The Native Vegetation of Yengo and Parr Reserves and Surrounds

Department of **Environment & Climate Change** NSW

THE NATIVE VEGETATION OF YENGO AND PARR RESERVES AND SURROUNDS

ACKNOWLEDGEMENTS

For enquiries regarding this report please contact the Manager, Information and Assessment Section, Metropolitan Branch, Environment Protection and Regulation Group, Department of Environment and Climate Change, Hurstville.

This report should be referenced as follows:

DECC (2008) *The Native Vegetation of Yengo Yengo and Parr Reserves and Surrounds.* Department of Environment and Climate Change NSW, Hurstville.

Thankyou to:

The numerous landowners neighbouring the park who provided access through their properties and local knowledge, including John Tullock, Rod Wallace, Jack Broadbent, Jim Donavan, Ross Darby, Merv Payne, P. Trenchev, June McQueen, Dale Segut, Ryan and Leanne Lambert, Tony Harvey, Lawson Stein, Jan Scott and Noeline Smith.

Published by:
Department of Environment and Climate Change
43 Bridge St, Hurstville NSW 2220
PO Box 1967, Hurstville NSW 1482
Phone (02) 995 5000 (switchboard)
www.environment.nsw.gov.au

ISBN: 978 1 74122 596 9

DECC: 2008/183

July 2008

This project was funded by the Central Branch, Parks and Wildlife Group, Biodiversity Survey Priorities Program

EXECUTIVE SUMMARY

This report describes the distribution and composition of the native vegetation of Yengo National Park, Parr State Conservation Area, Comleroy State Forest and adjoining private lands and inholdings. The project offers a revision of the vegetation classification and mapping studies completed by Sanders *et al.* (1988) and Bell *et al.* (1993). Since these previous efforts there has been a greater demand placed on vegetation maps to delineate the distribution of Endangered Ecological Communities (EECs) and threatened species habitats, as well as describe the condition of the vegetation within the reserve system to aid reserve management and regional conservation planning.

The completion of a new digital multi-attribute vegetation map for the study area is part of an incremental approach to achieving consistent flora and fauna information for all reserves in the Central Branch of the Parks and Wildlife Group under the Biodiversity Survey Priorities (BSP) program. In particular it is a step towards providing key natural resource data for management of the Blue Mountains World Heritage Area. In all, data from 124 new floristic sites was collected, providing a total of 441 sites across the reserves and adjoining lands. Over 1000 plant species are recognised from site data of which eighteen are listed as threatened under the *NSW Threatened Species Conservation Act (TSC Act), 1995*. Ten of these threatened species are also recognised nationally under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*. (*EPBC Act*). Maps describing the distribution of vegetation communities and disturbance patterns were generated by interpretation of recent 1:25 000 aerial photography and extensive field traverse.

The study area is situated within a large rainshadow zone between the coastal escarpment and the Blue Mountains-Wollemi ranges. Patterns in the local distribution of vegetation communities are heavily influenced by soil type and aspect. However within a broader regional and statewide context the vegetation composition relates more directly to the pervading dry and warm climate and infertile sandstone sediments that dominate the landscape.

The native vegetation communities present in the study area conform to several broad statewide vegetation classes described by Keith (2004) as follows:

- Sydney Hinterland Dry Sclerophyll Forests extend across the infertile sandstone plateaux. There are nine Map Units that fall into this class, offering a high diversity of shrubby forests and woodlands.
- Taller forests associated with sandstone gullies have only a low diversity and cover of mesic species and are very dry representations of the North Coast Wet Sclerophyll Forests. However it is in these forests that there are extensive stands of two rare eucalypts, the Hillgrove Gum (*Eucalyptus michealiana*) and a box eucalypt (*E. hypostomatica*).
- Small areas of depauperate Northern Warm Temperate Rainforests are found on sandstone in very deep gullies. Residual basalt peaks of Mount Yengo and Mount Wareng include small areas of Dry rainforest with Stinging Tree (*Dendrocnide excelsa*).
- Coastal Valley Grassy Woodlands are found on small areas of richer soils associated with residual shale caps, basalt flows and riverflats. These communities all are typified by the indicators of past and current disturbance associated with agricultural land use. Most stands exist in highly modified states and Map Units that fall within this vegetation class are mostly recognised as Endangered Ecological Communities (EECs) under the *NSW TSC Act, 1995*.
- Also in the riverflat environments there are examples of Coastal Floodplain Wetlands, Coastal Freshwater Wetlands Coastal Swamp Forests and Eastern Riverine Forests, all recognised as EECs under the *NSW TSC Act, 1995*.
- The study area encompasses the eastern half of the Mellong Plateau an area of unusual perched sand deposits. These support unique shrubby open woodlands and are recognised with their own statewide vegetation class, Sydney Sand Flats Dry Sclerophyll Forests.
- Small areas of Western Slopes Dry Sclerophyll Forests are present on the footslopes of the Hunter escarpment.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

1 INTRODUCTION

1.1 BACKGROUND

The Central Branch Parks and Wildlife Group (PWG) of the NSW Department of Environment and Climate Change [DECC, formerly NSW National Parks and Wildlife Service (NPWS)] has established a Biodiversity Survey Priorities (BSP) program for DECC managed estate within the Branch. This program recognises that information which documents biodiversity values held within reserves is fundamental to successful reserve management and to generating an improved understanding of the contribution reserves make to the protection of vegetation communities, plant and animal populations and their habitats. Currently there is only sparse and incomplete documentation of the role reserves play in ensuring the viability of vegetation communities and flora and fauna species across large regions and local areas.

It is an ironic situation that many of the largest reserves, which potentially contribute the most to biodiversity conservation, are also the most poorly understood and most deficient in data quality and quantity. The BSP program goes some way towards addressing this information shortfall by surveying the most poorly known reserves first and combining this work with larger regional conservation assessment projects.

The inscription on the world heritage register of the Greater Blue Mountains Area has reinforced the need for comprehensive and consistent information that describes the composition and distribution of vegetation communities. Such knowledge is essential for management of issues such as fire, weeds, pests, threatened species and Endangered Ecological Communities (EECs).

The purpose of this project is to improve the scale and accuracy of currently available vegetation mapping within Yengo National Park (NP) and Parr State Conservation Area (SCA). The aim is to provide a suitable resource to meet the demands of multiple uses including fire management, the identification of EECs, flora and fauna species habitat mapping, cultural heritage studies, pest and weed management and land acquisitions, as well as supporting community education and neighbour relations programs.

1.2 PROJECT AIMS

This project aims to:

- Review the vegetation classification system developed by Sanders *et al.* (1988) and Bell *et al.* (1993) that currently describe the composition and distribution of vegetation communities within the study area;
- Carry out multi-attribute aerial photo interpretation (API) mapping using 1:25 000 scale aerial photography flown in 2001.
- Carry out field sampling of environments based on new API mapping and any new vegetation assemblages identified during field traverses or from survey gaps and limitations identified in the reports of Sanders *et al.* (1988) and Bell *et al.* (1993).
- Describe the floristic composition of the defined vegetation communities and their distribution within the study area.
- Relate the vegetation communities found in the study area to those defined at a regional scale (NPWS 2000) and statewide (Keith 2004).
- Identify and map EECs listed under the *NSW Threatened Species Conservation Act 1995 (NSW TSC Act,1995)*

1.3 STUDY AREA

1.3.1 Location

The Yengo and Parr reserves cover an extensive area of dissected sandstone plateaux between the Hawkesbury River and the Hunter Valley. Parr State Conservation Area is situated less than 50 kilometres north west of Sydney, while the northern boundary of Yengo NP lies 20 kilometres south of Singleton. These reserves, and the adjoining private lands east of the Putty Road and north of the Hawkesbury River, form a study area of over 240 000 hectares.

The study area overlies a major watershed known as the Hunter Range, demarcating north flowing creeks that run toward the Hunter River and south flowing creeks that drain into the Hawkesbury-Nepean catchment. Rugged sandstone topography dominates the landscape with a network of hills, narrow gully and ridge systems and rock outcropping. These are interspersed with alluvial riverflats along the Macdonald, Hawkesbury and Wollombi Rivers. The extensive Mellong sandmass is found along the western boundary of the study area, and is bisected by the Putty Road.

Conservation forms the primary landuse of the study area. Both Yengo NP and Parr SCA were dedicated in 1989 and cover 172 000 and 35 641 hectares respectively. Yengo NP forms part of the Greater Blue Mountains World Heritage Area inscribed by the International Union of Conservation of Nature and Natural Resources in 2000. Yengo NP, Parr State Conservation Area (SCA) and other nearby areas of crown, lease and freehold land were also nominated as a wilderness area under the Wilderness Act (1987). An assessment carried out under the Act identified an area of 105 400 hectares as meeting wilderness criteria (NPWS 2001). However, no declaration has yet been made.

Outside of the reserves, the private lands along the fertile alluvial plains support a variety of agricultural activities such as grazing, orchards, plantations and turf farming. Small hobby farms are also characteristic of the land uses along the western and eastern boundaries of the study area.

1.3.2 Biogeography

Yengo and Parr reserves lie within the Sydney Basin Bioregion (Thackway and Cresswell 1995). This Bioregion delineates the landscapes of the sandstone plateaux between Batemans Bay in the south and the Hunter Valley in the north. It is characterised by a temperate climate with warm summers and no dry season. Approximately 40 percent of this Bioregion is reserved for conservation, largely as National Parks and Nature Reserves (NPWS 2003b).

1.3.3 Geology and geomorphology

The geology of the study area is characterised by sedimentary rock stratum of different ages. The oldest rocks are those associated with the Permian sediments of the Hunter Valley. These are only exposed around the northern rim of the study area underneath the cliffs of the Hunter Escarpment. The Permian sediments are primarily combinations of sandstones, shales and siltstones of the Wollombi Coal Measures (Rasmus, Rose and Rose 1969).

Above the Permian sediments are two sedimentary strata of Triassic Age. The older of the two, the Narrabeen series, consists of quartz-lithic sandstones interbedded with siltstone and claystone (McInnes 1997). The Narrabeen series geology dominates the northern third of the study area and contracts to the dissected gullies in the south. This series is highly variable in the field (Sanders *et al.* 1988) particularly where large bands of shale occur. These authors contend that different erodability of the sandstone and shale parent material results in shale benches exposed below residual rocky sandstone ridgelines or cliffs. The varying combinations of shale and sandstone influence the resultant soil properties within the Narrabeen series.

Overlying the Narrabeen series are thick strata of Hawkesbury Sandstone. This geological unit is widespread across the central and southern parts of the study area and is thickest near the Hawkesbury River. These coarse-grained quartz sandstones include some minor shale lenses, but are less frequent and usually much thinner than those associated with the Narrabeen series (Sanders *et al.* 1988). As a result the overall fertility of the siliceous soils derived from Hawkesbury Sandstone is likely to be lower than other sedimentary soils found in the study area (McInnes 1997).

Above the Hawkesbury Sandstone, a residual capping of Mittagong Formation sediments occur along the Putty Road near Colo Heights and along Wheelbarrow Ridge in the south-east of the study area. These form thin layers of fine-grained iron rich sandstone and lenses of dark shale (McInnes 1997). The derived sandstone soils are slightly enriched by the eroded clay material. Herbert and Helby (1980) suggest that the sandstones are similar to the underlying Hawkesbury strata though finer in texture. Our field experience indicates that this stratum is poorly mapped in the study area, often because the size of residual capping is too small to be delineated at the scale of available soil and geology mapping. Ashfield Shales from the Wianamatta Group are found in close proximity to the Mittagong Formation sometimes as residual caps above it. They comprise a dark grey to black claystone-siltstone and laminite (Herbert and Helby, 1980) weathering to a moderately fertile soil suitable for agriculture. Colo Heights and Wheelbarrow Ridge are the largest of the caps found in the study area.

Tertiary aged volcanic rocks are present in the study area, though patches are only small in size. These rocks are associated with diatremes or volcanic plugs. The most prominent of these extrusions are the twin peaks of Mount Wareng and Mount Yengo. Diatremes, otherwise known as craters or 'holes' by early explorers, are sporadically distributed in the south-west of the study area. Terraborra Craters and Devils Hole are two such examples. These diatremes are comprised of breccia, a mixture of igneous and sandstone rocks. Early settlers made use of the palatable grasses that grow on the richer soils derived from these volcanic rocks. Many diatremes today are denuded of their orginal vegetation cover due to these past agricultural ventures.

Quaternary Alluvium occupies two situations in the study area. The first occurs along floodplains and river flats along the Macdonald, Hawkesbury and Wollombi Rivers. These comprise a mix of unconsolidated sands, silts, clays and gravel (McInnes 1997). Similar erosional landscapes occur around the headwaters of many minor gullies throughout the sandstone plateaux. Downslope movement of sandy or shale material provides a deep infill in the low gradients of creek headwaters. These are either colluvial or alluvial in origin and have not been previously mapped in available soil or geological mapping.

The Mellong Range area, Garland Valley and Howes Swamps form other alluvial deposits however these are associated with the unusual upland plateau of the Mellong Range. These deposits form flat wide valley floors that are occasionally poorly drained (McInnes 1997). The alluvial material is sandy derived from the surrounding sandstone ranges and may reach up to 10 metres in depth (Henry, 1988).

1.3.4 Elevation

The study area occupies elevations that extend from sea level along the lower Macdonald River to a high point of 594 metres above sea level (asl) at the peak of Mount Yengo. Elevation climbs rapidly from the Hawkesbury River to around 250 metres after which a gradual tilt in the underlying sandstone stratum sees the northern end of Yengo NP conistently reach elevations above 400 metres asl.

1.3.5 Climate

The climate of Yengo and Parr reserves is typical of the Sydney Basin hinterlands situated at moderate to low elevations. Warm average annual temperatures with warm to hot summers and cool winters are common. Temperatures are hottest on the escarpment and footslopes that line the Hunter Valley, while south-eastern areas are tempered by a coastal influence. Mean annual temperatures range from 15ºC on the higher plateaux to 17.5ºC on the Macdonald and Wollombi Rivers.

Rainfall patterns illustrate greater variation across the study area than temperature. Orographic effects (elevation) and distance from the coast are the most likely source of these variations. In the north-eastern and northern escarpment of Yengo NP mean annual rainfall is at its lowest, at just 650 millimetres per year at Broke (Bureau of Meteorology 2001). In the centre of Yengo NP at Big Yango Station rainfall reaches 826 millimetres per year before falling again in the Howes Valley to 737 millimetres (Sanders *et al.* 1988). Average annual rainfall is highest at Colo Heights and Kulnura North where it reaches around 1000 millimetres (NPWS, 2001).

1.3.6 Tenure and Land Use

The study area covers 242 909 hectares of which 201 000 hectares (83%) comprises the Yengo and Parr Reserves currently managed by the DECC Hunter Range Area at Bulga and the Yango Area at Gosford. The remainder covers around 40 500 hectares comprising Comleroy State Forest, privately owned or managed leasehold lands that are either inholdings, or are found on the northern, eastern or western boundaries of the reserve.

The study area covers a region with a long history of Aboriginal land use. The Macdonald River area including Wollombi and Putty formed part of a territory associated with the Darkinjung people. The northern escarpment of Yengo NP was included within the greater Hunter Valley territories of the Wonnarua people (NPWS 2001). Mount Yengo continues to be recognised as a site of ethnographic and cultural significance to Aboriginal society (NPWS 2001). It is believed that some of the evidence of Aboriginal occupation including rock art sites, engravings and tools relate to the importance of Mount Yengo. Burragurra and Finchley are two such sites found in the east of Yengo NP.

Aboriginal use of the natural resources of the study area are not well understood although some references are made by early explorers to Aboriginal burning practices (Parr, 1817 in Macqueen, 2004). It is highly likely that, like other parts of the Sydney Basin, the well-watered and fertile environments

would have been extensively used, with the remote and rugged environments providing sites of spiritual and cultural significance and temporal resources.

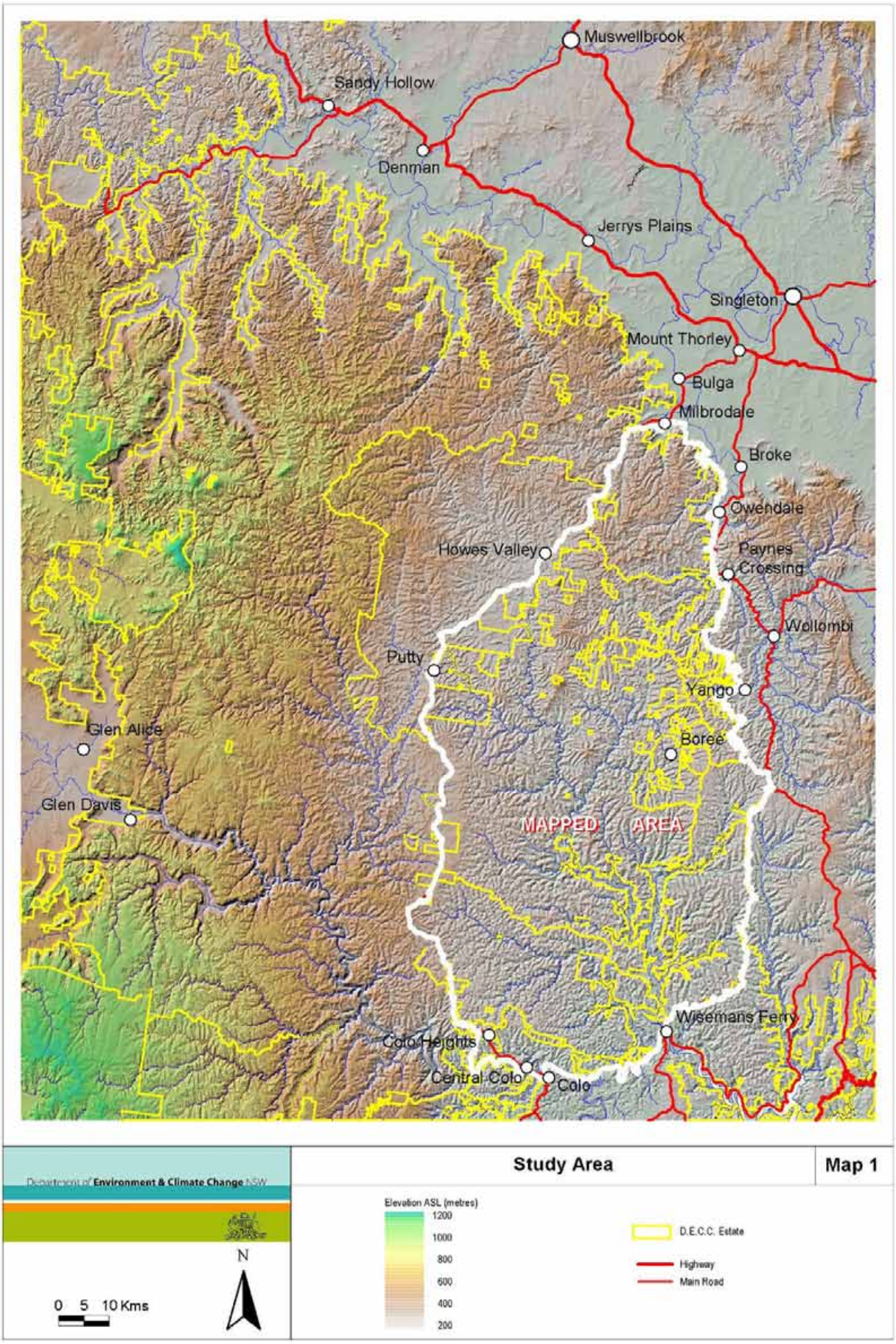
European settlement established quickly in the early 1800s due to the proximity of the area to Sydney. Early exploration identified the suitability of the alluvial valleys of Webbs Creek and the Macdonald and Wollombi Rivers. Strom (1981) suggests that settlement most likely began at Webbs Creek around 1800. Away from the alluvial flats the land was quickly recognised as sterile (Strom, 1981) with land holdings running up the Macdonald River until the flats petered out. The rapid development of the Hunter Valley produced demands by the landed gentry for a land crossing between Sydney and Newcastle to overcome the dependency on sea transport. Between 1810 and 1830 explorers such as Parr, Howe, Morriset, Blaxland and Finch traversed routes across the study area in search of an easy passage to the Hunter Valley. Some of these remain today including the Putty Road in the west, the Great North Road and the Wollombi Road. Access opened up areas for grazing at Colo Heights, the Putty Valley, Boree and Wollombi Valley as well as rough grazing near watered sites in the diatremes and flats of the sandstone plateau itself. Agricultural endeavours are still in practice in these areas today. Evidence of past landuses on marginal lands is still present across the Yengo and Parr reserves. While much of it remains localised to small diatremes and alluvial flats, it remains a testament to how far and remote early settlers were prepared to search for suitable lands.

Timber getting took hold in the area after the 1950s (NPWS 2001). Until then, selective logging had supplied landowners with timber for housing, fencing and firewood. Mechanised harvesting techniques targeted Ironbarks, Blue Gums, Turpentine, Stringybarks, Blackbutt and Cabbage Gum and fed sawmills located in Colo Heights, Putty and Muswellbrook. With the declaration of the Yengo and Parr reserves in 1989 logging ceased. However, evidence of logging remains today where regrowth stands of Blue Gum (*Eucalyptus saligna),* Ironbark (*E. crebra)* and Blackbutt (*E. pilularis)* mark gullies and sheltered slopes accessible from logging trails off the Putty Road.

Other localised landuses in the study area include mining of volcanic rock for ‘blue-metal’ at Pierces Quarry and sand mining at the Mellong Swamps near the western boundary of the study area. Bushrock collecting appears to have been an intensive practice along some of the ridges of the western portions of the study area (NPWS 2001).

1.4 PROJECT TEAM

This project and report was completed by the Biodiversity Survey and Data Group within the Information and Assessment Section, Metropolitan Branch, Environment Protection and Regulation. The project was managed and completed by Daniel Connolly and Elizabeth Magarey with contract assistance from Bob Wilson (Aerial Photograph Interpretation) and Stephen Bell (Botanical Survey). GIS and mapping tasks were completed by Bob Wilson and Kylie Madden and additional field assistance was provided by Joshua Madden. Kerry Oakes undertook document formatting and CD design.



Map 1: Study Area

2 METHODS

2.1 REVIEW OF EXISTING INFORMATION

Some fascinating early descriptions of the native vegetation of the study area are revealed in the surveying notes of Parr and Howe who traversed what is now Putty Road between 1817 and 1820 (Macqueen 2004). These descriptions, and those of the early botanical explorer Allan Cunningham in 1825, offer a rare view of the landscape at the time of early settlement. While the well-grassed areas of the Putty and Howes Valleys offered some possibilities for settlement, the rugged terrain of the sandstone plateau held little interest for agricultural pursuits and offered no exploitable mineral resources. There appears to have been little additional commentary on the native vegetation of the plateau itself until the early 1980s when Howard (1981), Benson (1982), and Doherty (1985) documented the sandy swamps of the Mellong Range and Garland Valley.

Sanders *et al*. (1988) was the first to document the floristic values of the sandstone plateau using systematic sampling techniques and a numerically based approach to the classification of the vegetation. This study afforded a unique insight into the relationships between vegetation composition and key environmental variables. Vegetation communities were described in detail using 102 sample sites and were accompanied by aerial photograph interpretation of major vegetation formations using 1984 1:50 000 black and white aerial photography. This study area focused on Yengo NP south of Howes Trail.

Bell *et al.* (1993) extended the systematic collection of field data work into northern Yengo NP. This provided the first numerically based vegetation classification for Yengo NP in its entirety. The derived vegetation communities were mapped using GIS based on associations between sample sites and elevation, mapped 1:25 000 geological features, satellite imagery and aspect. The purpose of this map was to classifiy and map communities to assist in understanding fire behaviour across the sandstone plateau.

Smaller scale 1:100 000 mapping was carried out by Ryan *et al.* (1995) for the St Albans 1:100 000 Map Sheet, which covers the southern half of Yengo NP and Parr SCA. This mapping relied on the classification of Bell e*t al.* (1993) for the area covered by the reserve and was mapped using 1:50 000 aerial photographs and satellite imagery. Since then small areas of Yengo NP were included within vegetation classification and mapping projects for the CRA/RFA process (NPWS 1998) and the Lower Hunter and Central Coast Regional Environment Strategy (NPWS 2000). Additions to Yengo NP near Little Darkey Creek (the MacTaggart lands) have also been recently surveyed (Peake and Hill 2003).

2.2 EXISTING SITE DATA

Existing vegetation survey data and mapping has been compiled for all of Yengo NP and Parr SCA and adjoining lands in order to provide a complete overview of the reserve. Table 2.1 provides an overview of the studies of relevance to this project and the number of survey sites utilised from each.

Table 2.1: Existing survey data in the study area

Survey Area	Sites Utilised	Survey Method	Source
Southern Yengo NP and Parr SCA	143	20X20 quadrat; 1-6 Braun-blanquet	Sanders *et al*. (1988)
North Yengo	92	20 X 20 quadrat; 1-6 Braun-Blanquet	Bell *et al.* (1993)
Hunter Region in the Lower North East CRA/RFA program	12	20 X 20 quadrat; 1-6 Braun-Blanquet	NPWS (1998)
MacTaggart Addition, Little Darkey Creek	11	20 X 20 quadrat; 1-6 Braun-Blanquet	Peake and Hill (2003)
Hunter Valley Remnant Vegetation Study	3	20 X 20 quadrat; 1-6 Braun-Blanquet	Peake (2006)
Wollemi National Park and Surrounds	9	20 X 20 quadrat; 1-6 Braun-Blanquet	NPWS (various)
State Forests Morriset Management Area	5	20 X 50 quadrat; 1-6 Braun-Blanquet	Binns (1996)

Other florisitic data outside the study area was gathered in order to examine the relationships between the vegetation communities found in the study area to other sandstone environments in the Sydney Basin Bioregion. Only data that had been classified using similar numerical analysis and mapping techniques were included. Table 2.2 cites the primary vegetation data sets from which this data has been drawn as well as the accompanying vegetation mapping report.

Table 2.2: Survey data and reports sourced for regional analysis

Survey Area	Sites Utilised	Survey Method	Source
Wollemi National Park	358	20X20 quadrat; 1-6 Braun-Blanquet	Bell (1998)
Warragamba Special Area	984	20 X 20 quadrat; 1-6 Braun-Blanquet	NPWS (2003b)
Lower Hunter and Central Coast	1142	20 X 20 quadrat; 1-6 Braun-Blanquet	NPWS (2000)
Nattai National Park and Bargo State Conservation Area	364	20 X 20 quadrat; 1-6 Braun-Blanquet	NPWS (2004)
Erskine, Woodford Ranges and Narrowneck Peninsula	240	20 X 20 quadrat; 1-7 Braun-Blanquet	DEC (2006 draft)
Woronora, O'Hares Creek and Metropolitan Special Areas	576	20 X 20 quadrat; 1-6 Braun-Blanquet	NPWS (2003a)
Western Blue Mountains	1257	20 X 20 quadrat; 1-6 Braun-Blanquet	DEC(2005)

2.3 AERIAL PHOTO INTERPRETATION

2.3.1 Objectives

Extensive Aerial Photo Interpretation (API) was required to generate a map showing the distribution of landcover elements across the full spatial extent of the study area. An experienced aerial photograph interpreter was used to stereoscopically map the variation in photo pattern. These patterns were related to vegetation, geological and topographical features that were observed and callibrated during extensive field traverses. Both field work and interpretation occur simultaneously, with the interpreter annotating aerial photographs during field traverses.

The API component of this project had several objectives, as follows:

- To quantify the extent of native vegetation cover across the study area.
- To guide and inform the mapping of vegetation communities derived from field data.
- To provide an index of relative vegetation condition for all native vegetation cover.

2.3.2 Area mapped and photography used

A single interpreter completed air photo interpretation of the study area using 1:25 000 scale aerial photos. Table 2.3 shows the date and coverage of aerial photographs used.

2.3.3 Aerial photo interpretation and landcover classification

API of landcover elements essentially involved categorising the variability in the landcover continuum according to a set of prescribed but open-ended criteria.

An API stratification of all landcover within the study area was undertaken by applying the following attribute classes to each polygon. (Each are described in greater detail in the text that follows).

- Feature Code
- Crown Cover
- Visible Rock
- API Confidence
- Understorey Characteristics
- Disturbance Severity and Type of Disturbance

To ensure consistency in the interpretation of features across the study area, interpretation was tied to explicit mapping thresholds within each of the above themes. Figure 2.2 illustrates the mapping pathway. The prescribed minimum patch size for mapping was one hectare. However, smaller patch sizes were mapped at the interpreter's discretion. Small areas considered significant enough to map included rock outcrops, rainforest patches, sedgeland and heathland.

Table 2.3: Aerial photography interpreted

Map Sheet	Run	Prints	Date
Cessnock	7	94-95	24/08/1994
Cessnock	8	11-13	24/08/1994
Cessnock	9	67-69	24/08/1994
Cessnock	10	61-64	24/08/1994
Cessnock	11	18-20	24/08/1994
Cessnock	12	109-111	24/08/1994
Cessnock	13	67-71	24/08/1994
Gosford	1	228-231	23/10/2001
Gosford	2	03-06	23/10/2001
Gosford	3	58-63	23/10/2001
Gosford	4	68-73	23/10/2001
Gosford	5	03-07	29/10/2001
Gosford	6	55-60	29/10/2001
Gosford	7	62-67	29/10/2001
Gosford	8	12-16	29/10/2001
Gosford	9	70-74	18/03/2002
Gosford	10	27-28	18/03/2002
Howes Valley	6	55-57	01/02/1993
Howes Valley	7	3-7	27/11/1992
Howes Valley	8	49-54	27/11/1992
Howes Valley	9	95-99	20/10/1992
Howes Valley	10	82-88	20/10/1992
Howes Valley	11	32-40	20/10/1992
Howes Valley	12	45-53	20/10/1992
Howes Valley	13	75-79	20/10/1992
Howes Valley	13	229-221	03/10/2004
St Albans	1	52-67	13/12/2002
St Albans	2	35-49	13/12/2003
St Albans	3	02-16	13/12/2003
St Albans	4	38-53	13/12/2003
St Albans	5	38-52	13/12/2003
St Albans	6	69-56	13/12/2003
St Albans	7	86-101	13/12/2003
St Albans	8	107-119	13/12/2003
St Albans	9	38-51	13/12/2003
St Albans	10	57-68	13/12/2003
St Albans	11	190-200	13/12/2003

2.3.4 API feature code

A primary requirement of the API was to map homogenous patterns in the vegetation species composition, structure and substrate. The conventional process of delineating such areas by drawing a line of best fit between areas that are typically occupied by a species or group of species has the effect of categorising the variability of the landcover into "canopy types" found within homogeous soil or geological characteristics. Feature codes were described using a two level hierarchy. The first level in the hierarchy,

Level 1, described a broad, consistently occurring pattern in upper strata species within a unique habitat. This unique habitat reflected similar geological substrates and topographic positions. The second level in the hierarchy, Level 2, was allocated for distinct patterns of canopy species that could be identified within the broader patterns described in Level 1 while retaining the same environmental characteristics.

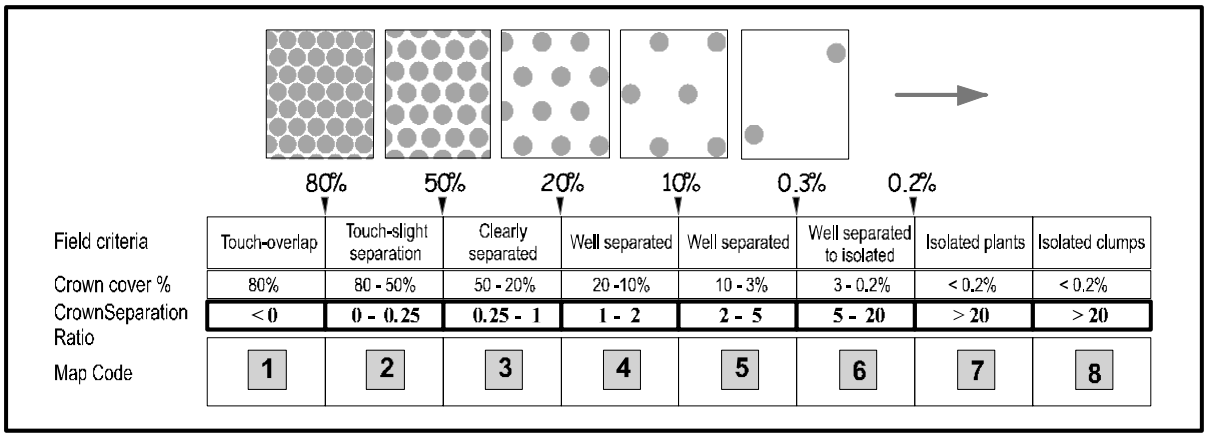
Field traverses were used to relate photo patterns with environmental features and canopy species composition. A total of 40 days were spent traversing the vegetation in the field to assist photo pattern recognition.

A table of feature codes was compiled throughout the course of the project from field observation and reference to other data sources such as plot based floristic survey and previous vegetation mapping (see Table 2.1). All vegetation cover classified as having a crown cover greater than ten percent was allocated a canopy species code based on the dominant combinations of the upper strata species. A species code was not applied to polygons with a canopy of less than ten percent crown cover. A complete list of feature codes is provided in Appendix A. The list of feature codes also includes other landcover features, including non-vegetated and highly modified landcover such as infrastructure and cleared lands.

2.3.5 Canopy cover

An adapted eight-scale classification of Crown Separation Ratio was utilised as a relative measure of canopy cover for all native vegetation cover (Figure 2.1).

Figure 2.1: Canopy Cover Classes



Field criteria	Touch-overlap	Touch-slight separation	Clearly separated	Well separated	Well separated	Well separated to isolated	Isolated plants	Isolated clumps
Crown cover %	80%	80 - 50%	50 - 20%	20 -10%	10 - 3%	3 - 0.2%	< 0.2%	< 0.2%
CrownSeparation Ratio	< 0	0 - 0.25	0.25 - 1	1 - 2	2 - 5	5 - 20	> 20	> 20
Map Code	1	2	3	4	5	6	7	8

Adapted from Walker and Hopkins (1990)

Closed, Mid-dense to Sparse Vegetation Cover: canopy map codes 1-4

All vegetation cover that displays canopy integrity has been mapped. Canopy integrity has been defined as having a Crown Separation Ratio less than two (equivalent to canopy cover greater than ten percent). All vegetation cover falling within this class and with an area greater than one hectare has been mapped. This encompasses large expanses of vegetation cover to remnant patches in cleared landscapes. They are attributed with a code describing the canopy species present, visible rock, the nature of the understorey, the severity and main types of disturbance present and an API confidence index.

Sparse Vegetation Cover: canopy map code 5

A regular feature of native vegetation cover in disturbed environments is the presence of scattered trees above an open or absent understorey in a mosaic of cleared and remnant vegetation. Areas having a Crown Separation Ratio between two and five (equivalent to canopy cover between three and ten percent) are considered not to display canopy integrity and as such have not been attributed with a code describing the canopy species present and the nature of the understorey. Attributes indicating visible rock, the severity and main types of disturbance and an API confidence index have been included.

Sparse to Very Sparse Vegetation Cover: canopy map codes 6-8

This includes obvious features such as built structures, cleared paddocks, etc. Specific non-vegetative features attributed include: landslides, rock outcrops and water bodies. Areas having a Crown Separation Ratio greater than five (equivalent to canopy cover less than three percent) are considered not to display

canopy integrity and as such have not been attributed with a code describing the canopy species present and the nature of the understorey.

Visible rock (Table 2.4) was interpreted for the purpose of providing information that may be of interest for further scientific survey investigation (herpetological, botanical, etc.) as well as for fire management and logistics (fuel and bushfire behaviour mapping, helicopter access points) etc. It delineates rocky ground cover, exposed rock plates and rock outcrops. The degree of exposed rock can be interpreted using the table below.

Table 2.4: Visible rock classes

Code	Class
0	NIL
1	Visible – 10%
2	10 - 25%
3	25 – 50%
4	50 – 75%
5	75 – 100%

2.3.6 API confidence

Vegetation maps rarely support an equivalent degree of attribute accuracy across the mapping area. This is because some areas are less well sampled or are inaccessible. To address some of these shortcomings and guide future endeavours three classes of interpreter mapping confidence were applied to each polygon (Table 2.5). These classes enable users to assess the reliability of the mapping features.

Table 2.5: Interpreter confidence classes

Mapping Confidence Class	Confidence Assessment Criteria
1: High	• Confident extrapolation from localised sampling • Interpretability of features considered high, consistent with features sampled elsewhere • Representative sites visited, features checked
2: Medium	• Not visited • Similarity with features sampled elsewhere • Some uncertainty in species interpretation
3: Low	• Site or locality not visited • Remote area • Inconsistent with features sampled elsewhere • Low confidence in species interpretation

2.3.7 Understorey classes

Understorey characteristics were interpreted where they were visible and grouped into a number of broad classes, as in Table 2.6. Understorey has been collected for a number of reasons. Firstly, it provides an additional layer of information that can be used to more accurately delineate vegetation community distribution. Secondly, it can be used to clarify habitat values for fauna.

Table 2.6: API understorey codes

Understorey Code	Dominant Understorey Elements
10	Mesic/Rainforest
10b	Grey Myrtle abundant
11	Intermediate Dry Shrubs
11r	Intermediate Dry Shrubs on rocky sites
12x	Drier Shrubs (Xeric Heath Shrubs/Scrub)
12r	Drier Shrubs/Scrub/Heath on rocky sites
13	Dry Shrubs and Grasses
13r	Dry Shrubs and Grasses on rocky sites
14	Shrubs Grasses/Herbs on Volcanic Derived Soils
15	Grasses/Herbs on Alluvium
16	Acacia
18a	Swamp Shrubs/Sedges on Gully Alluvium
18e	Estuarine Rush and Grasses
20	Intermediate - Moist Ferns/Shrubs
21	Riparian Complex
90	Understorey cleared, pasture etc
90e	Non-Native Vegetation
NA	Not Assessed

2.3.8 Disturbance severity classes

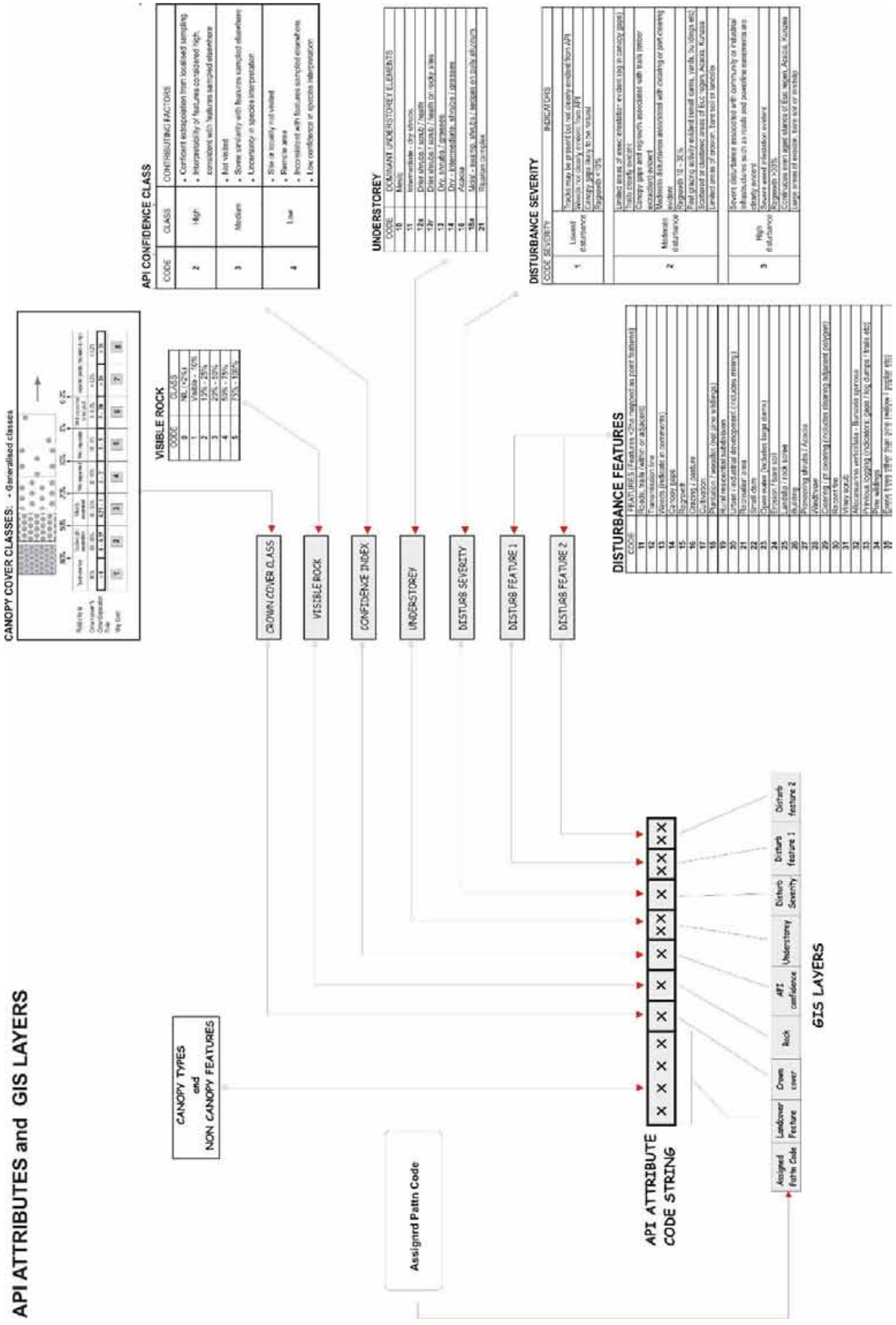
All vegetation cover was assessed for disturbance. An initial code was applied to indicate the severity of the visible disturbance based on a subjective assessment using a number of predefined indicators. A three-class system ranks each disturbance as Low, Medium or High. The two most dominant types of disturbance were recorded in separate fields. Disturbance severity classes are shown in Table 2.7.

