive
<i>Hypericum gramineum</i>	2	0.80	1	0.04	positive
<i>Isopogon anemonifolius</i>	2	0.80	2	0.40	positive
<i>Lepyrodia scariosa</i>	2	0.80	2	0.33	positive
<i>Lindsaea linearis</i>	2	1.00	2	0.25	positive
<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	2	0.60	2	0.22	positive
<i>Mitrasacme polymorpha</i>	2	1.00	2	0.15	positive
<i>Poa labillardierei</i> var. <i>labillardierei</i>	2	0.60	2	0.04	positive
<i>Pultenaea elliptica</i>	2	1.00	2	0.19	positive
<i>Corymbia gummifera</i>	0	0.00	2	0.52	negative
<i>Entolasia stricta</i>	2	1.00	2	0.53	constant

642. Upland Swamps: *Banksia* Thicket

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Banksia Thicket describes a low dense heath that forms on the fringes of the upland swamp complex within the O'Hares Creek Catchment (Keith 1994). These thickets extend beyond this catchment to cover similar habitat across the Woronora Plateau. These thickets are typified by an abundance of *Banksia ericifolia* subsp. *ericifolia* and *Hakea dactyloides* that occur in combination with *B. oblongifolia*, *Pultenaea aristata* and *Dillwynia floribunda*. Species common to Upland Swamps and Exposed Sandstone Scribbly Gum Woodlands occur in the understorey. *Empodisma minus*, *Dampiera stricta*, *Entolasia stricta*, *Selaginella stricta* and *Leptocarpus tenax* feature within a highly variable ground cover.

Banksia Thickets occur throughout the Woronora Plateau. In some locations *Banksia ericifolia* subsp. *ericifolia* completely dominates the understorey of adjoining stands of Exposed Sandstone Scribbly Gum Woodland (Map Unit 29). These areas have been included within this Map Unit although the species composition will vary from that found growing within the upland swamp complex. Areas of dense *Banksia ericifolia* subsp. *ericifolia* growing on broad rock plates are also included within the Map Unit.



□ FLORISTIC SUMMARY

Number of Sites: 3

Trees: 10-15 metres, 5-20% cover

Eucalyptus sclerophylla, *Corymbia gummifera*, *Eucalyptus sieberi*

Shrubs: 3 metres up to 40% cover

Banksia ericifolia subsp. *ericifolia*, *Hakea dactyloides*

Sedges and Rushes: 1.5 metres 70-90% cover

Tetrarrhena turfosa, *Selaginella uliginosa*, *Lindsaea linearis*, *Empodisma minus*, *Leptocarpus tenax*, *Entolasia stricta*, *Cassytha glabella* forma *glabella*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Dense thickets of *Banksia ericifolia* subsp. *ericifolia* adjoining upland swamps on the Woronora Plateau, underneath adjoining Exposed Sandstone Scribbly Gum Woodland.

□ EXAMPLE LOCATIONS

Maddens Plains; Stanwell Tops

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>47000	89	1120.03	n/a

Upland Swamp communities have not been mapped separately outside this report.

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	1117.94	99.8
B Moderate	1.91	0.2
C Heavy	0.18	0.0
Scattered trees	0	0
Total	1120.03	100

□ THREATENED PLANT SPECIES

Pultenaea aristata (V)

□ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Acacia terminalis	2	0.67	1	0.25	positive
Banksia ericifolia subsp. ericifolia	5	1.00	2	0.22	positive
Banksia robur	3	0.67	2	0.02	positive
Cassytha pubescens	2	0.67	1	0.23	positive
Empodisma minus	3	1.00	2	0.08	positive
Entolasia stricta	2	0.67	2	0.49	positive
Epacris microphylla var. microphylla	2	1.00	2	0.13	positive
Epacris obtusifolia	2	1.00	2	0.04	positive
Gleichenia dicarpa	2	0.67	2	0.08	positive
Hakea teretifolia	3	0.67	2	0.14	positive
Leptocarpus tenax	2	1.00	2	0.08	positive
Leptospermum squarrosum	3	1.00	2	0.06	positive
Leptospermum trinervium	2	1.00	2	0.40	positive
Lindsaea linearis	2	0.67	1	0.18	positive
Sprengelia incarnata	2	0.67	2	0.02	positive

643. Upland Swamps: Tea-tree Thicket

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

A low dense blend of Coral ferns (*Gleichenia dicarpa*, *G. microphylla*) and sedges (*Gahnia sieberiana*, *Empodisma minus*) are found along drainage lines within the Sedgeland-Heath Complex on soils with impeded drainage of the Woronora Plateau. Tea-trees (*Leptospermum juniperinum*), *Acacia rubida*, *Banksia ericifolia* subsp. *ericifolia* and *Melaleuca squarrosa* may form dense thickets to a height of three metres. These thickets may be sparse to absent depending on water table fluctuation and long term fire history (Keith 1994). Occasional individuals of *Banksia robur* and *Conospermum ellipticum* are present in the sparse low shrub layer. Other ground covers may include *Lepidosperma laterale*, *Baumea teretifolia* and *Tetrarrhena juncea*.

Keith (1994) describes an identical community of the same name in the O'Hares Creek Catchment. Survey sites in Avon and Cordeaux Catchments and Royal National Park indicate that Tea-tree Thicket occurs across the extent of the Woronora Plateau, although the Maddens Plains area supports the largest patches within its distribution.



□ FLORISTIC SUMMARY

Number of Sites: 4

Shrubs: 3 metres up to 40% cover

Banksia ericifolia subsp. *ericifolia*, *Leptospermum juniperinum*, *Acacia rubida*, *Melaleuca squarrosa*, *Banksia robur*

Sedges and Rushes: 1.5 metres 70-90% cover

Gleichenia microphylla, *Gleichenia dicarpa*, *Gahnia sieberiana*, *Empodisma minus*, *Lepydodia anarthria*, *Blechnum nudum*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- A ribbon of Tea-tree (*Leptospermum* spp.) thickets, *Banksia ericifolia* subsp. *ericifolia* within upland swamps on the Woronora Plateau.
- Dense scramble of Coral ferns (*Gleichenia* spp.) and sedges, including *Gahnia sieberiana*.

□ EXAMPLE LOCATIONS

Maddens Plains; Bulli Tops

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>47000	89	170.46	n/a

Upland Swamp communities have not been mapped separately outside this report.

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	170.46	100
B Moderate	0	0
C Heavy	0	0
Scattered trees	0	0
Total	170.46	100

□ THREATENED PLANT SPECIES

None recorded

□ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Acacia elongata	2	0.50	1	0.01	positive
Banksia ericifolia subsp. ericifolia	5	1	2	0.22	positive
Banksia oblongifolia	2	1	2	0.15	positive
Bauera rubioides	3	0.50	2	0.05	positive
Blechnum indicum	2	0.50	1	0.01	positive
Bossiaea stephensonii	3	0.50	1	0.01	positive
Callistemon citrinus	2	0.50	1	0.01	positive
Eurychorda complanata	2	0.50	2	0.03	positive
Gahnia sieberiana	2	1	2	0.07	positive
Gleichenia dicarpa	5	0.50	2	0.08	positive
Gleichenia microphylla	3	0.50	3	0.03	positive
Hakea dactyloides	3	0.50	2	0.30	positive
Hakea teretifolia	2	1	2	0.10	positive
Lepidosperma laterale	2	1	1	0.34	positive
Leptocarpus tenax	2	0.50	2	0.08	positive
Leptospermum juniperinum	3	1	2	0.03	positive
Leptospermum polygalifolium subsp. polygalifolium	2	0.50	2	0.13	positive
Melaleuca squarrosa	2	0.50	2	0.01	positive
Platysace linearifolia	2	0.50	2	0.29	positive
Schoenus brevifolius	3	1	1	0.02	positive
Selaginella uliginosa	2	0.50	2	0.08	positive

644. Upland Swamps: Sedgeland-Heath Complex

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

(a) Sedgeland

□ DESCRIPTION

Sedgeland is distinct component of this map unit that forms part of the Upland Swamp Complex on the Woronora Plateau. Sites from the Holsworthy area (French *et al.*, 2000) reflect a closely related species composition to that described by Keith (1994) for O'Hares Creek Catchment. Sedgeland forms a low dense cover of sedges and small shrubs on the perimeter of upland swamps or in minor depressions within the same complex. *Leptocarpus tenax*, *Schoenus brevifolius* and *S. paludosus* are consistently found in high abundance. The low shrub layer features *Baeckea imbricata*, *Epacris obtusifolia*, *Sprengelia incarnata*, *Symphionema paludosum*, and *Boronia parviflora*. *Hakea teretifolia* and *Banksia ericifolia* subsp. *ericifolia* occur occasionally at low abundance. Other ground cover species include *Ptilothrix deusta*, *Actinotus minor* and *Selaginella uliginosa*.

Keith (1994) found that Sedgeland occupied about 10% of this Sedgeland-Heathland in the O'Hares Creek Catchment. This community is difficult to distinguish using aerial photo patterns. However, a number of small isolated localities have been mapped in Woronora, Cataract and Avon Catchments during field traverses. As a result the total area of this community is unknown. Elsewhere, Sedgeland is known to occur in Holsworthy Military area and Keith (1994) notes that it is likely to be very limited in Royal National Park.