Table 2.7: Disturbance severity classes and indicators

Code	Severity	Indicators of Disturbance
1	**Lowest Disturbance**	• Tracks may be present but not clearly evident from API
		• Weeds not clearly evident from API
		• Canopy gaps likely to be natural
		• Regrowth <10%
2	**Moderate Disturbance**	• Limited areas of weed infestation evident (eg. in canopy gaps)
		• Trails clearly evident
		• Canopy gaps and regrowth associated with trails (timber extraction) evident
		• Moderate disturbance associated with clearing or part clearing evident
		• Regrowth 10 - 30%
		• Past grazing activity evident (small dams, yards, buildings, etc.)
		• Scattered or clustered areas of Eucalypt regeneration, *Acacia* spp., *Kunzea* spp. etc.
		• Limited areas of erosion, bare soil or landslip
3	**High Disturbance**	• Severe disturbance associated with community or industrial infrastructure Such as roads and powerline easements are clearly evident
		• Severe weed infestation evident
		• Regrowth >30%
		• Continuous, even-aged stands of Eucalypt regeneration, *Acacia* spp., *Kunzea* spp. etc
		• Large areas of erosion, bare soil or landslip

Additional attributes were collected to describe the type of disturbance that was most prominent on the photographs. A descriptive field is included within the digital data layer that highlights disturbance patterns such as canopy gaps, weeds, regrowth forests, fire, tracks and trails, buildings and plantations.

Figure 2.2: API mapping pathway and features



2.4 DIGITAL DATA CAPTURE

The transfer of API line work to a GIS format was undertaken using a scanning and photogrammetric rectification process for each annotated aerial photograph. Nine ground control points were established on each photo frame using 1:25 000 topographic maps and 1:25 000 series of digital orthographic photos. These control points were used to rectify (the adjustments used to compensate for distortion due to change in elevation) and geo-reference (reference the spatial location by using the locations of known features) for each photograph. Following this process, the raster data was converted to vectors, cleaned, and in turn converted to polygons. A digital data layer supporting topology was cleaned and built in the ArcInfo GIS package. Polygons were then attributed values identified during interpretation process as per the feature code table (Appendix A) and the tables described above. Each polygon supports a value for each of the attributes below:

- Feature Code (Formation, Sub-formation, Feature)
- Crown Cover
- Visible Rock
- API Confidence Class
- Understorey
- Disturbance Severity
- Disturbance Feature (two fields)

2.5 SURVEY STRATIFICATION AND SITE SELECTION

Previous studies have adopted a stratified sampling regime that uses combinations of geology, aspect and landform (Sanders *et al.* 1988; Bell *et al.* 1993) and rainfall (NPWS 2000) to identify homogenous units or 'strata' of environmental space present in the study area. Replicated sampling of each of these units ensures that the full range of environmental variation is examined. The spatial configuration of each unit relies on the accuracy of source data layers that describe patterns in substrate, climate and aspect. In the study area, published geology and soils mapping (Rasmus *et al.* 1969; Bryan 1966; Kovac and Lawrie 1991; McInnes 1997) varies between 1:250 000 and 1:100 000 scale. Further, climatic data relies on interpolations of patterns from weather stations situated within or adjoining the study area. The remoteness of the landscape means that few climatic stations are available from which to make reliable extrapolations. The consequence of these shortcomings is that vegetation communities identifiable in the field have previously been overlooked or have been difficult to map (Bell *et al.* 1993; Sanders *et al*. 1988; NPWS 2000).

For this study, API feature codes were used as the primary strata in order to sample floristic variations commensurate with the scale of final map production (1:25 000). Each feature code represents unique patterns in vegetation structure, dominant canopy species and soil/geological characteristics.

A total of 37 API feature codes were used as stratum. Existing sites were overlaid on the stratum to assess sampling adequacy. Strata were ranked from those that included the largest portions of the study area to the smallest. Strata were considered to be adequately sampled if sampling effort matched or bettered the proportion of area of each strata found in the study area. New survey effort was allocated to those strata that were unsampled followed by those that were undersampled. Given the overall purpose of the study, priority was given to those strata that were unsampled and situated within the reserves of the study area.

2.6 FIELD SAMPLING

New field sampling was undertaken between May and June 2006 and between March and June 2007. Sites were selected by identifying unsampled stratum in relation to access points in areas of minimum disturbance. Sampling was carried out in teams of two people consisting of a botanist and an assistant.

Standard field sites were fixed to 0.04 hectares in size. The area was marked out using a 20 by 20 metre quadrat, although in some communities (such as riparian vegetation) a rectangular configuration of the plot (eg. 10 by 40 metres) was required. Within each survey plot all vascular plant species were recorded and assigned a 1-6 cover abundance score using a modified six point Braun-Blanquet scale (Poore 1955) as follows:

1-Rare, few individuals (three or less) present and cover <5%

2-Common (consistent throughout plot) and <5%

3- >5% and <25%

4-Cover >25% and <50%

5-Cover >50% and <75%

6-Cover >75%

Species that could not be identified in the field were recorded to the nearest possible family or genus and sampled for later identification. Species that could not be identified confidently were lodged with the NSW Herbarium for identification. At each site estimates were made of the height range, projected foliage cover and dominant species of each vegetation stratum recognisable at the site. Measurements of slope, aspect and horizon azimuths were taken. Notes on geology, soil type and depth were also compiled. Estimations of the percentage of rock out-cropping, surface rock, litter and bare soil were made. Evidence of recent fire, erosion, clearing, grazing, weed invasion or soil disturbance was recorded. The location of the site was determined using a Global Positioning System (GPS) or a topographic map where a reliable reading could not be taken. Elevation values were recorded from both GPS and from 1:25 000 topographic maps. Digital photographs were also taken at each site.

2.7 SITE NOMENCLATURE

For the purpose of managing existing and new field data, each survey plot was given an eight digit alphanumerical survey identification number. A separate survey identification code was also given to all data to distinguish its source. This system enables the reader to understand basic geographical information about the survey site.

For example, site number BLG13P8M:

The first three letters “BLG” refer to the first three consonants of the 1:25 000 topographic mapsheet name, in this case the Bulga map sheet.

The fourth and fifth characters “13” refer to the site number by mapsheet, ie. the thirteenth site on this map sheet.

The sixth character “P” refers to the geological substrate evidenced at the site, in this case Permian Sandstone. The geologies found within the study area were coded as follows:

N = Narrabeen Sandstone

H = Hawkesbury Sandstone

P = Permian Sediments (mostly sandstone, siltstone and shale)

W = Wianamatta Shale

B = Basalt

A = Alluvium

Q = Quaternary sand

The seventh character “8” refers to the aspect observed at the site (NE in this case) using the following categories:

1 = 67.6° – 112.5° or E

2 = 112.6° – 157.5° or SE

3 = 157.6° – 202.5° or S

4 = 202.6° – 247.5° or SW

5 = 247.6° – 292.5° or W

6 = 292.6° – 337.5° or NW

7 = 337.6° – 22.5° or N

8 = 22.6° – 67.5° or NE

The eighth and final character “M” is used to describe the morphology. Morphology coding is as follows:

C = Crest

U = Upper Slope

L = Lower Slope

M = Mid Slope

O = Open Depression

D = Closed Depression

S = Simple Slope

F = Flats

R = Ridge

2.8 DATABASE STORAGE

All data collected during field surveys was entered into a Microsoft Access 2000 database. This database was developed by DECC to facilitate the storage, entry and manipulation of systematic floristic survey data. Database entry windows are similar to those used for field proformas to minimise entry errors. All species recorded are coded using the Census of Australian Vascular Plant Species (CAPS). New species or subspecies, as identified by the Royal Botanic Gardens, not previously listed in the CAPS were assigned new codes to the master CAPS database. An extensive data validation procedure was undertaken to ensure that the data entered into the Microsoft Access 2000 database matched what had been recorded in the field. Accuracy of survey site location was also reviewed against original field datasheets.

2.9 TAXONOMIC REVIEW

For this project, all species nomenclature was reviewed and standardised across data sets for analysis. This was particularly important, as survey effort has been carried out over many years, over which time large numbers of species have undergone some form of taxonomic revision. Synonyms were updated to reflect currently accepted revisions. Nomenclature was standardised to follow Harden (1990-1993 and revised editions 2000-2002). Recent taxonomic revisions have been identified using the PlantNET Website that has been developed by the Royal Botanic Gardens (2002). The principle outcomes of the taxonomic review are as follows.

- All exotic species were identified and excluded from the analysis dataset.
- The review highlighted species that were likely to have been incorrectly identified or incorrectly entered into the database. Original field sheets were reviewed to determine the status of these species and where data entry errors were detected, changes were made to the database. Where data entry errors were not detected, species were reviewed against existing literature. Where this indicated them to be outside their likely range, and no confirmation had been made, the record was deleted from the database.
- The review highlighted inconsistently collected records of species containing subspecies (subsp.) or varieties (var.). In such cases, subspecies were either lumped to species level or were assigned to a single subspecies or variant if only one variety was found to be present in the study area.
- *Eucalyptus beyeriana* and *Angophora euryphylla* were included as *E. crebra* and *A. costata* respectively, given inconsistency in identification between observers over time.
- The review identified species hybrids that are not recognised formally in the literature. These were assigned to one or other of the parent species based on the predominance of either in surrounding environments.
- The review identified species identified to genus level only. Samples identified to genus only level which were low in number and low in cover scores (less than five percent cover) were deleted from the analysis dataset. Genus-only samples that were numerous but could not be clearly assigned to a single species were left unchanged.

2.10 VEGETATION CLASSIFICATION

Two stages were undertaken as part of the data analysis. Firstly, all species abundance raw data from sites available from the study area was analysed using the PATN program (Belbin 1994). The Bray-Curtis coefficient was generated to identify dissimilarity between survey sites. An association matrix displaying dissimilarity scores between all pairs of sites was produced. An unweighted pair group arithmetic averaging (UPGMA) clustering strategy was applied to the matrix to derive a hierarchical classification. The default beta value of –0.1 was used on all analyses.

Homogeneity analysis (Bedward *et al*., 1992) was initially used to identify the number of groups that maximises returns to within-group floristic variation while minimising the total number of groups. A nearest neighbour analysis using a purpose built program "GDFcheck" was applied to identify possible misclassified sites within groups.

A dendrogram was then produced to display the hierarchical relationships between individual sites and groups of sites. Both groups and sites were tracked against similar analyses performed by Sanders *et al.* (1988), Bell *et al.* (1993) and NPWS (2000). Clusters of sites were labelled in the dendrogram using vegetation community labels of previous studies. Each of the defined groups were then analysed to uncover finer scale floristic assemblages where these related to changes in substrate or canopy species dominance. New groups were created where distinct changes in substrate, vegetation structure or canopy species dominance matched consistent patterns observed in the field.

A second analysis, using the same methods, was performed on a larger dataset that comprised site data held by DECC within the greater Sydney Basin Region. The purpose of this analysis was to examine relationships between the vegetation communities present in the Yengo and Parr reserves and other sandstone environments in the Sydney Basin Region (NPWS, 2000; Bell, 1998; NPWS 2003a; NPWS 2003b, DEC, 2006 *draft*). Provisional allocation of sites to vegetation communities from the first analysis was used to track site allocation in the second analysis. The second analysis was supplemented by labels identifying site allocation to vegetation communities described in studies listed above for Wollemi NP, Warragamba Special Area; Blue Mountains NP and the Woronora Plateau.

2.11 MAPPING OF EXTANT VEGETATION COMMUNITIES

Mapping of vegetation communities relied on the allocation of Level 2 API codes (Appendix A) to floristic groups derived from numerical analysis of field data. The allocation process was informed by the relationship between the mapped distribution of API codes and the location of floristic sites. Where relationships were unclear, the use of expert knowledge, alternative spatial layers such as slope and aspect and/or fine scale habitat attributes (such as understorey type, rock cover and crown cover) were examined to help resolve allocation decisions.

Initially site locations were intersected with API feature codes using a Geographic Information System. Each site was systematically examined against the API spatial layer to examine potential errors arising from spatial inaccuracies in the data. This was necessary as a significant proportion of sample data was collected prior to the availability of portable field Global Positioning Systems (GPS). In addition an inherent inaccuracy in the transfer of stereoscopic linework from aerial photos to two dimension digital formats also introduces possible error. Errors may also arise from incorrect attribution of API polygons.

A table was produced to indicate which API codes corresponded to each of the floristic groups identified by the numerical analysis. To assist in identifying obvious errors, unique API codes were summed to their parent classification described by the Level 1 API code (Appendix A) and compared to the Broad Floristic Unit (Figure 3.1) derived from data analysis. Sites that presented a mismatch between Broad Floristic Unit and Level 1 API code (eg. moist forest sample falling within an exposed sandstone woodland API code) were examined first. Sites and API attribution was reviewed using location descriptions, floristic composition, canopy dominants, habitat type and aerial photography. Where errors were confirmed to arise from spatial inaccuracies sites were then reallocated to an API code of best fit within 50 metres of the sample, provided the location description remained accurate.

From this, a new table was created to calculate two values that could be used to inform the allocation of an API code to floristic group: (1) the proportion of all sites within a unique floristic group that could be allocated to a single API code and (2) the proportion of all sites that fell within each API code that could be ascribed to the target floristic group. The allocation process then commenced for those floristic groups (Map Units) that corresponded to a single API code and for which no other alternative allocation could be achieved based on site data (ie. all samples falling within the API code conformed to the same floristic

group) . The understorey attribution tags allocated to the candidate API code was then reviewed to highlight inconsistencies between the habitat and floristic composition of the sample sites and the vegetation patterns observed during API. Where the sample(s) and the API code and understorey attributes were considered to match, the allocation was considered final. Where understorey attributes appeared to conflict with the habitat and floristic characteristics of the sample(s) these were excluded and were not assigned a floristic group until all other codes were allocated.

Sample sites defining some floristic groups corresponded to multiple API codes. In such cases each candidate code was considered and reviewed sequentially.

1. Codes for which no other alternative allocation was possible using Level 2 code or understorey attributes were finalised first. Again understorey attribution was examined and those considered a poor match to the sample site(s) floristic characteristics were not allocated and were revisited later.

2. API codes were not assigned to the target group if they comprised only a small proportion (less than five per cent) of all sites describing the floristic group and/or supported a low proportion of sites located within the API code conforming to the target floristic group (less than 10 per cent). These unassigned codes were visited later.

3. Where alternative allocations to a floristic group were possible for a given API code, sample sites were examined in relation to the corresponding understorey attribution. Allocation to one or other was completed where a majority relationship existed between different floristic groups based on understorey attribute. Where no majority relationship could be gleaned, alternative spatial layers were employed to identify possible ecologically meaningful splits in the API code. If none were found then expert judgment was used to finalise allocation.

The remaining pool of unassigned API codes and associated understorey types were then revisited. Where site data could not inform the allocation to a floristic group, an expert review of the floristic and landscape characteristics of each code was undertaken. Allocation to an existing floristic group was completed where it was considered to conform to the habitat, canopy and understorey characteristics and was situated in proximity to codes already allocated to the target floristic group. If no suitable allocation could be found a new floristic group was identified and assigned a new Map Unit label.

2.12 DESCRIPTION OF VEGETATION COMMUNITIES

Vegetation communities have been described in detail using a number of features. Firstly, combinations of sites defining unique groups in the cluster analysis were used to identify characteristic flora species. These are presented as a summary for each community in Appendix D of this report. Each vegetation community has been given a map unit name that describes a broad regional descriptor for its distribution within the Sydney Basin region, dominant or characteristic species (generally tree species), and/or a geological or topographical feature.

Each profile provides a brief summary of key identifying features. These include commonly occurring plant species and habitat characteristics. Example locations are also given, as is a sample photograph from a site used to describe the community in the cluster analysis. The degree of disturbance found within the mapped vegetation community is also presented along with figures highlighting the total extant area. Data describing the vegetation structure (height and vegetation cover) has been generated from field sample points.

Each profile includes a list of diagnostic species. This species list is derived from the field site data and can be used to help define the floristic composition of a community in relation to all others present in the study area. A concept known as ‘fidelity’ applied in Keith and Bedward (1999) based on Westhoff and van der Maarel (1978) provides a systematic method for identifying ‘diagnostic’ or ‘characteristic’ species within an assemblage. This approach recognises that, within a given vegetation community, a species may be conspicuous by the frequency and abundance at which it is recorded. However, in other communities the same species may only occur sparsely, at low abundance or not at all. Analysing the performance of each individual species found within each community may reveal patterns useful to classification. Table 2.8 describes the criteria used to define positive, negative, uninformative and constant species. Positive species are recorded more frequently within a community and/or at a higher median cover abundance than in all other vegetation communities. Positive species also include those that are only recorded within the target community irrespective of their frequency of detection or abundance. A species that is present in all other communities but is less common or abundant or not present at all in the target community is defined as a negative diagnostic species. A constant species is

one that occurs consistently within many communities. Uninformative species are those that are recorded at lower abundance and less frequently across all communities. The profile for each vegetation community lists all species classified as positive, negative and constant. In addition, some species that were classed as uninformative in the analysis have been included in the species list to aid field identification.

Table 2.8: Definitions of diagnostic species

		Occurrence of Species in Residual Map Units		
		Frequency>=35% AND C/A>=2	Frequency<35% OR C/A<2	Frequency=0
Occurrence of Species within Target Map Unit	Frequency>=35% AND C/A>=2	Constant	Positive Diagnostic	Positive Diagnostic
	Frequency<35% OR C/A<2	Negative Diagnostic	Uninformative	Positive Diagnostic
	Frequency=0	Negative Diagnostic	Uninformative	-

C/A = Cover Abundance

2.13 REGIONAL SIGNIFICANCE OF VEGETATION COMMUNITIES

A number of conservation based assessments were carried out in order to provide information on the regional significance of the vegetation communities found in the study area. These assessments include:

- *The regional distribution of the vegetation communities.* Relationships between sites located in the study area and others within the Sydney Basin Region. Each vegetation community has been reviewed to determine the estimated extent of the community beyond the study area. Area figures (hectares) have been provided based on currently available knowledge presented in broader regional studies including Tozer *et al*. (2006), NPWS (2000), NPWS (2003a 2003b), Bell (1998) and Peake (2006).
- *The reservation status of each community within the formal reserve system.* The area of each vegetation community (hectares) found within the reserve system managed by DECC has also been calculated from the above sources.
- *Disturbance.* The proportion of disturbance classes found within each vegetation community has been calculated.
- *Endangered Ecological Community status.* Vegetation communities have been reviewed against Endangered Ecological Community determinations made under the *NSW TSC Act (1995)*, current to March 2008 .
- *An analysis of the species richness within each community.* Mean (and associated Standard Deviation) values were generated using the field site data (0.04ha quadrats) used to the classify the communities.

3 RESULTS

3.1 SITES

A total of 124 new floristic survey sites were sampled over the course of this project. The total number of sites available for analysis was 441, equating to a sampling density of around one site per 450 hectares within the Yengo and Parr reserves and one site per 550 hectares across the study area.

Map 2 displays the location of all sites situated within the reserves and on other tenures within the study area.

3.2 FLORISTIC DIVERSITY AND SPECIES RICHNESS

Raw data collected from all field sites indicates that over 1000 indigenous vascular plant species have been recorded within the study area. The full list of species is presented in Appendix B. This list includes all original identifications made by many different obervers over more than twenty years. It was revised and reduced to provide a consistent, taxonomically current dataset for analysis purposes.

A total of 64 introduced plant species were recorded during field surveys, listed in Appendix C.

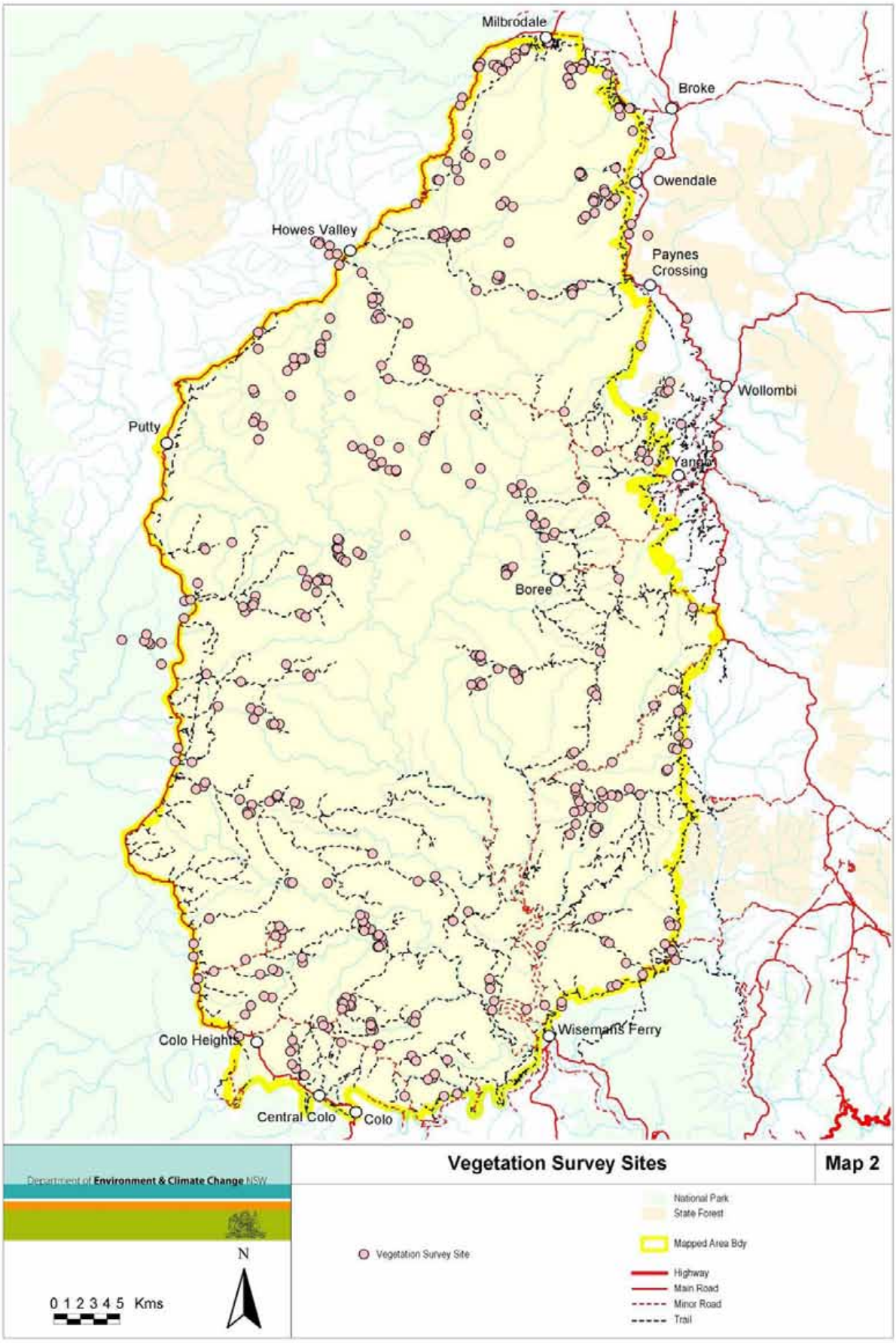
Species richness was calculated as the mean number of plant species found within the survey sites (0.04ha in area) located in each vegetation community. Mean richness scores varied between 5 and 46. The results for each individual community are included with the profiles in Appendix D of this report. The alluvial wetland communities possess the lowest richness scores. Of the sclerophyll forests the lowest scores were found in the communities that occupy the low rainfall band associated with exposed Narrabeen sandstone in northern Yengo NP. The highest richness values were obtained from the exposed and sheltered Hawkesbury sandstone communities.

3.3 AERIAL PHOTOGRAPH INTERPRETATION MAPPING

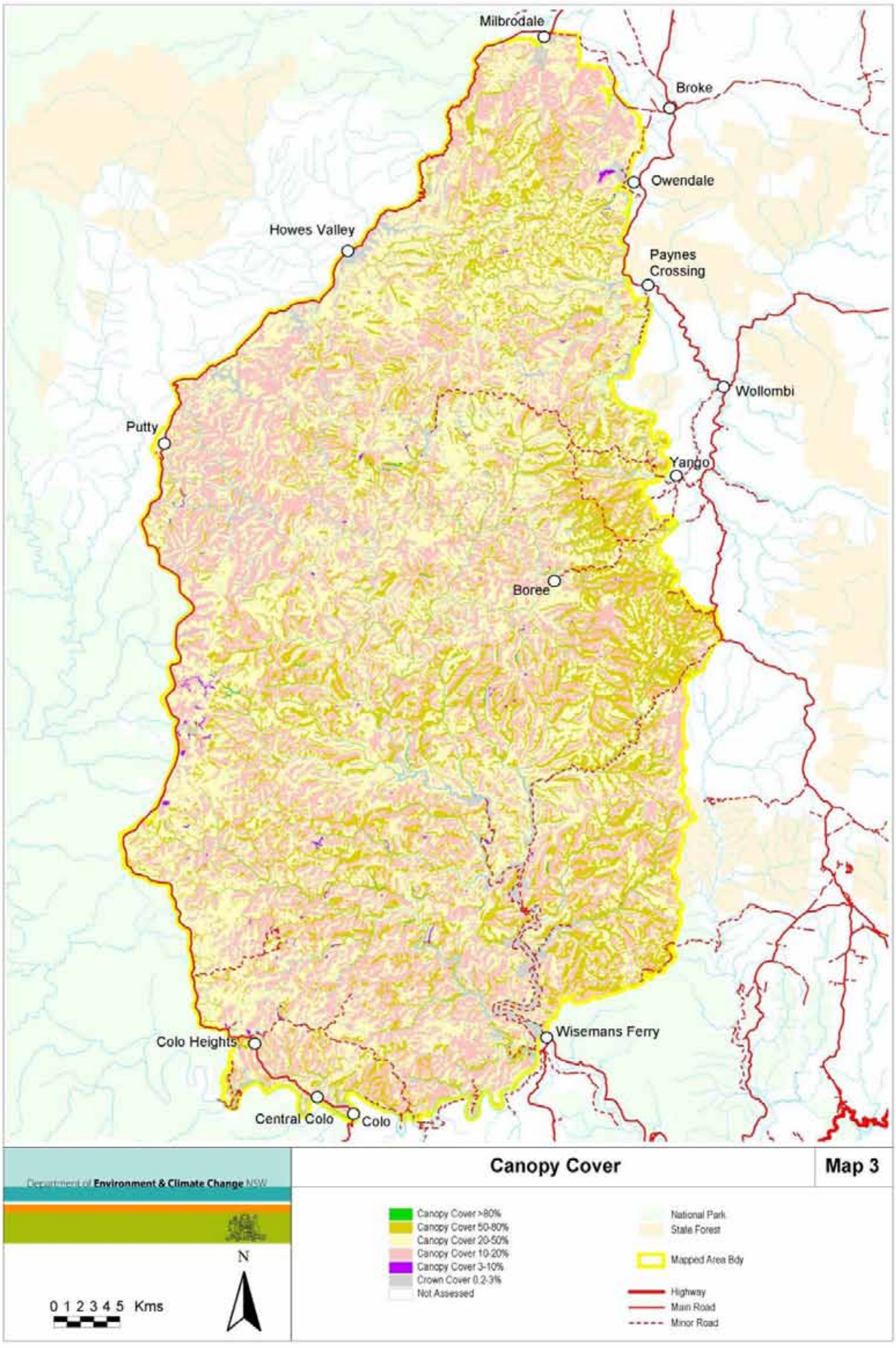
A total of 64 feature codes (including cleared, infrastructure and native vegetation cover) were mapped. These were distributed across 28 500 polygons, which were mapped across 243 000 hectares, giving an average polygon size of 8.5 hectares. A summary of all attributes collected during the API phase is given in Table 3.1.

Table 3.1: Results of multi-attribute mapping

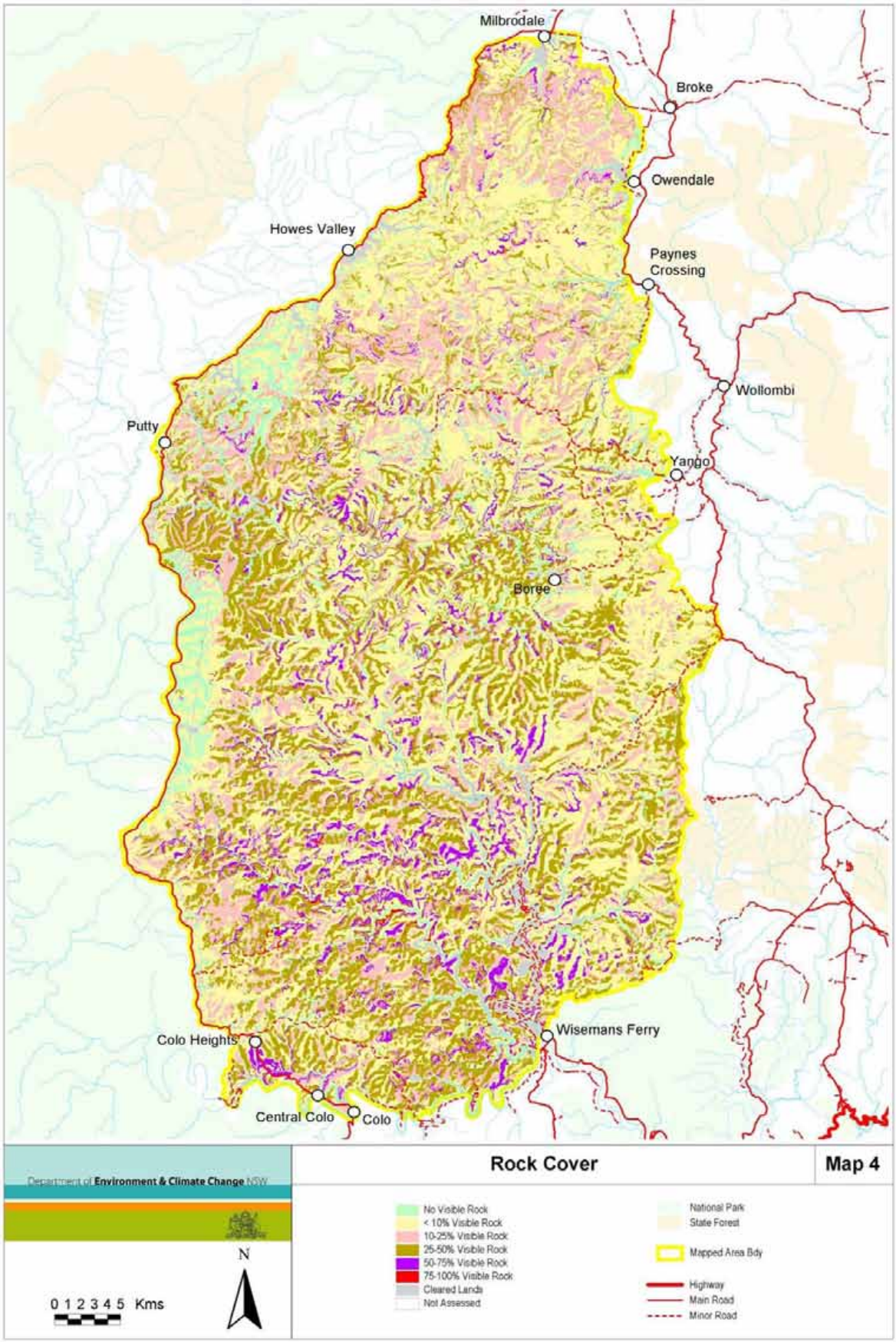
Attribute	Comment
Crown Cover	Map 3 shows the distribution of crown cover classes in the study area. Over 65 percent fall within classes 3 and 4, indicating that much of the native vegetation cover conforms to the woodland structure classification of Walker and Hopkins (1990).
Visible Rock Outcropping	Map 4 shows that around 85 percent of the study area has greater than ten percent cover of outcropping rock visible in each polygon.
Mapping Confidence	Map 5 shows the distribution of confidence levels associated with the interpretation of features. Almost 87 percent of mapping has been classed as having high to very high levels of confidence. This reinforces the value of extensive fieldwork. Less than one percent is considered to be low confidence.
Understorey Codes	Map 6 illustrates the variation in broad understorey types. As expected almost 70 percent of the mapping area falls within class 12, indicating a dominance of dry shrubs. It is noteworthy that the gully systems are considered to be intermediate dry shrubs rather than mesic.
Disturbance Severity	Map 7 shows the distribution of disturbance severity classes. Around six percent of the study area exhibits high levels of disturbance (as visible from aerial photographs). The disturbance is restricted to just a few of the Map Units that are associated with richer soils.
Disturbance Type	Describes the type of disturbance that is visible from aerial photographs. This includes logging, clearing, weeds, and soil and canopy disturbance.
Comments	A large number of notes are made pertaining to interesting characteristics within a polygon. This might include potential unusual vegetation, fauna habitat, and soil and landscape characteristics.



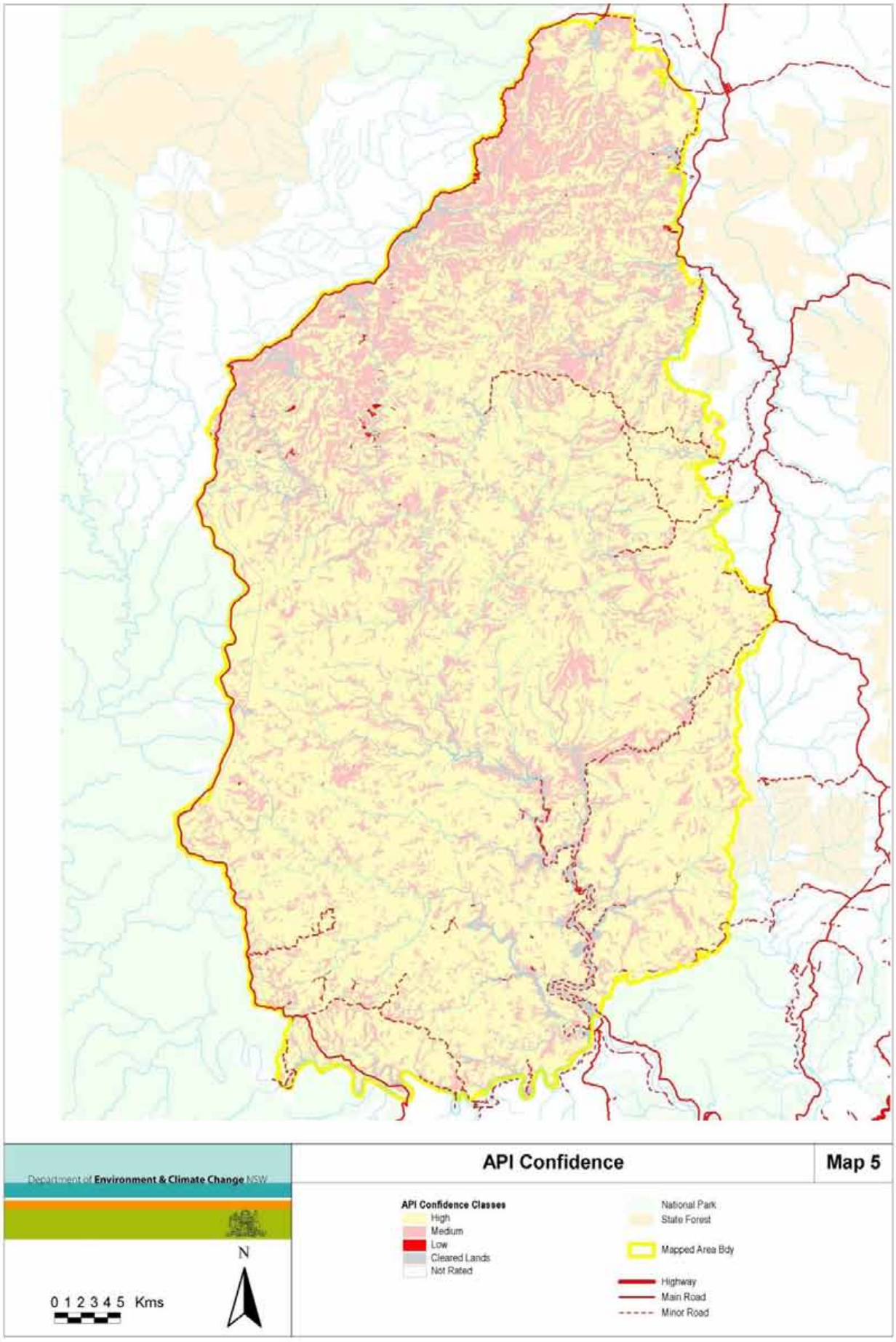
Map 2: Location of vegetation survey sites



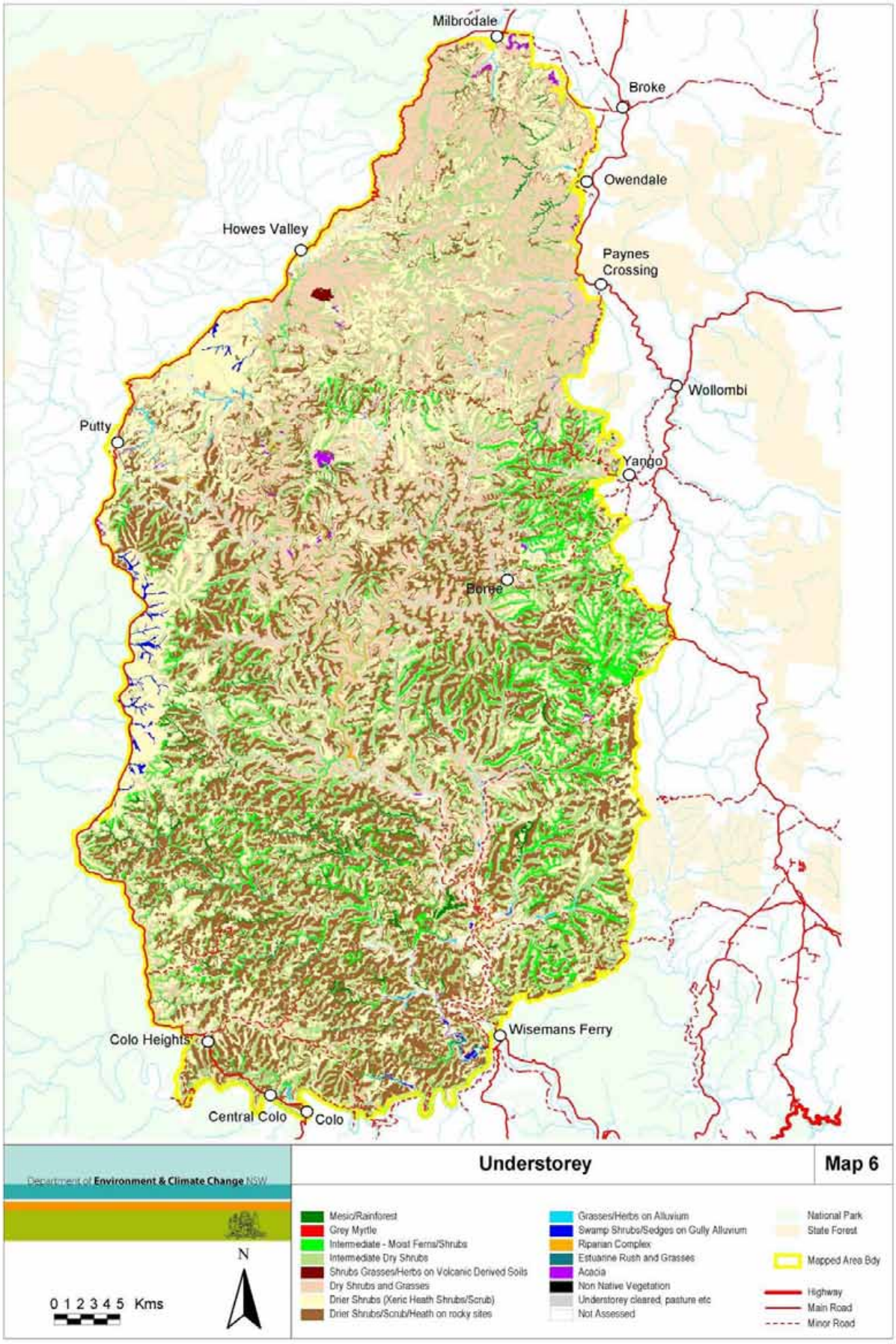
Map 3: Distribution of canopy cover classes



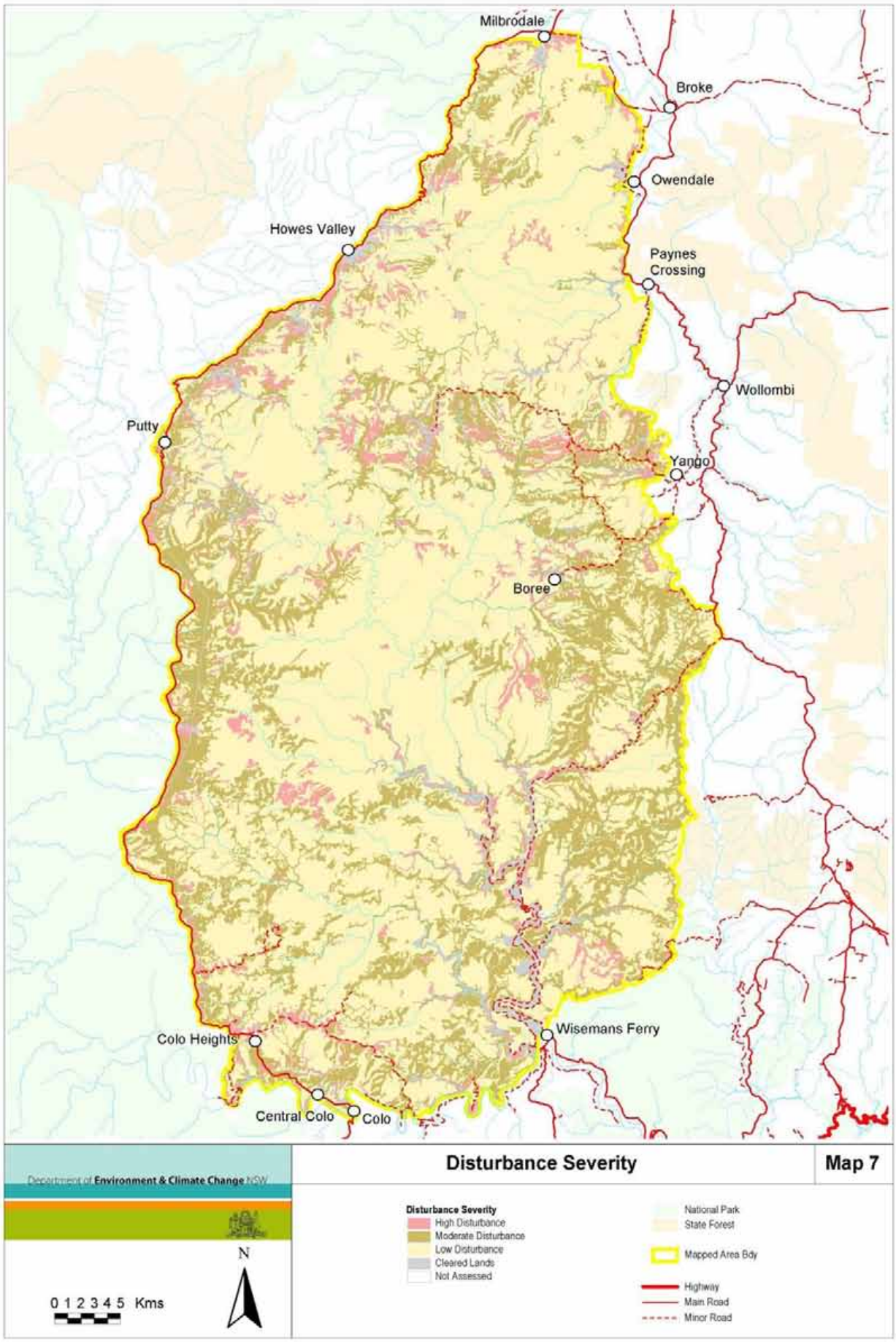
Map 4: Distribution of rock cover classes



Map 5: Distribution of API confidence classes



Map 6: Distribution of understorey classes



Map 7: Distribution of disturbance severity classes

3.4 VEGETATION CLASSIFICATION

Forty-three vegetation communities have been defined within the study area. Thirty-six of these have been classified using numerical analysis of systematically collected field data. An additional seven communities were described based on field traverse and aerial photo interpretation only. These communities were cross referenced to existing literature describing the vegetation of the study area (Sanders *et al.* 1988; Bell *et al.* 1993; Ryan *et al*. 1996). Figure 3.1 presents a simplified dendrogram that provides a hierarchical understanding of the vegetation patterns present within the study area. It illustrates eleven broad floristic classes, each encompassing 36 recognisable vegetation communities. Description of these broad classes and units follow as they occur in the dendrogram.

3.4.1 Sheltered Hawkesbury Sandstone Dry Forests

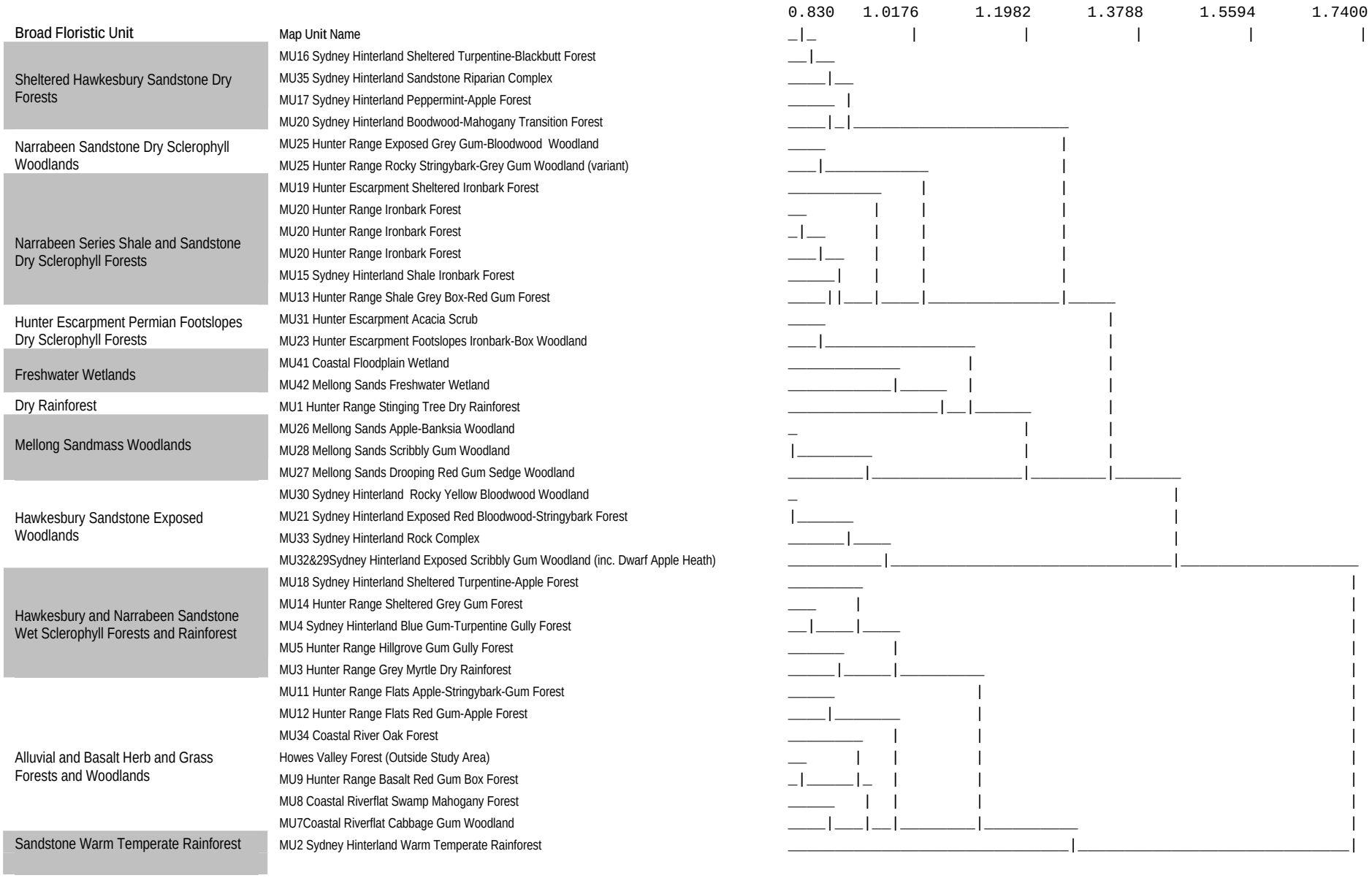
Three moderately tall dry shrub forest communities mostly associated with Hawkesbury Sandstone soils are shown in the first of the broad floristic classes. These can be considered part of the gully complexes of Keith's Sydney Hinterland Dry Sclerophyll Forests (Keith 2004). In Parr SCA, Comleroy State Forest and south east Yengo NP some sheltered sandstone slopes carry a dry sclerophyll forest that includes Blackbutt (*Eucalyptus pilularis*) (Map Unit 16). Situated on Hawkesbury and Narrabeen Sandstones, this forest shares many species with both Map Units 18 and 17. The dry open shrub layer is composed of *Dodonaea triquetra*, *Podolobium ilicifolium*, *Persoonia linearis* and *Acacia linifolia*. Taller *Allocasuarina torulosa* was consistently recorded. The presence of Blackbutt and the increased frequency of Kangaroo Grass (*Themeda australis*) amongst the ground cover point toward some subtle changes in soil properties. Available mapping of geology and soils (McInnes 1997; Rasmus *et al.* 1969) do not identify the presence of enriched sandstone or shale material, though Ryan *et al.* (1996) suggests the presence of thin capping of Mittagong sandstones may be important influences. While most of the sample sites of Map Unit 16 were proximate to residual shale capping, not all included *E. pilularis* in the canopy, nor were they situated in the Wheelbarrow Ridge area. This indicates that minor shale lenses in the Hawkesbury Sandstone stratum are likely to support a similar community, though are unlikely to be mapped as they cannot be identified using available soils mapping or API.

Map Unit 35 defines a complex of vegetation types associated with sand deposits along flood zones of major streams, colluvial deposits and shallow rocky gully lines. Two sample sites occupying very different situations help describe the complexity of this map unit. The first is a rocky riparian complex associated with a sandstone gully. The second is situated on a ferny drainage line within an elevated sandmass of the sandstone plateau. Both sites support low growing Water Gums (*Tristaniopsis laurina*) with sparse cover of small trees along with hardy mesic species such as Grey Myrtle (*Backhousia myrtifolia*) and Black Wattle (*Callicoma serratifolia*). A wide variety of overhanging species from the surrounding dry shrub forests may be observed such as *Banksia* spp., Tea Trees (*Leptospermum* spp) and Blueberry Ash (*Elaeocarpus reticularis).* Saw sedge (*Gahnia* spp.) is common in deep sands. A number of other riparian vegetation communities associated with riverbanks have not been sampled, but have been included within this Map Unit.

A drier sandstone shrub forest (Map Unit 17) is situated on mid to upper sheltered slopes on Hawkesbury Sandstone. Soil depth is marginally deeper than ridgelines though rock outcropping and benches are common. A familiar combination of tree species occurs, with Sydney Peppermint (*Eucalyptus piperata*), Smooth-barked Apple (*Angophora costata*) and Red Bloodwood (*Corymbia gummifera*) the most frequently recorded. Taller understorey species such as Christmas Bush (*Ceratopetalum gummiferum*) are a common member of the community. However, like the ridgetop vegetation, a diverse shrubby flora is present, featuring Geebungs, Wattles and Banksias along with a sparse cover of Bracken (*Pterdium esculentum*) and wire grasses including *Entolasia stricta*.

Map Unit 20 differs from others in this broad floristic unit in that it occurs on Mittagong Sandstone. This sandstone layer is recognised as an interbanding mix of shale and sandstone sediments (Herbert and Helby 1980). The greater clay content appears to marginally enrich the surrounding sandstone soil, and the resultant impact on the vegetation is a transitional mix of shale and sandstone species (Tozer 2003). A slightly taller dry shrub forest of Red Bloodwood (*Corymbia gummifera*) and Narrow-leaved Stringybark (*Eucalyptus sparsifolia*) forms stands interspersed with Blue Mountains Mahogany (*E. notabilis*). The shrub layer is typical of the surrounding sandstone woodlands with an array of prickly leaved species such as Banksias, Tea Tree and Geebungs. The shallow rooted species tend to exhibit the most influence of the residual shale material with *Austrostipa pubescens* and *Themeda australis* both patchily distributed on the forest floor. As the community name suggests Map Unit 20 is found across the Sydney Hinterland at low elevations near the interface of shale and sandstone geology. It is considered to form a component of Shale Sandstone Transition Forest, an EEC listed under the *NSW TSC Act, 1995.*

Figure 3.1: Summary hierachical classification of vegetation communities



3.4.2 Narrabeen Sandstone Dry Sclerophyll Woodlands

Exposed situations on coarse-grained lithic Narrabeen Sandstone ridges carry a low open woodland with a moderate cover of shrubs and a patchy grass cover. This community, Map Unit 25, is most pronounced in the northern regions of Yengo NP, particularly between Howes Valley and the Hunter Escarpment. This low open woodland features a combination of Stringybark (*Eucalyptus sparsifolia*), and Grey Gum (*E. punctata*) with a localised abundance of Yellow Bloodwood (*Corymbia eximia*). Distinctive clusters of Black Cypress Pine (*Callitris endlecheri*) are very occasionally seen clustered on rocky exposed slopes and cliff edges. Much of the distribution is aligned to areas defined as Narrabeen sandstone (Kovac and Lawrie 1991; Rasmus et al. 1969) though may also be associated with Hawkesbury sandstone along the Hunter Range. We hypothesise that the Hawkesbury stratum is thin in this area, blending with Narrabeen sandstones on wider ridgetops. Unlike other Hawkesbury Sandstone Woodlands in the south of the study area that occupy rocky ridgetops and slopes, this woodland aligns with slightly deeper soil profiles where rock outcrops are mostly absent. There are some characteristic tree species that overlap with Hawkesbury Sandstone Woodlands elsewhere (Map Unit 30) such as Yellow Bloodwood (*Corymbia eximia*) and Narrow-leaved Apple (*Angophora bakeri*). However differences lie in the understorey where shrub species *Leptospermum trinervium* and *Lambertia formosa* are absent from the woodland, leaving an understorey with a more open appearance sometimes with a patchy cover of grass including *Themeda austalis*.

3.4.3 Narrabeen Series Shale and Sandstone Dry Sclerophyll Forests

The Narrabeen series substrates are widespread across northern Yengo NP and diminish toward the south where they lie below the Hawkesbury Sandstone strata exposed only around the deeper incisions of the major river systems. Near the Hawkesbury River, the Hawkesbury Sandstone stratum is so thick that Narrabeen bedrocks are only exposed on the lower footslopes below the escarpment of the Macdonald Valley. The soils derived from the Narrabeen series are variable, as layers of shale are common between thick bedrocks of quartz lithic sandstone. In response to these changes, subtle transitions in vegetation composition can occur over a relatively short distance. This patterning blurs the boundaries of many vegetation communities that are aligned with the Narrabeen geology.

The sheltered Narrabeen Sandstone slopes of the Hunter Escarpment supporting a dry sclerophyll forest (Map Unit 19) is the most dissimilar of the Map Units found within this broad floristic class. Grey Gum and Ironbarks (*E. fibrosa/E. crebra*) dominate the canopy above an open shrub layer that is similar to that found on more exposed sites nearby (Map Unit 25). However, it is the low growing open cover of Grey Myrtle (*Backhousia myrtifolia)* found amongst the sandstone benches and boulders that most easily distinguishes the community. The area around the Hunter Escarpment is a barren, dry, fire prone environment that discourages the prevalence of mesic shrubs.

By contrast the next five Map Units of this broad floristic class are aligned to shale influenced soils mostly occurring as bands or lenses in either the Narrabeen series, Hawkesbury Sandstone strata or remnant shale caps. Most are a shrubby and grassy Ironbark dominated woodland and forest complex that does not easily conform to the Sydney Hinterland Dry Sclerophyll Forests class of Keith (2004). Map Unit 20 is typical of the exposed Narrabeen shale/sandstone soils and is widespread across the study area. The height and composition of the community can vary depending on the relative abundance of clay and sand in the soil. These variations are reflected in the dendrogram, though they are not mappable at the scale adopted for this project. A constant however, is that the canopy includes one or more of the ironbark species *Eucalyptus crebra, E. beyeriana, E. fibrosa* or the rare *E. fergusonii* subsp. *dorsiventralis*. However, *Corymbia eximia, Angophora costata* or *E. punctata* may be more abundant within a given site. Ground covers include an open and patchy cover of grasses such as *Aristida vagans* and *Themeda australis.*

The final two Map Units of this broad floristic class describe dry grassy communities associated with shale capping. The first of these (Map Unit 15) is associated with residual capping of the fertile Wianamatta shale around Colo Heights. It supports an open grassy forest of limited distribution in the study area, and is considered to be a component of Sydney Sandstone Shale Transition Forest EEC listed under the *NSW TSC Act, 1995*. Aligned to the flora of the Cumberland Plain and other Coastal Valley Grassy Woodlands (Keith 2004), this is a tall open grassy forest with a sparse shrub layer. The grass layer has abundant Kangaroo Grass (*Themeda australis*) and Threeawn Speargrass (*Aristida vagans*) forming dense tussocks. With their black deeply furrowed barks, Ironbark trees (*Eucalyptus paniculata* and *E.crebra*) are prominent members of the canopy while Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*) often form a dense stand of smaller trees. Historically referred to as “Parrs Brush” by

early settlers, this forest was recognised by Parr himself as covered in "….*rich meadow grass and indigo bushes" (*in MacQueen 2004*)…there is not better land to graze cattle…the trees are Iron, Stringy Bark, Forest Oak Gum Box and Apple Tree*" however patches were "*of the thickest brush I ever experienced*." These "brush" descriptions match those used for similar vegetation found near earlier settlements at Bargo in the south of Sydney. The taller Ironbark Forests with shrubby and grassy understoreys were labelled "Bargo Brush" and at times were also considered near impenetrable.

Further north in the study area residual shale caps occur along the old Bulga Road in northern Yengo NP. Only small in area, these grassy woodlands (Map Unit 13) are dominated by Forest Red Gum (*E. terticornis*), Ironbark (*E. crebra*) and Grey Box (*E. molucanna*). Despite their isolation, the abundance of grass covers encouraged rough grazing on many of the patches during early European settlement. Today small diameter regrowth trees typify stands. The understorey is grassy often with an abdundance of Kangaroo Grass (*Themeda australis*), and Wire Grasses (*Aristida* spp.)

3.4.4 Hunter Escarpment Permian Footslopes Dry Sclerophyll Forests

The Hunter Escarpment footslopes mark a change in geology from the Triassic sandstone plateau to the Permian sediments found on the Hunter Valley floor. A mix of shales, conglomerates and sandstones are found on these lower slopes, and while still an area of very low rainfall (around 650 millimetres per annum) the soil is more fertile than the plateau above. There are two distinctive communities described in this area, both of which evoke the Western Slopes Dry Sclerophyll Forests of Keith (2004). The first of these communities is Map Unit 23, an open woodland of Narrow-leaved Ironbark, Grey Box and Black Cypress Pine. A shrub layer is present, though sparse in cover because of the numerous small-leaved species such as *Olearia elliptica* and *Bursaria spinosa.* The diversity of grass species sets this community apart from the woodlands found on the sandstone plateau. The species found here are widespread in vegetation remnants of the Hunter Valley floor. These dry sites also contain infrequently recorded inland species such as the sub-shrub *Hibiscus sturtii* subsp*. sturtii.*

The north-facing Hunter Escarpment also features dense even-aged stands of the blue-green leaved *Acacia bulgaensis* (Map Unit 31). Found on steep rocky soils these depauperate scrubs of prolific wattle growth repress the development of other ground cover or shrub taxa. The floristic composition of these sites overlaps with those describing Map Unit 23, however species richness rarely exceeds a few individuals per site. Hunter (2005) indicates that this scrub is one of several *Acacia* dominated scrubs in North Eastern NSW that are thought to arise from infrequent intense fire events.

3.4.5 Freshwater Wetlands

On the river flats small drainage channels can be cut off from the main river channel by levee banks leading to free water and permanent waterlogged soils (Ryan *et al.* 1996). These wetlands appear to be highly variable (Stricker and Wall 2000). On a tributary of the Macdonald River one site describes a freshwater reedland dominated by *Eleocharis sphacelata (*Map Unit 41) On the Mellong Plateau, wetlands are sometimes an open profuse cover of sedges dominated by *Carex appressa* (Map Unit 42). Nearby, even-aged stands of *Melaleuca linariifolia* (Map Units 38 and 39) form thickets around the perimeter of the wetland and along minor watercourses. Additional shrubs are present such as *Acacia parramattensis*, and the ground cover maintains the diversity of water loving sedges, herbs and grasses.

The proliferation of *Melaleuca linariifolia* may represent the consequences of large- scale land clearing on these riverflats. The removal of deep-rooted eucalypts allows the shallow watertable to rise closer to the surface, leading to permanent saturated soils. In response plant species, such as *Melaleuca* spp., which are tolerant of these conditions are encouraged while those that require drier habitats are excluded.

3.4.6 Dry Rainforest

The peaks of Mount Wareng and Mount Yengo are old volcanic landforms and the rich soil located here provides sufficient moisture retention and nutrients to support an unusual dry rainforest, despite low annual rainfall (< 800mm per annum). On the south facing slopes of Mount Yengo tall Giant Stinging Tree (*Dendrocnide excelsa*) and Red Cedar (*Toona ciliata*) stand proudly above a rainforest sub-canopy and shrub layer. On exposed slopes or rocky scree, the rainforest is stunted and is dominated by the sprawling limbs of Figs (*Ficus rubiginosa*). Few examples of this community remain protected in reserve systems of the Sydney Basin region and as a result it is of high conservation value

3.4.7 Mellong Sandmass Woodlands

The low relief of the shallow incised valleys of the Mellong Plateau and Garland Valley are an anomalous landform in the Sydney Basin region (Henry 1988). These are perched sites of deep infill, comprising a mix of clayey and muddy sands. The sands are of sufficient depth to sustain a local sand extraction industry. There is still conjecture as to the evolutionary processes of this unique landform although Henry (1988) points toward changes in topography associated with the uplift along the Lapstone monocline.

The early search for passage to the Hunter Valley by Parr in 1817 is likely the first recorded description of these swamps. Howes 1819 Journal (in Macqueen 2004) describes walking through a *"flat sandy and rushy bottom interspersed by long swamps tho not deeper than over the Shoes and seldom that*". Little has changed to the present day.

These dry sandy deposits and swamps are part of a series of sandy deposits of the Sydney Basin with similar landforms found at Kurri Kurri, Agnes Banks, Wyong, Thirlmere and Ulan. Recognised as the Sydney Sand Flats Dry Sclerophyll Forests class of Keith (2004) these vegetation communities often include the presence of Drooping Red Gum (*E. parramattensis* subsp. *parramattensis*) and one of the Scribbly Gums (*E. sclerophylla*, *E. signata* and *E. rossii*). However at each of these locations there is considerable variation in the understorey taxa (Doherty 1985; NPWS 2000).

There are three shrubby sclerophyll communities described and mapped on the sandy deposits in the study area. The most widespread of these recognises the open woodland of widely spaced scribbly gums (*E. sclerophylla*) (Map Unit 28). A prominent shrubby layer of Banksias, Tea Trees and Hakeas is present and resemble the sandstone ridgetop flora of the Sydney Basin. A variation in overstorey species arises in the Garland Valley (Sanders *et al*. 1988) where Rough-barked Apple (*Angophora floribunda*) replaces *E. sclerophylla* (Map Unit 26). On minor drainage lines and depressions of these sand deposits soil properties change, perhaps with an increased clay and peat content (Doherty 1985). These poorly drained sites support an open woodland with a low growing sedge and shrub understorey (Map Unit 27). The uncommon eucalypt *E. parramattensis* subsp. *parrramattensis* is typical with *Melaleuca thymifolia* and *Callistemon citrinus* often found amongst the shrub layer along drainage channels. The ground layer is periodically water-logged and features an array of species from the *Restionacae/Cyperacae* families such as *Leptocarpus tenax.*

3.4.8 Hawkesbury Sandstone Exposed Woodlands

Shrub dominated woodlands and low open woodlands and heath grow in exposed situations on Hawkesbury sandstone across the hinterland of the Sydney Basin. These communities form a component of the Sydney Hinterland Dry Sclerophyll Forests of Keith (2004) a diverse class of vegetation communities situated on lower to mid elevation sandstone plateaux. The landscape is typified as much by the fire scarred, low growing twisted eucalypts and hard-leaved shrubs as it is by exposed boulders, rock plates and thin cover of yellow and white sandy soils. Within the study area the most common vegetation community on Hawkesbury Sandstone is Map Unit 30. The community is restricted to isolated rocky outcrops and peaks north of Howes Trail, however to the south it is widespread on ridgetops and north facing slopes. The tessellated yellowish plates found on the bark of the Yellow Bloodwood (*Corymbia eximia*) is more prominent than the other commonly recorded tree species, the lower growing Narrow-leaved Apple (*Angophora bakeri*). An open shrub layer is always present with taller species *Leptospermum trinervium* and *Persoonia linearis* mixed with distinctive flowering shrubs such as *Banksia spinulosa* var. *collina* and *Lambertia formosa*.

Map Unit 21 is very closely related to the previous community in the habitat in which it occurs as well as the species that occur within it. Both occur in exposed situations on Hawkesbury Sandstone, however in this map unit Red Bloodwood (*Corymbia gummifera*) replaces Yellow Bloodwood (*C. eximia*) and is the dominant member of the ridgetop woodland canopy. This is particularly the case in the south and east of the study area in the Wrights, Mogo and Webbs Creek catchments where this forest appears to become more widespread as annual rainfall levels are higher.

Also in the south and east of the study area Map Unit 29 and Map Unit 32 describe a low growing woodland and heath community that is distributed on skeletal Hawkesbury Sandstone soils found in Parr SCA and south-eastern Yengo NP along the Great North Road. These communities present a mosaic of vegetation structures including low open woodland, woodland and heath. Their distinguishing feature is the low growing Dwarf Apple (*Angophora hispida*) with its broad stalkless grey-green leaves and profuse post fire flowering habit. A dense and diverse sandstone shrub layer is also common and includes Banksias, Hakeas, Drumsticks, Wattles and Peas. Where a eucalypt canopy is very sparse or absent, the community is recognised as a heath (Map Unit 32). Map Unit 29 recognises the woodlands where a low

growing canopy of Scribbly Gums (*E. haemastoma/E.racemosa)* occur and *Angophora hispida* is less abundant. Both Map Units are found in two situations in the study area. The first is associated with small knolls at the end of minor ridgelines where soils are extremely thin and rocky. The second is on broader ridgelines on deposits of bleached white sands, particularly along the Great North Road.

3.4.9 Hawkesbury and Narrabeen Sandstone Wet Sclerophyll Forests and Rainforests

Yengo NP occupies a zone of lower annual rainfall (650 – 850mm per annum), compared to the coastal escarpment of the Watagan Ranges less than ten kilometres east and the Colo Plateaux to the west. The decrease in moisture availability coupled with high frequency fire severely restricts the availability of suitable habitat to encourage the abundance and diversity of warm-temperate waxy leaved trees and shrubs. Unlike Wollemi NP where slot canyons provide year round protection, the topography of the Yengo and Parr reserves are punctuated by shallower gully systems exposed to sun, drying winds and frequent intense fire. As a consequence rainforest and coastal wet sclerophyll forests are rare. Instead, sheltered sites carry very tall open eucalypt forests that have a simple mixed shrub layer of low-growing mesic and sclerophyll species, as well as rapid recolonisers such as small ferns, vines and herbs that depend on shelter provided by the micro habitat formed by sandstone benches, rocks and boulders. Prevalent across the sheltered forests are sub-canopy stands of Forest Oak (*Allocasuarina torulosa*) where the shedding of their needle-like leaves contributes to an abundant litter layer in long unburnt areas. Only the fire tolerant rainforest tree Grey Myrtle (*Backhousia myrtifolia*) is found consistently on these infertile sandstone soils. These eucalypt forests represent the driest margins of the North Coast Wet Sclerophyll Forests class of Keith (2004).

The dendrogram shown in Figure 3.1 presents four Eucalypt dominated communities, most of which are associated with Narrabeen sandstone gullies and sheltered slopes. However the first describes moister forests situated on Hawkesbury Sandstone (Map Unit 18). In the most protected situations, such as gullies and beneath south-facing clifflines and benches, these infertile soils support a forest to 30 metres tall. The forest is characterised by Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*), Smooth-barked Apple (*Angophora costata*) and Forest Oak (*Allocasuarina torulosa*) with a mix of shrub species such as Hop Bush (*Dodonaea triquetra*) and prickly–leaved shrubs such as Mountain Holly (*Podolobium ilicifolium*). Localised occurrence of Grey Myrtle (*Backhousia myrtifolia*) is also frequent.

The tallest eucalypt forests in the study area are the Blue Gum (*E. deanii* and *E. saligna*) and Turpentine (*Syncarpia glomulifera* subsp. *glomulifer*a) gully forests (Map Unit 4). They are more common in the eastern and southern areas of the reserves particularly in the Mogo and Wrights Creek catchments where rainfall levels exceed 800mm per year. This forest is characterised by a relatively simple mesic shrub layer compared to the coastal gully forests to the east. Small rainforest trees are few, and, where present, the hardy Grey Myrtle dominates. The understorey is ferny and contains a high number of vines and twiners that scramble across the forest floor and amongst the shrub layer. Several species listed on the Rare or Threatened Plants list (RoTAP), such as *Callistemon shiresii* and *Acacia prominens,* have been encountered within these forests. By contrast, gully systems in central Yengo NP support an uncommon vegetation community in the region (Map Unit 5). It is dominated by the tall, spotted white bark of the rare eucalypt, Hillgrove Gum (*E. michaeliana*) and is found on lower slopes above minor streams between the upper Macdonald River and St Albans. This zone of Yengo NP receives only low to moderate annaul rainfall (less than 800mm per year). Consequently this sheltered forest is characterised by a dense cover of the hardy *Backhousia myrtifolia* in the understorey where it forms a sprawling shrub amongst the sandstone.

Another community supporting an uncommon eucalypt canopy composition is Map Unit 14. Situated on shale influenced Narrabeen soils on steep south facing aspects in northern Yengo NP this tall open forest comprises two rare eucalypts of the Sydney Basin, Coast Box (*E. hypostomatica)* and the abovementioned Hillgrove Gum. However, Grey Gum (*E. punctata*) and Ironbarks (*E. crebra/E.fibrosa*) are more frequently recorded. Tall Forest Oak (*A. torulosa*) is also common amongst the tree stratum, with soft leaved forbs and grasses providing a moderate to sparse ground cover. Other than *Rapanea variabilis* there are very few mesic shrubs prominent withinin the Map Unit. Across the sandstone plateaux there is greater shelter from the northern sun wherever gullylines become pinched and deeper. In these situations *Backhousia myrtifolia* assumes increasing dominance in the small tree layer, where, at its most developed, it forms a dense stand of small trees of even height (Map Unit 3). This map unit can be considered a depauperate form of Keiths (2004) Dry Rainforest class as it includes a greater frequency of rainforest species such as *Clerodendrum tomentosum*, *Rapanea variabilis*, *Ficus coronata* and *Acmena smithii* although these provide only a sparse cover. In the Drews and Vault Creek areas in the far north east of Yengo NP there are scattered occurrences of species such as *Schizomeria ovata,*

Guoia semiglauca and *Endiandra sieberi* that are hints of the grander dry-subtropical rainforests found along the Watagan Range and Hunter Escarpments.

3.4.10 Alluvial and Basalt Herb and Grass Forests and Woodlands

The dendrogram (Figure 3.1) presents a distinct grouping of sites that largely describe tall open grassy forests and woodlands growing on deeper clay rich soils associated with flats and drainage lines of major rivers and creeks. The major riverflats run through central Yengo NP on the various branches of the Macdonald River and trace the eastern perimeter of the reserve along the Wollombi River. Similar small elevated floodplain-like landforms are found on the Mellong Plateau and near the Putty Valley. Within the reserves there are also areas of infill that form colluvial fans or minor flats at the headwaters of minor gullies and on lower terraces of steep slopes across the sandstone plateau. These are often a mix of eroded Narrabeen shales and sands and support an open forest similar to those found on the wider riverflats.

The easy terrain, abundance of palatable grasses and access to water has meant that much of the original vegetation on these soils has been cleared for agriculture. As a result what remains today are often stands of regrowth eucalypts with prolific growth of recolonising species such as *Acacias* along with invasive weed species such as Large-leaved Privet (*Ligustrum lucidum).* The current condition of these forests belies their grandeur described in 1817 by Parr in the Putty Valley and Boggy Swamp Creek "*I never saw anything so picturesque and fine in all my travels. The surface is, as if coverered with a fine young wheat and not a bush nor bough of a tree to be seen upon it….the trees which are Apple and Gum are very thin (sparse) upon the ground, but the Apple trees are the largest I ever saw. I measured three, the circumferences of which were 23 feet 6 inches (7 metres), 22 and 20 feet*. *They are also extremely tall*" (in Macqueen 2004). These notes also suggest how open these grand tall forests were "….*the trees which are Apple and Gum are very large but thinly set on the land, in some places two or three acres together has not a single tree or bush upon it*…." (*ibid*).

Today the forests alluded to by Parr are described and mapped as Map Unit 12 where Rough-barked Apple (*Angophora floribunda*), Cabbage Gum (*E. amplifolia*) and Paperbark (*Melaleuca linariifolia*) are prominent. The ground cover is still a sweep of grasses including *Microlaena stipoides* var. *stipoides.* These forests are found on the broader flats of the Mellong Plateau. They are recognised as a component of River-flat eucalypt forest on Coastal Floodplains, an EEC listed under the *NSW TSC Act, 1995*. A closely related forest community (Map Unit 11) occurs patchily across the sandstone plateau on flats associated with gully headwaters. Here the colluvial and alluvial fans are narrower with shallower sandy soils and are surrounded by steeply rising sandstone slopes. These forests have *Angophora floribunda* in the tree layer alongside Thin-leaved Stringybark (*E. eugenioides*). As the fan broadens, or in sites where there is higher clay content in the soil, Sydney Blue Gum (*E. saligna)* and/or Cabbage Gum (*E. amplifolia)* assume dominance. These forests are found around Big Yango station, Wallabadah and Boree. Many of these sites have also have a long history of logging, clearing and agricultural land use.

The lower Macdonald, Wrights Creek and Wollombi Valley support several additional riverflat communities. These communities differ from those described above by the presence of several rainforest species, indicating that perhaps gallery rainforests were once a part of the riverflat systems in zones of better soil and higher rainfall. Grey Myrtle (*Backhousia myrtifolia*), Lillipilli (*Acmena smithii*), Cheesetree (*Glochidion ferdinandii* var *ferdinandii*) and White Cedar (*Melia azederach*) have been recorded at some sites. This hypothes is supported by historical evidence of cedar-getting along the Hawkesbury River (Macqueen 2004) and further in 1933 a Sydney newspaper described "*For a great many years, and until recently, a big cedar tree grew outside The Settlers Arms* (pub at St Albans on the Macdonald River). *It was such a magnificent specimen that it always caused comment*" (Hutton Neve 1978)

Other floristic attributes are similar with the riverflat terraces dominated by tall eucalypts, primarily Cabbage Gum and Rough-barked Apple (Map Unit 7). However in a small creekline in Parr SCA not far from the Hawkesbury River, Swamp Mahogany (*E. robusta*) occurs near the perimeter of a large floodplain wetland (Map Unit 8). This tree is common around sea level not far from the coastline and its occurrence here approaches the western limit of its distribution in the Sydney Region.

Tall narrow stands of River Oak (*Casuarina cunninghamiana* subsp *cunninghamiana*) are found on the banks of the Wollombi and Macdonald Rivers (Map Unit 34). These forests occupy sites of high flood disturbance where sands, pebbles and gravels are scoured or deposited along the river. As a result the floristic composition of any given site can be highly variable and susceptible to infestation of water carried weeds.

Four Map Units have been recognised from vegetation patterns associated with Basalt soils. Two (Map Units 1 and 9) were explicitly identified from numerical analysis, while an additional two Map Units (10 and 37) were discriminated from floristic groups using soil and landform characteristics rather than floristic composition.

Basalt soils mix with the underlying Narrabeen Sandstone to form a 'breccia" on the slopes of these peaks. Map Unit 9 describes the forest community that is characterised by Forest Red Gum (*E. tereticornis*), Grey Gum (*E. punctata*) and/or Grey Box (*E. moluccana*). A rare and distinctive wattle *Acacia fulva* is found on these richer soils and is locally abundant where present. The high grass cover, comprising *Themeda australis* amongst others, once encouraged clearing and rough grazing by early settlers. A small area of ground water seepage between the basalt and sandstone strata supports a grove of Paperbark (*Melaleuca styphelioides)* (Map Unit 37).