□ FLORISTIC SUMMARY

Number of Sites: 3

Shrubs: 0.5-1m. Mean Projected Cover 30%

Baeckea imbricata, *Epacris obtusifolia*, *Epacris microphylla* var. *microphylla*, *Sprengelia incarnata*, *Symphionema paludosum*, *Boronia parviflora*, *Hakea teretifolia*, *Banksia ericifolia* subsp. *ericifolia*, *Pimelea linifolia* subsp. *linifolia*, *Dillwynia floribunda*

Ground covers: 0-0.5 m tall. Mean Projected Canopy Cover 70%

Leptocarpus tenax, *Schoenus brevifolius*, *Schoenus paludosus*, *Lepyrodia scariosa*, *Ptilothrix deusta*, *Dampiera stricta*, *Stylidium graminifolium*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- A low treeless plain dominated by sedges and rushes, such as *Leptocarpus tenax* and *Schoenus brevifolius*.

□ EXAMPLE LOCATIONS

Forest Walk, Darkes Forest; Dharawal State Recreation Area; Woronora Catchment

□ DIAGNOSTIC SPECIES

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
<i>Boronia parviflora</i>	2	0.67	1	0.01	positive
<i>Dillwynia floribunda</i>	3	0.67	1	0.06	positive
<i>Drosera spatulata</i>	2	0.67	2	0.04	positive
<i>Epacris microphylla</i> var. <i>microphylla</i>	2	1.00	2	0.20	positive
<i>Epacris obtusifolia</i>	4	0.67	2	0.06	positive
<i>Haemodorum corymbosum</i>	2	0.67	1	0.07	positive
<i>Hakea teretifolia</i>	2	0.67	2	0.23	positive
<i>Leptocarpus tenax</i>	4	1.00	2	0.13	positive
<i>Lepyrodia scariosa</i>	2	0.67	2	0.34	positive
<i>Lycopodiella lateralis</i>	2	0.33	0	0.00	positive
<i>Ptilothrix deusta</i>	2	1.00	2	0.14	positive
<i>Schoenus brevifolius</i>	4	1.00	1	0.04	positive
<i>Schoenus paludosus</i>	2	0.67	0	0.00	positive
<i>Selaginella uliginosa</i>	4	0.67	2	0.13	positive
<i>Sprengelia incarnata</i>	4	0.67	2	0.03	positive
<i>Stylidium graminifolium</i>	2	1.00	1	0.10	positive
<i>Symphionema paludosum</i>	3	0.67	1	0.01	positive
<i>Corymbia gummifera</i>	0	0.00	2	0.52	negative
<i>Entolasia stricta</i>	1	0.33	2	0.53	negative

(b) Restioid Heath

□ DESCRIPTION

Restioid Heath forms part of the upland swamp complex found on the Woronora Plateau (Keith 1994). A low shrub layer of *Banksia oblongifolia*, *Hakea teretifolia* and *Epacris obtusifolia* consistently occur with occasional *B. robur*, *Melaleuca thymifolia* and *M. squarrosa*. A diverse combination of rushes, herbs and grasses are present forming a dense ground cover. Species present include *Empodisma minus*, *Lepyrodia scariosa*, *Leptocarpus tenax*, *Lindsaea linearis*, *Xanthorrhoea resinifera*, *Stackhousia nuda*, *Mitrasacme polymorpha* and *Schoenus brevifolius*.

Restioid Heath has been mapped as a Sedgeland-Heath Complex (sensu. Keith 1994). It occurs extensively on the Maddens Plains and in Avon and Woronora Catchments in smaller patches. Keith (1994) suggests there are similar, though restricted, communities present in Royal, Ku-ring-gai Chase and Brisbane Water National Parks.

□ FLORISTIC SUMMARY

Number of Sites: 5

Shrubs: 1m tall. Mean Projected Canopy Cover 40%

Banksia oblongifolia, *Hakea teretifolia*, *Epacris obtusifolia*

Ground Cover: 0.5 tall. Mean Projected Canopy Cover 70-90%

Empodisma minus, *Lepyrodia scariosa*, *Leptocarpus tenax*, *Lindsaea linearis*, *Xanthorrhoea resinifera*, *Stackhousia nuda*, *Mitrasacme polymorpha*, *Schoenus brevifolius*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Large open treeless swamps on the Woronora plateau.
- An open to dense heath layer comprising *Banksia oblongifolia* and *Hakea teretifolia*.
- A dense understorey of rushes from the family Restionaceae including *Lepyrodia scariosa*, *Leptocarpus tenax* and *Empodisma minus* as the dominant species.

□ EXAMPLE LOCATIONS

Maddens Plains

□ DIAGNOSTIC SPECIES

(Note that Abundance Scores are derived from a 1-6 Braun-Blanquet Cover Scale)

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
<i>Actinotus minor</i>	2	0.5	2	0.20	positive
<i>Agrostis avenacea</i> var. <i>avenacea</i>	2	0.7	2	0.04	positive
<i>Baeckea imbricata</i>	2	0.5	2	0.03	positive
<i>Banksia oblongifolia</i>	3	0.9	2	0.14	positive
<i>Banksia robur</i>	3	0.5	2	0.02	positive

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Baumea acuta	2	0.5	1	0.01	positive
Baumea teretifolia	2	0.7	2	0.01	positive
Burchardia umbellata	2	0.6	1	0.02	positive
Cassytha glabella forma glabella	2	0.9	1	0.15	positive
Cyathochaeta diandra	3	0.5	2	0.27	positive
Dichopogon fimbriatus	1	0.1	0	0.00	positive
Eleocharis sphacelata	2	0.5	2	0.01	positive
Empodisma minus	3	1.0	2	0.07	positive
Entolasia stricta	2	0.8	2	0.49	positive
Epacris obtusifolia	2	1.0	2	0.03	positive
Epaltès australis	1	0.1	0	0.00	positive
Eurychorda complanata	2	0.7	2	0.01	positive
Euryomyrtus ramosissima subsp. ramosissima	2	0.6	1	0.01	positive
Hakea teretifolia	3	0.9	2	0.14	positive
Lepidosperma longitudinale	2	0.1	0	0.00	positive
Lepidosperma neesii	2	0.5	2	0.02	positive
Leptocarpus tenax	3	0.9	2	0.08	positive
Leptospermum arachnoides	2	0.7	1	0.12	positive
Lepyrodia scariosa	3	1.0	2	0.23	positive
Lindsaea linearis	2	0.9	1	0.17	positive
Mitrasacme polymorpha	2	0.9	2	0.09	positive
Selaginella uliginosa	2	0.7	2	0.07	positive
Tetrarrhena turfosa	2	0.5	2	0.02	positive
Xanthorrhoea resinifera	2	0.9	2	0.12	positive
Xyris bracteata	2	0.8	1	0.04	positive
Xyris operculata	2	0.5	2	0.01	positive

(c) Cyperoid Heath

□ DESCRIPTION

Cyperoid Heath forms part of the upland swamp complex found on the Woronora Plateau (Keith 1994). Cyperoid Heath grows on seepage and water discharge sites that are periodically water logged. Species from the Cyperaceae family characterise the dense ground cover that grows up to a metre in height. *Lepidosperma limicola*, *Gymnoschoenus sphaerocephalus*, *Chorizandra sphaerocephala* and *Baumea rubiginosa* are frequent and abundant. A number of other species common to Restioid Heath are also consistently recorded within this community. These include *Empodisma minus*, *Leptocarpus tenax* and *Mitrasacme polymorpha*. *Xyris operculata* and *Selaginella uliginosa* are less frequently observed, though they are characteristic of the assemblage. A low, open shrub layer is present and includes species such as *Banksia robur*, *Melaleuca squarrosa*, *Hakea teretifolia* and *Leptospermum juniperinum*. Small shrubs such as *Pultenaea divaricata* and *Baeckea linifolia* are also found.

This community has been mapped as a Sedgeland-Heath Complex (sensu. Keith 1994). Survey sites describing this community are located at Maddens Plains within the Cataract Catchment although this community extends into Avon and Cordeaux Catchments in less extensive patches. Keith (1994) notes that Cyperoid Heaths are likely to be limited to small areas within Royal, Ku-ring-gai Chase and Brisbane Waters National Parks.

□ FLORISTIC SUMMARY

Number of Sites: 8

Shrubs: 1.5m tall. Mean Projected Canopy Cover 5-35% cover

Banksia robur, *Melaleuca squarrosa*, *Hakea teretifolia*, *Leptospermum juniperinum*, *Banksia ericifolia* subsp. *ericifolia*, *Pultenaea divaricata*, *Baeckea linifolia*

Sedges and Rushes: up to 1m tall. Mean Projected Canopy Cover 70-90% cover

Lepidosperma limicola, *Gymnoschoenus sphaerocephalus*, *Chorizandra sphaerocephala*, *Baumea rubiginosa*, *Empodisma minus*, *Leptocarpus tenax*, *Mitrasacme polymorpha*, *Xyris operculata*

□ KEY IDENTIFYING FEATURES**Easily recognisable features to assist in identifying this map unit are**

- Large open treeless swamps on the Woronora plateau.
- A dense and dominant cover of sedges from the family Cyperaceae including Button grass (*Gymnoschoenus sphaerocephalus*) and Razor sedge (*Lepidosperma limicola*).
- A low cover of Swamp banksia (*Banksia robur*).