There are just a few small igneous plugs within study area, variously known as holes, clears, craters, vents or diatremes. These oval shaped depressions occupy the headwaters of minor drainage lines. Soils are a mix of basaltic and sandstone material. These richer soils produce an abundant cover of grasses and herbs and thus it is not surprising that, irrespective of the size of the patch or its remoteness many have been cleared. Map Unit 10 illustrates the location of these diatremes and describes the flora that grows on them. While further sampling is required, the forest can be dominated by a combination of Rough-barked Apple (*Angophora floribunda*), Thin-leaved Stringybark *(E. eugenioides*) and Narrow-leaved Ironbark (*E. crebra*) with Cabbage Gum (*E. amplifolia*) occupying drainage depressions within the diatreme. At a diatreme at Pierces Hole, the canopy includes Yellow Box (*E. melliodora*), an unusual species in hinterland environments of the Sydney Basin.

3.4.11 Sandstone Warm Temperate Rainforest

Warm-temperate rainforest only occurs in isolated and small patches in the reserves. These stands are only moderately tall and maintain a closed canopy of Coachwood (*Cerapetalum apetalum),* Lillipilli *(Acmena smithii)* and Grey Myrtle (*Backhousia myrtifolia*) (Map Unit 2*).* These rainforests are restricted to the south-eastern area of Yengo NP and Parr SCA where annual rainfall exceeds 900mm per annum.

3.4.12 Other Vegetation Communities

Five vegetation communities have been described for which there was no systematic sampling effort. These have been identified from aerial photography and field traverse. Most occur outside of the reserves on the flats of the Macdonald River. Two estuarine communities situated at the junction of the Hawkesbury River are small in area (Map Units 36 and 40) though are more extensive on the coastal plain to the east. Further up the valley, dense stands of Paperbark (*Melaleuca linariifolia* and *M. stypheliodes*) (Map Unit 39) form groves along drainage lines, depressions and around the perimeter of open wetlands. Each of these floodplain communities are referable to several EECs under Schedule 3 of the *NSW TSC Act, 1995*.

Within the reserves, two additional communities were identified. The first (Map Unit 43), identifies two small areas of sedgelands associated with sandstone, otherwise known as 'upland' or 'hanging swamps'. The second (Map Unit 35), represents a complex of vegetation formations and landscape features associated with the riparian environment along the Macdonald River. A complex mosaic of open water, sand banks, riparian scrubs and tall eucalypts are all present within this map unit. This patterning changes rapidly over distance as the river meanders through the dissected sandstone plateau. It also likely to change over time as floods periodically alter the location of sand deposits and vegetation on banks, as well as the width of the river itself.

One further community has emerged from further systematic survey in the adjoining Putty and Howes Valleys (DECC 2008b). Map Unit 49 is situated on lower slopes and undulating grades of shale influenced Narrabeen soils. It is characterised by combinations of Rough-barked Apple (*Angophora floribunda*), Narrow-leaved Ironbark (*E. crebra*) and Grey Gum (*E. punctata*) with Forest Red Gum (*E. tereticornis*) common near minor drainage lines. A sparse layer of shrubs is common and includes numerous Wattles (*Acacia* spp.) and Blackthorn (*Bursaria spinosa*) and small trees such as Forest Oak (*Allocasuarina torulosa*). The ground cover is distinctly grassy and this has led to a variety of agricultural pursuits throughout the study area. Much of the extant distribution of this community supports open even aged regrowth with widespread evidence of human disturbances such as tracks, fences and canopy gaps. Only small areas are present in Yengo NP near the interface with private tenures in the Howes Valley area.

3.5 MAPPING OF VEGETATION COMMUNITIES

A total of 43 Map Units have been identified from 38 API codes and 441 sites. Table 3.2 indicates that a high level of agreement was achieved between Level 1 API codes and broad floristic classes derived from analysis of site data. Over 90% agreement was obtained for all broad classes except two rainforest communities that occur in patch sizes that are often too small to map at the scale of photography used for this project.

The level of agreement between individual vegetation communities derived from site data to API codes was more variable. Table 3.3 shows that over half of the communities could be ascribed to a map unit using a single API code. This was the case for communities that have a sharp boundary by virtue of their distinctive structural form (eg. heath, wetland) or highly identifiable habitat (eg. alluvium, basalt cap, shale cap).

Other Map Units required combinations of API codes to describe their distribution. Higher levels of agreement were reached between API codes and floristic groups when a number of API codes were reflecting subtle variations in canopy species composition within the same vegetation formation (eg. Blue Gum-Turpentine Gully Forests on Narrabeen Sandstone). This indicates that in some instances subtle changes in canopy dominance does not result in changes in overall floristic composition.

The dry forest and woodland communities associated with Narrabeen series geology returned the lowest levels of agreement. This is not surprising because of the complex nature of the three lithologies present within this stratum: lithic sandstone, sandstone shale and shale bands. Subtle changes to understorey composition occur within very short distances while a relatively uniform canopy composition and structure is retained. Considered together these dry shrub-grass communities achieved over 90% agreement between field sites and Level 1 API patterns, while individual floristic groups achieved just over 70% with allocated Level 2 API codes.

Table 3.2: Agreement between broad floristic class and level 1 aerial photograph interpretation

Broad Floristic Class	Broad API Class (Level1)	Number sites	Number in API Class	Percent Agreement
Hawkesbury Sandstone Dry Forests	Sheltered Hawkesbury Sandstone Dry Forests	54	51	94%
Sandstone Dry Sclerophyll Forests and Woodlands	Narrabeen and Hawkesbury Sandstone Woodlands	40	38	95%
Narrabeen Series Shale and Sandstone Dry Sclerophyll Forests	Narrabeen Shale and Sandstone Forests	58	54	93%
Hunter Escarpment Permian Footslopes Dry Sclerophyll Forests	Permian Sediments Woodlands	6	6	100%
Freshwater Wetlands	Wetlands			
Basalt Dry-Subtropical Rainforest	Basalt Dry-Subtropical Rainforest	3	2	67%
Mellong Sandmass Woodland	Mellong Sandmass Woodlands	7	7	100%
Hawkesbury Sandstone Exposed Woodlands	Exposed Hawkesbury Sandstone Woodlands	89	86	97%
Hawkesbury and Narrabeen Sandstone Wet Sclerophyll Forests and Rainforest	Sheltered and Wet Sclerophyll Forests and Rainforests	73	67	92%
Alluvial and Basalt Herb and Grass Forests and Woodlands	Grassy and Herb Forests on Alluvium,and Basalt	40	38	95%
Sandstone Warm Temperate Rainforest	Wet Sclerophyll Forests and Rainforests	6	4	67%

Table 3.3: Relationship between level 2 API codes and Map Units

Map Unit Name (PATN Floristic Group)	API Codes	Percentage of Sites (%) within PATN Floristic Group that fell within API code	Percentage of Sites (%) within API Code that describe the PATN Floristic Group in Column 1	Understorey Attributes from the API Code Allocated to the PATN Floristic Group in Column 1	Allocated to Map Unit (Column 1)
MU18 Sydney Hinterland Sheltered Turpentine-Apple Forest	1016	13	16	Moist Understorey 20 only	Yes
	1017	75	70	All except Moist Understorey Codes 10 and 20	Yes
	1066	4	8	Not considered	No
	1042	4	14	Not Considered	No
MU16 Sydney Hinterland Sheltered Turpentine-Blackbutt Forest	1019	100	100	All except Moist Understorey Codes 10 and 20	Yes
MU35 Sydney Hinterland Sandstone Riparian Complex	1081c	Not Sampled	Not Sampled	All	Yes
MU17 Sydney Hinterland Peppermint-Apple Forest	1018	12	100	All	Yes
	1016	88	84	All except Moist Understorey Codes 10 and 20	Yes
	1017	6	5	Not considered	No
MU20 Sydney Hinterland Bloodwood-Mahogany Transition Forest	1029m	100	100	All	Yes
MU25 Hunter Range Exposed Stringybark-Grey Gum	1032	80	100	All	Yes
	1015	20	100	All	Yes
	1025	50	60	All except moist understorey codes 20 and 10	Yes
	1022	50	69	All	Yes
MU19 Hunter Escarpment Sheltered Ironbark Forest	1031	70	28	Include Understorey Code 11only	Yes
	1025	20	17	Code 10 only	Yes
	1023	10	4	All	No
MU20 Hunter Range Ironbark Forest	1023	32	74	All	Yes
	1031	27	57	All except Understorey Codes 11,10,20	Yes
	1022	23	30	Code 13 only	Yes
	1036	5	25	Not considered	No
	1041	5	17	Not considered	No
	1063	5	10	Not considered	No
MU49 Hunter Range Footlslopes Ironbark-Red Gum Forest	1023a	100	100	All	Yes
MU15 Sydney Hinterland Shale Ironbark Forest	1029	88	100	All	Yes
	1023	13	0	Not considered	No
MU13 Hunter Range Shale Grey Box-Red Gum Forest	1023	50	5	Select where Box, Red Gum present and grassy understorey in comments	Yes
	1033	50	20	Select Ridgetop locations only	Yes
MU31 Hunter Escarpment Acacia Scrub	1091	1	100	All	Yes
MU23 Hunter Escarpment	1023p	100	100	All	Yes

Map Unit Name (PATN Floristic Group)	API Codes	Percentage of Sites (%) within PATN Floristic Group that fell within API code	Percentage of Sites (%) within API Code that describe the PATN Floristic Group in Column 1	Understorey Attributes from the API Code Allocated to the PATN Floristic Group in Column 1	Allocated to Map Unit (Column 1)
Footslopes Ironbark-Box Woodland					
	1033p	100	100	All	Yes
MU41 Coastal Floodplain Wetland	1081b	100	100	All	Yes
MU42 Hunter Range Flats Freshwater Wetland	1081a	100	100	All	Yes
MU1 Hunter Range Stinging Tree Dry Rainforest	1053	1	100	All	Yes
MU26 Mellong Sands Apple-Banksia Woodland	1972	100	100	All	Yes
MU28 Mellong Sands Scribbly Gum Woodland	1071	50	100	All	Yes
	1072	33	50	All	Yes
	1013a	17	100	All	Yes
MU27 Mellong Sands Drooping Red Gum Sedge Woodland	1073	100	100	All	Yes
MU30 Sydney Hinterland Rocky Yellow Bloodwood Woodland	1011	80	75	All	Yes
	1014	9	25	Not considered	No
	1016	7	18	Not considered	No
MU21 Sydney Hinterland Exposed Red Bloodwood-Stringybark Forest	1014	50	88	All	Yes
	1017	5	4	Not considered	No
	1011	35	11	Not considered	No
MU33 Sydney Hinterland Rock Complex	4003	40	100	All	Yes
	1011	0	0	Rock >75% cover only	Yes
MU32 Sydney Hinterland Dwarf Apple Heath	1012	100	100	All	Yes
MU29 Sydney Hinterland Exposed Scribbly Gum Woodland	1013	100	100	All	Yes
MU14 Hunter Range Sheltered Grey Gum Forest	1041	8	33	All except Moist Understorey 10	Yes
	1033	8	40	Understorey 11 only	Yes
	1036	8	50	Understorey 11 only	Yes
	1031	33	39	Understory 11 only	Yes
	1066	13	10	All	Yes
	1042	8	25	All	Yes
MU4 Sydney Hinterland Blue Gum-Turpentine Gully Forest	1066	43	67	All	Yes
	1068	29	33	All	Yes
	1042	7	17	Include with Understory 10 only	Yes
	1062	14	20	Include with Understory 10 and 20 only	Yes
	1017	14	7	Include with Understory 10 and 20 only	Yes
MU5 Hunter Range Hillgrove Gum Gully Forest	1063	87	82	All	Yes
	1036	100	100	Sites with Understorey10 or 11b only	Yes
MU3 Hunter Range Grey Myrtle Dry Rainforest	1051	20	100	All	Yes

Map Unit Name (PATN Floristic Group)	API Codes	Percentage of Sites (%) within PATN Floristic Group that fell within API code	Percentage of Sites (%) within API Code that describe the PATN Floristic Group in Column 1	Understorey Attributes from the API Code Allocated to the PATN Floristic Group in Column 1	Allocated to Map Unit (Column 1)
	1017	13	4	Not considered	No
	1066	7	33	Not considered	No
	1068	20	33	Not considered	No
	1041	7	14	Not considered	No
MU11 Hunter Range Flats Apple-Stringybark-Gum Forest	1065	73	80	All	Yes
	1062	20	80	All	Yes
	1031	7	3	Not considered	No
MU12 Hunter Range Flats Red Gum-Apple Forest	1064	67	100	All	Yes
	1074	17	20	Not considered	No
	1072	17	33	All	Yes
MU34 Coastal River Oak Forest	1067	100	100	All	Yes
MU9 Hunter Range Basalt Red Gum Box Forest	1027	100	100	All	Yes
	1028	100	100	All	Yes
MU8 Coastal Riverflat Swamp Mahogany Forest	1069	100	100	All	Yes
MU7Coastal Riverflat Cabbage Gum Woodland	1064	100	100	On Macdonald and Wollombi River Flats only	Yes
MU2 Sydney Hinterland Warm Temperate Rainforest	1052	100	100	All	Yes

Table 3.4: Unsampled API codes and map unit allocation

Map Unit Name	API Code
MU6 Coastal Riverflat Blue Gum-Peppermint Forest	1067b
MU10 Sydney Hinterland Diatreme Forest	1037a,b
MU35 Sydney Hinterland Sandstone Riparian Complex	1067c
	1085
MU36 Coastal Estuarine Swamp Oak Forest	1067a
MU37 Hunter Range Basalt Paperbark Thicket	1043
MU39 Coastal Riverflat Paperbark Thicket	1074
MU40 Coastal Estuarine Paperbark Thicket	1074e
MU43 Sydney Hinterland Sandstone Upland Swamp	1084

3.6 DISTURBANCE ASSESSMENT

3.6.1 Disturbance severity

The impact of human disturbance on the extant native vegetation of the study area is shown in Table 3.5 and illustrated in Map 7. Based on the aerial photography used for the project (various between 1998-2002) both Yengo NP and Parr SCA show little evidence of intensive human disturbance. This is not surprising as the infertile soils, rugged topography and low rainfall have made much of the reserve undesirable for intensive landuse. Intensive disturbance patterns tend to follow boundaries of private lands on the perimeter of the reserve where agricultural activities are still pursued. Within the reserves disturbance patterns appear lighter with most impacts associated with operational and regenerating logging and fire trails. Evidence of past logging is still visible in the canopy around areas that support merchantable timber. This includes canopy gaps, a high proportion of young trees in the eucalypt canopy

and snig tracks and logging trails. Some of these disturbance features such as regenerating eucalypts, trails, open canopy are also associated with former rough grazing in areas supporting a well grassed ground cover and water.

Table 3.5: Area and proportion of disturbance classes found in the study area

Severity Classes	Area (ha)	Proportion %
Low Disturbance	165830	68
Moderate Disturbance	55427	23
High Disturbance	15264	6
Cleared Lands	6397	3
Not Assessed (water)	135	0

As Table 3.6 indicates, disturbance has been concentrated within just a few vegetation communities, namely those characterised by more fertile soil and some grass cover. One example is the alluvial flats around the perimeter of the study area that primarily occur on private lands and are made more attractive by the presence of permanent water. Map Units 6, 7, 8,12,13, 39, 40, 41 have been extensively cleared and remaining stands are heavily disturbed by past or continued agricultural land use. Similar patterns are found amongst those communities found on richer basalt or shale-influenced soils (Map Units 9, 10, 15 and 23)

Table 3.6: Vegetation Community by disturbance intensity (percentage of extant vegetation)

MU_NO	MAPUNIT	High Disturbance	Moderate Disturbance	Low Disturbance	Grand Total
		% total	% total	% total	Hectares
01	Hunter Range Stinging Tree Dry Rainforest	0%	38%	62%	37
02	Sydney Hinterland Warm Temperate Rainforest	1%	1%	98%	172
03	Hunter Range Grey Myrtle Dry Rainforest	2%	15%	83%	422
04	Sydney Hinterland Blue Gum-Turpentine Gully Forest	9%	25%	66%	19569
05	Hunter Range Hillgrove Gum Gully Forest	0%	19%	81%	2176
06	Coastal Riverflat Blue Gum-Peppermint Forest	100%	0%	0%	48
07	Coastal Riverflat Cabbage Gum Forest	100%	0%	0%	3
08	Coastal Riverflat Swamp Mahogany Forest	100%	0%	0%	12
09	Hunter Range Basalt Red Gum-Grey Box Forest	21%	59%	20%	290
10	Sydney Hinterland Diatreme Forest	67%	27%	7%	90
11	Hunter Range Flats Apple-Stringybark-Gum Forest	42%	22%	36%	7479
12	Hunter Range Flats Red Gum-Apple Forest	64%	2%	34%	194
13	Hunter Range Shale Grey Box-Red Gum Forest	74%	10%	16%	107
14	Hunter Range Sheltered Grey Gum Forest	3%	13%	84%	10111
15	Sydney Hinterland Shale Ironbark Forest	57%	38%	5%	244
16	Sydney Hinterland Sheltered Turpentine-Blackbutt Forest	15%	26%	59%	1204
17	Sydney Hinterland Peppermint-Apple Forest	2%	23%	75%	39474
18	Sydney Hinterland Sheltered Turpentine-Apple Forest	2%	27%	71%	11869
19	Hunter Escarpment Sheltered Ironbark Forest	0%	13%	87%	467
20	Hunter Range Ironbark Forest	6%	12%	83%	40183
21	Sydney Hinterland Bloodwood-Mahogany Transition Forest	64%	28%	8%	983
22	Sydney Hinterland Exposed Red Bloodwood-Stringybark Forest	3%	34%	62%	18672
23	Hunter Escarpment Footslopes Ironbark-Box Woodland	57%	10%	33%	423
25	Hunter Range Exposed Stringybark-Grey	6%	19%	75%	16860

MU_NO	MAPUNIT	High Disturbance	Moderate Disturbance	Low Disturbance	Grand Total
		% total	% total	% total	Hectares
	Gum Woodland				
26	Mellong Sands Apple-Banksia Woodland	49%	13%	38%	712
27	Mellong Sands Drooping Red Gum Sedge Woodland	10%	73%	17%	661
28	Mellong Sands Scribbly Gum Woodland	10%	54%	36%	2161
29	Sydney Hinterland Exposed Scribbly Gum Woodland	0%	40%	60%	5594
30	Sydney Hinterland Rocky Yellow Bloodwood Woodland	3%	28%	70%	52364
31	Hunter Escarpment Acacia Scrub	100%	0%	0%	133
32	Sydney Hinterland Dwarf Apple Scrub	0%	39%	61%	1165
33	Sydney Hinterland Rock Complex	0%	16%	84%	172
34	Coastal River Oak Forest	64%	31%	6%	121
35	Sydney Hinterland Sandstone Riparian Complex	0%	0%	100%	318
36	Coastal Estuarine Swamp Oak Forest	77%	23%	0%	71
37	Hunter Range Basalt Paperbark Thicket	0%	100%	0%	1
38	Hunter Range Flats Paperbark Thicket	55%	21%	25%	51
39	Coastal Riverflat Paperbark Thicket	66%	15%	18%	197
40	Coastal Estuarine Paperbark Thicket	81%	19%	0%	5
41	Coastal Floodplain Wetland	86%	14%	0%	87
42	Hunter Range Flats Freshwater Wetland	37%	48%	15%	60
43	Sydney Hinterland Sandstone Upland Swamp	0%	0%	100%	3
44	Acacia Regeneration	86%	13%	1%	505
45	Regenerating Trees and Shrubs				476
46	Cleared Lands				6397
47	Exotic Species				69
49	Hunter Range Footslopes Ironbark-Red Gum Forest	57%	13%	30%	505
Grand Total					243054

3.6.2 Exotic species

Systematic field survey work recorded 64 exotic vascular plant species in a wide variety of locations and environments. A complete list is provided in Appendix C. The locations of these species have been stored in an electronic database and are available from the Atlas of NSW Wildlife.

3.7 CONSERVATION STATUS ASSESSMENT

3.7.1 Regional and Statewide Conservation Status

Table 3.7 presents figures describing the regional reservation status for each community. The region used is the Sydney Basin Bioregion (Thackway and Creswell 1995). Reservation Status is calculated against the proportion of each vegetation community located within DECC estate as at 2006, and relies on the work of Tozer *et al.* (2006), Bell (1998), Peake (2006) and NPWS (2000). Figures are given where available to describe the level of clearing of each community since European arrival.

Table 3.7: Distribution and area of vegetation communities in study area

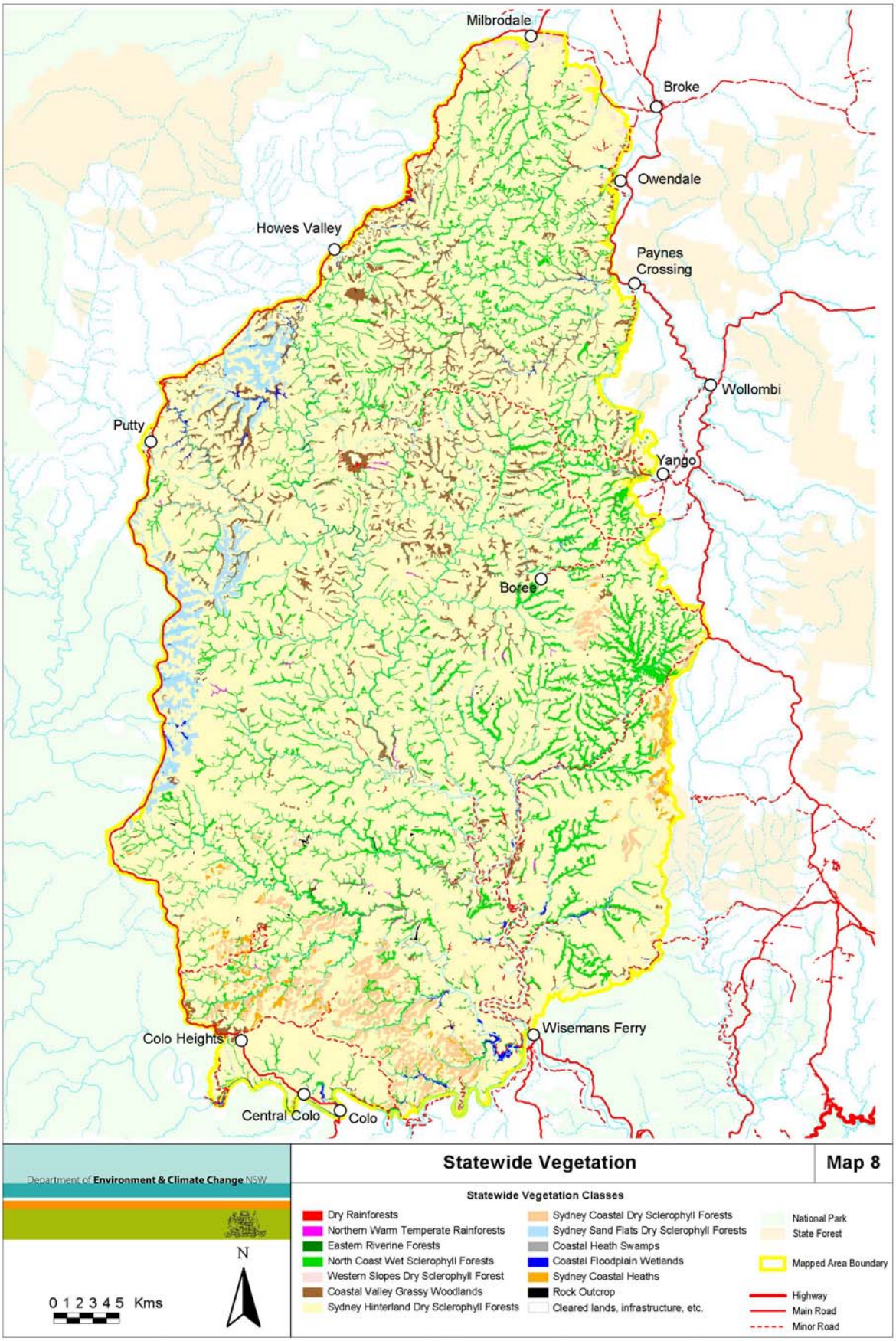
Map Unit Name and Number	Regional Classification Unit (Source)	Statewide Vegetation Class	Total Area (Hectares) in Study Area	Extant Area in Sydney Basin Bioregion (est)	Extant Area in Reserves (est)	Estimate of Clearing	Estimate of Pre-clearing Area in DECC Estate
01Hunter Range Stinging Tree Dry Rainforest	Hunter Valley Dry Rainforest (NPWS,2000)	Dry Rainforests	37	1338	149	70-80%	2-5%
02Sydney Hinterland Warm Temperate Rainforest	A component of Sandstone Ranges Warm Temperate Rainforests (NPWS, 2000); Sandstone Scarp Warm Temperate Rainforest (Tozer *et al*., 2006)	Northern Warm Temperate Rainforests	172	7604	6200	5%	95%
03Hunter Range Grey Myrtle Dry Rainforest	A component of Sandstone Grey Myrtle Sheltered Rainforest	Dry Rainforests	422	12650	11435		40-60%
04Sydney Hinterland Blue Gum-Turpentine Gully Forest	Sheltered Blue Gum Forest (NPWS, 2000); Lower Blue Mountains Wet Forest (Tozer *et al.*, 2006)	North Coast Wet Sclerophyll Forests	19569	35113	31059	5%	75-90%
05Hunter Range Hillgrove Gum Gully Forest	Not described	North Coast Wet Sclerophyll Forests	2176	2176	2176	N/A	N/A
06Coastal Riverflat Blue Gum-Peppermint Forest	Not described	Coastal Floodplain Wetlands	48	N/A	0	>90%	0
07Coastal Riverflat Cabbage Gum Forest	A component of Wollombi River Oak-Red Gum Forest (NPWS,2000); Cumberland Riverflat Forest (Tozer *et al.,*2006)	Coastal Floodplain Wetlands	3	6022	110	80-95%	2%
08Coastal Riverflat Swamp Mahogany Forest	Sydney Swamp Forest (Tozer *et al.*, 2006); A component of Swamp Mahogany-Paperbark Forest (NPWS, 2000)	Coastal Floodplain Wetlands	12	4321	420	75-85%	<10%

Map Unit Name and Number	Regional Classification Unit (Source)	Statewide Vegetation Class	Total Area (Hectares) in Study Area	Extant Area in Sydney Basin Bioregion (est)	Extant Area in Reserves (est)	Estimate of Clearing	Estimate of Pre-clearing Area in DECC Estate
09Hunter Range Basalt Red Gum-Grey Box Forest	Not described	Coastal Valley Grassy Woodlands	290	<1000	<500	65-90%	65-80%
10Sydney Hinterland Diatreme Forest	Not described	Coastal Valley Grassy Woodlands	90	<1000	<500	65-90%	65-80%
11Hunter Range Flats Apple-Stringybark-Gum Forest	A component of Wollombi River Oak-Red Gum Forest (NPWS,2000)	Coastal Valley Grassy Woodlands	7479	N/A	N/A	N/A	N/A
12Hunter Range Flats Red Gum - Apple Forest	Not described	Coastal Floodplain Wetlands	194	<1000	1200	>70%	<10%
13Hunter Range Shale Grey Box-Red Gum Forest	Not described	Coastal Valley Grassy Woodlands	107	<500	100	40%	50%
14Hunter Range Sheltered Grey Gum Forest	Hunter Range Grey Gum Forest (NPWS,2000)	Sydney Hinterland Dry Sclerophyll Forests	10111	20058	18973	5%	75-90%
49Hunter Range Footslopes Red Gum-Ironbark Forest	Not described	Coastal Valley Grassy Woodlands	288	<3500	288	60-70%	65-80%
15Sydney Hinterland Shale Ironbark Forest	Cumberland Shale Sandstone Transition Forest (Tozer *et al*.,2006)	Coastal Valley Grassy Woodlands	244	9844	240	60-80%	2%
16Sydney Hinterland Sheltered Turpentine-Blackbutt Forest	Hinterland Sandstone Gully Forest (Tozer *et al*, 2006)	Sydney Hinterland Dry Sclerophyll Forests	1204	90800	44600	5-20%	35-55%
17Sydney Hinterland Peppermint-Apple Forest	Sheltered Dry Hawkesbury Woodland; (NPWS,2000)	Sydney Coastal Dry Sclerophyll Forests	39472	138142	89200	13%	65%

Map Unit Name and Number	Regional Classification Unit (Source)	Statewide Vegetation Class	Total Area (Hectares) in Study Area	Extant Area in Sydney Basin Bioregion (est)	Extant Area in Reserves (est)	Estimate of Clearing	Estimate of Pre-clearing Area in DECC Estate
18Sydney Hinterland Sheltered Turpentine-Apple Forest	Hinterland Sandstone Gully Forest (Tozer *et al*, 2006); Hinterland Sandstone Gully Forest (Tozer, 2006)	Sydney Hinterland Dry Sclerophyll Forests	11869	185484	133800	13%	72%
19 Hunter Escarpment Sheltered Ironbark Forest	Not described	Sydney Hinterland Dry Sclerophyll Forests	467	3107	N/A	N/A	N/A
20Hunter Range Ironbark Forest	Macdonald Exposed Ironbark Woodland (NPWS,2000)	Sydney Hinterland Dry Sclerophyll Forests	40183	40247	31560	5%	78%
21Sydney Hinterland Bloodwood-Mahogany Transition Forest	Sydney Hinterland Transition Woodland (Tozer *et al*., 2006)	Sydney Hinterland Dry Sclerophyll Forests	983	42683	12700	20-40%	30%
22Sydney Hinterland Exposed Red Bloodwood-Stringybark Forest	Exposed Yellow Bloodwood Woodland (NPWS,2000)	Sydney Coastal Dry Sclerophyll Forests	18672	23867	21000	<5%	88%
23Hunter Escarpment Footslopes Ironbark-Box Woodland	Western Hunter Narrabeen Footslopes Ironbark - Cypress Pine Woodland (Peake, 2006)	Western Slopes Dry Sclerophyll Forests	423	N/A	N/A	N/A	N/A
25Hunter Range Exposed Stringybark-Grey Gum Woodland	Exposed Narrabeen Woodland (NPWS,2000)	Sydney Hinterland Dry Sclerophyll Forests	16860	26420	20937	1%	85-95%
26Mellong Sands Apple-Banksia Woodland	Not described	Sydney Sand Flats Dry Sclerophyll Forests	712	<2000	>500	10-30%	75-90%
27Mellong Sands Drooping Red Gum Sedge Woodland	Not described	Sydney Sand Flats Dry Sclerophyll Forests	661	<2000	>500	10-30%	75-90%

Map Unit Name and Number	Regional Classification Unit (Source)	Statewide Vegetation Class	Total Area (Hectares) in Study Area	Extant Area in Sydney Basin Bioregion (est)	Extant Area in Reserves (est)	Estimate of Clearing	Estimate of Pre-clearing Area in DECC Estate
28Mellong Sands Scribbly Gum Woodland	Not described	Sydney Sand Flats Dry Sclerophyll Forests	2161	<2000	>500	10-30%	75-90%
29Sydney Hinterland Exposed Scribbly Gum Woodland	Coastal Sandstone Ridgetop Woodland (Tozer *et al.* 2006); Scribbly Gum-Dwarf Apple Woodland (NPWS, 2000)	Sydney Coastal Dry Sclerophyll Forests	5594	110600	47900	10-25%	43%
30Sydney Hinterland Rocky Yellow Bloodwood Woodland	Exposed Yellow Bloodwood Woodland (NPWS, 2000)	Sydney Hinterland Dry Sclerophyll Forests	52394	52394	42000	<5%	80%
31Hunter Escarpment Acacia Scrub	Not described	Western Slopes Dry Sclerophyll Forests	133	133	20	n/a	15%
32Sydney Hinterland Dwarf Apple Scrub	Coastal Sandstone Plateau Heath (Tozer *et al.* 2006); Scribbly Gum-Dwarf Apple Woodland (NPWS, 2000)	Sydney Coastal Heath	1165	16500	10400	10%	63%
33Sydney Hinterland Rock Complex	Coastal Sandstone Plateau Heath (Tozer *et al*. 2006); Scribbly Gum-Dwarf Apple Woodland (NPWS, 2000)	Sydney Coastal Heath	172	16500	10400	10%	63%
34Coastal River Oak Forest	Wollombi River Oak-Red gum Forest (NPWS,2000)	Eastern Riverine Forests	121	N/A	N/A	N/A	N/A
35Sydney Hinterland Sandstone Riparian Complex	Sandstone Riparian Scrub (Tozer *et al.,* 2006)	Eastern Riverine Forests	318	3318	1500	10%	45%
36Coastal Estuarine Swamp Oak Forest	Estuarine Swamp Oak-Rush Forest (NPWS, 2000); Estuarine Fringe Forest	Coastal Floodplain Wetlands	71	7519	444	80-95%	6%

Map Unit Name and Number	Regional Classification Unit (Source)	Statewide Vegetation Class	Total Area (Hectares) in Study Area	Extant Area in Sydney Basin Bioregion (est)	Extant Area in Reserves (est)	Estimate of Clearing	Estimate of Pre-clearing Area in DECC Estate
37Hunter Range Basalt Paperbark Thicket	Not described	Coastal Valley Grassy Woodlands	1	N/A	N/A	N/A	N/A
38Hunter Range Flats Paperbark Thicket	Not described	Coastal Swamp Forests	51	N/A	N/A	N/A	N/A
39Coastal Riverflat Paperbark Thicket	Sydney Swamp Forest (Tozer *et al.*, 2006); A component of Swamp Mahogany-Paperbark Forest (NPWS, 2000)	Coastal Swamp Forests	197	4506	420	75-85%	<10%
40Coastal Estuarine Paperbark Thicket	Estuarine Creekflat Scrub (Tozer *et al.,*2006); Estuarine Swamp Oak-Rushland Forest (NPWS,2000)	Coastal Floodplain Wetlands	5	9929	1244	15-30%	13%
41Coastal Floodplain Wetland	Freshwater Wetland Complex (NPWS,2000)	Coastal Floodplain Wetlands	87	5973	968	70%	16%
42Hunter Range Flats Freshwater Wetland	Freshwater Wetland Complex (NPWS,2000)	Coastal Floodplain Wetlands	60	5973	968	70%	16%
43Sydney Hinterland Sandstone Upland Swamp	Coastal Upland Swamp	Coastal Heath Swamps	3	5156	1200	10%	15-30%



Map 8: Statewide vegetation classes (from Keith 2004)

4 DISCUSSION

4.1 THREATENED SPECIES AND ENDANGERED ECOLOGICAL COMMUNITIES

4.1.1 NSW Endangered Ecological Communities

Five Endangered Ecological Communities (EECs), listed under the NSW TSC Act (1995), occur in the study area. These EECs are identified in Table 4.1.

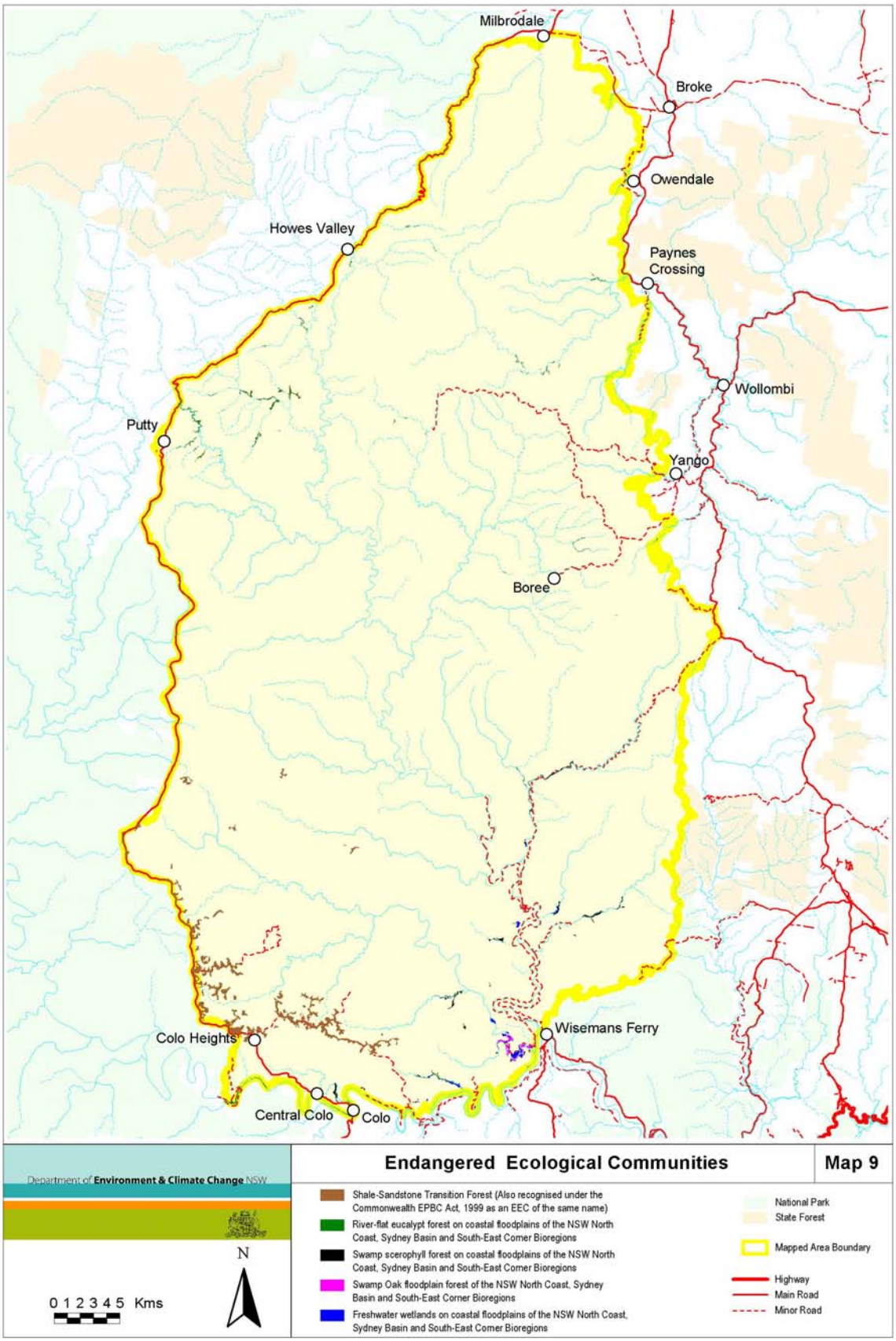
The determination that accompanies the listing of each of these communities under the NSW TSC Act (1995) provides information on habitat and typical species. In addition, example locations are provided as reference points. Both of these factors were used to relate the vegetation communities defined in this report to potential EECs. Table 4.1 highlights the relationship between the Map Units described by this study and EECs listed under the Act. Several EEC determinations are described by multiple Map Units identified and mapped by this report. The distributions of all EECs located within the study area are shown in Map 9. Most are situated outside of the reserves on private lands.

Table 4.1: Relationship between endangered ecological communities (NSW TSC Act (1995)) and vegetation communities described in this report

Endangered Ecological Community Name	Map Units from this report that correspond to an EEC
River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin Forest and South East Corner Bioregions	Coastal Riverflat Cabbage Gum Forest (MU7) Coastal Riverflat Swamp Mahogany Forest (MU8) Coastal Riverflat Blue Gum-Peppermint Forest (MU6) Hunter Range Flats Red Gum-Apple Forest(MU12) Hunter Range Paperbark Thicket (MU38)
Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Coastal Riverflat Paperbark Thicket (MU39)
Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	Coastal Estuarine Swamp Oak Forest (MU36) Coastal Estuarine Paperbark Thicket (MU40)
Freshwater wetlands on coastal floodplains of the NSW North Coast Sydney Basin and South-East Corner Bioregions	Coastal Floodplain Wetland (MU41)
Shale-Sandstone Transition Forest* (Also recognised under the Commonwealth EPBC Act, 1999 as an EEC of the same name)	Sydney Hinterland Shale Ironbark Forest (MU15) Sydney Hinterland Red Bloodwood-Mahogany Transition Forest(MU21)

4.1.2 Threatened plant species

Eighteen plant species listed as threatened under the *NSW TSC Act 1995* and/or the Commonwealth *EPBC Act, 1999* are known to occur in the study area. A review of all threatened plant records held within the Atlas of NSW Wildlife, DECC systematic survey databases and RBG (PlantNET) databases has been undertaken. The rare and endangered plants of the reserves have been more fully described in earlier work (Maryott-Brown and Wilks, 1992). Other relevant reviews of interesting taxa in the Hunter Range area include that by Bell (2001; Bell in press). The table below (Table 4.2) presents an updated list of species currently listed as threatened species on either the *NSW TSC Act, 1995* or the *EPBC Act*, *1999*. Species listed as Rare or Threatened Plants (RoTaP) are not included in the review. Table 4.3 lists species within five kilometres of the study area boundary for which there are no known records from Yengo and Parr reserves.



Map 9: Endangered Ecological Communities

Table 4.2: Plant species listed under the *NSW TSC Act* (1995) and *EPBC Act* (1999) that occur within the study area

(E1= Endangered Species; E2= Endangered Population; V=Vulnerable Specis)

Scientific Name	TSC Act	EPBC Act	Known Species Habitat	Total Known Distribution	Known distribution within reserves	Records within study area
Acacia bynoeana	E1	V	Heath and Dry Sclerophyll Forest on sandy soils	Central Eastern NSW. Cessnock to the Southern Highlands and west to the Blue Mountains	Records from Judge Dowling Range, Wallaby Swamp Track, Colo Heights and near Melon Creek diatreme	6 records
Ancistrachne maidenii	V		Dry Sclerophyll Forest on transitional geologies between Hawkesbury and Watagan soil landscapes	Northern Greater Sydney and SW of Grafton	One record between Wellums and Wrights Creeks, St Albans. Records outside park in Dharug NP and Wisemans Ferry	1 record
Dillwynia tenuifolia	V	V	Escarpment woodland on Narrabeen Sandstone soils (Yengo population)	Bulga Mountains in the north to Woodford in the west, and south to Liverpool LGA	Not in reserve. Three locations on Bulga Mountains SW of Milbrodale	3 records within 500m of Yengo NP
Eucalyptus camaldulensis	E2		Isolated trees in Riparian situations on the Hunter Valley Floor	Australia wide, although species is considered an endangered population only in the Hunter Catchment	Endangered population of River Red Gums on the Hunter Valley Floor. Outside of reserves on adjoining private property below the Hunter escarpment	4 records
Eucalyptus fracta	V		Grows on shallow sandy soils in dry Eucalypt woodland often on the upper edge of sandstone escarpments	Restricted to the Broken Back Range (Yengo NP; Pokolbin SF)	One population south of Sentry Box Point, Milbrodale. Possibly exists elsewhere in northern Yengo NP	1 record
Kennedia retrorsa	V	V	Creeks, Sheltered forest and exposed slopes	Muswellbrook and Merriwa LGA's. Goulbourn R and Wollemi NP	Recorded near Putty Road and at Devils Hole near Diatreme	2 records
Lasiopetalum joyceae	V	V	Lateritic/shale ridge tops. Shrubby Dry Sclerophyll Forest and sandstone heath	Most records from the Hornsby Plateau between Berrilee and Duffy's Forest.	Sixteen known locations on the Womerah Range between St Albans and Webbs Creek.	17 records of populations ranging from 1 to 30 plants
Leucopogon fletcheri subsp. *fletcheri*	E1		Dry Eucalypt woodland or shrubland. Lateritic/clay soils on flat to gently sloping terrain along ridges and spurs	North-western Sydney just south of Mogo Creek to Winmalee in the west and Annangrove in the south	Two known locations on Langans Logging Track south of Mogo Creek. Likely to occur elsewhere in the eastern portions of the reserve.	2 records
Melaleuca deanei	V	V	Heathlands and shrubby Dry Sclerophyll Forests	Key locations in Ku-ring-gai and Holsworthy. Isolated occurrences in Yengo, Wollemi and Blue Mtns NP's, and west of Nowra	Three locations within or close to Yengo NP. Two records from Wrights Creek/Books Ferry and one from Devils Hole just east of the Putty Road	2 records in reserve, 1 within 50m of Yengo NP

Scientific Name	TSC Act	EPBC Act	Known Species Habitat	Total Known Distribution	Known distribution within reserves	Records within study area
Melaleuca groveana	V		Heath and shrubland. Exposed, rocky outcrops and cliffs often at high elevations. Dry woodlands	Widespread. From Hawkesbury/Nepean River to SE Queensland	Regularly recorded north of the Hunter Range. Wilks Ck, Bulga Mountains and west of Adam's Peak	10 records of populations ranging from 1 to 28 plants
Olearia cordata	V	V	Dry open sclerophyll forests and shrublands on sandstone ridges	Occurs in the SW of the Hunter Plateau; eastern Colo Plateau and the NW Hornsby Plateau	Populations near the headwaters of Wrights Creek; Access trail to Big Yengo; East of Melon Ck. Possibly more common than previously thought	19 recorded locations with populations ranging from 4 to 290 plants
Persoonia hirsuta ssp. hirsuta (including Persoonia hirsuta subsp. *nov.? Yengo NP*	E1	E	Sandy soils supporting dry sclerophyll open forest. Woodland and heath on sandstone	Coastal areas from Gosford to Royal NP. Below 300m alt	Small populations north of Wheelbarrow Ridge; Bala and Hunter Ranges; west of Mangrove Creek Dam	8 records with populations ranging from 1 to 18 plants
Prostanthera cineolifera	V	V	Open woodland on sandstone ridges	Walcha Scone and St Albans	One record each from Mogo Creek area and St Albans. Recorded 1920's. Possibly inaccurate.	1
Pterostylis gibbosa	V	E	Various but mostly fine-grained sediments and open shrub grass woodlands in drier coastal valleys and plains	Hunter (Milbrodale); Albion Park and Yallah; and the Shoalhaven region	Hunter Escarpment footslopes in shrub/grassy woodland	7 records within 2km of Yengo NP
Rutidosis heterogama	V		Dry open heath and woodlands on sandy soils and near moist gradients in open forest	Central Coast, Hunter to New England Tablelands	Single record from adjoining lands outside of reserves in the Howes Valley Area	1 record
Tetratheca glandulosa	V	V	Grows on shallow shale/sandstone transition soils amongst Sandstone Ridge top Woodland	Wallambine (Yengo NP) in the north to West Pymble in the south. Ingleside to the east and Kurrajong in the west	Scattered strongholds throughout Parr SCA, Yengo and Dharug NP's	21 records with populations from 1 to 245 plants
Velleia perfoliata	V	V	Grows within heath on sandy loam, often in shallow depressions on sandstone. Ridges	Hawkesbury and Upper Hunter	Two locations within southern Yengo NP along the Hunter and Bala Ranges, Boree Track	2 recorded locations in Yengo NP
Zieria involucrata	E1	V	Mostly grows on Hawkesbury Sandstone derived shallow sandy soils amongst sheltered gully forest	Melon and Mogo Creek in Yengo NP to Little Cattai Creek (Maroota). Also a disjunct population exists in the Springwood area	Populations at Melon Creek, Womerah Range, The Left Arm Track. Populations also at Webbs Creek and SW of Terraborra	37 records

Table 4.3 Additional threatened species records within 5 kilometres of the study area boundary.

(E1=Endangered Species; E2=Endangered Population; E4=Presumed Extinct; V=Vulnerable)

Scientific Name	TSC Act	EPBC Act	Known Species Habitat	Total Known Distribution	Year
Amperea xiphoclada var. *pedicellata*	E4	Presumed Extinct			
Asterolasia elegans	E1	E	On Hawkesbury Sandstone Gully Forest - lower slopes, sheltered	Colo, Hawkesbury, W of Gosford, Baulkham Hills	1979-2003
Cynanchum elegans	E1	E	On edges of Dry Rainforest and within Littoral Rainforest, also moist eucalypt forest	Brunswick Heads to Gerroa (Illawarra)	1998
Darwinia biflora	V	V	Edges of shale-capped ridges and sandstone intergrades	NW Sydney, Baulkham Hills, Hornsby, Ryde, Ku-ring-gai	1995-98
Gyrostemon thesioides	E1		Hillsides, riverbanks, may be restricted to fine sandy soils	Colo, Nepean and Georges River	2004
Keraudrenia corrolata var. *denticulata*	E2		Colo Riverflat forests	Hawkesbury LGA	1959-1995
Micromyrtus blakelyi	V	V	Heathlands on shallow sandy soils	Hawkesbury River, Maroota, Hornsby, Baulkham Hills	1995-2002
Pomaderris brunnea	V		moist woodland or forest on clay and alluvial soils of flood plains and creek lines	Nepean/Hawkesbury River including Bargo. New England and East Gippsland	1918 and 2005
Prostanthera marifolia	E4	Presumed Extinct			1921

4.2 RELATIONSHIP TO PREVIOUS VEGETATION CLASSIFICATIONS

The completion of further sampling and detailed mapping has confirmed many of the vegetation patterns described by the authors of earlier work (Bell *et al.* 1993 and Sanders *et al.* 1988). While vegetation community labels in the new work have been amended to reflect regional distribution, many communities are readily comparable. This is to be expected as the same data has been used to augment new work within the reserves. However additional sampling has also yielded several new communities not previously described in detail. Further sampling of areas suggested by both authors have confirmed patterns observed but not mapped during earlier field work. Detailed aerial photographic interpretation and extensive field traverse has also been invaluable in identifying vegetation communities otherwise obscured by a reliance on broad scale substrate mapping. Table 4.4 sets out the relationships between mapping classification of Bell *et al.* (1993) and this project.

Table 4.4: Relationship between vegetation communities

Map Unit Name and Number (This study)	Vegetation Community Name (Sanders et al., 1988)	Vegetation Community Name (Bell *et al.*, 1993)
01Hunter Range Stinging Tree Dry Rainforest	Community 12: *Dendrocnide excelsa-Ficus rubiginosa* dry rainforest	3e Stinging Tree Dry Rainforest
02Sydney Hinterland Warm Temperate Rainforest	Not Described	Not Described
03Hunter Range Grey Myrtle Dry Rainforest	Community 7: Rainforest on Recent Alluvium	Rainforest on Alluvium
04Sydney Hinterland Blue Gum-Turpentine Gully	Community 6: Narrabeen-	3b Sheltered Forest on Rich

Map Unit Name and Number (This study)	Vegetation Community Name (Sanders et al., 1988)	Vegetation Community Name (Bell *et al.*, 1993)
Forest	Hawkesbury Sheltered Forest	Soils
05Hunter Range Hillgrove Gum Gully Forest	Community 6: Narrabeen-Hawkesbury Sheltered Forest	3b Sheltered Forest on Rich Soils
06Coastal Riverflat Blue Gum-Peppermint Forest	Not Described	Not Described
07Coastal Riverflat Cabbage Gum Forest	Not Described	Not Described
08Coastal Riverflat Swamp Mahogany Forest	Not Described	Not Described
09Hunter Range Basalt Red Gum-Grey Box Forest	Community 10: *Eucalyptus tereticornis-E.molucanna* open forest	3c Grey Box Open Forest
10Sydney Hinterland Diatreme Forest	Not Described	Not Described
11Hunter Range Flats Apple-Stringybark-Gum Forest	Community 9: *Angophora floribunda-Acacia filicifolia* association on alluvium	3d Roughbarked Apple Woodland on Alluvium
12Hunter Range Flats Red Gum - Apple Forest	Community 9: *Angophora floribunda-Acacia filicifolia* association on alluvium	3d Roughbarked Apple Woodland on Alluvium
13Hunter Range Shale Grey Box-Red Gum Forest	Not described	3c Grey Box Open Forest
14Hunter Range Sheltered Grey Gum Forest	Community 6: Narrabeen-Hawkesbury Sheltered Forest	3a Hawkesbury-Narrabeen Sheltered Forest
15Sydney Hinterland Shale Ironbark Forest	Not Described	Not Described
16Sydney Hinterland Sheltered Turpentine-Blackbutt Forest	Community 2: *Angophora costata-Eucalyptus pilularis* Hawkesbury Sandstone Forest	1.Sheltered Dry Hawkesbury Forest
17Sydney Hinterland Peppermint-Apple Forest	Community 3: Sheltered Hawkesbury Sandstone Forest	1.Sheltered Dry Hawkesbury Forest
18Sydney Hinterland Sheltered Turpentine-Apple Forest	Community 1: Complex Hawkesbury Sandstone sheltered forest	3a Hawkesbury-Narrabeen Sheltered Forest
19 Hunter Escarpment Sheltered Ironbark Forest	Not Described	Not Described
49 Hunter Range Footslopes Red Gum- Ironbark Forest	Not Described	Not Described
20Hunter Range Ironbark Forest	Community 5: Narrabeen-Hawkesbury ironbark forest	4b Hawkesbury-Narrabeen Ironbark Forest
21Sydney Hinterland Bloodwood-Mahogany Transition Forest	Not Described	Not Described
22Sydney Hinterland Exposed Red Bloodwood-Stringybark Forest	Community 4: Exposed Hawkesbury Sandstone Woodland	2a Exposed Hawkesbury Woodland
23Hunter Escarpment Footslopes Ironbark-Box Woodland	Not Described	5 Northern Escarpment Woodland
25Hunter Range Exposed Stringybark-Grey Gum Woodland	Not Described	4a Exposed Narrabeen Woodland
26Mellong Sands Apple-Banksia Woodland	Not Described	6a Woodland on Perched Sands
27Mellong Sands Drooping Red Gum Sedge Woodland	Not Described	6b Swamp Woodland on Perched Sands

Map Unit Name and Number (This study)	Vegetation Community Name (Sanders et al., 1988)	Vegetation Community Name (Bell *et al.,* 1993)
28Mellong Sands Scribbly Gum Woodland	Not Described	6a Woodland on Perched Sands
29Sydney Hinterland Exposed Scribbly Gum Woodland	Not Described	2b Dwarf Apple Low Open Woodland
30Sydney Hinterland Rocky Yellow Bloodwood Woodland	Community 4: Exposed Hawkesbury Sandstone Woodland	2a Exposed Hawkesbury Woodland
31Hunter Escarpment Acacia Scrub	Not Described	5 Northern Escarpment Woodland
32Sydney Hinterland Dwarf Apple Scrub	Not Described	2b Dwarf Apple Low Open Woodland
33Sydney Hinterland Rock Complex	Not Described	Not Described
34Coastal River Oak Forest	Not Described	Not Described
35Sydney Hinterland Sandstone Riparian Complex	Not Described	Not Described
36Coastal Estuarine Swamp Oak Forest	Not Described	Not Described
37Hunter Range Basalt Paperbark Thicket	Not Described	Not Described
38Hunter Range Flats Paperbark Thicket	Community13: *Melaleuca linariifolia* swamp	7 Melaleuca Swamp Forest
39Coastal Riverflat Paperbark Thicket	Community13: *Melaleuca linariifolia* swamp	7 Melaleuca Swamp Forest
40Coastal Estuarine Paperbark Thicket	Not Described	Not Described
41Coastal Floodplain Wetland	Not Described	Not Described
42Hunter Range Flats Freshwater Wetland		Not Described
43Sydney Hinterland Sandstone Upland Swamp		Not Described
49 Hunter Range Footslopes Ironbark-Red Gum Forest	Not Described	Not Described

4.3 FIELD IDENTIFICATION OF VEGETATION COMMUNITIES

Each vegetation community profile in Appendix D includes a description of key identifying features and a list of diagnostic species. The diagnostic species lists are presented to guide users in differentiating communities from one another, or confirming the type of vegetation at a site of interest. The list of diagnostic species has been drawn from site data collected in this project. They do not represent the total list present at any given location or within any given community. The first thing to note is the number of replicates that have been used to describe the community. Vegetation communities that are described using fewer site numbers are likely to have less accuracy in the diagnostic species list than those with a higher number of replicates.

The Fidelity Class column lists two types of species: positive and constant. Two other types called ‘uninformative’ and ‘negative’ are not presented in this list, but may be present in the Floristic Summary list in the profile (if it is a conspicuous species or a canopy species). Table 4.5 provides an example from which to discuss the interpretation of the diagnostic species list.

Group Score and Frequency: These refer to median cover abundance and the frequency at which these species have occurred in the sites that have been used to define this community. Using the table below as an example, it can be seen that *Croton verreauxii* occurred in 82 percent of sites that describe the example map unit below. Of these sites, the median cover abundance score was 3 (5-20 percent).

Non Group Score and Frequency: These provide a comparative cover abundance and frequency of occurrence for this species across all other sites (communities). In this example, *Croton verreauxii* has been recorded in 23 percent of all other sites at a cover abundance of 3.

Positive species: These are species that are recorded more frequently and at higher abundances within a given vegetation community compared to all other communities in the study area. They may also be species that are unique to that community, that is, they were not found amongst sites that defined any other community. In this example (Table 4.3) it is seen that *Cassine australis* var. *australis* occurs at 100 percent of the sites within this community, at a mean cover abundance of 4, while it occurred in only 35 percent of all other sites at a lower mean cover abundance. It is also noted that *Ficus superba* var. *henneana* is unique to this community, and has not been recorded in any other sites (Non-Group Frequency equals 0).

Negative species: These are species that have been recorded less frequently and at lower abundance in the given community relative to all communities. It may also be that the species has never been recorded within the sites that describe the given community. In this example (Table 4.3) it is noted that *Livistona australis* has not been recorded at all in this community (Group Frequency score of 0), and that it occurs in 52 percent of sites outside this community. *Eustrephus latifolius* has also been recorded as a negative diagnostic species even though it has occurred in 91 percent of the sites within the community, though at a lower cover abundance than at other sites. The Non Group scores indicate that generally this species occurs with a higher abundance elsewhere than recorded within this group, so it is not an indicator species for this community.

Constant species: These are species that occur at relatively consistent frequencies and abundance across all communities. These species are not useful in differentiating vegetation communities, yet are useful in describing them. In the example it can be seen that *Pandorea pandorana* subsp. *pandorana* has occurred in 100 percent of sites within the community, at a mean cover abundance of 2. However, this does not help to differentiate the community, as the species was recorded in 61 percent of all other sites, also with a mean cover abundance of 2.

Diagnostic species can be used as a guide only. These species can be misleading, because an apparent uniqueness to or absentia from a community may simply result from insufficient floristic sampling. However, for communities with a large number of floristic sampling replicates, diagnostic species may be used to distinguish communities from one another, only if identical vegetation sampling methods are employed. Reliability of identification will increase with the greater number of positive diagnostic species identified at a site. Confidence can also be improved with an understanding of the habitat and structural characteristics of the vegetation community of interest.

Table 4.5: Example diagnostic species list

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Cassine australis var. *australis*	4	1.00	3	0.35	positive
Cayratia clematidea	2	0.55	1	0.24	positive
Croton verreauxii	3	0.82	3	0.23	positive
Diospyros australis	4	0.91	1	0.40	positive
Diospyros pentamera	1	0.09	0	0.00	positive
Doodia aspera	3	0.55	3	0.46	positive
Ficus superba var. *henneana*	5	0.09	0	0.00	positive
Pittosporum multiflorum	3	0.91	2	0.34	positive
Planchonella australis	4	0.73	4	0.10	positive
Streblus brunonianus	5	1.00	1	0.22	positive
Geitonoplesium cymosum	2	0.91	2	0.61	constant
Pandorea pandorana subsp. *pandorana*	2	1.00	2	0.61	constant

4.4 MAP ACCURACY

4.4.1 Sources of error

The delineation of vegetation community boundaries has relied on the combination of field site data and the allocation of API feature codes. Each of these data sets contains inherent spatial and attribution errors. As a result, the derived vegetation map is not 100 percent accurate and users should be aware of its limitations.

The spatial or positional accuracy of both site data and API line work has already been discussed. Nevertheless, it is important to reiterate that the distortion arising from the steep and rugged terrain found along the sandstone escarpments can generate spatial discrepancies of up to 40 metres between the vegetation map and the 1:25 000 topographic maps. The reliability of GPS readings is also low in some environments.

Errors may also arise from misinterpretation of canopy patterns, or interpretation difficulty. The latter can be assessed using the reliability code present in the digital coverage. Coding errors may also arise during the data transfer process. The reliability of the API is one method to review map accuracy. The distribution of API confidence classes is displayed in Map 5. Another method is to use the distribution and sampling intensity of floristic sites, presented in Map 2.

Vegetation community boundaries rarely change abruptly. The transition between one community and another tends to be gradual often over tens of metres. As such a line used to separate the two can be misleading and is really only a simple representation of the complexity on the ground. This is particularly the case for two or more closely related communities such as those that describe changes as a result of elevation, rainfall or sheltering.

The allocation of API feature codes to a vegetation classification derived from field site data introduces other sources of error. Firstly, they may occur in the allocation of unsampled feature codes. However, given the hierarchical structure of the API classification, the potential for such errors is minimised.

Communities with distinctive appearance from aerial photographs are mapped with greatest reliability. Those communities that vary in response to regional scale influences, such as shelter, elevation or rainfall, are likely to be least accurate along the zone of transition.

4.4.2 Common misapplications

A common problem is the use of mapping products at a scale for which they are not designed. GIS systems make it easy for users to zoom into a small area and simply overlay the vegetation map on the area of interest. Mapping line work and attribution does not hold the same accuracy in a focused area (say for example 1:4000 scale) as it does at 1:25 000 scale.

The attribution of the mapping work varies in accuracy across the study area. This arises from access constraints, sampling intensity and so on. Users should at least review the API confidence score and proximity of field sampling sites to judge accuracy of vegetation mapping at any given point.

4.5 USING THE MAP AND REPORT

4.5.1 How to use the data

A digital vegetation attribute data layer has been built for use in ARCView, ARCGIS or MAPinfo Geographical Information Systems. The data layer should be accessed for all questions regarding the distribution of vegetation communities and associated attributes. Far more information exists within the digital data layer than can be presented on a summary map of vegetation communities.

Each polygon in the data layer has eleven different fields that can be queried. These are:

- Vegetation Community Name as displayed in this report.
- Regional vegetation classification label.
- State-wide vegetation classification label.
- Soil type
- Feature Code highlighting canopy trees and habitat within each polygon (see Appendix A).

- Understorey Code highlighting the understorey type of each polygon (see Table 2.6)
- Disturbance Severity Code (see Table 2.7)
- Disturbance Code 1: Type of Disturbance (eg. weeds, erosion, tracks) present within polygon (see Table 2.7)
- Disturbance Code 2: Type of Disturbance present within polygon if present (see Table 2.7)
- API confidence: Interpretability of vegetation features present in polygon (see Table 2.5)
- Visible rock present: The % cover of rock outcropping present in each polygon (see Table 2.4)
- Canopy cover: The amount of cover occupied by the upper vegetation stratum in each polygon (see Figure 2.1)
- Comments Field: A large number of polygons contain notes of interest to individual polygons. This includes rare tree species such as Hillgrove Gum (*E. michaeliana*), habitats of interest including potential Rock Wallaby Habitat and exposed rock plates that are potential aboriginal engraving sites.

4.5.2 Fire management

The information captured and presented during this project provides an opportunity for field data and vegetation mapping to be applied to the development of fire management plans for the study area.

Vegetation Community Profiles provide an estimate of vegetation structure (height), cover and vegetation strata. Importantly the characteristics of the vegetation associated with each community are readily accessible. Broad Fuel Hazard Classes associated with each vegetation type can be assessed using the floristic information contained within the profiles to complete a spatial coverage for the study area. These broad hazard classes may then be refined using site based assessments such as those promoted by McCarthy *et al.* (1999) using bark hazard, elevated fuel hazard and surface fine fuel hazard.

Planning for Hazard Reduction Burns can utilise the array of information captured from the Aerial Photograph Interpretation. Local planning maps can easily be constructed to show vegetation community boundaries, presence of rock outcrops, proportion of rock within each site, understorey characteristics and tree types present. Prominent landscape features such as rainforests and heaths are easily recognised for those not familiar with vegetation of the area.

Visible rock outcropping can also be used to identify potential helicopter pads during remote fire fighting activities.

4.5.3 Conservation assessment and identification of EECs

Information provided in this report allows land managers to understand the conservation significance of different types of vegetation present within the study area. The mapping delineates: the extent of EECs at a scale of 1:25 000; threatened plant species within each vegetation community; and regional reservation status of each vegetation community. These factors are relevant to the preparation of Reviews of Environmental Factors (REFs). EECs describing transitional shale/sandstone vegetation are difficult to describe and map. Much of the variation occurs in the understorey, a feature that is highly dynamic following fire and disturbance events. Individual locations may require replicated systematic sampling to confirm presence.

4.5.4 Vegetation disturbance assessment

Disturbance features that are visible by stereoscopically viewing 1:25 000 aerial photos have now been mapped. The severity of the disturbance has been interpreted using a three-scale class. The disturbance intensity score relates only to the type of disturbance identified and should not be considered an equivalent summation of all disturbances across the study area. In other words a polygon tagged highly disturbed- tracks and trails is a very different disturbance to highly disturbed-clearing.

The spatial layer may be examined to understand dominant disturbance types such as weed infestations, regrowth forests, transmission lines, roads and trails etc. The data provides baseline information across the whole of the study area as at August 1993.

The disturbance features as mapped provide an indication of where vegetation condition may be affected. However, this does not preclude the need for on-ground assessment of smaller-scale patches prior to the drawing of conclusions about current vegetation condition. Such on-ground assessment

should include a detailed inventory of native species and a review of the structural integrity of the vegetation.

4.5.5 Species habitat mapping

The attributes collected during the mapping program may be used to more accurately delineate habitats of conservation significance. For example, Brush-tailed Rock-wallaby (*Petrogale penicillata*) are known from the northern part of the study area, where they make use of rock benches and outcrops near grassy alluvium and permanent water. Use of the rock outcropping attribute in the digital data layer, in combination with the vegetation community attribute will enable identification of likely key habitats. Other species (including flora) that have highly specific habitat attributes that could now be successfully identified using the map include species dependent on: mesic forests (such as Sooty Owl); dry grassy woodlands (such as Diamond Firetail, Hooded Robin, Brown Treecreeper, Black-chinned Honeyeater, Regent Honeyeater and Squirrel Glider).

4.6 FUTURE SURVEY WORK

The completion of detailed mapping of the study area has brought together approximately fifteen years of vegetation study. While small areas will always present questions as to the identification of new communities, the detail and understanding of vegetation patterns are now suitable for multiple applications associated with reserve management and conservation planning. There is now good understanding of local-scale vegetation patterns within the study area, as well as an improved view of the relationship these vegetation communities have to regional and statewide vegetation classification systems.

Further systematic field work is only likely to be required to clarify the relationships between the vegetation present in Yengo NP and the greater Sydney Basin region. Other efforts should be directed toward identifying threatened plant species habitats within the reserve and understanding the impacts of high fire frequency on vegetation composition.

5 REFERENCES

Bedward, M., Keith, D.A., & Pressey, R.L. (1992) Homogeneity analysis: assessing the utility of classifications and maps of natural resources. *Australian Journal of Ecology* 17: 133-140

Belbin, L. (1994) *PATN Pattern Analysis Package*. CSIRO Canberra.

Bell, S. (1998) *Wollemi National Park Vegetation Survey. Volume 1. A Fire Management Document.* Unpublished Report to NSW National Parks and Wildlife Service, Upper Hunter District.

Bell, S.A.J (2001) Notes on the distribution and conservation status of some restricted plant species from sandstone environments of the Upper Hunter Valley New South Wales. *Cunninghamia* (1) 77-88

Bell, S.A.J. (in press) *Significant vascular plant species of Wollemi National Park, central eastern New South Wales.* Cunninghamia

Bell, S., Vollmer, J. and Gellie, N. (1993) *Yengo National Park and Parr State Recreation Area: Vegetation Survey for use in Fire Management*. Unpublished report for NSW National Parks and Wildlife Service.

Benson, D. (1982) "*Botanical Survey of Proposed Sand Extraction Area near Garland Valley, via Putty NSW*", Royal Botanic Gardens Sydney.

Binns, D. (1996) *Flora Survey, Morissett Forestry District, Central Region New South Wales. Morisset Forestry District EIS. Supporting document No.3.* Research Division, State Forests of New South Wales, Sydney.

Briggs, J.D. and Leigh, J.H. (1995) *Rare or Threatened Australian Plants*. Centre for Plant Biodiversity Research, CSIRO Division of Plant Industry, Canberra.

Bryan, J.H. (1966) *Sydney 1:250 000 Geological Sheet S1 56-5*. Department of Mineral Resources Sydney NSW.

Bureau of Meteorology (2001) Historical Data on Rainfall, Temperature. http/www.bom.gov.au

DEC (2005) *The Native Vegetation of the Western Blue Mountains.* Unpublished Report. NSW National Parks and Wildlife Service, Hurstville.

DEC (2006 draft) *The Native Vegetation of the Erskine and Woodland Ranges, Kings Tableland and Narrowneck Peninsula*. A draft report to the Central Branch Parks and Wildlife Group.

DECC (2008) *The Native Vegetation of the Putty Valley* Report to the Hawkesbury Nepean Catchment Management Authority Department of Environment and Climate Change Hurstville

Doherty, M. (1985) *Vegetation patterns on Quaternary Deposits and their surrounds in the Upper Mellong Creek Catchment Area, New South Wales*. Honours Thesis Submitted to University of Sydney Bachelor of Science.

Harden, G.J. (ed.) (1990-1993) *The Flora of New South Wales. Volumes 3-4*. New South Wales University Press, Kensington.

Harden, G.J. (ed.) (2000-2002) *The Flora of New South Wales. Volume 1-2 (Revised Edition)* New South Wales University Press.

Henry, D. (1988) *The Mellong Sands* Royal Society of NSW Volume 120 Parts 3 and 4 [*Issued May, 1988*

Herbert, C. (1980) Wianamatta Group and Mittagong Formation in Herbert, C. and Helby, R. (1980) "*A Guide to the Sydney Basin*" Geological Survey of New South Wales Bulletin 26 Department of Mineral Resources

Herbert, C. and Helby, R. (1980) "*A Guide to the Sydney Basin*" Geological Survey of New South Wales Bulletin 26 Department of Mineral

Howard, T. (1981) *The Mellong Swamps*. Unpublished report submitted to the NSW National Parks and Wildlife Service Sydney

Hunter, J.T. (2005) Floristics and Distribution of Wattle Dry Sclerophyll Forests and Scrubs in north eastern New South Wales *Cunninghamia 9(2):* 317-323

Hutton-Neve M., (1978) *The Forgotten valley: History of the Macdonald Valley and St Albans.* NSW Library of Australian History Ambassador Press Granville

Keith, D.A. (2004) *Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT.* Department of Environment and Conservation, Hurstville.

Keith, D.A. and Bedward, M. (1999) Native Vegetation of the South East Forests region, Eden, New South Wales. *Cunninghamia* 6(1):1-218

Kovac, M and Lawrie J.W (1991) *Soil Landscapes of the of the Singleton 1:250 000 sheet.* Soil Conservation Service of NSW

Macqueen, A. (2004) *Somewhat Perilous. The journeys of Singleton, Parr, Howe, Myles & Blaxland in the Northern Blue Mountains*. Andy Macqueen, Wentworth Falls.

Marryott-Brown, K. and Wilks, D. (1992) *Rare and Threatened Plants of Yengo National Park* unpublished National Parks and Wildlife Service Sydney

McCarthy G.J., Tolhurst K.G. and Chatto K. (1999) *Overall Fuel Hazard Guide Fire Management Research Report No.47 Third Edition* Natural Resources and Environment, Victoria

McInnes, S.K. (1997) *Soil Landscapes of the St Albans 1:100 000 Sheet*, Department of Land and Water Conservation Sydney.

NPWS (1998) *Forest Ecosystem Classification and Mapping in the Hunter Sub Region in the Lower North East Comprehensive Regional Assessment*. A report undertaken for the NSW CRA/RFA Steering Committee

NPWS (2000) *Vegetation Survey, Classification and Mapping Lower Hunter and Central Coast*. Unpublished. A project undertaken for the Lower Hunter and Central Coast Regional Environmental Management Strategy

NPWS (2001) *Assessment of the Yengo Wilderness* Central Conservation Programs and Planning Division NSW NPWS November 2001

NPWS (2003a) *The Native Vegetation of the Woronora, O'Hares and Metropolitan Catchments.* Unpublished Report. NSW National Parks and Wildlife Service, Hurstville.

NPWS (2003b) *The Native Vegetation of the Warragamba Special Area.* Unpublished Report. NSW National Parks and Wildlife Service, Hurstville.

NPWS (2004) *The Native Vegetation of the Nattai and Bargo reserves.* Unpublished Report. NSW National Parks and Wildlife Service, Hurstville.

NPWS (Various) Systematic Floristic data held by NPWS Databases now DECC

Peake, T. and Hill, L. (2003) *Vegetation Survey of the McTaggart Additions to Yengo National Park*. A report to the National Parks and Wildlife Service Bulga

Peake, T.C. (2006) *The Vegetation of the Central Hunter Valley, New South Wales*. A Report on the Findings of the Hunter Remnant Vegetation Project.. Hunter – Central Rivers Catchment Management Authority, Paterson

Poore, M.E.D. (1955) The use of photosociological methods in ecological investigations. I. The Braun Blanquet System. *Journal of Ecology* 43: 226-244

Rasmus, P.L., Rose, D.M. and Rose, G. (1969) Singleton 1:250 000 Geological Series Sheet s156-1 First Edition NSW Department of Mines Sydney.

Royal Botanic Gardens (2002) PlantNET-The Plant Information Network System of The Royal Botanic Gardens, Sydney (Version 1.4) http://plantnet.rbgsyd.gov.au. First accessed 1/5/07.

Ryan, K., Fisher, M. and Schaeper L., (1996) The Natural Vegetation of the St Albans 1:100 000 map sheet. *Cunninghamia* Vol. 4(3) 1996

Sanders, J., Bedward, M., Leahy, B., Robinson, M. and Sheringham, P. (1988) *Preliminary Report on the Vegetation of Yengo National Park and Parr State Recreation Area*. An unpublished report to the National Parks and Wildlife Service of NSW.

Stricker, J.S, and Wall C.A, (2000) *Wetlands of the Nepean-Hawkesbury Catchment* Sydney Water

Strom, A. (1981) *The Macdonald Valley: Some notes as a guide to a study of the Environment of the Macdonald Valley* Government Printer NSW

Thackway, R. and Cresswell, D. (1995) *An interim biogeographic regionalisation for Australia: a framework for setting priorities in the national reserves system cooperative program*. Australian Nature Conservation Agency, Canberra.

Tozer MG (2003) The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* **8,** 1-75.

Tozer, M.G, Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall,D., and Pennay,C (2006) "*Native Vegetation of Southeast NSW: a revised classification and map for the coast and eastern tablelands Version 1.0"* NSW Department of Environment and Conservation, NSW Department of Infrastructure, Planning and Natural Resources, Sydney

Walker, J.S. and Hopkins, M.S. (1990) Vegetation. In *Australian soil and land survey field handbook.* Second edition. Macdonald, R.C., Isbell, R.F., Speight, J.G., Walker, J. and Hopkins, M.S. (eds.) Inkata Press. Melbourne.

Westhoff V. and van der Maarel E. (1978) "The Braun Blanquet Approach" in Whittaker R.H (1978) ed. "*Classification of Plant Communities"* Dr W. Junk b.v. Publishers The Hague

APPENDIX A: API FEATURE CODES

Level 1 API Code	Level 2 API Code	API Code sort	Common Dominant / Codominants	Associates (subsidiary and minor)	COMMENTS
Rainforest	**1051**	**01**	**B.myrtifolia**	A.smithii	Sheltered and semi-sheltered gullies
Rainforest	**1052**	**02**	**C.apetalum, A.smithii, B.myrtifolia**	Emergent Eucalypts (<10%)	Occurs in sheltered gullies, typically with E.deanei / E.eugenoides emergents
Rainforest	**1053**	**03**	**T.ciliata, D.excelsa**		Associated with Mt Yengo and Mt Warung volcanic soils
Volcanic	**1027**	**04**	**E.tereticornis**		Associated with Mt Yengo and Mt Warung volcanic soils
Volcanic	**1028**	**05**	**E.tereticornis E.moluccana**	E.punctata	
Volcanic	**1037**	**06**	**A.floribunda, E.eugeniodes**		Sheltered forest associated with diatremes
Volcanic	**1037a**	**07**	**A.floribunda, E.amplifolia, E.eugeniodes**		Sheltered forest associated with diatremes
Volcanic	**1037b**	**08**	**A.floribunda, E.eugeniodes, E. meliodora**		Localised occurrence
Volcanic	**1043**	**09**	**M.stypheliodes**		Localised patches in sheltered watercourses.
Shale Cap	**1029s**	**10**	**E crebra/paniculata S.glomulifera, E.pilularis, C.gummifera**	E.sparsifolia, A.costata, E.notabalis,	Associated with shale caps
Dry Mittagong Sandstone	**1029m**	**11**	**A.costata, S.glomulifera, Esparsifolia, E.notabalis,**	C.gummifera, E.crebra, C.eximia, A.torlusa	Associated with residual patches of Mittagong sandstone
Dry Hawkesbury Sandstone	**1012**	**12**	**A.hispida, Scribbly gum (E.haemastoma)**	B.serrata E.capitellata+/-	Occurs on exposed Hawkesbury sandstone ridge tops and side slopes. B.serrata oc co-dom. Open rocky woodland.
Dry Hawkesbury Sandstone	**1013**	**13**	**E.haemastoma E.eximia, E.sparsifolia, A.bakerii**	B.serrata A.hispida+/-, E.capitellata+/-	Occurs on exposed very dry Hawkesbury sandstone rocky ridge tops and side slopes. Open rocky woodland.
Dry Hawkesbury Sandstone	**1013a**	**14**	**E.haemastoma**	B.serrata	Localised patches occurring on sandy substrate in exposed low gradient watercourses.
Dry Hawkesbury Sandstone	**1011**	**15**	**E.eximia, E.sparsifolia, A.bakerii**	E.punctata, Ironbark, A.costata	Occurs on exposed, sandstone rocky ridge tops and side slopes. Typically lower than 1014

Level 1 API Code	Level 2 API Code	API Code sort	Common Dominant / Codominants	Associates (subsidiary and minor)	COMMENTS
					. E.squamosa occasionally present on ridge tops, particularly in proximity to "Mellong sands area". Open rocky woodland.
Dry Hawkesbury Sandstone	**1033**	**16**	**E.moluccana, Ironbark, E.sparsifolia E.punctata**	S.glomulifera, A.torulosa	Oc grades to E.hypostomatica, S.glomulifera. Appears to occur on shale enriched bands.
Dry Hawkesbury Sandstone	**1033p**	**17**	**E.moluccana, Ironbark,**		
Dry Hawkesbury Sandstone	**1014**	**18**	**E.eximia, C.gummifera E.sparsifolia,**	E.punctata, A.bakerii, Scribbly gum, A.costata	Occurs on exposed, dry Hawkesbury sandstone ridge tops and side slopes. Similar 1022. C.gummifera and E.sparsifolia typically dominant. C.eximia and E.punctata co dominant in places.
Dry Hawkesbury Sandstone	**1015**	**19**	**E.sparsifolia, E.punctata, A.costata, C.gummifera**	E.floribunda E.crebra, A.bakeri, C.eximia, E.squamosa+/-	Common on mid to lower slopes grading to "perched sands" community. Little or no visible rock. Typically grades to 1070 series. E.crebra / A.floribunda oc co dominant.
Dry Hawkesbury Sandstone	**1035**	**20**	**Scribbly gum**	E,punctata, Esparsifolia, A.costata,	Localised patches.
Sheltered Hawkesbury Sandstone	**1016**	**21**	**A.costata, E.piperita, C.gummifera E.punctata, E.agglomerata**	C.eximia, S.glomulifera, Ironbark, E.sparsifolia, A.torulosa,	Occurs on semi-sheltered Hawkesbury sandstone aspects. Dry to intermediate forest, grades to type 6 with increased sheltering. S.glomulifera <20%
Sheltered Hawkesbury Sandstone	**1017**	**22**	**S.glomulifera, A.costata, E.piperita, C.gummifera E.punctata,**	C.eximia, Ironbark, E.sparsifolia, Bucketty stringy, B.myrtifolia, A.torulosa,	Occurs on sheltered Hawkesbury sandstone aspects. Intermediate to moist forest. S.glomulifera always present, sometimes singularly dominant. (1042 on Narrabeen sandstone)
Sheltered Hawkesbury Sandstone	**1018**	**23**	**E.piperita, A.costata+/-, S.glomulifera+/-**	E,punctata, Esparsifolia, Esclerophylla	Generally occurring on low gradient, (sandy) drainage lines.
Dry Narrabeen Sandstone	**1022**	**24**	**E.eximia, E.sparsifolia, E.punctata, Ironbark**	A.bakerii, A.costata,	Taller than 1011. Variable type, oc a species may be locally absent, typically grades to 1030 grp with increased shelter.