□ EXAMPLE LOCATIONS

Maddens Plains

□ DIAGNOSTIC SPECIES

(Note that Abundance Scores are derived from a 1-6 Braun-Blanquet Cover Scale)

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
<i>Baeckea linifolia</i>	2	0.50	2	0.02	positive
<i>Banksia robur</i>	2	0.67	2	0.01	positive
<i>Baumea rubiginosa</i>	2	0.50	2	0.01	positive
<i>Dampiera stricta</i>	2	0.50	2	0.25	positive
<i>Empodisma minus</i>	3	1.00	2	0.08	positive
<i>Gymnoschoenus sphaerocephalus</i>	4	0.50	2	0.02	positive
<i>Lepidosperma limicola</i>	3	0.83	2	0.01	positive
<i>Leptocarpus tenax</i>	3	1.00	2	0.08	positive
<i>Lepyrodia muelleri</i>	2	0.17	0	0.00	positive
<i>Mitrasacme polymorpha</i>	2	0.67	2	0.09	positive
<i>Pultenaea divaricata</i>	2	0.50	2	0.01	positive
<i>Selaginella uliginosa</i>	2	0.67	2	0.08	positive
<i>Sprengelia incarnata</i>	2	0.50	2	0.02	positive
<i>Xyris operculata</i>	2	0.67	2	0.01	positive

□ CONSERVATION STATUS

As the three components of Sedgeland-Heath Complex are not mapped separately, the summary statistics for Conservation Status are presented in the table for the one Map Unit.

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>47000	89	3448.64	n/a

Upland Swamp communities have not been mapped separately outside this report.

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	3448.25	100.0
B Moderate	0.39	0.0
C Heavy	0	0
Scattered trees	0	0
Total	3448.64	100

□ THREATENED PLANT SPECIES

Acacia baueri subsp. *aspera* (V), *Pultenaea aristata* (V), *Monotoca ledifolia* (3R)

645. Upland Swamps: Fringing Eucalypt Woodland

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Fringing Eucalypt Woodland has been delineated to highlight the ecotone between the Upland Swamps communities and the surrounding Sandstone Woodlands. The transition between the two can be either abrupt or very gradual. In the case of the latter, a very open woodland with a canopy cover less than ten percent supports widely spaced *Eucalyptus racemosa*, *E. oblonga* or *E. sieberi*. The understorey characteristics are transitional, with some sites sharing greater similarity with the drier components of Restioid Heathlands (Map Unit 44b) than Exposed Sandstone Scribbly Gum Woodland (Map Unit 29).

□ FLORISTIC SUMMARY

Number of Sites: 8

Trees: 5-12m tall: Projected Canopy Cover 5-15%

Eucalyptus racemosa/haemastoma/sclerophylla, *Eucalyptus oblonga*, *Eucalyptus sieberi*

Shrubs: 1.5m tall. Projected Canopy Cover 15-30% cover

Banksia ericifolia subsp. *ericifolia*, *Banksia oblongifolia*, *Hakea dactyloides*, *Hakea teretifolia*

Sedges and Rushes: up to 1m tall. Projected Canopy Cover 50-70% cover

Leptocarpus tenax, *Sprengelia incarnata*, *Lindsaea linearis*, *Mitrasacme polymorpha*, *Empodisma minus*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are

- Widely spaced Eucalypts marking the transition between sandstone woodland and treeless heath and sedgelands.

□ EXAMPLE LOCATIONS

Maddens Plains; Fire Trail 9 Woronora Catchment.

□ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>47000	89	1579.95	n/a

Upland Swamp communities have not been mapped separately outside this report.

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	1579.95	100
B Moderate	0	0
C Heavy	0	0
Scattered trees	0	0
Total	1579.95	100

❑ THREATENED PLANT SPECIES

Epacris purpurascens var. *purpurascens* (V), *Pultenaea aristata* (V), *Darwinia grandiflora* (2R), *Eucalyptus apiculata* (3R)

❑ DIAGNOSTIC SPECIES

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Actinotus minor	2	0.50	2	0.30	positive
Amphibromus nervosus	3	0.50	0	0.00	positive
Baeckea diosmifolia	2	0.50	2	0.01	positive
Baloskion gracile	3	0.50	2	0.04	positive
Banksia oblongifolia	3	1.00	2	0.23	positive
Banksia spinulosa var. spinulosa	2	1.00	2	0.45	positive
Bossiaea heterophylla	2	0.50	2	0.32	positive
Carex inversa	3	0.50	2	0.02	positive
Cassytha pubescens	2	1.00	1	0.25	positive
Cryptandra ericoides	2	0.50	1	0.01	positive
Dillwynia floribunda	5	0.50	2	0.06	positive
Empodisma minus	2	0.50	2	0.13	positive
Entolasia marginata	2	1.00	2	0.23	positive
Epacris microphylla var. microphylla	2	0.50	2	0.20	positive
Eucalyptus racemosa	2	1.00	2	0.30	positive
Eurychorda complanata	3	0.50	2	0.04	positive
Grevillea oleoides	3	1.00	2	0.24	positive
Hakea dactyloides	3	1.00	2	0.38	positive
Isopogon anemonifolius	2	1.00	2	0.40	positive
Leptocarpus tenax	2	1.00	2	0.14	positive
Leptospermum arachnoides	2	1.00	2	0.18	positive
Leptospermum polygalifolium	2	1.00	2	0.11	positive
Lepyrodia scariosa	4	0.50	2	0.34	positive
Microlaena stipoides var. stipoides	2	0.50	2	0.11	positive
Micromyrtus ciliata	2	0.50	2	0.01	positive
Persoonia lanceolata	2	0.50	1	0.10	positive
Petrophile sessilis	2	0.50	2	0.14	positive
Platysace linearifolia	2	0.50	2	0.39	positive
Poa affinis	2	0.50	2	0.02	positive
Pultenaea aristata	3	0.50	2	0.02	positive
Corymbia gummifera	0	0.00	2	0.52	negative
Entolasia stricta	0	0.00	2	0.54	negative

646. Upland Swamps: Mallee-Heath

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Upland Swamps: Mallee-Heath represents a minor variant to the complex of upland swamp communities. No sample sites have been completed within this map unit and descriptions are borrowed from Benson & Fallding (1985) until further work is completed. A Mallee-Heath community is present on drier gradients with the Upland Swamp Complex in the Avon and Nepean Catchments, and only occasionally in the north near Maddens Plains. *Eucalyptus stricta* occurs in dense clumps amongst a low cover of shrubs such as *Banksia ericifolia* subsp. *ericifolia*, *B. paludosa* subsp. *paludosa*, *Allocasuarina nana*, *Petrophile sessilis* and *Leptospermum attenuatum*. Ground covers are typical of Restioid Heath, including *Leptocarpus tenax*, *Lepyrodia scariosa* and *Empodisma minus*.



□ FLORISTIC SUMMARY

Number of Sites: none

Shrubs: 1.5m tall. Mean Projected Canopy Cover 5-35% cover

Eucalyptus stricta, *Banksia ericifolia* subsp. *ericifolia*, *Hakea teretifolia*, *Banksia paludosa* subsp. *paludosa*, *Allocasuarina nana*

Sedges and Rushes: up to 1m tall. Mean Projected Canopy Cover 70-90% cover

Leptocarpus tenax, *Lepyrodia scariosa*, *Empodisma minus*, *Mitrasacme polymorpha*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are

- Emergent Mallee ash (*Eucalyptus stricta*) above a shrub layer of Banksias, Hakeas and Tea-trees (*Leptospermum* spp.).
- Within broad upland swamp complexes in southern catchments near escarpment edge.

□ **EXAMPLE LOCATIONS**

Fire Trail 15, Avon Catchment; No 1 Fire Trail at Stockyard Swamp

□ **CONSERVATION STATUS**

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>47000	89	124.49	n/a

Upland Swamp communities have not been mapped separately outside this report.

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion (%)	Extant
A Light	124.49	100	
B Moderate	0	0	
C Heavy	0	0	
Scattered trees	0	0	
Total	124.49	100	

□ **THREATENED PLANT SPECIES**

Eucalyptus apiculata (3R)

□ **DIAGNOSTIC SPECIES**

No Diagnostic Species List available as no survey sites were undertaken in this community.