Level 1 API Code	Level 2 API Code	API Code sort	Common Dominant / Codominants	Associates (subsidiary and minor)	COMMENTS
Dry Narrabeen Sandstone	**1023**	**25**	**Ironbark, E.sparsifolia, C.eximia, E.punctata,**	A.floribunda E.tereticornis, A.costata	For most part occurs on Narrabeen sandstone however may also occur on on clay rich sandstone strata benches and caps on Hawkesbury sandstone. E.tereticornis oc locally co dominant, particularly toward lower slopes in association with alluvium and 1065 . Localised occurrence of E.fergusonii in places.
Dry Narrabeen Sandstone	**1023p**	**26**	**Ironbark, E.molucanna, E.tereticornis,**	C.endlicheri,	Permian influence
Dry Narrabeen Sandstone	**1025**	**27**	**E.punctata, E.sparsifolia, E.crebra**	E.eximia, A.bulgaensis, E.endlicheri	Variation of 1022. Occurs on ridge tops and exposed to semi-sheltered aspects at the northern end of the park on Narrabeen lithic sandstone? Typified by the presence of C.endlicheri and C.eximia becoming more common than occurs in 1022a
Sheltered Narrabeen Sandstone	**1019**	**28**	**E.pilularis**	C.gummifera E.punctata C.eximia	Occurs on both Hawkesbury sandstone and Narrabeen sandstone.
Sheltered Narrabeen Sandstone	**1031**	**29**	**E.sparsifolia, E.punctata, A.costata+/-, E.eugeniodes+/-, Ironbark+/-**	C.eximia, S.glomulifera, A.torulosa, E.piperita, E.michaeliana+/-, E.deanei	Variable type, oc a species may be locally absent. A.torulosa common in sheltered locations. E.piperita oc present in proximity to Hawkesbury sandstone. E.michaeliana commonly occurs in proximity to 1063
Sheltered Narrabeen Sandstone	**1036**	**30**	**E.michaeliana, Ironbark**	E.punctata, E.sparsifolia, B.myrtifolia	Occurs on semi-sheltered slopes, typically a fringing community in proximity to drainage lines carrying E.deanei. E.michaeliana oc dominant.
Sheltered Narrabeen Sandstone	**1041**	**31**	**E.hypostomatica, S.glomulifera**	Ironbark, E.punctata E.eugeniodes, A.costata, E.deanei, B.myrtifolia, A.torulosa, B.myrtifolia	Sheltered moist gully heads and drainage lines. Commonly associated with B.myrtifolia on shale bands within Narrabeen sandstone.

Level 1 API Code	Level 2 API Code	API Code sort	Common Dominant / Codominants	Associates (subsidiary and minor)	COMMENTS
Sheltered Narrabeen Sandstone	**1042**	**32**	**S.glomulifera E.punctata**	E, deanei, Ironbark, E.eugeniodes, A.costata, B.myrtifolia, A.torulosa, A.floribunda	Moist gully heads and drainage lines. Intermediate type between semi-moist phase 1031 and 1060 series
Sheltered Deanes Gum - Blue Gum	**1063**	**33**	**B.myrtifolia, E.michaeliana, Ironbark**	E.punctata, E.sparsifolia,	Commonly occurs in semi-sheltered (relatively dry) gully systems in association with B. myrtifolia. Occasionally extending to minor gullies and sheltered aspects in assoc with 1031 (review 1036 yengo nth). E.michaeliana sometimes dominant.
Sheltered Deanes Gum - Blue Gum	**1066**	**34**	**E.deanei, Stringybark, A.floribunda+/- B.myrtifolia**	E.punctata, E.eugeniodes, E.hypostomatica, E.michaelianna, S.glomulifera, oc rainforest spp.	Generally occurs on Narrabeen sandstone but may extend to Hawkesbury sandstone in sheltered gully heads. Common in major watercourses (limited alluvium) and extending to sheltered gullies and side slopes. E.deanei commonly dominant. Includes former type 1061
Sheltered Deanes Gum - Blue Gum	**1068**	**35**	**E.deanei, S.glomulifera**	S.glomulifera, E.punctata, E.eugeniodes	Upper catchments gullies. S.glomulifera > 30% and E.deanei > 30%. Intermediate between 1066 (rlg) and 1042 (tp)
Sheltered Deanes Gum - Blue Gum	**1062**	**36**	**E.deanei, E.saligna, E.eugeniodes A.floribunda+/-**	S.glomulifera, E.punctata, E.eugeniodes, A.floribunda	Low gradient major watercourses (moderate alluvium content). Transitional blue Gum type. Typically grades upstream to 1066. A.floribunda more abundant as drainage course becomes more wide and high alluvium content. On exiting to river flats C.cunninghammia occasionally present
Alluvial - Riparian	**1067**	**37**	**A.floribunda, C.cunninghamiana**	E.tereticornis	C.cunninghamiana always present, sometimes dominant
Alluvial - Riparian	**1067a**	**38**	**C.glauca**		Occurs on sub-saline soils in proximity to supra-tidal sites.
Alluvial - Riparian	**1067b**	**39**	**E.elata**		Occurs adjacent the Colo River on deep alluvial soils.

Level 1 API Code	Level 2 API Code	API Code sort	Common Dominant / Codominants	Associates (subsidiary and minor)	COMMENTS
Alluvial - Riparian	**1067c**	**40**	**Sandstone riparian complex**		Various growth forms often intermixed with stream bed gravels and rock outcrops etc. Species present are variable and may include E.deanei, E.michaeliana, B.myrtifolia, T.laurina, Leptospermum spp.
Alluvial - Riparian	**1064**	**41**	**A.floribunda, Eamplifolia+/-**	E.deanei, E.saligna, E.punctata, E.eugeniodes, C.cunninghamiana	Low gradient major watercourses, wide streamside and elevated alluvium beds. Rock <10%
Alluvial - Riparian	**1065**	**42**	**A.floribunda, E.tereticornis+/-**	Epunctata, E.sparsifolia, E.eugeniodes, E.piperita, E.deanei, S.glomulifera	Gullies, sheltered side slopes adjacent main watercourses. Less alluvium than 1064. Extending up lower slopes, E.tereticornis extending further upslope on exposed aspects, A.floribunda extending further on sheltered aspects. Some rock outcrops oc present.
Alluvial - Riparian	**1069**	**43**	**E.robusta, M.linariifolia**		Remnant patches occurring on wet silty alluvium on river flats
Mellong sands	**1073**	**44**	**E.parramattensis**	A.floribunda, A.bakeri, B.serrata,	Typically occurs in drainage depressions.
Mellong sands	**1072**	**45**	**A.bakeri / A.floribunda, B.serrata**	P.linearis E.parramattensis, E.punctata, Scribbly gum (localised), E.amplifolia, E.eximia	Perched dry silty alluvium. P.linearis common. Grades into 1064 in places.
Mellong sands	**1071**	**46**	**Scribbly gum, A.bakeri B.serrata,**	P.linearis A.floribunda	Perched dry sandy alluvium. P.linearis common. E.parramattensis may be present in localised moist patches
Swamp forest / wetland	**1074**	**47**	**M.thicket**		Perched moist silty alluvium
Swamp forest / wetland	**1074m**	**48**	**M.thicket**		
Swamp forest / wetland	**1074e**	**49**	**M.ericifolia**		Melaleuca thicket associated with sub-saline sites
Swamp forest / wetland	**1082**	**50**	**Shrub/swamp**		Freshwater wetland associated with Mellong sands

Level 1 API Code	Level 2 API Code	API Code sort	Common Dominant / Codominants	Associates (subsidiary and minor)	COMMENTS
Swamp forest / wetland	**1083**	**51**	**Shrub/swamp**		Freshwater wetland associated with alluvial river flats
Swamp forest / wetland	**1084**	**52**	**Shrub/swamp**		Sandstone upland swamps
Swamp forest / wetland	**1085**	**53**	**Shrub/swamp**		Sandstone riparian scrub
Rock Outcrop	**4003**	**54**	**Rock (> 5 csr)**		
Non Native Vegetation	**2030**	**55**	**Exotics (unidentified)**		
Acacia	**1092**	**56**	**Other Acacia spp.**		Generally associated with disturbance.
Acacia	**1091**	**57**	**A.bulgaensis**		Occurs in the Northern section of Yengo NP. Appears to be associated with lithic sandstone and Hunter escarpment.
Cleared Lands	**3010**	**58**	**Transmission line**		
Cleared Lands	**3020**	**59**	**Road / rail + verges**		
Cleared Lands	**3040**	**60**	**Mining; Quarry**		
Cleared Lands	**4000**	**61**	**Cleared (> 5 csr)**		
Regenerating Trees and Shrubs	**4001**	**62**	**Regen, trees and shrubs**		
Water	**3050**	**63**	**Water**		

APPENDIX B: NATIVE FLORA SPECIES RECORDED AT FLORISTIC SAMPLE SITES

Family	Scientific Name	Common Name
Acanthaceae	*Brunoniella australis*	Blue Trumpet
Acanthaceae	*Brunoniella pumilio*	Dwarf Blue Trumpet
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair
Adiantaceae	*Adiantum diaphanum*	Filmy Maidenhair
Adiantaceae	*Adiantum formosum*	Giant Maidenhair
Adiantaceae	*Adiantum hispidulum*	Rough Maidenhair
Adiantaceae	*Cheilanthes austrotenuifolia*	Rock Fern
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern
Adiantaceae	*Cheilanthes lasiophylla*	
Adiantaceae	*Cheilanthes sieberi subsp. sieberi*	
Adiantaceae	*Pellaea falcata*	Sickle Fern
Adiantaceae	*Pellaea nana*	Dwarf Sickle Fern
Adiantaceae	*Pellaea paradoxa*	
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed
Amaranthaceae	*Deeringia amaranthoides*	
Anacardiaceae	*Euroschinus falcata var. falcata*	Ribbonwood
Anthericaceae	*Arthropodium milleflorum*	Vanilla Lily
Anthericaceae	*Arthropodium minus*	Small Vanilla Lily
Anthericaceae	*Caesia parviflora var. parviflora*	
Anthericaceae	*Caesia parviflora var. vittata*	
Anthericaceae	*Laxmannia compacta*	
Anthericaceae	*Laxmannia gracilis*	Slender Wire Lily
Anthericaceae	*Thysanotus tuberosus*	Common Fringe-lily
Anthericaceae	*Tricoryne elatior*	Yellow Autumn-lily
Anthericaceae	*Tricoryne simplex*	
Apiaceae	*Actinotus helianthi*	Flannel Flower
Apiaceae	*Actinotus minor*	Lesser Flannel Flower
Apiaceae	*Centella asiatica*	Pennywort
Apiaceae	*Daucus glochidiatus*	Native Carrot
Apiaceae	*Hydrocotyle acutiloba*	
Apiaceae	*Hydrocotyle geraniifolia*	Forest Pennywort
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort
Apiaceae	*Hydrocotyle peduncularis*	
Apiaceae	*Hydrocotyle tripartita*	Pennywort

Family	Scientific Name	Common Name
Apiaceae	*Platysace clelandii*	
Apiaceae	*Platysace ericoides*	
Apiaceae	*Platysace lanceolata*	
Apiaceae	*Platysace linearifolia*	
Apiaceae	*Trachymene anisocarpa*	
Apiaceae	*Xanthosia atkinsoniana*	
Apiaceae	*Xanthosia pilosa*	Woolly Xanthosia
Apiaceae	*Xanthosia tridentata*	
Apocynaceae	*Parsonsia brownii*	Mountain Silkpod
Apocynaceae	*Parsonsia lanceolata*	
Apocynaceae	*Parsonsia purpurascens*	Black Silkpod
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Araceae	*Gymnostachys anceps*	Settler's Flax
Araliaceae	*Astrotricha floccosa*	
Araliaceae	*Astrotricha latifolia*	
Araliaceae	*Astrotricha longifolia*	
Araliaceae	*Astrotricha obovata*	
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax
Araliaceae	*Polyscias sambucifolia subsp. A*	
Asclepiadaceae	*Marsdenia flavescens*	Hairy Milk Vine
Asclepiadaceae	*Marsdenia rostrata*	Common Milk Vine
Asclepiadaceae	*Marsdenia suaveolens*	Scented Marsdenia
Asclepiadaceae	*Tylophora barbata*	Bearded Tylophora
Asclepiadaceae	*Tylophora paniculata*	Thin-leaved Tylophora
Aspleniaceae	*Asplenium flabellifolium*	Necklace Fern
Asteraceae	*Brachyscome angustifolia var. angustifolia*	
Asteraceae	*Brachyscome angustifolia var. heterophylla*	
Asteraceae	*Brachyscome microcarpa*	
Asteraceae	*Brachyscome multifida var. dilatata*	
Asteraceae	*Brachyscome multifida var. multifida*	
Asteraceae	*Calotis dentex*	
Asteraceae	*Calotis lappulacea*	Yellow Burr-daisy
Asteraceae	*Cassinia aculeata*	Dolly Bush
Asteraceae	*Cassinia arcuata*	Sifton Bush
Asteraceae	*Cassinia compacta*	
Asteraceae	*Cassinia cunninghamii*	
Asteraceae	*Cassinia leptocephala*	

Family	Scientific Name	Common Name
Asteraceae	*Cassinia longifolia*	
Asteraceae	*Cassinia quinquefaria*	
Asteraceae	*Cassinia uncata*	Sticky Cassinia
Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting, Yellow But
Asteraceae	*Cotula australis*	Common Cotula
Asteraceae	*Epaltes australis*	Spreading Nut-heads
Asteraceae	*Euchiton gymnocephalus*	Creeping Cudweed
Asteraceae	*Euchiton involucratus*	Star Cudweed
Asteraceae	*Euchiton sphaericus*	
Asteraceae	*Glossogyne tannensis*	Cobbler's Tack
Asteraceae	*Helichrysum adenophorum var. waddelliae*	
Asteraceae	*Helichrysum collinum*	
Asteraceae	*Helichrysum scorpioides*	Button Everlasting
Asteraceae	*Lagenifera gracilis*	Slender Lagenophora
Asteraceae	*Lagenifera stipitata*	Blue Bottle-daisy
Asteraceae	*Olearia elliptica*	Sticky Daisy Bush
Asteraceae	*Olearia microphylla*	
Asteraceae	*Olearia ramulosa*	
Asteraceae	*Olearia tomentosa*	
Asteraceae	*Ozothamnus diosmifolius*	White Dogwood
Asteraceae	*Podolepis jaceoides*	Showy Copper-wire Daisy
Asteraceae	*Rutidosis heterogama*	
Asteraceae	*Senecio amygdalifolius*	
Asteraceae	*Senecio diaschides*	
Asteraceae	*Senecio hispidulus*	Hill Fireweed
Asteraceae	*Senecio hispidulus var. hispidulus*	
Asteraceae	*Senecio lautus subsp. lanceolatus*	
Asteraceae	*Senecio lautus subsp. lautus*	
Asteraceae	*Senecio linearifolius*	
Asteraceae	*Senecio prenanthoides*	
Asteraceae	*Senecio quadridentatus*	Cotton Fireweed
Asteraceae	*Senecio vagus subsp. eglandulosus*	
Asteraceae	*Senecio velleioides*	
Asteraceae	*Sigesbeckia australiensis*	
Asteraceae	*Sigesbeckia orientalis subsp. orientalis*	Indian Weed
Asteraceae	*Vernonia cinerea var. cinerea*	
Asteraceae	*Vittadinia cervicularis var. subcervicularis*	

Family	Scientific Name	Common Name
Asteraceae	*Vittadinia cuneata var. cuneata*	Fuzzweed
Asteraceae	*Vittadinia hispidula var. setosa*	
Asteraceae	*Vittadinia triloba*	
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine
Blandfordiaceae	*Blandfordia nobilis*	
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern
Blechnaceae	*Blechnum nudum*	Fishbone Water Fern
Blechnaceae	*Doodia aspera*	Prickly Rasp Fern
Blechnaceae	*Doodia australis*	Common Rasp Fern
Blechnaceae	*Doodia caudata*	
Boraginaceae	*Cynoglossum australe*	
Boraginaceae	*Cynoglossum suaveolens*	
Boraginaceae	*Ehretia acuminata var. acuminata*	Koda
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell
Campanulaceae	*Wahlenbergia gracilis*	Sprawling or Australian Bluebell
Campanulaceae	*Wahlenbergia luteola*	
Campanulaceae	*Wahlenbergia stricta subsp. stricta*	
Caryophyllaceae	*Stellaria flaccida*	
Casuarinaceae	*Allocasuarina distyla*	
Casuarinaceae	*Allocasuarina gymnanthera*	
Casuarinaceae	*Allocasuarina littoralis*	Black Sheoak
Casuarinaceae	*Allocasuarina luehmannii*	Bulloak
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak
Casuarinaceae	*Casuarina cunninghamiana subsp. cunninghamiana*	River Oak, River Sheoak
Casuarinaceae	*Casuarina glauca*	Swamp Oak
Celastraceae	*Cassine australis var. australis*	Red Olive-berry
Celastraceae	*Celastrus australis*	Staff VIne
Celastraceae	*Maytenus silvestris*	Narrow-leaved Orangebark
Chenopodiaceae	*Chenopodium carinatum*	Keeled Goosefoot
Chenopodiaceae	*Chenopodium pumilio*	Small Crumbweed
Chenopodiaceae	*Einadia hastata*	Berry Saltbush
Chenopodiaceae	*Einadia nutans subsp. nutans*	
Chenopodiaceae	*Einadia trigonos subsp. trigonos*	Fishweed
Chloanthaceae	*Spartothamnella juncea*	
Clusiaceae	*Hypericum gramineum*	Small St John's Wort
Clusiaceae	*Hypericum japonicum*	

Family	Scientific Name	Common Name
Colchicaceae	*Burchardia umbellata*	Milkmaids
Commelinaceae	*Aneilema acuminatum*	
Commelinaceae	*Aneilema biflorum*	
Commelinaceae	*Commelina cyanea*	Native Wandering Jew
Commelinaceae	*Commelina ensifolia*	Scurvy Grass
Convolvulaceae	*Calystegia marginata*	
Convolvulaceae	*Cuscuta australis*	Australian Dodder
Convolvulaceae	*Dichondra repens*	Kidney Weed
Convolvulaceae	*Dichondra species A*	
Convolvulaceae	*Polymeria calycina*	
Crassulaceae	*Crassula colorata var. acuminata*	
Crassulaceae	*Crassula helmsii*	Swamp Stonecrop
Crassulaceae	*Crassula sieberiana subsp. sieberiana*	Australian Stonecrop
Cucurbitaceae	*Zehneria cunninghamii*	Slender Cucumber
Cunoniaceae	*Aphanopetalum resinosum*	Gum Vine
Cunoniaceae	*Callicoma serratifolia*	Black Wattle
Cunoniaceae	*Ceratopetalum apetalum*	Coachwood
Cunoniaceae	*Ceratopetalum gummiferum*	Christmas Bush
Cunoniaceae	*Schizomeria ovata*	Crabapple
Cupressaceae	*Callitris endlicheri*	Black Cypress Pine
Cyatheaceae	*Cyathea australis*	Rough Treefern
Cyperaceae	*Carex appressa*	Tall Sedge
Cyperaceae	*Carex breviculmis*	
Cyperaceae	*Carex inversa*	Knob Sedge
Cyperaceae	*Carex longebrachiata*	Bergalia Tussock
Cyperaceae	*Caustis flexuosa*	Curly Wig
Cyperaceae	*Caustis recurvata var. recurvata*	
Cyperaceae	*Cladium procerum*	
Cyperaceae	*Cyathochaeta diandra*	
Cyperaceae	*Cyperus difformis*	Dirty Dora
Cyperaceae	*Cyperus enervis*	
Cyperaceae	*Cyperus fulvus*	
Cyperaceae	*Cyperus gunnii subsp. gunnii*	
Cyperaceae	*Cyperus imbecillis*	
Cyperaceae	*Cyperus laevis*	
Cyperaceae	*Cyperus odoratus*	
Cyperaceae	*Cyperus tetraphyllus*	

Family	Scientific Name	Common Name
Cyperaceae	*Cyperus trinervis*	
Cyperaceae	*Eleocharis sphacelata*	Tall Spike Rush
Cyperaceae	*Fimbristylis dichotoma*	Common Fridge-sedge
Cyperaceae	*Fimbristylis velata*	
Cyperaceae	*Gahnia aspera*	Rough Saw-sedge
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge
Cyperaceae	*Gahnia melanocarpa*	
Cyperaceae	*Gahnia sieberiana*	
Cyperaceae	*Isolepis inundata*	
Cyperaceae	*Lepidosperma concavum*	
Cyperaceae	*Lepidosperma elatius*	
Cyperaceae	*Lepidosperma filiforme*	
Cyperaceae	*Lepidosperma gunnii*	
Cyperaceae	*Lepidosperma laterale*	
Cyperaceae	*Lepidosperma urophorum*	
Cyperaceae	*Lepidosperma viscidum*	
Cyperaceae	*Lipocarpha microcephala*	
Cyperaceae	*Ptilothrix deusta*	
Cyperaceae	*Schoenus brevifolius*	
Cyperaceae	*Schoenus ericetorum*	
Cyperaceae	*Schoenus imberbis*	
Cyperaceae	*Schoenus maschalinus*	
Cyperaceae	*Schoenus melanostachys*	
Cyperaceae	*Scleria mackaviensis*	
Dennstaedtiaceae	*Dennstaedtia davallioides*	Lacy Ground Fern
Dennstaedtiaceae	*Histiopteris incisa*	Bat's Wing Fern
Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dicksoniaceae	*Calochlaena dubia*	Common Ground Fern
Dilleniaceae	*Hibbertia acicularis*	
Dilleniaceae	*Hibbertia aspera subsp. aspera*	Rough Guinea Flower
Dilleniaceae	*Hibbertia bracteata*	
Dilleniaceae	*Hibbertia circumdans*	
Dilleniaceae	*Hibbertia dentata*	Twining Guinea Flower
Dilleniaceae	*Hibbertia diffusa*	
Dilleniaceae	*Hibbertia empetrifolia subsp. empetrifolia*	
Dilleniaceae	*Hibbertia fasciculata*	

Family	Scientific Name	Common Name
Dilleniaceae	*Hibbertia linearis*	
Dilleniaceae	*Hibbertia monogyna*	
Dilleniaceae	*Hibbertia nitida*	
Dilleniaceae	*Hibbertia obtusifolia*	
Dilleniaceae	*Hibbertia pedunculata*	
Dilleniaceae	*Hibbertia procumbens*	
Dilleniaceae	*Hibbertia riparia*	
Dilleniaceae	*Hibbertia rufa*	
Dilleniaceae	*Hibbertia saligna*	
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower
Dilleniaceae	*Hibbertia serpyllifolia*	
Doryanthaceae	*Doryanthes excelsa*	Gymea/Giant Lily
Droseraceae	*Drosera auriculata*	
Droseraceae	*Drosera burmannii*	
Droseraceae	*Drosera peltata*	
Droseraceae	*Drosera spatulata*	
Dryopteridaceae	*Lastreopsis decomposita*	Trim Shield Fern
Dryopteridaceae	*Polystichum australiense*	Harsh Shield Fern
Dryopteridaceae	*Polystichum proliferum*	Mother Shield Fern
Ebenaceae	*Diospyros australis*	Black Plum
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash
Epacridaceae	*Acrotriche aggregata*	
Epacridaceae	*Acrotriche divaricata*	
Epacridaceae	*Brachyloma daphnoides subsp. daphnoides*	
Epacridaceae	*Dracophyllum secundum*	
Epacridaceae	*Epacris microphylla*	
Epacridaceae	*Epacris pulchella*	
Epacridaceae	*Leucopogon appressus*	
Epacridaceae	*Leucopogon attenuatus*	
Epacridaceae	*Leucopogon biflorus*	
Epacridaceae	*Leucopogon ericoides*	
Epacridaceae	*Leucopogon juniperinus*	Prickly Beard-heath
Epacridaceae	*Leucopogon lanceolatus var. lanceolatus*	
Epacridaceae	*Leucopogon microphyllus var. microphyllus*	
Epacridaceae	*Leucopogon muticus*	Blunt Beard-heath
Epacridaceae	*Leucopogon setiger*	
Epacridaceae	*Leucopogon virgatus*	

Family	Scientific Name	Common Name
Epacridaceae	*Lissanthe strigosa subsp. subulata*	Peach Heath
Epacridaceae	*Melichrus procumbens*	Jam Tarts
Epacridaceae	*Melichrus urceolatus*	Urn Heath
Epacridaceae	*Monotoca elliptica*	Tree Broom-heath
Epacridaceae	*Monotoca scoparia*	
Epacridaceae	*Sprengelia incarnata*	
Epacridaceae	*Styphelia laeta*	
Epacridaceae	*Styphelia laeta subsp. latifolia*	
Epacridaceae	*Styphelia triflora*	Pink Five-Corners
Epacridaceae	*Styphelia tubiflora*	
Epacridaceae	*Trochocarpa laurina*	Tree Heath
Epacridaceae	*Woollsia pungens*	
Euphorbiaceae	*Alchornea ilicifolia*	Native Holly
Euphorbiaceae	*Amperea xiphoclada var. xiphoclada*	
Euphorbiaceae	*Bertya oleifolia*	
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush
Euphorbiaceae	*Claoxylon australe*	Brittlewood
Euphorbiaceae	*Croton insularis*	Silver Croton
Euphorbiaceae	*Croton verreauxii*	Native Cascarilla
Euphorbiaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree
Euphorbiaceae	*Glochidion ferdinandi var. pubens*	Hairy Cheese Tree
Euphorbiaceae	*Micrantheum ericoides*	
Euphorbiaceae	*Omalanthus populifolius*	Bleeding Heart, Native Poplar
Euphorbiaceae	*Phyllanthus gunnii*	
Euphorbiaceae	*Phyllanthus hirtellus*	
Euphorbiaceae	*Phyllanthus similis*	
Euphorbiaceae	*Phyllanthus virgatus*	
Euphorbiaceae	*Poranthera ericifolia*	
Euphorbiaceae	*Poranthera microphylla*	
Euphorbiaceae	*Pseudanthus orientalis*	
Euphorbiaceae	*Ricinocarpos bowmanii*	
Euphorbiaceae	*Ricinocarpos pinifolius*	Wedding Bush
Eupomatiaceae	*Eupomatia laurina*	Bolwarra
Fabaceae (Faboideae)	*Aotus ericoides*	
Fabaceae (Faboideae)	*Bossiaea buxifolia*	
Fabaceae (Faboideae)	*Bossiaea ensata*	
Fabaceae (Faboideae)	*Bossiaea heterophylla*	Variable Bossiaea

Family	Scientific Name	Common Name
Fabaceae (Faboideae)	*Bossiaea lenticularis*	
Fabaceae (Faboideae)	*Bossiaea obcordata*	Spiny Bossiaea
Fabaceae (Faboideae)	*Bossiaea rhombifolia subsp. rhombifolia*	
Fabaceae (Faboideae)	*Bossiaea stephensonii*	
Fabaceae (Faboideae)	*Daviesia acicularis*	
Fabaceae (Faboideae)	*Daviesia alata*	
Fabaceae (Faboideae)	*Daviesia corymbosa*	
Fabaceae (Faboideae)	*Daviesia genistifolia*	Broom Bitter Pea
Fabaceae (Faboideae)	*Daviesia mimosoides subsp. mimosoides*	
Fabaceae (Faboideae)	*Daviesia squarrosa*	
Fabaceae (Faboideae)	*Daviesia ulicifolia subsp. ulicifolia*	Gorse Bitter Pea
Fabaceae (Faboideae)	*Daviesia umbellulata*	
Fabaceae (Faboideae)	*Desmodium brachypodum*	Large Tick-trefoil
Fabaceae (Faboideae)	*Desmodium gunnii*	
Fabaceae (Faboideae)	*Desmodium rhytidophyllum*	
Fabaceae (Faboideae)	*Desmodium varians*	Slender Tick-trefoil
Fabaceae (Faboideae)	*Dillwynia acicularis*	
Fabaceae (Faboideae)	*Dillwynia crispii*	
Fabaceae (Faboideae)	*Dillwynia elegans*	
Fabaceae (Faboideae)	*Dillwynia floribunda*	
Fabaceae (Faboideae)	*Dillwynia glaberrima*	
Fabaceae (Faboideae)	*Dillwynia juniperina*	
Fabaceae (Faboideae)	*Dillwynia retorta*	
Fabaceae (Faboideae)	*Dillwynia rudis*	
Fabaceae (Faboideae)	*Dillwynia sericea*	
Fabaceae (Faboideae)	*Dillwynia tenuifolia*	
Fabaceae (Faboideae)	*Glycine clandestina*	
Fabaceae (Faboideae)	*Glycine hygrophila*	
Fabaceae (Faboideae)	*Glycine microphylla*	
Fabaceae (Faboideae)	*Glycine tabacina*	
Fabaceae (Faboideae)	*Glycine tomentella*	Woolly Glycine
Fabaceae (Faboideae)	*Gompholobium glabratum*	Dainty Wedge Pea
Fabaceae (Faboideae)	*Gompholobium grandiflorum*	Large Wedge Pea
Fabaceae (Faboideae)	*Gompholobium huegelii*	Pale Wedge Pea
Fabaceae (Faboideae)	*Gompholobium inconspicuum*	
Fabaceae (Faboideae)	*Gompholobium latifolium*	Golden Glory Pea
Fabaceae (Faboideae)	*Gompholobium minus*	Dwarf Wedge Pea

Family	Scientific Name	Common Name
Fabaceae (Faboideae)	*Gompholobium pinnatum*	Pinnate Wedge Pea
Fabaceae (Faboideae)	*Gompholobium uncinatum*	Red Wedge Pea
Fabaceae (Faboideae)	*Gompholobium virgatum*	Leafy Wedge Pea
Fabaceae (Faboideae)	*Gompholobium virgatum var. aspalathoides*	
Fabaceae (Faboideae)	*Goodia lotifolia*	
Fabaceae (Faboideae)	*Hardenbergia violacea*	False Sarsaparilla
Fabaceae (Faboideae)	*Hovea lanceolata*	
Fabaceae (Faboideae)	*Hovea linearis*	
Fabaceae (Faboideae)	*Hovea longifolia*	
Fabaceae (Faboideae)	*Hovea purpurea*	
Fabaceae (Faboideae)	*Indigofera australis*	
Fabaceae (Faboideae)	*Jacksonia scoparia*	Dogwood
Fabaceae (Faboideae)	*Kennedia rubicunda*	Red Kennedy Pea
Fabaceae (Faboideae)	*Mirbelia pungens*	
Fabaceae (Faboideae)	*Mirbelia rubiifolia*	
Fabaceae (Faboideae)	*Mirbelia speciosa subsp. speciosa*	
Fabaceae (Faboideae)	*Oxylobium pulteneae*	Wiry Shaggy Pea
Fabaceae (Faboideae)	*Phyllota phylicoides*	Heath Phyllota
Fabaceae (Faboideae)	*Platylobium formosum*	
Fabaceae (Faboideae)	*Platylobium formosum subsp. parviflorum*	
Fabaceae (Faboideae)	*Podolobium aciculiferum*	Needle Shaggy Pea
Fabaceae (Faboideae)	*Podolobium ilicifolium*	Prickly Shaggy Pea
Fabaceae (Faboideae)	*Pultenaea daphnoides*	
Fabaceae (Faboideae)	*Pultenaea divaricata*	
Fabaceae (Faboideae)	*Pultenaea echinula*	
Fabaceae (Faboideae)	*Pultenaea euchila*	
Fabaceae (Faboideae)	*Pultenaea ferruginea var. deanei*	
Fabaceae (Faboideae)	*Pultenaea ferruginea var. ferruginea*	
Fabaceae (Faboideae)	*Pultenaea flexilis*	
Fabaceae (Faboideae)	*Pultenaea microphylla*	
Fabaceae (Faboideae)	*Pultenaea retusa*	
Fabaceae (Faboideae)	*Pultenaea rosmarinifolia*	
Fabaceae (Faboideae)	*Pultenaea scabra*	
Fabaceae (Faboideae)	*Pultenaea spinosa*	
Fabaceae (Faboideae)	*Pultenaea stipularis*	
Fabaceae (Faboideae)	*Pultenaea tuberculata*	
Fabaceae (Faboideae)	*Viminaria juncea*	Native Broom

Family	Scientific Name	Common Name
Fabaceae (Mimosoideae)	*Acacia binervata*	Two-veined Hickory
Fabaceae (Mimosoideae)	*Acacia binervia*	Coast Myall
Fabaceae (Mimosoideae)	*Acacia brownii*	Heath Wattle
Fabaceae (Mimosoideae)	*Acacia bulgaensis*	
Fabaceae (Mimosoideae)	*Acacia buxifolia subsp. buxifolia*	Box-leaved Wattle
Fabaceae (Mimosoideae)	*Acacia bynoeana*	Bynoe's Wattle
Fabaceae (Mimosoideae)	*Acacia doratoxylon*	Currawang
Fabaceae (Mimosoideae)	*Acacia echinula*	Hedgehog Wattle
Fabaceae (Mimosoideae)	*Acacia elata*	Mountain Cedar Wattle
Fabaceae (Mimosoideae)	*Acacia elongata*	Swamp Wattle
Fabaceae (Mimosoideae)	*Acacia falcata*	
Fabaceae (Mimosoideae)	*Acacia falciformis*	Broad-leaved Hickory
Fabaceae (Mimosoideae)	*Acacia filicifolia*	Fern-leaved Wattle
Fabaceae (Mimosoideae)	*Acacia floribunda*	White Sally
Fabaceae (Mimosoideae)	*Acacia fulva*	Velvet Wattle
Fabaceae (Mimosoideae)	*Acacia hispidula*	
Fabaceae (Mimosoideae)	*Acacia implexa*	Hickory Wattle
Fabaceae (Mimosoideae)	*Acacia irrorata subsp. irrorata*	Green Wattle
Fabaceae (Mimosoideae)	*Acacia linifolia*	Flax-leaved Wattle
Fabaceae (Mimosoideae)	*Acacia longifolia subsp. longifolia*	Sydney Golden Wattle
Fabaceae (Mimosoideae)	*Acacia longissima*	Narrow-leaved Wattle
Fabaceae (Mimosoideae)	*Acacia lunata*	Lunate-leaved Acacia
Fabaceae (Mimosoideae)	*Acacia maidenii*	Maiden's Wattle
Fabaceae (Mimosoideae)	*Acacia myrtifolia*	Red-stemmed Wattle
Fabaceae (Mimosoideae)	*Acacia obliquinervia*	Mountain Hickory
Fabaceae (Mimosoideae)	*Acacia paradoxa*	Kangaroo Thorn
Fabaceae (Mimosoideae)	*Acacia parramattensis*	Parramatta Wattle
Fabaceae (Mimosoideae)	*Acacia parvipinnula*	Silver-stemmed Wattle
Fabaceae (Mimosoideae)	*Acacia penninervis var. penninervis*	Mountain Hickory
Fabaceae (Mimosoideae)	*Acacia prominens*	Gosford Wattle
Fabaceae (Mimosoideae)	*Acacia saliciformis*	
Fabaceae (Mimosoideae)	*Acacia schinoides*	Green Cedar Wattle
Fabaceae (Mimosoideae)	*Acacia suaveolens*	Sweet Wattle
Fabaceae (Mimosoideae)	*Acacia terminalis subsp. angustifolia*	
Fabaceae (Mimosoideae)	*Acacia terminalis subsp. longiaxialis*	
Fabaceae (Mimosoideae)	*Acacia trinervata*	Three-nerved Wattle
Fabaceae (Mimosoideae)	*Acacia ulicifolia*	Prickly Moses

Family	Scientific Name	Common Name
Fabaceae (Mimosoideae)	*Acacia uncinata*	Gold-dust Wattle
Fabaceae (Mimosoideae)	*Acacia undulifolia*	
Gentianaceae	*Centaurium spicatum*	Spike Centaury
Geraniaceae	*Geranium homeanum*	
Geraniaceae	*Geranium potentilloides var. potentilloides*	
Geraniaceae	*Geranium solanderi*	Native Geranium
Geraniaceae	*Pelargonium australe*	Native Storksbill
Geraniaceae	*Pelargonium inodorum*	
Gleicheniaceae	*Gleichenia dicarpa*	Pouched Coral Fern, Tangle Fern
Gleicheniaceae	*Gleichenia microphylla*	
Gleicheniaceae	*Sticherus flabellatus var. flabellatus*	Umbrella Fern
Goodeniaceae	*Coopernookia barbata*	
Goodeniaceae	*Dampiera purpurea*	
Goodeniaceae	*Dampiera stricta*	
Goodeniaceae	*Goodenia bellidifolia subsp. bellidifolia*	
Goodeniaceae	*Goodenia decurrens*	
Goodeniaceae	*Goodenia hederacea subsp. hederacea*	
Goodeniaceae	*Goodenia heterophylla subsp. eglandulosa*	
Goodeniaceae	*Goodenia heterophylla subsp. heterophylla*	
Goodeniaceae	*Goodenia heterophylla subsp. montana*	
Goodeniaceae	*Goodenia ovata*	Hop Goodenia
Goodeniaceae	*Goodenia paniculata*	
Goodeniaceae	*Goodenia rotundifolia*	
Goodeniaceae	*Scaevola ramosissima*	Purple Fan-flower
Goodeniaceae	*Velleia perfoliata*	
Grammitaceae	*Grammitis billardierei*	Finger Fern
Haemodoraceae	*Haemodorum corymbosum*	
Haemodoraceae	*Haemodorum planifolium*	
Haloragaceae	*Gonocarpus elatus*	
Haloragaceae	*Gonocarpus longifolius*	
Haloragaceae	*Gonocarpus micranthus*	
Haloragaceae	*Gonocarpus tetragynus*	
Haloragaceae	*Gonocarpus teucrioides*	Raspwort
Hymenophyllaceae	*Hymenophyllum cupressiforme*	Common Filmy Fern
Hypoxidaceae	*Hypoxis hygrometrica var. villosisepala*	
Iridaceae	*Libertia paniculata*	
Iridaceae	*Patersonia glabrata*	

Family	Scientific Name	Common Name
Iridaceae	*Patersonia longifolia*	
Iridaceae	*Patersonia sericea*	Silky Purple-Flag
Juncaceae	*Juncus continuus*	
Juncaceae	*Juncus pauciflorus*	
Juncaceae	*Juncus prismatocarpus*	
Juncaceae	*Juncus usitatus*	
Lamiaceae	*Ajuga australis*	Austral Bugle
Lamiaceae	*Hemigenia purpurea*	
Lamiaceae	*Lycopus australis*	Australian Gipsywort
Lamiaceae	*Mentha satureioides*	Native Pennyroyal
Lamiaceae	*Plectranthus parviflorus*	
Lamiaceae	*Prostanthera incana*	Velvet Mint-bush
Lamiaceae	*Prostanthera incisa*	Cut-leaved Mint-bush
Lamiaceae	*Prostanthera lanceolata*	
Lamiaceae	*Prostanthera linearis*	Narrow-leaved Mint-bush
Lamiaceae	*Prostanthera ovalifolia*	
Lamiaceae	*Prostanthera rhombea*	
Lamiaceae	*Prostanthera rotundifolia*	Round-leaved Mint-bush
Lamiaceae	*Prostanthera violacea*	
Lamiaceae	*Scutellaria humilis*	Dwarf Skullcap
Lamiaceae	*Scutellaria mollis*	Soft Skullcap
Lauraceae	*Cassytha glabella forma glabella*	
Lauraceae	*Cassytha pubescens*	
Lauraceae	*Endiandra sieberi*	Hard Corkwood
Lauraceae	*Neolitsea dealbata*	White Bolly Gum
Lindsaeaceae	*Lindsaea linearis*	Screw Fern
Lindsaeaceae	*Lindsaea microphylla*	Lacy Wedge Fern
Lobeliaceae	*Isotoma axillaris*	Showy Isotome
Lobeliaceae	*Lobelia gibbosa*	Tall Lobelia
Lobeliaceae	*Pratia purpurascens*	Whiteroot
Loganiaceae	*Logania albiflora*	
Loganiaceae	*Logania pusilla*	
Loganiaceae	*Mitrasacme alsinoides*	
Loganiaceae	*Mitrasacme polymorpha*	
Lomandraceae	*Lomandra brevis*	
Lomandraceae	*Lomandra confertifolia subsp. pallida*	
Lomandraceae	*Lomandra confertifolia subsp. rubiginosa*	

Family	Scientific Name	Common Name
Lomandraceae	*Lomandra cylindrica*	
Lomandraceae	*Lomandra filiformis subsp. coriacea*	
Lomandraceae	*Lomandra filiformis subsp. filiformis*	
Lomandraceae	*Lomandra fluviatilis*	
Lomandraceae	*Lomandra glauca*	Pale Mat-rush
Lomandraceae	*Lomandra gracilis*	
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush
Lomandraceae	*Lomandra obliqua*	
Loranthaceae	*Amyema miquelii*	
Loranthaceae	*Amyema pendulum subsp. pendulum*	
Loranthaceae	*Atkinsonia ligustrina*	
Loranthaceae	*Dendrophthoe vitellina*	
Loranthaceae	*Muellerina celastroides*	
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Lycopodiaceae	*Huperzia australiana*	Fir Clubmoss
Malvaceae	*Abutilon oxycarpum*	Flannel Weed
Malvaceae	*Hibiscus heterophyllus subsp. heterophyllus*	Native Rosella
Malvaceae	*Hibiscus sturtii var. sturtii*	
Malvaceae	*Sida filiformis*	
Malvaceae	*Sida trichopoda*	
Meliaceae	*Melia azedarach*	White Cedar
Meliaceae	*Toona ciliata*	Red Cedar
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine
Menispermaceae	*Stephania japonica var. discolor*	Snake Vine
Menyanthaceae	*Villarsia exaltata*	Yellow Marsh Flower
Monimiaceae	*Doryphora sassafras*	Sassafras
Moraceae	*Ficus coronata*	Creek Sandpaper Fig
Moraceae	*Ficus rubiginosa*	Port Jackson Fig, Rusty Fig
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn
Moraceae	*Streblus brunonianus*	Whalebone Tree
Myoporaceae	*Eremophila debilis*	Amulla
Myoporaceae	*Eremophila deserti*	Turkeybush
Myoporaceae	*Myoporum montanum*	Western Boobialla
Myrsinaceae	*Rapanea howittiana*	Brush Muttonwood
Myrsinaceae	*Rapanea variabilis*	Muttonwood

Family	Scientific Name	Common Name
Myrtaceae	*Acmena smithii*	Lilly Pilly
Myrtaceae	*Angophora bakeri*	Narrow-leaved Apple
Myrtaceae	*Angophora costata*	Sydney Red/Rusty Gum
Myrtaceae	*Angophora euryphylla*	
Myrtaceae	*Angophora floribunda*	Rough-barked Apple
Myrtaceae	*Angophora hispida*	Dwarf Apple
Myrtaceae	*Babingtonia densifolia*	
Myrtaceae	*Babingtonia pluriflora*	
Myrtaceae	*Backhousia myrtifolia*	Grey Myrtle
Myrtaceae	*Baeckea diosmifolia*	
Myrtaceae	*Baeckea linifolia*	
Myrtaceae	*Callistemon citrinus*	Crimson Bottlebrush
Myrtaceae	*Callistemon pallidus*	Lemon Bottlebrush
Myrtaceae	*Callistemon pinifolius*	Pine-leaved Bottlebrush
Myrtaceae	*Callistemon rigidus*	Stiff Bottlebrush
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush
Myrtaceae	*Callistemon shiressii*	
Myrtaceae	*Callistemon sieberi*	River Bottlebrush
Myrtaceae	*Calytrix tetragona*	
Myrtaceae	*Choricarpia leptopetala*	Brush Turpentine
Myrtaceae	*Corymbia eximia*	Yellow Bloodwood
Myrtaceae	*Corymbia gummifera*	Red Bloodwood
Myrtaceae	*Eucalyptus agglomerata*	Blue-leaved Stringybark
Myrtaceae	*Eucalyptus amplifolia subsp. amplifolia*	
Myrtaceae	*Eucalyptus beyeriana*	
Myrtaceae	*Eucalyptus blakelyi*	Blakely's Red Gum
Myrtaceae	*Eucalyptus capitellata*	Brown Stringybark
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark
Myrtaceae	*Eucalyptus dawsonii*	Slaty Gum
Myrtaceae	*Eucalyptus deanei*	Mountain Blue Gum
Myrtaceae	*Eucalyptus eugenioides*	Thin-leaved Stringybark
Myrtaceae	*Eucalyptus fergusonii subsp. dorsiventralis*	
Myrtaceae	*Eucalyptus fibrosa*	Red Ironbark
Myrtaceae	*Eucalyptus fracta*	
Myrtaceae	*Eucalyptus globoidea*	White Stringybark
Myrtaceae	*Eucalyptus haemastoma*	Broad-leaved Scribbly Gum
Myrtaceae	*Eucalyptus hypostomatica*	

Family	Scientific Name	Common Name
Myrtaceae	*Eucalyptus michaeliana*	Brittle/Hillgrove Gum
Myrtaceae	*Eucalyptus moluccana*	Grey Box
Myrtaceae	*Eucalyptus notabilis*	Mountain Mahogany
Myrtaceae	*Eucalyptus paniculata*	Grey Ironbark
Myrtaceae	*Eucalyptus paniculata subsp. paniculata*	
Myrtaceae	*Eucalyptus parramattensis subsp. parramattensis*	
Myrtaceae	*Eucalyptus pilularis*	Blackbutt
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint
Myrtaceae	*Eucalyptus prominula*	Stringybark
Myrtaceae	*Eucalyptus punctata*	Grey Gum
Myrtaceae	*Eucalyptus racemosa*	Narrow-leaved Scribbly Gum
Myrtaceae	*Eucalyptus resinifera subsp. resinifera*	
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany
Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum
Myrtaceae	*Eucalyptus sclerophylla*	Hard-leaved Scribbly Gum
Myrtaceae	*Eucalyptus sparsifolia*	Narrow-leaved Stringybark
Myrtaceae	*Eucalyptus squamosa*	Scaly Bark
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Myrtaceae	*Euryomyrtus ramosissima subsp. ramosissima*	
Myrtaceae	*Kunzea capitata*	
Myrtaceae	*Leptospermum arachnoides*	
Myrtaceae	*Leptospermum continentale*	Prickly Teatree
Myrtaceae	*Leptospermum juniperinum*	Prickly Tea-tree
Myrtaceae	*Leptospermum parvifolium*	
Myrtaceae	*Leptospermum polygalifolium subsp. cismontanum*	
Myrtaceae	*Leptospermum polygalifolium subsp. polygalifolium*	
Myrtaceae	*Leptospermum trinervium*	
Myrtaceae	*Melaleuca groveana*	
Myrtaceae	*Melaleuca linariifolia*	
Myrtaceae	*Melaleuca styphelioides var. styphelioides*	
Myrtaceae	*Melaleuca thymifolia*	
Myrtaceae	*Micromyrtus ciliata*	
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine
Myrtaceae	*Syncarpia glomulifera subsp. glomulifera*	
Myrtaceae	*Tristaniopsis collina*	Mountain Water Gum

Family	Scientific Name	Common Name
Myrtaceae	*Tristaniopsis laurina*	Kanuka
Olacaceae	*Olax stricta*	
Oleaceae	*Jasminum volubile*	
Oleaceae	*Notelaea longifolia forma longifolia*	
Oleaceae	*Notelaea microcarpa*	Native Olive
Oleaceae	*Notelaea ovata*	
Oleaceae	*Notelaea venosa*	Veined Mock-olive
Ophioglossaceae	*Botrychium australe*	Parsley Fern
Orchidaceae	*Acianthus exsertus*	Mosquito Orchid
Orchidaceae	*Acianthus fornicatus*	Pixie Caps
Orchidaceae	*Caladenia catenata*	White Caladenia
Orchidaceae	*Caleana major*	Large Duck Orchid
Orchidaceae	*Chiloglottis diphylla*	
Orchidaceae	*Chiloglottis seminuda*	
Orchidaceae	*Chiloglottis trapeziformis*	
Orchidaceae	*Cryptostylis erecta*	Tartan Tongue Orchid
Orchidaceae	*Cryptostylis subulata*	Large Tongue Orchid
Orchidaceae	*Cymbidium suave*	Snake Orchid
Orchidaceae	*Dendrobium aemulum*	Ironbark Orchid
Orchidaceae	*Dendrobium linguiforme*	Tongue Orchid
Orchidaceae	*Dendrobium speciosum*	Rock Lily
Orchidaceae	*Dipodium punctatum*	
Orchidaceae	*Eriochilus cucullatus*	Parson's Bands
Orchidaceae	*Glossodia major*	Waxlip Orchid
Orchidaceae	*Liparis reflexa*	
Orchidaceae	*Orthoceras strictum*	Horned/Bird's-mouth Orchid
Orchidaceae	*Plectorrhiza tridentata*	Tangle Orchid
Orchidaceae	*Pterostylis acuminata*	Pointed Greenhood
Orchidaceae	*Pterostylis alveata*	
Orchidaceae	*Pterostylis concinna*	Trim Greenhood
Orchidaceae	*Pterostylis curta*	Blunt Greenhood
Orchidaceae	*Pterostylis gibbosa*	
Orchidaceae	*Pterostylis grandiflora*	Cobra Greenhood
Orchidaceae	*Pterostylis longifolia*	Tall Greenhood
Orchidaceae	*Pterostylis nutans*	Nodding Greenhood
Orchidaceae	*Pterostylis obtusa*	
Orchidaceae	*Pterostylis ophioglossa*	Snake Tongue Greenhood

Family	Scientific Name	Common Name
Orchidaceae	*Pterostylis parviflora*	Tiny Greenhood
Orchidaceae	*Pterostylis pedunculata*	Maroonhood
Orchidaceae	*Pterostylis reflexa*	
Orchidaceae	*Sarcochilus falcatus*	Orange Blossom Orchid
Orchidaceae	*Sarcochilus parviflorus*	
Osmundaceae	*Todea barbara*	King Fern
Oxalidaceae	*Oxalis chnoodes*	
Oxalidaceae	*Oxalis exilis*	
Oxalidaceae	*Oxalis perennans*	
Oxalidaceae	*Oxalis radicosa*	
Passifloraceae	*Passiflora herbertiana subsp. herbertiana*	Native Passionfruit
Peperomiaceae	*Peperomia blanda var. floribunda*	
Philydraceae	*Philydrum lanuginosum*	Frogsmouth
Phormiaceae	*Dianella caerulea var. assera*	
Phormiaceae	*Dianella caerulea var. caerulea*	
Phormiaceae	*Dianella caerulea var. cinerascens*	
Phormiaceae	*Dianella caerulea var. producta*	
Phormiaceae	*Dianella caerulea var. protensa*	
Phormiaceae	*Dianella longifolia var. longifolia*	
Phormiaceae	*Dianella prunina*	
Phormiaceae	*Dianella revoluta var. revoluta*	
Phormiaceae	*Dianella tasmanica*	
Phormiaceae	*Stypandra glauca*	Nodding Blue Lily
Pittosporaceae	*Billardiera scandens*	Appleberry
Pittosporaceae	*Billardiera scandens var. scandens*	
Pittosporaceae	*Bursaria longisepala*	
Pittosporaceae	*Bursaria spinosa subsp. spinosa*	
Pittosporaceae	*Hymenosporum flavum*	Native Frangipani
Pittosporaceae	*Pittosporum multiflorum*	Orange Thorn
Pittosporaceae	*Pittosporum revolutum*	Rough Fruit Pittosporum
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Pittosporaceae	*Rhytidosporum procumbens*	
Plantaginaceae	*Plantago debilis*	
Plantaginaceae	*Plantago gaudichaudii*	
Poaceae	*Anisopogon avenaceus*	Oat Speargrass
Poaceae	*Aristida acuta*	
Poaceae	*Aristida benthamii*	

Family	Scientific Name	Common Name
Poaceae	*Aristida ramosa*	Purple Wiregrass
Poaceae	*Aristida vagans*	Threeawn Speargrass
Poaceae	*Aristida warburgii*	
Poaceae	*Austrodanthonia bipartita*	
Poaceae	*Austrodanthonia fulva*	Wallaby Grass
Poaceae	*Austrodanthonia racemosa var. racemosa*	
Poaceae	*Austrodanthonia setacea*	
Poaceae	*Austrostipa pubescens*	
Poaceae	*Austrostipa ramosissima*	Stout Bamboo Grass
Poaceae	*Austrostipa rudis subsp. rudis*	
Poaceae	*Austrostipa scabra subsp. scabra*	
Poaceae	*Austrostipa setacea*	Corkscrew Grass
Poaceae	*Austrostipa verticillata*	Slender Bamboo Grass
Poaceae	*Bothriochloa decipiens*	Red Grass
Poaceae	*Bothriochloa macra*	Red Grass
Poaceae	*Cenchrus caliculatus*	Hillside Burrgrass
Poaceae	*Cleistochloa rigida*	
Poaceae	*Cymbopogon obtectus*	Silky Heads
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Danthonia linkii*	
Poaceae	*Deyeuxia nudiflora*	
Poaceae	*Dichelachne micrantha*	Shorthair Plumegrass
Poaceae	*Dichelachne rara*	
Poaceae	*Digitaria breviglumis*	
Poaceae	*Digitaria brownii*	Cotton Panic Grass
Poaceae	*Digitaria diffusa*	
Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass
Poaceae	*Digitaria ramularis*	
Poaceae	*Echinopogon caespitosus var. caespitosus*	Tufted Hedgehog Grass
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass
Poaceae	*Entolasia marginata*	Bordered Panic
Poaceae	*Entolasia stricta*	Wiry Panic
Poaceae	*Entolasia whiteana*	
Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Poaceae	*Eragrostis elongata*	Clustered Lovegrass
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass

Family	Scientific Name	Common Name
Poaceae	*Eragrostis sororia*	
Poaceae	*Hemarthria uncinata var. uncinata*	
Poaceae	*Hierochloe rariflora*	Scented Hollygrass
Poaceae	*Imperata cylindrica var. major*	Blady Grass
Poaceae	*Joycea pallida*	Silvertop Wallaby Grass
Poaceae	*Lachnagrostis filiformis*	
Poaceae	*Microlaena stipoides var. stipoides*	
Poaceae	*Notodanthonia longifolia*	Long-leaved Wallaby Grass
Poaceae	*Oplismenus aemulus*	
Poaceae	*Oplismenus imbecillis*	
Poaceae	*Panicum effusum*	Poison or Hairy Panic
Poaceae	*Panicum pygmaeum*	Pygmy Panic
Poaceae	*Panicum simile*	Two-colour Panic
Poaceae	*Paspalidium albovillosum*	
Poaceae	*Paspalidium criniforme*	
Poaceae	*Paspalidium distans*	
Poaceae	*Paspalidium gracile*	Slender Panic
Poaceae	*Phragmites australis*	Common Reed
Poaceae	*Poa affinis*	
Poaceae	*Poa labillardierei var. labillardierei*	Tussock
Poaceae	*Poa queenslandica*	
Poaceae	*Poa sieberiana var. sieberiana*	Snowgrass
Poaceae	*Pseudoraphis paradoxa*	Slender Mudgrass
Poaceae	*Sarga leiocladum*	
Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass
Poaceae	*Sporobolus diander*	
Poaceae	*Sporobolus elongatus*	Slender Rat's Tail Grass
Poaceae	*Themeda australis*	Kangaroo Grass
Podocarpaceae	*Podocarpus spinulosus*	
Polygalaceae	*Comesperma defoliatum*	
Polygalaceae	*Comesperma ericinum*	
Polygalaceae	*Comesperma sphaerocarpum*	
Polygonaceae	*Persicaria decipiens*	Slender Knotweed
Polygonaceae	*Persicaria praetermissa*	
Polygonaceae	*Rumex brownii*	Swamp Dock
Polypodiaceae	*Dictymia brownii*	
Polypodiaceae	*Platycerium bifurcatum*	Elkhorn

Family	Scientific Name	Common Name
Polypodiaceae	*Pyrrosia rupestris*	Rock Felt Fern
Portulacaceae	*Calandrinia pickeringii*	
Proteaceae	*Banksia ericifolia subsp. ericifolia*	
Proteaceae	*Banksia oblongifolia*	
Proteaceae	*Banksia serrata*	Old-man Banksia
Proteaceae	*Banksia spinulosa var. collina*	
Proteaceae	*Banksia spinulosa var. spinulosa*	
Proteaceae	*Conospermum ericifolium*	
Proteaceae	*Conospermum longifolium subsp. longifolium*	
Proteaceae	*Conospermum taxifolium*	
Proteaceae	*Grevillea arenaria*	
Proteaceae	*Grevillea buxifolia*	Grey Spider Flower
Proteaceae	*Grevillea montana*	
Proteaceae	*Grevillea mucronulata*	
Proteaceae	*Grevillea phylicoides*	
Proteaceae	*Grevillea sericea*	
Proteaceae	*Grevillea sphacelata*	
Proteaceae	*Grevillea triternata*	
Proteaceae	*Hakea bakeriana*	
Proteaceae	*Hakea dactyloides*	Finger Hakea, Broad-leaved Hakea
Proteaceae	*Hakea laevipes subsp. laevipes*	
Proteaceae	*Hakea propinqua*	
Proteaceae	*Hakea salicifolia*	Willow-leaved Hakea
Proteaceae	*Hakea sericea*	Needlebush
Proteaceae	*Isopogon anemonifolius*	Borad-leaf Drumsticks
Proteaceae	*Isopogon dawsonii*	
Proteaceae	*Lambertia formosa*	Mountain Devil
Proteaceae	*Lomatia myricoides*	River Lomatia
Proteaceae	*Lomatia silaifolia*	Crinkle Bush
Proteaceae	*Persoonia chamaepitys*	Mountain Geebung
Proteaceae	*Persoonia isophylla*	
Proteaceae	*Persoonia lanceolata*	
Proteaceae	*Persoonia laurina subsp. laurina*	
Proteaceae	*Persoonia levis*	Broad-leaved Geebung
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung
Proteaceae	*Persoonia oblongata*	
Proteaceae	*Persoonia pinifolia*	Pine-leaved Geebung

Family	Scientific Name	Common Name
Proteaceae	*Petrophile pulchella*	Conesticks
Proteaceae	*Stenocarpus salignus*	Scrub Beefwood
Proteaceae	*Telopea speciosissima*	Waratah
Proteaceae	*Xylomelum pyriforme*	Woody Pear
Pteridaceae	*Pteris tremula*	Tender Brake
Ranunculaceae	*Clematis aristata*	Old Man's Beard
Ranunculaceae	*Clematis glycinoides*	Headache Vine
Ranunculaceae	*Clematis glycinoides var. glycinoides*	
Ranunculaceae	*Ranunculus collinus*	
Ranunculaceae	*Ranunculus inundatus*	
Ranunculaceae	*Ranunculus lappaceus*	Common Buttercup
Ranunculaceae	*Ranunculus plebeius*	
Restionaceae	*Hypolaena fastigiata*	
Restionaceae	*Leptocarpus tenax*	
Restionaceae	*Lepyrodia muelleri*	
Restionaceae	*Lepyrodia scariosa*	
Rhamnaceae	*Alphitonia excelsa*	Red Ash
Rhamnaceae	*Cryptandra amara var. amara*	Bitter cryptandra
Rhamnaceae	*Cryptandra buxifolia*	
Rhamnaceae	*Cryptandra spinescens*	
Rhamnaceae	*Pomaderris aspera*	Hazel Pomaderris
Rhamnaceae	*Pomaderris elliptica subsp. elliptica*	
Rhamnaceae	*Pomaderris ferruginea*	
Rhamnaceae	*Pomaderris intermedia*	
Rhamnaceae	*Pomaderris lanigera*	
Rhamnaceae	*Pomaderris velutina*	
Rosaceae	*Rubus moluccanus var. trilobus*	Molucca Bramble
Rosaceae	*Rubus parvifolius*	Native Raspberry
Rosaceae	*Rubus rosifolius*	Rose-leaf Bramble
Rubiaceae	*Asperula conferta*	Common Woodruff
Rubiaceae	*Asperula scoparia*	Prickly Woodruff
Rubiaceae	*Canthium buxifolium*	Stiff Canthium
Rubiaceae	*Canthium coprosmoides*	Coast Canthium
Rubiaceae	*Coprosma quadrifida*	Prickly Currant Bush
Rubiaceae	*Galium binifolium*	
Rubiaceae	*Galium ciliare*	
Rubiaceae	*Galium gaudichaudii*	Rough Bedstraw

Family	Scientific Name	Common Name
Rubiaceae	*Galium liratum*	
Rubiaceae	*Galium migrans*	
Rubiaceae	*Galium propinquum*	Maori Bedstraw
Rubiaceae	*Morinda jasminoides*	Sweet Morinda
Rubiaceae	*Opercularia aspera*	Coarse Stinkweed
Rubiaceae	*Opercularia diphylla*	
Rubiaceae	*Opercularia hispida*	Hairy Stinkweed
Rubiaceae	*Pomax umbellata*	
Rubiaceae	*Psychotria loniceroides*	Hairy Psychotria
Rutaceae	*Asterolasia correifolia*	
Rutaceae	*Boronia anemonifolia var. anemonifolia*	
Rutaceae	*Boronia anethifolia*	
Rutaceae	*Boronia ledifolia*	Sydney Boronia
Rutaceae	*Boronia pinnata*	
Rutaceae	*Boronia polygalifolia*	
Rutaceae	*Boronia rubiginosa*	
Rutaceae	*Correa reflexa var. reflexa*	Native Fuschia
Rutaceae	*Crowea exalata subsp. exalata*	
Rutaceae	*Eriostemon australasius*	
Rutaceae	*Leionema dentatum*	Toothed Phebalium
Rutaceae	*Melicope micrococca*	Hairy-leaved Doughwood
Rutaceae	*Nematolepis squamea subsp. squamea*	Satinwood
Rutaceae	*Phebalium squamulosum subsp. lineare*	Scaly Phebalium
Rutaceae	*Phebalium squamulosum subsp. squamulosum*	
Rutaceae	*Philotheca hispidula*	
Rutaceae	*Philotheca salsolifolia*	
Rutaceae	*Philotheca trachyphylla*	
Rutaceae	*Zieria adenodonta*	
Rutaceae	*Zieria caducibracteata*	
Rutaceae	*Zieria cytisoides*	Downy Zieria
Rutaceae	*Zieria fraseri subsp. compacta*	
Rutaceae	*Zieria involucrata*	
Rutaceae	*Zieria laevigata*	
Rutaceae	*Zieria pilosa*	
Rutaceae	*Zieria smithii*	Sandfly Zieria
Sambucaceae	*Sambucus australasica*	Native Elderberry
Sambucaceae	*Sambucus gaudichaudiana*	White Elderberry

Family	Scientific Name	Common Name
Santalaceae	*Choretrum candollei*	White Sour Bush
Santalaceae	*Choretrum pauciflorum*	Dwarf Sour Bush
Santalaceae	*Choretrum species A*	
Santalaceae	*Exocarpos cupressiformis*	Native Cherry
Santalaceae	*Exocarpos strictus*	Dwarf Cherry
Santalaceae	*Leptomeria acida*	Sour Currant Bush
Santalaceae	*Omphacomeria acerba*	
Sapindaceae	*Alectryon subcinereus*	Wild Quince
Sapindaceae	*Dodonaea camfieldii*	
Sapindaceae	*Dodonaea multijuga*	
Sapindaceae	*Dodonaea pinnata*	
Sapindaceae	*Dodonaea triquetra*	Large-leaf Hop-bush
Sapindaceae	*Dodonaea truncatiales*	
Sapindaceae	*Dodonaea viscosa subsp. cuneata*	
Sapindaceae	*Dodonaea viscosa subsp. spatulata*	
Sapindaceae	*Dodonaea viscosa subsp. viscosa*	
Sapindaceae	*Guioa semiglauca*	
Schizaeaceae	*Schizaea bifida*	Forked Comb Fern
Scrophulariaceae	*Gratiola peruviana*	
Scrophulariaceae	*Veronica calycina*	Hairy Speedwell
Scrophulariaceae	*Veronica plebeia*	Trailing Speedwell
Smilacaceae	*Smilax australis*	Sarsaparilla
Smilacaceae	*Smilax glyciphylla*	Sweet Sarsparilla
Solanaceae	*Duboisia myoporoides*	Corkwood
Solanaceae	*Solanum americanum*	Glossy Nightshade
Solanaceae	*Solanum aviculare*	Kangaroo Apple
Solanaceae	*Solanum brownii*	Violet Nightshade
Solanaceae	*Solanum campanulatum*	
Solanaceae	*Solanum cinereum*	Narrawa Burr
Solanaceae	*Solanum densevestitum*	
Solanaceae	*Solanum opacum*	Green-berry Nightshade
Solanaceae	*Solanum prinophyllum*	Forest Nightshade
Solanaceae	*Solanum pungetium*	Eastern Nightshade
Solanaceae	*Solanum stelligerum*	Devil's Needles
Stackhousiaceae	*Stackhousia viminea*	Slender Stackhousia
Sterculiaceae	*Brachychiton populneus subsp. populneus*	
Sterculiaceae	*Commersonia fraseri*	Brush Kurrajong

Family	Scientific Name	Common Name
Sterculiaceae	*Lasiopetalum ferrugineum var. cordatum*	
Sterculiaceae	*Lasiopetalum ferrugineum var. ferrugineum*	
Sterculiaceae	*Lasiopetalum macrophyllum*	
Sterculiaceae	*Lasiopetalum parviflorum*	
Sterculiaceae	*Lasiopetalum rufum*	
Sterculiaceae	*Rulingia dasyphylla*	Kerrawang
Stylidiaceae	*Stylidium graminifolium*	Grass Triggerplant
Stylidiaceae	*Stylidium laricifolium*	Tree Triggerplant
Stylidiaceae	*Stylidium lineare*	Narrow-leaved Triggerplant
Stylidiaceae	*Stylidium productum*	
Thelypteridaceae	*Cyclosorus interruptus*	
Thymelaeaceae	*Pimelea curviflora var. sericea*	
Thymelaeaceae	*Pimelea linifolia subsp. linifolia*	
Thymelaeaceae	*Wikstroemia indica*	
Tremandraceae	*Tetratheca ericifolia*	
Tremandraceae	*Tetratheca glandulosa*	
Typhaceae	*Typha orientalis*	Broad-leaved Cumbungi
Ulmaceae	*Trema tomentosa var. viridis*	Native Peach
Urticaceae	*Dendrocnide excelsa*	Giant Stinging Tree
Urticaceae	*Parietaria debilis*	Native Pellitory
Urticaceae	*Urtica incisa*	Stinging Nettle
Uvulariaceae	*Schelhammera undulata*	
Verbenaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum, Downy Chance Tree
Violaceae	*Hybanthus monopetalus*	Slender Violet-bush
Violaceae	*Hybanthus vernonii*	
Violaceae	*Hymenanthera dentata*	Tree Violet
Violaceae	*Viola betonicifolia*	
Violaceae	*Viola hederacea forma A*	
Violaceae	*Viola hederacea forma C*	
Violaceae	*Viola hederacea forma G*	
Viscaceae	*Notothixos subaureus*	Golden Mistletoe
Vitaceae	*Cayratia clematidea*	Slender Grape
Vitaceae	*Cissus antarctica*	Water Vine
Vitaceae	*Cissus hypoglauca*	Giant Water Vine
Vitaceae	*Tetrastigma nitens*	
Xanthorrhoeaceae	*Xanthorrhoea arborea*	

Family	Scientific Name	Common Name
Xanthorrhoeaceae	*Xanthorrhoea glauca subsp. glauca*	
Xanthorrhoeaceae	*Xanthorrhoea latifolia subsp. latifolia*	
Xanthorrhoeaceae	*Xanthorrhoea macronema*	
Xanthorrhoeaceae	*Xanthorrhoea media*	
Xanthorrhoeaceae	*Xanthorrhoea resinifera*	
Xyridaceae	*Xyris complanata*	
Zamiaceae	*Macrozamia communis*	Burrawang
Zamiaceae	*Macrozamia reducta*	
Zamiaceae	*Macrozamia spiralis*	

APPENDIX C: EXOTIC FLORA SPECIES RECORDED AT FLORISTIC SAMPLE SITES

Family	Scientific Name	CommonName
Amygdalaceae	*Prunus spp.*	
Asclepiadaceae	*Araujia sericifera*	Moth Vine
Asclepiadaceae	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush
Asparagaceae	*Myrsiphyllum asparagoides*	Florist's Smilax
Asteraceae	*Ageratina adenophora*	Crofton Weed
Asteraceae	*Aster subulatus*	Wild Aster
Asteraceae	*Bidens pilosa*	Cobbler's Pegs
Asteraceae	*Bidens subalternans*	Greater Beggar's Ticks
Asteraceae	*Cirsium vulgare*	Spear Thistle
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane
Asteraceae	*Conyza sumatrensis*	Tall fleabane
Asteraceae	*Facelis retusa*	
Asteraceae	*Gamochaeta spicata*	
Asteraceae	*Hypochaeris radicata*	Catsear
Asteraceae	*Lactuca saligna*	Willow-leaved Lettuce
Asteraceae	*Senecio madagascariensis*	Fireweed
Asteraceae	*Sonchus oleraceus*	Common Sowthistle
Asteraceae	*Tagetes minuta*	Stinking Roger
Asteraceae	*Taraxacum officinale*	Dandelion
Asteraceae	*Xanthium orientale*	Californian Burr
Brassicaceae	*Lepidium africanum*	
Cactaceae	*Opuntia stricta var. stricta*	Common Prickly Pear
Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear Chickweed
Caryophyllaceae	*Paronychia brasiliana*	Chilean Whitlow Wort
Caryophyllaceae	*Polycarpon tetraphyllum*	Four-leaved Allseed
Caryophyllaceae	*Stellaria media*	Common Chickweed
Commelinaceae	*Tradescantia fluminensis*	Wandering Jew
Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge
Fabaceae (Faboideae)	*Trifolium repens*	White Clover
Fumariaceae	*Fumaria muralis subsp. muralis*	Wall Fumitory
Gentianaceae	*Centaurium erythraea*	Common Centaury
Lamiaceae	*Prunella vulgaris*	Self-heal
Lamiaceae	*Stachys arvensis*	Stagger Weed
Malvaceae	*Pavonia hastata*	

Family	Scientific Name	CommonName
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne
Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis
Passifloraceae	*Passiflora edulis*	Common Passionfruit
Phytolaccaceae	*Phytolacca octandra*	Inkweed
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass
Poaceae	*Digitaria ciliaris*	
Poaceae	*Ehrharta erecta*	Panic Veldtgrass
Poaceae	*Eragrostis mexicana*	Mexican Lovegrass
Poaceae	*Paspalum dilatatum*	Paspalum
Poaceae	*Pennisetum clandestinum*	Kikuyu Grass
Poaceae	*Setaria gracilis*	Slender Pigeon Grass
Poaceae	*Sporobolus africanus*	Parramatta Grass
Polygonaceae	*Acetosella vulgaris*	Sorrel, Sheep Sorrel
Polygonaceae	*Rumex conglomeratus*	Clustered Dock
Primulaceae	*Anagallis arvensis*	Scarlet/Blue Pimpernel
Rosaceae	*Rosa rubiginosa*	Sweet Briar
Rosaceae	*Rubus ulmifolius*	Blackberry
Rubiaceae	*Richardia brasiliensis*	Mexican Clover
Sapindaceae	*Cardiospermum halicacabum var. halicacabum*	Small Balloon Vine
Simaroubaceae	*Ailanthus altissima*	Tree of Heaven
Solanaceae	*Datura stramonium*	Common Thornapple
Solanaceae	*Physalis peruviana*	Cape Gooseberry
Solanaceae	*Solanum chenopodioides*	Whitetip Nightshade
Solanaceae	*Solanum mauritianum*	Wild Tobacco Bush
Solanaceae	*Solanum nigrum*	Black-berry Nightshade
Solanaceae	*Solanum pseudocapsicum*	Madeira Winter Cherry
Solanaceae	*Solanum radicans*	
Verbenaceae	*Lantana camara*	Lantana
Verbenaceae	*Verbena bonariensis*	Purpletop
Verbenaceae	*Verbena quadrangularis*	

APPENDIX D: VEGETATION COMMUNITY PROFILES

USING VEGETATION COMMUNITY PROFILES

The following provides a summary explanation of the vegetation community profiles presented in this report.

Regional: Using NPWS (2000)
State: Using Keith (2004)
PVP Biometric Type: Using revised vegetation types as described for the Hunter Central Rivers and Hawkesbury-Nepean Catchment Management Authorities. This statewide vegetation classification has been developed for the purposes of Property Vegetation Plans (PVP), Biobanking and Threatened Species Assessments

This number lets you know the number of field samples that have been used to classify the community

This number provides the mean number of native species recorded from each of the sites used to classify the community

Number of Sites: 6 No. taxa/plot: 48.5

- ***DESCRIPTION***

This section summarises the abundant and frequently occurring plant species found in the community based on sample site data. The description provides an overview of the environmental characteristics of the community, in particular soil or geology type, elevation gradients and/or climatic features and spatial distribution within the study area. It also informs the reader of the community's conservation status under the NSW Threatened Species Conservation Act (1995) and known occurrence outside of the study area.

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

- ***FLORISTIC SUMMARY***

Trees: Mean Upper Height and canopy is given (standard deviation in parentheses)

The dominant tree species are listed here. *Eucalyptus elata, Eucalyptus muelleriana, Eucalyptus radiata* subsp. *radiata, Eucalyptus cypellocarpa, Eucalyptus fastigata, Eucalyptus punctata*
Minor associates: Other tree species that have been recorded in this community are listed here.

Shrubs: Mean Upper Height and canopy is given (standard deviation in parentheses)
Example Species: *Hibbertia aspera* subsp. *aspera, Leucopogon juniperina, Persoonia linearis, Pittosporum revolutum, Zieria smithii, Dodonaea triquetra*

Ground covers: Mean Upper Height and canopy is given (standard deviation in parentheses)
Example Species*: Microlaena stipoides, Tylophora barbata, Lagenifera stipitata, Stypandra glauca, Opercularia diphylla, Viola hederacea, Lomandra longifolia, Echinopogon caespitosus* var. *caespitosus*

- ***KEY IDENTIFYING FEATURES***

Easily recognisable features to assist in identifying this map unit are:
This section describes prominent (and conspicuous) plant species found in the community using common names where available. It also describes the important environmental factors that are associated with this vegetation community.

- ***EXAMPLE LOCATIONS***

Occurrences of the community are presented here especially for recognisable or accessible localities.

- ***CONDITION ASSESSMENT***

This section provides figures for the disturbance intensity classes observed across the study area.

	Area (ha)	Proportion Extant (%)
A Low	835	79
B Medium	221	20
C High	7	1
Total	1063	100

- ***THREATENED PLANT SPECIES***

This section lists plant species and EECs that are on the NSW Threatened Species Conservation Act (1995).

- ***DIAGNOSTIC SPECIES***

Diagnostic Species provide one method of quantitatively reviewing the performance of plant species within a given community as compared to all other communities found in the study area. Site data has been used to understand the median cover abundance (using a 1-6 cover scale) and frequency of occurrence of all species within the community. Species that occur frequently and at higher cover scores have been highlighted as diagnostic species to help with the field identification of the community.
The fidelity class of the species has been classified as positive if it is unique to this community or it occurs more frequently and with higher median cover than all other communities found in the study area. It is negative if it is less abundant and less frequent in this community compared to other communities. It is constant if the species occurs as frequently and abundantly in all communities. It is uninformative if it is neither frequently recorded nor abundant in sites.