647. Highlands Sandstone Swamp Woodland

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

Highlands Sandstone Swamp Woodland occurs on the Mittagong Formation Sandstones above 500 metres in elevation. The distribution of the community closely follows minor drainage lines and depressions of broad plateaux. The canopy is generally open and includes *Eucalyptus ovata*, *E. radiata* subsp. *radiata*, *E. mannifera* subsp. *mannifera* and *E. globoidea*. Drainage lines have sporadic dense thickets of *Leptospermum polygalifolium* subsp. *polygalifolium* occurring with *Banksia spinulosa* var. *spinulosa* and *Acacia rubida*. Ground cover also varies depending on moisture gradient. At permanently soaked sites rushes such as *Juncus continuus* and *Eleocharis sphacelata* may feature prominently. *Lomandra longifolia*, *Pteridium esculentum* and *Entolasia stricta* are more common on the fringe sometimes with *Mirbelia platylobioides*. Highlands Sandstone Swamp Woodland occupies the headwaters of streams that flow out onto the shale plains of the southern highlands.



Some floristic similarity is likely between this community and Map Unit 24 on alluvial flats and Map Unit 48.

□ FLORISTIC SUMMARY

Number of Sites: none

Trees: 5-12m tall. Mean Projected Canopy Cover 5-15% cover

Eucalyptus ovata, *Eucalyptus radiata* subsp. *radiata*, *Eucalyptus mannifera* subsp. *mannifera*, *Eucalyptus globoidea*

Shrubs: 1-3m tall. Mean Projected Canopy Cover 5-45% cover

Leptospermum polygalifolium subsp. *polygalifolium*

Ground: up to 1m tall. Mean Projected Canopy Cover 60-70% cover

Lomandra longifolia, *Pteridium esculentum*, *Cyathochaeta diandra*, *Entolasia stricta*

□ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are

- Low open woodland occurring on minor drainage flats and channels on Mittagong sandstone at elevations above 500 metres.

□ **EXAMPLE LOCATIONS**

Fire Trail 3, minor creek crossing south of Chain of ponds Creek

□ **CONSERVATION STATUS**

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>440	0	439.60	100

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	439.60	100
B Moderate	0	0
C Heavy	0	0
Scattered trees	0	0
Total	439.60	100

□ **THREATENED PLANT SPECIES**

Eucalyptus apiculata (3R)

□ **DIAGNOSTIC SPECIES**

No Diagnostic Species List available as no survey sites were undertaken in this community.

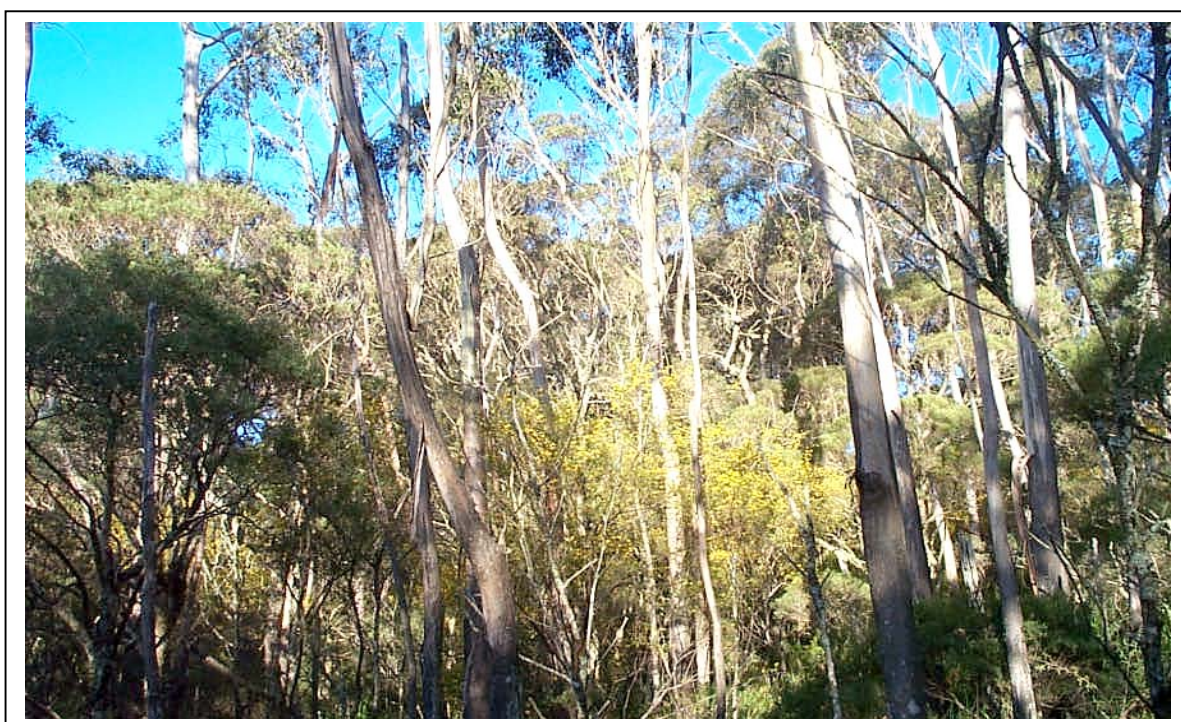
648. Highlands Swamp Gum-Melaleuca Woodland

This description is a direct extract from the Native Vegetation of the Woronora, O'Hare's and Metropolitan Catchments report (NPWS 2002).

□ DESCRIPTION

On the Southern Highlands Plateau in the far south of the Study Area, a unique community is associated with changes in geology between basalts, shales and sandstones. These appear to be water table discharge sites where the surface is periodically inundated by water. The composition of the community is variable depending on water availability and underlying parent material. A low canopy comprising *Eucalyptus ovata* and *Melaleuca linariifolia* is characteristic. It may support a shrubby understorey of *Melaleuca squarrosa*, *Leptospermum polygalifolium* subsp. *polygalifolium*, *Hakea salicifolia* and *Banksia spinulosa* var. *spinulosa* and graminoids dominated by *Lomandra longifolia* and *Schoenus melanostachys*. At other locations, *E. ovata* are taller with an open grassy understorey and do not share sandstone shrub and sedge species present at sites such as Macquarie Hill.

NPWS (2000a) describe a Moist Heath Community (Forest Ecosystem 144) of which several positive diagnostic species are shared with Highlands Swamp Gum-Melaleuca Woodland. Further regional analysis will clarify these relationships. At present the site at Macquarie Hill is protected by water catchment land use.



❑ FLORISTIC SUMMARY

Number of Sites: 1

Trees: 8-12m tall. Mean Projected Canopy Cover 25%

Eucalyptus ovata, *Melaleuca linariifolia*

Shrubs: 4-8m tall. Mean Projected Canopy Cover 60%

Melaleuca linariifolia, *Melaleuca squarrosa*, *Leptospermum polygalifolium* subsp. *polygalifolium*, *Pultenaea blakelyi*

Ground Cover: 0-1m tall. Mean Projected Canopy Cover 90%

Lomandra longifolia, *Schoenus melanostachys*

❑ KEY IDENTIFYING FEATURES

Easily recognisable features to assist in identifying this map unit are:

- Low dense scrub with dense shrubs of *Melaleuca linariifolia*.
- Dense ground cover of *Schoenus melanostachys*.
- Low cover of Swamp gums (*Eucalyptus ovata*).

❑ EXAMPLE LOCATIONS

Macquarie Hill, on Fire Trail 15a; Fire Trail 1, Molly Morgan Gully

❑ CONSERVATION STATUS

BIOREGIONAL STATUS

Total Area within Sydney Basin Bioregion (ha)	Proportion of Bioregional Area within NPWS Reserve (%)	Area within Catchment (ha)	Proportion of Bioregional Area within Catchment (%)
>144	0.1	144.23	100

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Light	119.44	82.8
B Moderate	10.80	7.5
C Heavy	0	0
Scattered trees	13.99	9.7
Total	144.23	100

❑ THREATENED PLANT SPECIES

None recorded

□ **DIAGNOSTIC SPECIES**

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
<i>Banksia spinulosa</i> var. <i>spinulosa</i>	4	1	1	0.02	positive
<i>Callistemon citrinus</i>	2	1	0	0.00	positive
<i>Empodisma minus</i>	4	1	4	0.01	positive
<i>Entolasia stricta</i>	2	1	3	0.13	positive
<i>Eucalyptus ovata</i>	4	1	0	0.00	positive
<i>Gonocarpus teucroides</i>	4	1	3	0.05	positive
<i>Goodenia paniculata</i>	2	1	0	0.00	positive
<i>Hakea salicifolia</i>	4	1	2	0.02	positive
<i>Hibbertia aspera</i> subsp. <i>aspera</i>	3	1	2	0.03	positive
<i>Hibbertia scandens</i>	2	1	1	0.20	positive
<i>Leptospermum polygalifolium</i> subsp. <i>polygalifolium</i>	4	1	4	0.02	positive
<i>Leucopogon lanceolatus</i> var. <i>lanceolatus</i>	2	1	2	0.07	positive
<i>Lomandra longifolia</i>	5	1	2	0.45	positive
<i>Melaleuca linariifolia</i>	5	1	4	0.01	positive
<i>Melaleuca squarrosa</i>	4	1	1	0.01	positive
<i>Pratia purpurascens</i>	2	1	2	0.16	positive
<i>Pultenaea blakelyi</i>	2	1	2	0.02	positive
<i>Schoenus melanostachys</i>	5	1	3	0.01	positive
<i>Tmesipteris truncata</i>	1	1	0	0.00	positive
<i>Eustrephus latifolius</i>	0	0	2	0.67	negative
<i>Geitonoplesium cymosum</i>	0	0	2	0.64	negative
<i>Marsdenia rostrata</i>	0	0	2	0.58	negative
<i>Notelaea venosa</i>	0	0	3	0.58	negative
<i>Oplismenus imbecillis</i>	0	0	3	0.59	negative
<i>Pandorea pandorana</i> subsp. <i>pandorana</i>	0	0	2	0.65	negative
<i>Pittosporum undulatum</i>	0	0	2	0.63	negative
<i>Pseuderanthemum variabile</i>	0	0	3	0.61	negative

702. Bargo Brush Forest

Sites: Survey sites not available for Wingecaribee Shire.

Area (ha, 2001/1750):

Proportion Extant (%)

No. Taxa (total):

No. Taxa per Plot:

Description

This community has been identified from existing Royal Botanic Gardens Mapping. Vegetation surveyed data was not available within Wingecaribee Shire. Bargo Brush Forest was described by the NSW Royal Botanic Gardens for the Wollongong 1:100 000 mapsheet (Draft, unpub.). The information presented here has been extracted from the Royal Botanic Gardens draft report.

Bargo Brush Forest is an open forest community dominated by *Eucalyptus crebra*, *E. bosistoana*, *E. eugenioides*, *E. fibrosa*, *E. globoidea* and *E. quadrangulata*. It occurs on clay soils derived from the Mittagong formation south of Appin.

Previous Floristic Classifications

This community has previously been classified as 'Bargo Brush Forest' by the Royal Botanic Gardens (Map Unit 9mf). This information was taken from 'Draft Vegetation of the Wollongong 1:100 000 Mapsheet' (unpub.).

703. Nattai Sandstone Gully Forest

Sites: Vegetation survey sites for are not available within Wingecarribee Shire.

Area (ha, 2001/1750):

Proportion Extant (%)

No. Taxa (total):

No. Taxa per Plot:

Description

This community has been identified from existing Royal Botanic Gardens Mapping. Vegetation survey data was not available within Wingecarribee Shire. Information on this community has been extracted from Royal Botanic Gardens 'Vegetation of the Burragorang 1:100 000 Mapsheet' (Fisher, Ryan & Lembit, 1995).

Nattai Sandstone Gully Forest is an open forest community dominated by *Angophora costata*, *Eucalyptus agglomerata*, and *E. piperita*. It occurs on Triassic Hawkesbury and Narrabeen Group Sandstone below 700m in sheltered slopes and gullies on plateaux.

Previous Floristic Classifications

This community has previously been classified as 'Sydney Sandstone Gully Forest' (Map Unit 10ag) by the Royal Botanic Gardens (Fisher, Ryan & Lembit 1995).

706. Dry Nattai Escarpment Complex

Sites: Not surveyed within Wingecarribee Shire.

Area (ha, 2001/1750):

Proportion Extant (%)

No. Taxa (total):

No. Taxa per Plot:

Description

Dry Nattai Escarpment Complex has been identified from NSW Royal Botanic Gardens 'Vegetation of the Burragorang 1:100 000 Mapsheet'. This community is dominated by *Angophora costata*, *A. floribunda*, *Eucalyptus piperita*, *E. punctata* and *E. fibrosa*.

It occurs on Illawarra and Shoalhaven Group Sediments at 300-500m on north-northwest escarpment faces in gullies and sheltered slopes within the Nattai Gorge area.

Previous Floristic Classifications

This community has previously been classified as 'Dry Escarpment Forest Complex' (Map Unit 6hd) by the Royal Botanic Gardens (Fisher, Ryan & Lembit 1995).

707. Moist Nattai Escarpment Complex

Sites: Not surveyed within Wingecarribee Shire.

Area (ha, 2001/1750):

Proportion Extant (%)

No. Taxa (total):

No. Taxa per Plot:

Description

Moist Nattai Escarpment Complex has been identified from NSW Royal Botanic Gardens 'Vegetation of the Burragorang 1:100 000 Mapsheet'. This community is dominated by *Eucalyptus Agglomerata*, *E. crebra*, *E. deanei*, *E. eugenioides*, *E. piperita*, *E. punctata*, *E. hypostomatica* and *Syncarpia glomulifera*. It occurs on Illawarra and Shoalhaven Group Sediments at 300-500m on south-southeast escarpment faces in gullies and sheltered slopes

Previous Floristic Classifications

This community has previously been classified as 'Dry Escarpment Forest Complex' (Map Unit 6hm) by the Royal Botanic Gardens (Fisher, Ryan & Lembit 1995).

821. Shoalhaven Gorge Moist Shrub Forest

This community has been identified in the Southern CRA Forest Ecosystems Mapping (NPWS, unpub.). The following community profile has been directly extracted from the appendices of the associated report.

Description

Shoalhaven Gorge Moist Shrub Forest is a tall forest over 30 metres tall comprising a variable tree canopy. In the southern end of its range *Corymbia maculata* and *Eucalyptus pilularis* dominate the tree canopy whereas in the north *Syncarpia glomulifera* and *E. saligna* (composite) tend to be more dominant. An intermediate tree layer comprises *Synoum glandulosum*, *Elaeocarpus reticulatus*, *Notolea longifolia*, *Acacia mabelliae*, and *Persoonia linearis*. An intermediate shrub layer contains *Macrozamia communis*, *Hibbertia aspera*, and *Breynia oblongifolia*. A variable ground cover of sedges *Gahnia melanocarpa*, *Lomandra longifolia*, and *Lepidosperma urophorum*, is intertwined with vines *Smilax australis*, *Parsonsia straminea*, *Clematis aristata*, *Pandorea pandorana* and *Morinda jasminoides*. Ferns such as *Calochlaena dubia* and *Doodia aspera* form small patches in amongst the rest of the ground cover.

This forest ecosystem is found on sheltered slopes on Ordovician sediments in the rolling coastal foothills in the Clyde-Kioloa area. Further to the North, it is found in sheltered gullies and slopes on the Permian mudstone escarpment and in the lower Shoalhaven and Kangaroo Valley valleys. It is found mainly between 20 and 250 metres in elevation on deep clay soils.

Previous Floristic Classifications

The Southern CRA Forest Ecosystems Mapping Project previously classified this community as 'FOREST ECOSYSTEM 21: Northern Foothills Moist Shrub Forest - *C. maculata* / *E. pilularis*'.

Diagnostic Plant Species

Species	Group cover	Group freq	Non-group cover	Non-group freq	Fidelity class
<i>Cissus hypoglauca</i>	2	0.909	2	0.093	positive
<i>Entolasia stricta</i>	2	0.764	2	0.140	positive
<i>Corymbia maculata</i>	3	0.709	3	0.034	positive
<i>Synoum glandulosum</i>	2	0.673	2	0.072	positive
<i>Pteridium esculentum</i>	2	0.655	2	0.303	positive
<i>Notelaea longifolia</i> forma <i>longifolia</i>	2	0.582	1	0.018	positive
<i>Eucalyptus pilularis</i>	2	0.564	3	0.022	positive
<i>Acacia mabellae</i>	2	0.527	2	0.018	positive
<i>Gahnia melanocarpa</i>	2	0.527	1	0.042	positive
<i>Hibbertia aspera</i>	2	0.527	2	0.065	positive
<i>Notelaea ovata</i>	1	0.073	0	0.000	positive
<i>Maytenus silvestris</i>	1	0.055	0	0.000	positive
<i>Poa affinis</i>	4	0.036	0	0.000	positive
<i>Acacia jonesii</i>	1	0.018	0	0.000	positive
<i>Acacia linifolia</i>	1	0.018	0	0.000	positive
<i>Callistemon salignus</i>	1	0.018	0	0.000	positive
<i>Elaeocarpus reticulatus</i>	1	0.818	1	0.094	uninformative
<i>Dianella caerulea</i> var <i>caerulea</i>	1	0.764	1	0.156	uninformative
<i>Eustrephus latifolius</i>	1	0.746	1	0.137	uninformative
<i>Macrozamia communis</i>	1	0.746	2	0.053	uninformative
<i>Leucopogon lanceolatus</i> var <i>lanceolatus</i>	1	0.709	1	0.162	uninformative
<i>Lomandra longifolia</i>	1	0.691	2	0.413	uninformative
<i>Persoonia linearis</i>	1	0.691	1	0.175	uninformative
<i>Schelhammera undulata</i>	1	0.673	1	0.075	uninformative
<i>Tylophora barbata</i>	1	0.673	2	0.098	uninformative
<i>Breynia oblongifolia</i>	1	0.600	1	0.080	uninformative
<i>Geitonoplesium cymosum</i>	1	0.582	1	0.109	uninformative
<i>Hibbertia dentata</i>	1	0.582	1	0.050	uninformative
<i>Pseuderanthemum variabile</i>	1	0.564	2	0.058	uninformative
<i>Smilax australis</i>	1	0.564	2	0.141	uninformative
<i>Parsonsia straminea</i>	1	0.546	2	0.058	uninformative
<i>Clematis aristata</i>	1	0.527	1	0.265	uninformative
<i>Desmodium varians</i>	1	0.527	1	0.166	uninformative
<i>Pandorea pandorana</i>	1	0.527	2	0.143	uninformative
<i>Morinda jasminoides</i>	1	0.509	3	0.091	uninformative
<i>Psychotria loniceroides</i>	1	0.509	2	0.052	uninformative

853. Shoalhaven Gorge Riparian Shrub Forest

This community has been identified in the Southern CRA Forest Ecosystems Mapping (NPWS, unpub.). The following community profile has been directly extracted from the appendices of the associated report.

Description

Riparian Acacia Shrub/Grass/Herb Forest is a tall forest up to 30 metres tall, dominated by *Casuarina cunninghamiana*. As it is a widespread vegetation type, it may have variable shrub and ground cover layers. In the South Coast section of the Southern CRA Region, it may contain a tall shrub layer of *Hymenanthera dentata*, *Acacia mearnsii*, and *Acacia floribunda*. The ground cover may be an open to dense cover of grasses such as *Microlaena stipoides*, *Echinopogon ovatus*, *Entolasia marginata*, and *Oplismenus aemulus*, with forbs and graminoids, such as *Carex appressa*, *Carex longebrachiata*, *Dichondra repens*, and *Geranium solanderi* var *solanderi*.

Riparian Acacia Shrub/Grass/Herb Forest is widespread riparian community occurring from near sea level up to 750 metres in elevation. The western patches of this assemblage may contain different ground cover elements and have not been extensively sampled.

Previous Floristic Classifications

The Southern CRA Forest Ecosystems Mapping Project previously classified this community as 'FOREST ECOSYSTEM 53: Riparian Acacia Shrub/Grass/Herb Forest - *Casuarina cunninghamiana*'.

Diagnostic Plant Species

Species		Group cover	Group freq	Non-group cover	Non-group freq	Fidelity class
<i>Microlaena stipoides</i> var <i>stipoides</i>		3	1.000	2	0.269	positive
<i>Hymenanthera dentata</i>		2	0.647	1	0.051	positive
<i>Acacia mearnsii</i>		3	0.588	2	0.058	positive
<i>Casuarina cunninghamiana</i> ssp		4	0.588	3	0.005	positive
<i>Alisma plantago-aquatica</i>		1	0.059	0	0.000	positive
<i>Callitris muelleri</i>		1	0.059	0	0.000	positive
<i>Omalanthus stillingiifolius</i>		1	0.059	0	0.000	positive
<i>Pimelea axiflora</i> ssp <i>alpina</i>		1	0.059	0	0.000	positive
<i>Entolasia marginata</i>		1	0.588	2	0.051	uninformative
<i>Acacia floribunda</i>		3	0.471	1	0.006	uninformative
<i>Carex appressa</i>		1	0.471	1	0.073	uninformative
<i>Carex longibrachiata</i>		2	0.471	2	0.023	uninformative
<i>Echinopogon ovatus</i>		2	0.471	1	0.109	uninformative
<i>Oplismenus aemulus</i>		2	0.471	1	0.018	uninformative
<i>Rumex brownii</i>		1	0.471	1	0.063	uninformative
<i>Dichondra repens</i>		1	0.412	2	0.206	uninformative
<i>Geranium solanderi</i> var <i>solanderi</i>		1	0.412	1	0.131	uninformative
<i>Lomandra longifolia</i>		1	0.412	2	0.417	uninformative
<i>Oplismenus imbecillis</i>		2	0.412	2	0.120	uninformative
<i>Poa labillardieri</i>		1	0.412	2	0.093	uninformative
<i>Stephania japonica</i> var <i>discolor</i>		1	0.353	1	0.048	uninformative
<i>Urtica incisa</i>		2	0.353	2	0.052	uninformative
<i>Acaena novae-zelandiae</i>		1	0.294	1	0.188	uninformative
<i>Adiantum aethiopicum</i>		1	0.294	1	0.052	uninformative
<i>Commelina cyanea</i>		2	0.294	1	0.011	uninformative
<i>Glycine clandestina</i>		1	0.294	1	0.300	uninformative
<i>Pellaea falcata</i> var <i>falcata</i>		1	0.294	2	0.101	uninformative
<i>Pratia purpurascens</i>		2	0.294	1	0.103	uninformative
<i>Pteridium esculentum</i>		1	0.294	2	0.308	uninformative
<i>Senecio linearifolius</i>		1	0.294	1	0.076	uninformative
<i>Alternanthera denticulata</i>		1	0.235	1	0.001	uninformative
<i>Clematis glycinoides</i> var <i>glycinoides</i>		1	0.235	1	0.048	uninformative
<i>Cynodon dactylon</i>		3	0.235	2	0.009	uninformative
<i>Juncus usitatus</i>		1	0.235	1	0.006	uninformative
<i>Melaleuca ericifolia</i>		4	0.235	2	0.006	uninformative
<i>Senecio minimus</i>		1	0.235	1	0.012	uninformative
<i>Sigesbeckia orientalis</i> ssp <i>orientalis</i>		1	0.235	1	0.065	uninformative

Appendix 2 – Rare Fauna Models

PART A

Map Unit	Community	Australasian Bittern	Glossy Black-Cockatoo	Speckled Warbler	Brown Treecreeper	Hooded Robin	Turquoise Parrot	Barking Owl	Powerful Owl
702	Bargo Brush Forest				potential		potential		potential
13	Bindook Porphyry Dry Woodland		potential	potential	potential	potential	potential	potential	potential
12	Bindook Porphyry Moist Woodland			potential	potential				
636	Budawang Ash Mallee Scrub		potential	potential					
2	Bundanoon Sandstone Woodland		potential	potential					potential
11	Burraborang Ironbark Woodland		potential	potential	potential	potential	potential	potential	potential
706	Dry Nattai Escarpment Complex		potential	potential	potential	potential	potential	potential	potential
632	Escarpment Edge Silvertop Ash Forest		potential	potential					potential
629	Exposed Sandstone Scribbly Gum Woodland								
1	Hawkesbury Sandstone Woodland		potential						potential
641	Highlands Sandstone Allocasuarina Heath		potential						
647	Highlands Sandstone Swamp Woodland								
648	Highlands Swamp Gum-Melaleuca Woodland								
18	Joadja Tall Open Forest								potential
4	Mittagong Sandstone Woodland		potential	potential					potential
608	Moist Gully Gum Forest		potential						potential
707	Moist Nattai Escarpment Complex		potential						potential
20	Mt Gibraltar Forest		potential				potential		potential
703	Nattai Sandstone Gully Forest		potential						potential
630	Nepean Enriched Sandstone Woodland		potential						potential
609	Nepean Gorge Moist Forest		potential						potential

Map Unit	Community	Australasian Bittern	Glossy Black-Cockatoo	Speckled Warbler	Brown Treecreeper	Hooded Robin	Turquoise Parrot	Barking Owl	Powerful Owl
627	Nepean Sandstone Gully Forest		potential						potential
9	Riparian Casuarina Forest	potential	potential					potential	
14	Robertson Basalt Rainforest								
16	Robertson Basalt Tall Open Forest								potential
638	Rock Pavement Heath		potential						
639	Rock Plate Heath-Mallee		potential						
604	Sandstone Riparian Scrub	potential							
7	Sandstone Wet Heath/Sedge								
6	Scribbly Gum Open Woodland								
821	Shoalhaven Gorge Moist Shrub Forest								potential
853	Shoalhaven Gorge Riparian Shrub Forest	potential							
15	Shoalhaven Gorge Tall Open Forest								potential
17	Southern Highlands Shale Woodland			potential	potential		potential	potential	potential
8	Swamp	potential							
3	Sydney Sandstone Gully Forest		potential						potential
701	Tall Open Gully Gum Forest				potential				potential
619	Transitional Shale Open Blue Gum Forest		potential		potential		potential		potential
623	Transitional Shale Stringybark Forest		potential		potential		potential		potential
642	Upland Swamps: Banksia Thicket								
645	Upland Swamps: Fringing Eucalypt Woodland								
646	Upland Swamps: Mallee-Heath								
644	Upland Swamps: Sedgeland-Heath Complex								
643	Upland Swamps: Tea Tree Thicket								
635	Upper Georges River Sandstone Woodland		potential						potential
19	Upper Shoalhaven Tall Open Forest								potential

Map Unit	Community	Australasian Bittern	Glossy Black-Cockatoo	Speckled Warbler	Brown Treecreeper	Hooded Robin	Turquoise Parrot	Barking Owl	Powerful Owl
21	Warm Temperate Rainforest								
5	Wingecarribee Mallee		potential						
10	Wingecarribee Woodland		potential	potential	potential		potential	potential	potential
9999	Water	potential							

PART B

Map Unit	Community	Blue-billed Duck	Diamond Firetail	Freckled Duck	Sooty Owl	Regent Honeyeater	Giant Dragonfly	Eastern Pygmy Possum	Spotted-tailed Quoll
702	Bargo Brush Forest		potential			potential		potential	
13	Bindook Porphyry Dry Woodland		potential			potential			
12	Bindook Porphyry Moist Woodland				potential	potential			potential
636	Budawang Ash Mallee Scrub							potential	
2	Bundanoon Sandstone Woodland				potential	potential		potential	potential
11	Burraborang Ironbark Woodland		potential			potential			
706	Dry Nattai Escarpment Complex		potential			potential		potential	potential
632	Escarpment Edge Silvertop Ash Forest							potential	
629	Exposed Sandstone Scribbly Gum Woodland							potential	
1	Hawkesbury Sandstone Woodland							potential	
641	Highlands Sandstone Allocasuarina Heath							potential	
647	Highlands Sandstone Swamp Woodland							potential	
648	Highlands Swamp Gum-Melaleuca Woodland							potential	
18	Joadja Tall Open Forest								potential
4	Mittagong Sandstone Woodland				potential	potential		potential	potential

Map Unit	Community	Blue-billed Duck	Diamond Firetail	Freckled Duck	Sooty Owl	Regent Honeyeater	Giant Dragonfly	Eastern Pygmy Possum	Spotted-tailed Quoll
608	Moist Gully Gum Forest				potential				potential
707	Moist Nattai Escarpment Complex				potential	potential			potential
20	Mt Gibraltar Forest		potential			potential		potential	potential
703	Nattai Sandstone Gully Forest				potential	potential		potential	potential
630	Nepean Enriched Sandstone Woodland							potential	
609	Nepean Gorge Moist Forest				potential	potential		potential	potential
627	Nepean Sandstone Gully Forest				potential	potential		potential	potential
9	Riparian Casuarina Forest								
14	Robertson Basalt Rainforest				potential				
16	Robertson Basalt Tall Open Forest				potential			potential	potential
638	Rock Pavement Heath							potential	
639	Rock Plate Heath-Mallee							potential	
604	Sandstone Riparian Scrub							potential	potential
7	Sandstone Wet Heath/Sedge							potential	
6	Scribbly Gum Open Woodland							potential	
821	Shoalhaven Gorge Moist Shrub Forest				potential				potential
853	Shoalhaven Gorge Riparian Shrub Forest							potential	potential
15	Shoalhaven Gorge Tall Open Forest				potential	potential		potential	potential
17	Southern Highlands Shale Woodland		potential			potential		potential	potential
8	Swamp	potential		potential			potential		
3	Sydney Sandstone Gully Forest				potential			potential	potential
701	Tall Open Gully Gum Forest				potential	potential		potential	potential
619	Transitional Shale Open Blue Gum Forest		potential		potential	potential		potential	potential
623	Transitional Shale Stringybark Forest		potential			potential		potential	potential
642	Upland Swamps: Banksia Thicket							potential	

Map Unit	Community	Blue-billed Duck	Diamond Firetail	Freckled Duck	Sooty Owl	Regent Honeyeater	Giant Dragonfly	Eastern Pygmy Possum	Spotted-tailed Quoll
645	Upland Swamps: Fringing Eucalypt Woodland							potential	
646	Upland Swamps: Mallee-Heath							potential	
644	Upland Swamps: Sedgeland-Heath Complex							potential	
643	Upland Swamps: Tea Tree Thicket							potential	
635	Upper Georges River Sandstone Woodland							potential	
19	Upper Shoalhaven Tall Open Forest				potential	potential		potential	potential
21	Warm Temperate Rainforest				potential				
5	Wingecarribee Mallee							potential	
10	Wingecarribee Woodland		potential			potential		potential	potential
9999	Water	potential		potential					

PART C

Map Unit	Community	Southern Brown Bandicoot	Yellow-bellied Glider	Squirrel Glider	Brush-tailed Rock-wallaby	Koala	Long-nosed Potoroo	Broad-headed Snake	Red-crowned Toadlet
702	Bargo Brush Forest	NOT	potential	potential		potential			
13	Bindook Porphyry Dry Woodland	MODELLED				potential	potential		
12	Bindook Porphyry Moist Woodland		potential			potential	potential		
636	Budawang Ash Mallee Scrub			potential			potential	potential	
2	Bundanoon Sandstone Woodland		potential	potential	potential	potential	potential	potential	potential
11	Burraborang Ironbark Woodland		potential			potential			
706	Dry Nattai Escarpment Complex		potential	potential		potential	potential		
632	Escarpment Edge Silvertop Ash Forest		potential	potential	potential	potential	potential	potential	potential
629	Exposed Sandstone Scribbly Gum Woodland			potential					
1	Hawkesbury Sandstone Woodland		potential	potential	potential	potential	potential	potential	
641	Highlands Sandstone Allocasuarina Heath								
647	Highlands Sandstone Swamp Woodland			potential			potential		potential
648	Highlands Swamp Gum-Melaleuca Woodland			potential			potential		potential
18	Joadja Tall Open Forest		potential						
4	Mittagong Sandstone Woodland		potential	potential	potential	potential	potential	potential	potential
608	Moist Gully Gum Forest		potential	potential		potential	potential		
707	Moist Nattai Escarpment Complex		potential	potential		potential	potential		
20	Mt Gibraltar Forest			potential					
703	Nattai Sandstone Gully Forest		potential	potential	potential	potential	potential		potential
630	Nepean Enriched Sandstone Woodland			potential	potential	potential	potential	potential	potential
609	Nepean Gorge Moist Forest		potential	potential	potential	potential	potential		
627	Nepean Sandstone Gully Forest		potential	potential	potential	potential	potential		potential
9	Riparian Casuarina Forest								

Map Unit	Community	Southern Brown Bandicoot	Yellow-bellied Glider	Squirrel Glider	Brush-tailed Rock-wallaby	Koala	Long-nosed Potoroo	Broad-headed Snake	Red-crowned Toadlet
14	Robertson Basalt Rainforest						potential		
16	Robertson Basalt Tall Open Forest		potential				potential		
638	Rock Pavement Heath				potential			potential	potential
639	Rock Plate Heath-Mallee				potential			potential	potential
604	Sandstone Riparian Scrub			potential			potential		potential
7	Sandstone Wet Heath/Sedge			potential			potential		potential
6	Scribbly Gum Open Woodland			potential					
821	Shoalhaven Gorge Moist Shrub Forest		potential	potential		potential	potential		
853	Shoalhaven Gorge Riparian Shrub Forest			potential			potential		
15	Shoalhaven Gorge Tall Open Forest		potential	potential		potential	potential		
17	Southern Highlands Shale Woodland					potential	potential		
8	Swamp								
3	Sydney Sandstone Gully Forest		potential	potential	potential	potential	potential		potential
701	Tall Open Gully Gum Forest		potential	potential		potential	potential		
619	Transitional Shale Open Blue Gum Forest		potential	potential		potential	potential		
623	Transitional Shale Stringybark Forest		potential	potential		potential	potential		
642	Upland Swamps: Banksia Thicket			potential			potential		potential
645	Upland Swamps: Fringing Eucalypt Woodland			potential			potential		potential
646	Upland Swamps: Mallee-Heath			potential					potential
644	Upland Swamps: Sedgeland-Heath Complex			potential			potential		potential
643	Upland Swamps: Tea Tree Thicket						potential		potential
635	Upper Georges River Sandstone Woodland			potential	potential	potential	potential	potential	potential
19	Upper Shoalhaven Tall Open Forest		potential	potential		potential			
21	Warm Temperate Rainforest						potential		
5	Wingecarribee Mallee			potential	potential			potential	

Map Unit	Community	Southern Brown Bandicoot	Yellow-bellied Glider	Squirrel Glider	Brush-tailed Rock-wallaby	Koala	Long-nosed Potoroo	Broad-headed Snake	Red-crowned Toadlet
10	Wingecarribee Woodland		potential	potential		potential	potential		
9999	Water								

Appendix 3 – Rare Flora Models

PART A

Community	<i>Acacia bynoeana</i>	<i>Baloskion longipes</i>	<i>Boronia deanei</i>	<i>Carex klaphakei</i>	<i>Eucalyptus aquatica</i>	<i>Gentiana wingecarribiensis</i>	<i>Grevillea molyneuxii</i>	<i>Grevillea rivularis</i>	<i>Kunzea cambagei</i>
Bargo Brush Forest									
Bindook Porphyry Dry Woodland									
Bindook Porphyry Moist Woodland									
Budawang Ash Mallee Scrub	potential								
Bundanoon Sandstone Woodland							potential	potential	
Burraborang Ironbark Woodland									
Dry Nattai Escarpment Complex									
Escarpment Edge Silvertop Ash Forest	potential								
Exposed Sandstone Scribbly Gum Woodland	potential								
Hawkesbury Sandstone Woodland	potential								
Highlands Sandstone Allocasuarina Heath	potential								potential
Highlands Sandstone Swamp Woodland		potential	potential	potential					potential
Highlands Swamp Gum-Melaleuca Woodland									potential
Joadja Tall Open Forest									
Mittagong Sandstone Woodland	potential								
Moist Gully Gum Forest									
Moist Nattai Escarpment Complex									
Mt Gibraltar Forest									
Nattai Sandstone Gully Forest									
Nepean Enriched Sandstone Woodland	potential								
Nepean Gorge Moist Forest									

Community	<i>Acacia bynoeana</i>	<i>Baloskion longipes</i>	<i>Boronia deanei</i>	<i>Carex klaphakei</i>	<i>Eucalyptus aquatica</i>	<i>Gentiana wingecarribiensis</i>	<i>Grevillea molyneuxii</i>	<i>Grevillea rivularis</i>	<i>Kunzea cambagei</i>
Nepean Sandstone Gully Forest									
Riparian Casuarina Forest									
Robertson Basalt Rainforest									
Robertson Basalt Tall Open Forest									
Rock Pavement Heath	potential								potential
Rock Plate Heath-Mallee	potential								potential
Sandstone Riparian Scrub									
Sandstone Wet Heath/Sedge		potential	potential	potential	potential	potential			potential
Scribbly Gum Open Woodland									
Shoalhaven Gorge Moist Shrub Forest									
Shoalhaven Gorge Riparian Shrub Forest									
Shoalhaven Gorge Tall Open Forest									
Southern Highlands Shale Woodland									
Swamp		potential	potential	potential	potential	potential			
Sydney Sandstone Gully Forest									
Tall Open Gully Gum Forest									
Transitional Shale Open Blue Gum Forest									
Transitional Shale Stringybark Forest									
Upland Swamps: Banksia Thicket									potential
Upland Swamps: Fringing Eucalypt Woodland									potential
Upland Swamps: Mallee-Heath	potential								potential
Upland Swamps: Sedgeland-Heath Complex	potential	potential	potential	potential					potential
Upland Swamps: Tea Tree Thicket		potential	potential	potential					potential
Upper Georges River Sandstone Woodland	potential								
Upper Shoalhaven Tall Open Forest									

Community	<i>Acacia bynoeana</i>	<i>Baloskion longipes</i>	<i>Boronia deanei</i>	<i>Carex klaphakei</i>	<i>Eucalyptus aquatica</i>	<i>Gentiana wingecarribiensis</i>	<i>Grevillea molyneuxii</i>	<i>Grevillea rivularis</i>	<i>Kunzea cambagei</i>
Warm Temperate Rainforest									
Wingecarribee Mallee									
Wingecarribee Woodland	potential								
Water									

PART B

Community	<i>Persoonia acerosa</i>	<i>Persoonia bargoensis</i>	<i>Persoonia glaucescens</i>	<i>Persoonia hirsuta</i>	<i>Phyllota humifusa</i>	<i>Pomaderris cotoneaster</i>	<i>Pomaderris sericea</i>	<i>Prasophyllum uroglossum</i>	<i>Pterostylis pulchella</i>
Bargo Brush Forest									
Bindook Porphyry Dry Woodland									
Bindook Porphyry Moist Woodland									
Budawang Ash Mallee Scrub									
Bundanoon Sandstone Woodland						potential			potential
Burraborang Ironbark Woodland									
Dry Nattai Escarpment Complex									
Escarpment Edge Silvertop Ash Forest	potential								
Exposed Sandstone Scribbly Gum Woodland	potential	potential	potential	potential					
Hawkesbury Sandstone Woodland	potential	potential	potential	potential					
Highlands Sandstone Allocasuarina Heath	potential								
Highlands Sandstone Swamp Woodland								potential	

Community	<i>Persoonia acerosa</i>	<i>Persoonia bargoensis</i>	<i>Persoonia glaucescens</i>	<i>Persoonia hirsuta</i>	<i>Phyllota humifusa</i>	<i>Pomaderris cotoneaster</i>	<i>Pomaderris sericea</i>	<i>Prasophyllum uroglossum</i>	<i>Pterostylis pulchella</i>
Highlands Swamp Gum-Melaleuca Woodland									
Joadja Tall Open Forest									
Mittagong Sandstone Woodland	potential	potential	potential	potential					
Moist Gully Gum Forest									
Moist Nattai Escarpment Complex									
Mt Gibraltar Forest									
Nattai Sandstone Gully Forest									
Nepean Enriched Sandstone Woodland	potential			potential					
Nepean Gorge Moist Forest									
Nepean Sandstone Gully Forest									
Riparian Casuarina Forest									
Robertson Basalt Rainforest									
Robertson Basalt Tall Open Forest									
Rock Pavement Heath	potential								
Rock Plate Heath-Mallee	potential								
Sandstone Riparian Scrub									
Sandstone Wet Heath/Sedge					potential			potential	potential
Scribbly Gum Open Woodland									
Shoalhaven Gorge Moist Shrub Forest							potential		
Shoalhaven Gorge Riparian Shrub Forest									
Shoalhaven Gorge Tall Open Forest							potential		
Southern Highlands Shale Woodland									
Swamp								potential	
Sydney Sandstone Gully Forest									

Community	<i>Persoonia acerosa</i>	<i>Persoonia bargoensis</i>	<i>Persoonia glaucescens</i>	<i>Persoonia hirsuta</i>	<i>Phyllota humifusa</i>	<i>Pomaderris cotoneaster</i>	<i>Pomaderris sericea</i>	<i>Prasophyllum uroglossum</i>	<i>Pterostylis pulchella</i>
Tall Open Gully Gum Forest									
Transitional Shale Open Blue Gum Forest									
Transitional Shale Stringybark Forest									
Upland Swamps: Banksia Thicket					potential				
Upland Swamps: Fringing Eucalypt Woodland					potential				
Upland Swamps: Mallee-Heath					potential				
Upland Swamps: Sedgeland-Heath Complex					potential			potential	
Upland Swamps: Tea Tree Thicket					potential			potential	
Upper Georges River Sandstone Woodland	potential	potential	potential	potential					
Upper Shoalhaven Tall Open Forest									
Warm Temperate Rainforest									
Wingecarribee Mallee									
Wingecarribee Woodland	potential		potential						
Water									

PART C

Community	<i>Zieria murphyi</i>	<i>Rulingia prostrata</i>	<i>Pomaderris brunea</i>	<i>Persicaria elatio</i>	<i>Telopea mongaensis</i>	<i>Prostanthera rugosa</i>	<i>Lysimachia vulgaris</i>	<i>Pultenea parrisiae</i>
Bargo Brush Forest								
Bindook Porphyry Dry Woodland								
Bindook Porphyry Moist Woodland								
Budawang Ash Mallee Scrub								
Bundanoon Sandstone Woodland	potential				potential			
Burraborang Ironbark Woodland								
Dry Nattai Escarpment Complex								
Escarpment Edge Silvertop Ash Forest								
Exposed Sandstone Scribbly Gum Woodland			potential					
Hawkesbury Sandstone Woodland			potential					
Highlands Sandstone Allocasuarina Heath								
Highlands Sandstone Swamp Woodland		potential		potential				
Highlands Swamp Gum-Melaleuca Woodland				potential				
Joadja Tall Open Forest						potential		
Mittagong Sandstone Woodland			potential			potential		
Moist Gully Gum Forest				potential				
Moist Nattai Escarpment Complex								
Mt Gibraltar Forest								
Nattai Sandstone Gully Forest								
Nepean Enriched Sandstone Woodland								
Nepean Gorge Moist Forest				potential				
Nepean Sandstone Gully Forest				potential				

Community	<i>Zieria murphyi</i>	<i>Rulingia prostrata</i>	<i>Pomaderris brunea</i>	<i>Persicaria elatior</i>	<i>Telopea mongaensis</i>	<i>Prostanthera rugosa</i>	<i>Lysimachia vulgaris</i>	<i>Pultenea parrisiae</i>
Riparian Casuarina Forest								
Robertson Basalt Rainforest								
Robertson Basalt Tall Open Forest								
Rock Pavement Heath								
Rock Plate Heath-Mallee								
Sandstone Riparian Scrub				potential				
Sandstone Wet Heath/Sedge	potential	potential					potential	potential
Scribbly Gum Open Woodland								
Shoalhaven Gorge Moist Shrub Forest								
Shoalhaven Gorge Riparian Shrub Forest								
Shoalhaven Gorge Tall Open Forest								
Southern Highlands Shale Woodland								
Swamp		potential					potential	potential
Sydney Sandstone Gully Forest								
Tall Open Gully Gum Forest								
Transitional Shale Open Blue Gum Forest								
Transitional Shale Stringybark Forest								
Upland Swamps: Banksia Thicket				potential				
Upland Swamps: Fringing Eucalypt Woodland				potential				
Upland Swamps: Mallee-Heath				potential				
Upland Swamps: Sedgeland-Heath Complex		potential		potential				
Upland Swamps: Tea Tree Thicket		potential		potential				
Upper Georges River Sandstone Woodland			potential					
Upper Shoalhaven Tall Open Forest								
Warm Temperate Rainforest								

Community	<i>Zieria murphyi</i>	<i>Rulingia prostrata</i>	<i>Pomaderris brunea</i>	<i>Persicaria elatior</i>	<i>Telopea mongaensis</i>	<i>Prostanthera rugosa</i>	<i>Lysimachia vulgaris</i>	<i>Pultenea parrisiae</i>
Wingecaribee Mallee								
Wingecaribee Woodland						potential		
Water								