Species Name	Group Score	Group Freq	Non Group Score	Non Group Freq	Fidelity Class
Adiantum aethiopicum	5	0.67	2	0.22	positive
Allocasuarina torulosa	1	0.10	3	0.67	negative
Austrostipa pubescens	3	0.60	3	0.54	constant
Brunoniella pumilio	1	0.20	3	0.33	uninformative

This number presents the median cover score recorded for the species within sites used to classify the community. In this case a median score

This provides the frequency of occurrence within the sites used to classify the community. In this case the species has been found at 10% of sites

This number provides the median cover score for this species across all other communities in the study area. In this case the cover abundance is much higher in other communities (3= 5-25% cover)

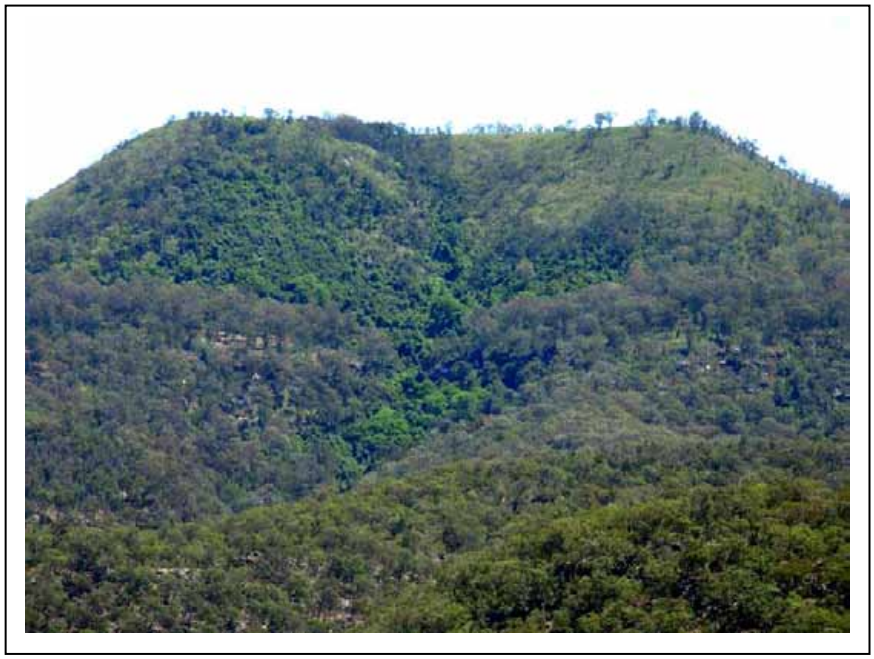
This number tells you how frequently the species has been recorded in other groups. In this case other communities feature this species in 33% of sites

MU1 HUNTER RANGE STINGING TREE DRY RAINFOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Hunter Valley Dry Rainforest
State: Dry Rainforests
PVP Biometric Type: Fig - Whalebone Tree - Stinging Tree dry rainforest of the southern North Coast
Number of Sites: 3 Number of identified native species per plot: 24

❑ *DESCRIPTION*



Steep basalt scree slopes on Mount Wareng and Mount Yengo support a species poor dry-subtropical rainforest community. On exposed aspects the sprawling Rusty Fig (*Ficus rubiginosa*) and Stinging Tree (*Dendrocnide excelsa*) form the prominent canopy species, while on the southern side of Mount Yengo a small stand of tall Red Cedar (*Toona ciliata*) is found. Smaller trees and shrubs of this community include a number of dry rainforest species including *Streblus brunonianus*, *Alectryon subcinereus* and *Croton verreauxii.* A number of climbers and vines are also a distinctive feature of this rainforest community, such as *Maclura cochinchinensis* and *Celastrus australis.* The understorey is sparse, with only shade tolerant ferns such as *Doodia aspera* and *Adiantum formosum* forming significant cover.

Hunter Range Stinging Tree Dry Rainforest is of high conservation significance. It includes many plant species that are found no where else within the reserves. The isolated and inaccessible nature of the habitat has maintained the extant area in relatively good condition, though weed incursion would be a serious threat should invasive species take hold on the rich basalt soils. Within the Sydney Basin Bioregion the community shares many species with other dry-subtropical rainforest communities found on igneous rocks in warm environments that experience low annual rainfall. Example locations include the Burragorang and Kowmung Valleys in the Nattai and Blue Mountains National Parks, Illawarra Escarpment Footslopes and Razorback Range South Western Sydney. However this form of dry rainforest has been extensively cleared in NSW due to its association with rich soils. Considered as a member of the Dry Rainforest class of Keith (2004), only small examples are present within the current reserve system.

❑ *FLORISTIC SUMMARY*

Emergents: **Height to 30 metres; 50-70% cover**

Toona ciliata sheltered aspect only

Trees: **Height 10-15 metres; 70-90% cover**

Dendrocnide excelsa, Ficus rubiginosa

Low Trees/Shrubs: **Height 2 metres; 5-30% cover**

Alectryon subcinereus, Claoxylon australe, Streblus brunonianus, Neolitsea dealbata, Bursaria spinosa, Pittosporum multiflorum, Pittosporum revolutum, Ficus coronata

Ground Covers: **Height 1 metre; 20-40% cover**

Adiantum formosum, Doodia aspera, Pellaea falcata

Vines & Climbers: **no structural data available**

Cissus antarctica, Pandorea pandorana, Clematis aristata, Maclura cochinchinensis, Celastrus australis, Morinda jasminoides, Marsdenia suaveolens

❑ *KEY IDENTIFYING FEATURES*

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

- Closed forest on basalt scree on Mount Yengo and Mount Wareng

❑ *EXAMPLE LOCATIONS*

Mount Yengo, Mount Wareng

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	22	62
B Medium	13	38
C High	0	0
Total	**36**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Adiantum formosum	3	67%	3	3%	positive
Alectryon subcinereus	2	100%	1	1%	positive
Celastrus australis	1	33%	0	0%	positive
Cissus antarctica	3	67%	2	5%	positive
Claoxylon australe	3	67%	2	3%	positive
Clematis aristata	3	67%	1	18%	positive
Croton verreauxii	3	67%	0	0%	positive
Dendrocnide excelsa	4	100%	0	0%	positive
Doodia aspera	2	67%	2	16%	positive
Ficus coronata	2	67%	1	3%	positive
Maclura cochinchinensis	3	67%	0	0%	positive
Marsdenia suaveolens	2	67%	1	2%	positive
Parietaria debilis	2	33%	0	0%	positive
Pellaea falcata	2	67%	2	8%	positive
Peperomia blanda var. floribunda	2	33%	0	0%	positive
Pittosporum multiflorum	3	67%	2	3%	positive
Pittosporum revolutum	2	100%	1	11%	positive
Pteris tremula	3	33%	0	0%	positive
Pyrrosia rupestris	2	67%	2	3%	positive
Sambucus australasica	2	67%	1	0%	positive
Toona ciliata	5	33%	0	0%	positive

MU2 SYDNEY HINTERLAND WARM TEMPERATE RAINFOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Sandstone Warm Temperate Rainforest
State: Northern Warm Temperate Rainforests
PVP Biometric Type: Coachwood - Lilly Pilly warm temperate rainforest in moist sandstone gullies, Sydney Basin
Number of Sites: 7 Number of identified native species per plot: 25.8

❑ *DESCRIPTION*

There are only limited areas within Yengo NP and Parr SCA where warm temperate rainforest occurs. These are situated in the deepest of the west to east running gullies where sandstone cliffs and benches provide shelter from the sun, wind and fire. Coachwood (*Cerapetalum apetalum*), Lillypilly (*Acmena smithii*) and Grey Myrtle (*Backhousia myrtifolia*) can attain heights of twenty metres or more, and provide a closed canopy. Occasional large vines such as *Cissus antarctica* drop from the tallest trees, while other climbers such as *Smilax australis* and *Eustrephus latifolius* are more common amongst the ground covers and low growing shrubs. Creek beds support the larger fern *Todea barbara* while banks and lower slopes are mix of smaller ferns including *Blechnum cartilaegeineum, Sticherus flabellatus* and *Doodea aspera. Tristanopsis laurina* was found to be common though variable in height with some individuals forming taller trees, included within the upper canopy, while others are found amongst the small tree or shrub layer.

Some examples of this community are too small to map using 1:25 000 scale aerial photography. Nevertheless mappable locations are likely to afford insight into the changing nature of the vegetation in the reserves over time. Predictions of climate change including decreased annual rainfall, warmer temperatures and increased fire frequency may result in this assemblage of plants disappearing from the reserves. Currently the reserves represent marginal habitat for this community, with more extensive stands common throughout the central coast hinterland and west in the gorges of the Wollemi and Blue Mountains NPs. For this reason it holds no special conservation significance at a regional level, though sites remain of particular local interest for long term monitoring of the values present in Yengo and Parr reserves. Protection of these sites from fire is encouraged.

❑ *FLORISTIC SUMMARY*

Emergents: **Mean Height 30 (7) metres; 20% Cover (14)**

Syncarpia glomulifera subsp. *glomulifera*

Trees: **Mean Height 20.4 (2) metres; 77% Cover (12)**

Cerapetalum apetalum, Acmena smithii, Backhousia myrtifolia, *Acacia elata*

Low Trees/Shrubs: **Mean Height 7 (4.9) metres; 36% Cover (27.6)**

Callicoma serratifolia, Tristaniopsis laurina, Todea barbara, Notelaea longifolia, Eupomatia laurina, Rapanea variabilis, Pittosporum multiflorum, Pittosporum revolutum, Ficus coronata, Trochocarpa laurina

Ground Covers: **Mean Height 1.1 (0.25) metres; 40% Cover (22)**

Blechnum cartilaegieneum, Adiantum aethiopicum, Doodia aspera, Pellaea falcata, Sticherus flabellatus, Parsonsia straminea, Lomandra longifolia

Vines & Climbers: **no structural data available**

Eustrephus latifolius, Smilax australis, Pandorea pandorana, Clematis aristata, Morinda jasminoides, Marsdenia suaveolens, Cissus antarctica

❑ *KEY IDENTIFYING FEATURES*

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

- Closed canopy of tall Coachwood (*Cerapetalum apetalum*)
- Deep, narrow east-west running sandstone gully systems

❑ *EXAMPLE LOCATIONS*

Womerah Creek; Gorricks Creek Yengo NP

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	167	98
B Medium	2.2	1
C High	1.5	1
Total	**171**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia elata	3	57%	2	2%	positive
Acmena smithii	3	86%	2	3%	positive
Backhousia myrtifolia	4	100%	3	21%	positive
Blechnum cartilagineum	4	86%	2	5%	positive
Blechnum nudum	2	43%	2	0%	positive
Callicoma serratifolia	2	43%	1	2%	positive
Ceratopetalum apetalum	4	100%	2	0%	positive
Cyathea australis	1	14%	0	0%	positive
Doodia aspera	2	57%	2	16%	positive
Eustrephus latifolius	2	57%	1	18%	positive
Gahnia sieberiana	1	14%	0	0%	positive
Hymenophyllum cupressiforme	2	57%	2	1%	positive
Lomandra longifolia	3	43%	1	32%	positive
Schoenus maschalinus	1	14%	0	0%	positive
Smilax australis	2	86%	2	12%	positive
Smilax glyciphylla	2	57%	1	11%	positive
Sticherus flabellatus var. flabellatus	3	71%	0	0%	positive
Syncarpia glomulifera subsp. glomulifera	2	71%	3	31%	positive
Todea barbara	2	100%	1	0%	positive
Tristaniopsis laurina	3	71%	2	4%	positive
Trochocarpa laurina	2	43%	1	1%	positive

MU3 HUNTER RANGE GREY MYRTLE DRY RAINFOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Sandstone Grey Myrtle Sheltered Rainforest
State: Dry Rainforest
PVPBiometric Type: Grey Myrtle dry rainforest of the Sydney Basin and South East Corner
Number of Sites: 16 Number of identified native species per plot: 44

❑ *DESCRIPTION*

The low annual rainfall of northern Yengo NP (less than 800mm), the absence of deep slot canyons, and frequent fires prevent the development of significant areas of the warm temperate rainforests that are found in Wollemi NP to the west and the coastal ranges to the east. Instead, the fire tolerant rough-barked species *Backhousia myrtifolia* forms dense stands along dry rocky or sandy gully systems and sheltered slopes. This dry rainforest community forms only narrow ribbons of small trees and shrubs. Typically mesic species including *Rapanea variabilis, Clerodendrum tomentosum,* and less frequently *Claoxylon australe,* accompany species such as *Breynia oblongifolia* and *Bursaria spinosa.* There is a high diversity of vines, climbers and twiners that gather amongst the shrub and ground layers. *Morinda jasminoides* and *Pandorea pandorana* are the most commonly recorded of these. The forest floor is mostly ferny, with *Adiantum* spp. and *Doodia aspera* growing amongst rocks and boulders. Emergent eucalypts are not uncommon, sometimes reaching 30 metres in height.

The species richness in this dry rainforest falls as annual rainfall levels decrease from east to west. On the western side of the study area, the community may be characterised by a stand of *Backhousia myrtifolia* and a sparse ground cover of ferns. While this community is referable to the Dry Rainforests of Keith (2004), it is one of the most depauperate forms of this state-wide classification. It is widespread across the dry northern sandstone plateaux of Yengo, Wollemi and Goulburn River National Parks. Similar assemblages are also common across the southern Blue Mountains (NPWS 2003b). The infertile nature and inaccessibility of sites has prevented substantial loss from land clearing. As a result the community is considered to be adequately protected within reserves.

❑ *FLORISTIC SUMMARY*

Emergents: **Mean Height to 30 (5) metres; 20.8% (10) cover**

Eucalyptus saligna, E.deanei, E. punctata, E.hypostomatica, Syncarpia glomulifera, Angophora floribunda

Trees: **Mean Height 12.3 (3.7) metres; 55.6%(18.5) cover**

Backhousia myrtifolia, Rapanea variabilis, Alectryon subcinereus, Alphitonia excelsa, Acmena smithii

Low Shrubs: **Mean Height 3.2 (0.8) metres; 57.6% (9.8) cover**

Pittosporum revolutum, Trema tomentosa, Ficus coronata, Breynia oblongifolia, Bursaria spinosa, Clerodendrum tomentosum

Ground Covers: **Mean Height 0.5 (0.3) metres; 11.6% (20) cover**

Asplenium flabellifolium, Doodia aspera, Pellaea falcata, Adiantum hispidulum, Stellaria flaccida, Dichondra repens,

Vines & Climbers: **no structural data available**

Morinda jasminoides, Smilax australis, Smilax glyciphylla, Cissus hypoglauca, Clematis aristata

❑ *KEY IDENTIFYING FEATURES*

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

- Rainforest shrubs and small trees dominated by Grey Myrtle (*Backhousia myrtifolia*)

❑ *EXAMPLE LOCATIONS*

Side streams of Little Darkey Creek

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	351	83
B Medium	63	15
C High	6	2
Total	**421**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq	Non group Score (60 Percentile)	Non group Freq	Fidelity Class
Acacia prominens	2	56%	3	2%	positive
Adiantum aethiopicum	2	44%	2	20%	positive
Adiantum diaphanum	1	6%	0	0%	positive
Adiantum formosum	3	50%	1	1%	positive
Aneilema acuminatum	1	6%	0	0%	positive
Angophora floribunda	2	50%	2	21%	positive
Asplenium flabellifolium	2	56%	2	7%	positive
Backhousia myrtifolia	4	89%	3	20%	positive
Bursaria spinosa	2	56%	2	22%	positive
Calystegia marginata	1	6%	0	0%	positive
Cissus antarctica	2	56%	2	4%	positive
Cissus hypoglauca	2	56%	2	5%	positive
Claoxylon australe	2	61%	2	1%	positive
Deeringia amaranthoides	1	6%	0	0%	positive
Dennstaedtia davallioides	3	6%	0	0%	positive
Dichondra repens	2	39%	2	19%	positive
Doodia aspera	3	83%	2	14%	positive
Ehretia acuminata var. acuminata	1	6%	0	0%	positive
Endiandra sieberi	1	6%	0	0%	positive
Eustrephus latifolius	2	56%	1	17%	positive
Maytenus silvestris	2	39%	1	22%	positive
Oplismenus imbecillis	2	61%	2	18%	positive
Pandorea pandorana	2	61%	1	22%	positive
Panicum pygmaeum	2	6%	0	0%	positive
Paspalidium criniforme	1	6%	0	0%	positive
Pellaea falcata	2	67%	2	5%	positive
Phyllanthus similis	2	6%	0	0%	positive
Plectranthus parviflorus	2	67%	2	19%	positive
Polystichum proliferum	3	11%	0	0%	positive
Pratia purpurascens	2	39%	2	32%	positive
Pseuderanthemum variabile	2	50%	2	11%	positive
Pteridium esculentum	2	39%	2	31%	positive
Senecio quadridentatus	1	6%	0	0%	positive

Species Name	Group Score (60 percentile)	Group Freq	Non group Score (60 Percentile)	Non group Freq	Fidelity Class
Smilax australis	2	61%	2	11%	positive
Stellaria flaccida	2	44%	2	7%	positive
Syncarpia glomulifera subsp. glomulifera	2	44%	3	31%	positive
Zehneria cunninghamii	2	6%	0	0%	positive
Entolasia stricta	2	39%	2	72%	constant

MU4 SYDNEY HINTERLAND BLUE GUM-TURPENTINE GULLY FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Sheltered Blue Gum Forest/Lower Blue Mountains Wet Forest
State: North Coast Wet Sclerophyll Forests
PVP Biometric Type: Turpentine - Smooth-barked Apple moist shrubby forest of the lower Blue Mountains, Sydney Basin
Number of Sites: 20 Number of identified native species per plot: 43.2

❑ *DESCRIPTION*

Protected gullies and sheltered lower slopes on Narrabeen Sandstone carry a tall to very tall forest (c. 35 metres in height) dominated by Blue Gums (*Eucalyptus deanii* and infrequently *E. saligna*), Turpentine (*Syncarpia glomulifera)* and Rough-barked Apple (*Angophora floribunda).* A prominent upper mid stratum of Forest Oak (*Allocasuarina torulosa*) is present along with Grey Myrtle (*Backhousia myrtifolia*). The lower mid-storey is variable in height but generally moderately open, and consists of shrubs and small trees such as *Breynia oblongifolia, Rapanea variabilis* and various Wattles, such as *Acacia parvipinnula*. The ground is rocky with ferns such as *Pteridium esculentum*, *Doodia aspera* and *Adiantum aethiopicum* growing alongside the grass *Entolasia marginata* and rush *Lomandra longifolia*. Various climbers are also present in this community, with the most common being *Billardiera scandens* and *Clematis aristida*.

This tall forest is aligned with other similar Blue Gum-Turpentine Forests of the Sydney Basin region. However, unlike these other gully forests, those occuring in Yengo NP occupy much drier environments and so the lush ferny ground cover and layers of mesic, waxy leaved shrubs are not present. While they form a component of the North Coast Wet Sclerophyll Forests of Keith (2004), the Sydney Hinterland Blue Gum-Turpentine Forests include a mix of both wet and dry sclerophyll species. The community is adequately protected within the current reserve system.

❑ *FLORISTIC SUMMARY*

Trees: **Mean Height 28.1 (5) metres; 35.7% (6) cover**

Eucalyptus deanei, Syncarpia glomulifera, Angophora floribunda, Angophora costata, Eucalyptus punctata, Eucalyptus saligna, Eucalyptus crebra

Small Trees: Mean Height 11.2 (3.1) metres; 23.8% (23.5) cover

Allocasuarina torulosa, Backhousia myrtifolia

Shrubs: **Mean Height 3.5(1.5) metres; 20.8% (13.9) cover**

Breynia oblongifolia, Rapanea variabilis, Acacia parvipinnula, Maytenus silvestris, Polyscias sambucifolia, Persoonia linearis, Bursaria spinosa, Pittosporum revolutum, Dodonea triquetra, Podolobium illicifolium

Ground Covers: Mean Height 1 (0.76) metres; 43.5% (24) cover

Dianella caerulea, Pratia purpurescens, Oplismenus imbecillus, Doodia aspera, Entolasia marginata, Adiantum aethiopicum, Pseuderanthemum variabile, Viola hederacea, Lepidopsperma laterale, Lomandra longifolia

Vines & Climbers: no structural data available

Billardiera scandens, Pandorea pandorana, Morinda jasminoides, Smilax australis, Smilax glyciphylla, Cissus hypoglauca, Clematis aristata, Eustrephus latifolius

❑ *KEY IDENTIFYING FEATURES*

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

- Narrabeen sandstone sheltered lower slopes and gullies
- Rocky narrow creek lines
- Tall Round-leaved Gum (*E. deanii*) and/ or Turpentine (*Syncarpia glomulifera*)
- Shrubby layer of Grey Myrtle (*Backhousia myrtifolia)*
- Tall Forest Oak (*Allocasuarina torulosa*)

❑ *EXAMPLE LOCATIONS*

Bulga Creek; Wilks Creek; Partridge Creek

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	12823	66
B Medium	4947	25
C High	1798	9
Total	19568	100

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq	Non group Score (60 Percentile)	Non group Freq	Fidelity Class
Adiantum aethiopicum	2	65%	2	19%	positive
Allocasuarina torulosa	2	80%	2	31%	positive
Angophora floribunda	2	55%	2	21%	positive
Astrotricha latifolia	2	45%	2	9%	positive
Backhousia myrtifolia	4	75%	3	20%	positive
Billardiera scandens	2	60%	1	40%	positive
Blechnum cartilagineum	2	40%	2	5%	positive
Cissus hypoglauca	2	35%	1	5%	positive
Dianella caerulea	2	90%	1	46%	positive
Dodonaea triquetra	2	45%	2	17%	positive
Doodia aspera	2	70%	2	14%	positive
Elaeocarpus reticulatus	2	55%	1	9%	positive
Galium ciliare	1	5%	0	0%	positive
Glycine clandestina	2	40%	1	21%	positive
Glycine hygrophila	1	5%	0	0%	positive
Grammitis billardierei	2	5%	0	0%	positive
Grevillea arenaria	1	5%	0	0%	positive
Hierochloe rariflora	2	5%	0	0%	positive
Hydrocotyle geraniifolia	2	30%	0	0%	positive
Lastreopsis decomposita	1	5%	0	0%	positive
Lomandra longifolia	2	50%	1	31%	positive
Maytenus silvestris	2	45%	1	22%	positive
Microlaena stipoides var. stipoides	2	35%	2	29%	positive
Oplismenus imbecillis	2	85%	2	17%	positive
Pandorea pandorana	2	70%	1	21%	positive
Platysace lanceolata	2	50%	2	13%	positive
Plectranthus parviflorus	2	35%	2	20%	positive

Species Name	Group Score (60 percentile)	Group Freq	Non group Score (60 Percentile)	Non group Freq	Fidelity Class
Poa affinis	2	40%	2	10%	positive
Polyscias sambucifolia	2	60%	1	15%	positive
Pratia purpurascens	2	70%	2	30%	positive
Pseuderanthemum variabile	2	35%	2	12%	positive
Psychotria loniceroides	2	20%	0	0%	positive
Pteridium esculentum	2	55%	2	30%	positive
Rapanea variabilis	2	60%	1	18%	positive
Smilax australis	2	85%	1	10%	positive
Syncarpia glomulifera subsp. glomulifera	3	75%	2	29%	positive
Tetrastigma nitens	2	5%	0	0%	positive
Viola hederacea	2	45%	2	6%	positive
Entolasia stricta	2	70%	2	70%	constant
Lepidosperma laterale	2	80%	2	41%	constant
Podolobium ilicifolium	2	45%	2	35%	constant

MU5 HUNTER RANGE HILLGROVE GUM GULLY FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not previously described
State: North Coast Wet Sclerophyll Forests
PVP Biometric Type: Not described
Number of Sites: 13 Number of identified native species per plot: 46.3

❑ *DESCRIPTION*

Distributed widely throughout dry, central Yengo NP, this community is dominated by tall stands (c. 30 metres) of the rare Hillgrove Gum (*Eucalyptus michaeliana*). Previously thought to be uncommon within the reserve, this survey has revealed that this tree may be far more common here than at other known populations found at Hillgrove and the McPherson Ranges on the NSW northern tablelands. The forest is situated on sheltered mid to lower slopes and gullies on Narrabeen sandstone. It exhibits a preference for protected positions around smaller streams rather than the deeper dissected gullies associated with the primary river systems. It extends from Mt Wareng in the north west of the study area south to the St Albans area. Mean annual rainfall in this area rarely exceeds 800 mm.

The canopy may also include *Angophora floribunda*, *Syncarpia glomulifera* subsp. *glomulifera or E. crebra.* The sub canopy layers are characterised by a high cover of *Backhousia myrtifolia* growing at various heights. At times this hardy rainforest species provides a small tree layer to 10 metres in height, while at others it forms a dense low growing shrub layer amongst sandstone boulders and/or benches. Other shrub and small tree species present may include *Breynia oblongifolia, Acacia parramattensis, Elaeocarpus reticularis, Rapanea variabilis* and *Cassinia uncata.* A moderate cover of small ferns such as *Pellaea falcata*, *Adiantum aethiopicum* and *Doodia aspera* grow amongst a patchy cover of twiners, grasses and herbs. The full extent of this community in the region is not known although there is anecdotal evidence that a similar forest may be present in south-eastern Wollemi National Park. The community is of high conservation significance in NSW given its apparent rarity. With much of the forest located within Yengo NP it remains secure.

❑ *FLORISTIC SUMMARY*

Trees **Mean Height 29.6 (7.6) metres; 30.5% (15.1) cover**

Eucalyptus michaeliana, Angophora floribunda, Syncarpia glomulifera subsp. *glomulifera, Eucalyptus crebra*

Small Trees: **Mean Height 12.36 (4.3) metres; 48.5% (23.3) cover**

Backhousia myrtifolia

Shrubs: **Mean Height 3.5 (0.4) metres; 52.8% (23.6) cover**

Backhousia myrtifolia, Acacia parramattensis, Breynia oblongifolia, Rapanea variabilis, Pittosporum revolutum, Notelaea longifolia

Ground Covers: Mean Height 0.51 (0.1) metres; 11.6% (7.2) cover

Adiantum aethiopicum, Microleana stipoides var. *stipoides, Pteridum esculentum, Dichondra repens, Pratia purpurescens, Oplismenus imbecillus, Doodia aspera, Stellaria flaccida, Poa affinis*

Vines & Climbers: no structural data available

Cayratia clematadia, Eustrephus latifolius, Maytenus silvestrus

❑ *KEY IDENTIFYING FEATURES*

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

- Spotted white trunk of the dominant Hillgrove Gum (*E. michaeliana)*
- Dense cover of Grey Myrtle (*Backhousia myrtifolia*) in the mid storey.
- Gullies on Narrabeen sandstones of the Upper Macdonald and Webbs Creek Catchments

❑ *EXAMPLE LOCATIONS*

Yokey Creek near Mt Yengo; Branch Creek off Mount Calore

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	1755	81
B Medium	411	19
C High	9	0.1
Total	**2176**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq	Non group Score (60 Percentile)	Non group Freq	Fidelity Class
Adiantum aethiopicum	2	69%	2	19%	positive
Angophora floribunda	2	46%	2	22%	positive
Asplenium flabellifolium	2	69%	1	7%	positive
Astrotricha latifolia	2	54%	2	9%	positive
Backhousia myrtifolia	5	100%	3	20%	positive
Bursaria spinosa	2	69%	2	22%	positive
Callistemon salignus	1	8%	0	0%	positive
Cayratia clematidea	2	46%	1	8%	positive
Croton insularis	3	8%	0	0%	positive
Cyperus laevis	2	62%	2	5%	positive
Dichondra repens	2	77%	2	18%	positive
Doodia aspera	2	62%	2	15%	positive
Doodia caudata	2	46%	1	0%	positive
Entolasia marginata	2	38%	2	11%	positive
Eucalyptus michaeliana	4	92%	3	2%	positive
Galium binifolium	2	38%	1	7%	positive
Galium liratum	1	8%	0	0%	positive
Galium propinquum	2	46%	2	4%	positive
Geranium potentilloides var. potentilloides	2	8%	0	0%	positive
Glycine clandestina	2	38%	1	21%	positive
Goodenia ovata	3	46%	1	8%	positive
Hydrocotyle laxiflora	2	46%	2	6%	positive
Jasminum volubile	2	8%	0	0%	positive
Kennedia rubicunda	2	46%	1	7%	positive
Melicope micrococca	2	46%	2	2%	positive
Microlaena stipoides var. stipoides	2	69%	2	28%	positive
Oplismenus imbecillis	2	100%	2	18%	positive
Pandorea pandorana	2	69%	1	22%	positive
Pellaea falcata var. falcata	2	77%	2	1%	positive
Pittosporum multiflorum	2	38%	2	3%	positive
Plectranthus parviflorus	2	85%	2	19%	positive
Poa affinis	2	69%	2	9%	positive

Species Name	Group Score (60 percentile)	Group Freq	Non group Score (60 Percentile)	Non group Freq	Fidelity Class
Pratia purpurascens	2	62%	2	31%	positive
Pseuderanthemum variabile	2	62%	2	11%	positive
Pyrrosia rupestris	2	54%	2	2%	positive
Rapanea variabilis	2	62%	1	19%	positive
Solanum densevestitum	2	8%	0	0%	positive
Stellaria flaccida	2	85%	2	6%	positive
Stenocarpus salignus	2	46%	1	4%	positive
Veronica plebeia	2	38%	1	10%	positive
Zieria caducibracteata	1	8%	0	0%	positive

MU6 COASTAL RIVERFLAT BLUE GUM-PEPPERMINT FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not Described
State: Coastal Floodplain Wetlands
PVP Biometric Type: Not described
Number of Sites: 0 Number of identified native species per plot: n/a

❑ *DESCRIPTION*

The alluvial flats of the lower Colo River support a tall forest dominated by the blue gums *Eucalyptus saligna* and *E. deanii* and River Peppermint (*E. elata*). A layering of mesic small trees and shrubs are found on remnants in reasonable condition close to the riverbank. *Acmena smithii, Trema aspera* and *Ficus coronata* are examples although there are often high abundances of introduced species found amongst them. Combinations of vines such as *Eustrephus latifolius* and *Geitonoplesium cymosum* are common amongst a moderate cover of ferns such as *Doodia aspera* and *Adiantum aethiopicum* and the grass *Microlaena stipoides* var. *stipoides*

This tall forest has been extensively cleared and exists only as narrow remnants fringing the Colo River. Isolated large eucalypts or small regrowth stands remain in open paddocks and on river banks.

Coastal Riverflat Blue Gum-Peppermint Forest forms a component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *FLORISTIC SUMMARY*

Trees: Height 18-25 metres; 30-45% cover

Eucalyptus saligna, E. deanii, E.elata, Angophora floribunda

Small Trees: Height 5-15 metres; 5-15% cover

Backhousia myrtifolia, Acmena smithii, Glochidion ferdinandi, Tristaniopsis laurina

Shrubs: Height 1-5 metres; 40-60% cover

Dubosia myoporoides, Acacia filicifolia, Clerodendrum tomentosum,Trema aspera

Ground Covers: Height 0-1 metres; 30-50% cover

Lomandra longifolia, Microlaena stipoides var. *stipoides, Calochalena dubia, Doodia aspera, Lepidosperma laterale*

Vines & Climbers: no structural data available

Smilax glyciphylla, Eustrephus latifolius, Clematis aristata, Pandorea pandorana

❑ *KEY IDENTIFYING FEATURES*

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

- Alluvial flats in close proximity to the Colo River
- Tall stands of Blue Gums (*E.deanii* and *E. saligna*) and River Peppermint (*E.elata*)

❑ *EXAMPLE LOCATIONS*

Putty Road crossing Colo River

- ***CONDITION ASSESSMENT***

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low		
B Medium		
C High	48	100
Total	**48**	**100**

- ***THREATENED PLANT SPECIES***

A component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

- ***DIAGNOSTIC SPECIES***

Community not sampled in the study area. No diagnostic species list generated.

MU7 COASTAL RIVERFLAT CABBAGE GUM FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Wollombi Red Gum-River Oak Forest
State: Coastal Floodplain Wetlands
PVP Biometric Type: Rough-barked Apple - Red Gum grassy woodland of the Macdonald River Valley on the Central Coast, Sydney Basin
Number of Sites: 5 Number of identified native species per plot: 37.8

❑ *DESCRIPTION*

The broad riverflats along the Macdonald and Wollombi Rivers have been heavily cleared with only highly disturbed remnants of the original forest remaining. However a number of sites collected in these remnants provide strong clues to the type of forest that originally covered these coastal rain shadow valleys. Away from the riverflat depressions that held wetlands and standing water, a tall open grassy forest dominated by Cabbage Gum (*Eucalyptus amplifolia* subsp. *amplifolia)* above open stands of paperbark (*Melaleuca linariifolia*) and wattle (*Acacia parramattensis*) is likely to have been common. The permanently damp soils still carry an herbaceous and grassy ground cover that includes *Microlaena stipoides* var. *stipoides, Oplismenus imbecillus, Dichondra repens* and *Viola hederacea*. Wetter sites include scattered *Carex appressa* and *Phragmites australis.* Hardy mesic shrubs are still found including *Backhousia myrtifolia* and *Glochidion ferdanandi* as are a number of ferns, vines and twiners.

Within the study area this forest occurs exclusively on private land along the Macdonald, Wollombi and Hawkesbury Rivers and their tributaries. Many of the remnants of this forest are found along the banks of the major rivers in very narrow bands no more than the width of a tree canopy. These individual remnants have not been delineated in the mapping. This community has been extensively cleared and remains poorly reserved throughout the Sydney Basin Bioregion. It forms a component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 25(9.1) metres; 33.5% (14.9) cover

Eucalyptus amplifolia subsp. *amplifolia, Eucalyptus saligna, Angophora floribunda, Melaleuca linariifolia*

Small Trees: Mean Height 9.7 (3.3) metres; 25% (24.4) cover

Melaleuca linariifolia, Melaleuca styphelioides, Acacia parramattensis, Backhousia myrtifolia, Acmena smithii, Glochidion ferdinandi

Shrubs: Mean Height 3.3 (1.5) metres; 20% (5) cover

Sigesbeckia orientalis subsp. *orientalis, Hymenanthera dentata, Duboisia myoporoides*

Ground Covers: Mean Height 1 (0) metres; 70% (20) cover

Microlaena stipoides var. *stipoides, Lomandra longifolia, Oplismenus imbecillus, Echinopogon obovatus, Calochalena dubia, Cynodon dactylon, Dichondra repens, Entolasia marginata, Pratia purpurescens, Hydroctyle laxiflora, Carex appressa, Ranunculus pleibeus, Viola hederacea*

Vines & Climbers: no structural data available

Geithonoplesium cynosum, Smilax glyciphylla, Eustrephus latifolius

❑ *KEY IDENTIFYING FEATURES*

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

- Alluvial flats along the Macdonald and Wollombi Rivers
- Cabbage Gum (*Eucalyptus amplifolia* subsp. *amplifolia*) and Paperbark (*Melaleuca* spp)

❑ *EXAMPLE LOCATIONS*

Macdonald and Wollombi River Valleys

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low		
B Medium	0	0
C High	2.5	100
Total	**2.5**	**100**

❑ *THREATENED PLANT SPECIES*

A component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia parramattensis	2	83%	2	11%	positive
Adiantum aethiopicum	2	50%	2	20%	positive
Calochlaena dubia	2	50%	2	7%	positive
Carex appressa	2	83%	6	0%	positive
Cladium procerum	2	17%	0	0%	positive
Cyclosorus interruptus	1	17%	0	0%	positive
Dichondra repens	2	67%	2	19%	positive
Entolasia marginata	2	83%	2	11%	positive
Eucalyptus amplifolia subsp. amplifolia	4	83%	3	3%	positive
Geitonoplesium cymosum	2	50%	1	7%	positive
Huperzia australiana	2	17%	0	0%	positive
Hydrocotyle laxiflora	2	50%	2	6%	positive
Lomandra longifolia	2	50%	1	32%	positive
Melaleuca linariifolia	4	100%	3	3%	positive
Microlaena stipoides var. stipoides	6	67%	2	29%	positive
Oplismenus imbecillis	4	50%	2	20%	positive
Phragmites australis	2	17%	0	0%	positive
Pratia purpurascens	2	83%	2	32%	positive
Prostanthera lanceolata	2	33%	0	0%	positive
Pteridium esculentum	2	50%	2	31%	positive
Ranunculus plebeius	1	33%	0	0%	positive
Rubus parvifolius	2	50%	2	8%	positive
Sigesbeckia orientalis subsp. orientalis	2	50%	2	9%	positive
Viola hederacea	2	83%	2	7%	positive

MU8 COASTAL RIVERFLAT SWAMP MAHOGANY FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Swamp Mahogany-Paperbark Forest/Sydney Swamp Forest
State: Coastal Floodplain Wetlands
PVP Biometric Type: Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin and South East Corner
Number of Sites: 2 Number of identified native species per plot: 23.5

❑ *DESCRIPTION*

A low lying alluvial flat on the southern boundary of Parr SCA features remnants of the forest system once more extensive across the Hawkesbury River flats. These small patches are highly disturbed but still contain large Swamp Mahogany (*E. robusta*) and *Melaleuca linariifolia*. At the interface with sandstone soils occassional Sydney Peppermint (*E. piperita*) are included in the canopy. The sample sites exhibit a reduced richness in ground cover species due to a profuse growth of *Backhousia myrtifolia* and past grazing and clearing. Some shrub and small tree species typical of coastal alluvial forests still remain including *Dubosia myoporoides*, *Melia azederach*, *Acmena smithii* and *Glochidion ferdinandi.* Other isolated stands of this riverflat forest are found in Dharug National Park and on the southern side of the Hawkesbury River.

Coastal Riverflat Swamp Mahogany Forest forms a component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 26.5 (2.1) metres; 22.5% (3.5) cover

Eucalyptus robusta

Small Trees: Mean Height 12 (0) metres; 77.5% (3.5) cover

Melaleuca linariifolia, Backhousia myrtifolia, Acmena smithii, Glochidion ferdinandi

Shrubs: Mean Height 1.5 (1.5) metres ; 20% (5) cover

Dubosia myoporoides, Acacia parramattensis, Clerodendrum tomentosum

Ground Covers: Mean Height 0.75 (0) metres; 7.5% (3.5) cover

Lomandra longifolia, Microlaena stipoides var. *stipoides, Calochlaena dubia, Lepidosperma laterale*

Vines & Climbers: no structural data available

Smilax glyciphylla, Eustrephus latifolius, Clematis aristata

❑ *KEY IDENTIFYING FEATURES*

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

- Alluvial flats in close proximity to the Hawkesbury River
- Swamp Mahogany (*Eucalyptus robusta*) and Paperbark (*Melaleuca* spp.)

❑ *EXAMPLE LOCATIONS*

Near Greens Swamp southern Parr SCA

- ***CONDITION ASSESSMENT***

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low		
B Medium		
C High	11.9	100
Total	**11**	**100**

- ***THREATENED PLANT SPECIES***

A component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

- ***DIAGNOSTIC SPECIES***

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acmena smithii	3	50%	2	4%	positive
Backhousia myrtifolia	6	100%	3	22%	positive
Calochlaena dubia	2	50%	2	7%	positive
Eucalyptus piperita	2	50%	3	12%	positive
Eucalyptus robusta	4	100%	0	0%	positive
Eustrephus latifolius	2	100%	1	18%	positive
Geitonoplesium cymosum	2	100%	1	7%	positive
Melaleuca linariifolia	4	100%	4	3%	positive
Melia azedarach	3	50%	2	1%	positive
Microlaena stipoides var. stipoides	2	100%	2	29%	positive
Morinda jasminoides	2	100%	1	7%	positive
Oplismenus imbecillis	2	100%	2	20%	positive
Pseuderanthemum variabile	2	100%	2	12%	positive
Stenocarpus salignus	2	50%	1	5%	positive
Syncarpia glomulifera subsp. glomulifera	3	50%	3	31%	positive

MU9 HUNTER RANGE BASALT RED GUM-BOX WOODLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not described
State: Coastal Valley Grassy Woodlands
PVP Biometric Type: Not described
Number of Sites: 2 Number of identified native species per plot: 29

❑ *DESCRIPTION*

Rich basalt soils are found on the prominent peaks of Mount Wareng and Mount Yengo. They support an open herbaceous and grassy forest that is dominated by Grey Box (*Eucalyptus molucanna*) and Red Gum (*E. tereticornis*) with an occasional Kurrajong (*Brachychiton populneus* subsp. *populneus*). A sparse shrub layer is typical of less disturbed areas and features *Breynia oblongifolia*, *Acacia fulva* and *Plectranthus parvifolius.* The diversity lies in the ground cover where grasses *Microlaena stipoides* var. *stipoides* and *Carex inversa* are abundant and commonly recorded alongside herbs such as *Dichondra repens* and *Desmodium varians*.

Evidence of disturbance is widespread on the rich soils of Mount Yengo. Regeneration following clearing and/or fire is characterised by dense thickets of *Acacia fulva* (recognised as Map Unit 44 Acacia Regeneration). This distinctive velvet and silver leaved wattle is rare in NSW is known primarily from basalt and clay soils in the Hunter Range area and near Gloucester. These small areas of basalt woodlands are vegetation communities of high conservation value. They form part of the Grassy Woodlands complex of Keith (2004) and are recognised as extensively cleared and poorly reserved throughout NSW.

❑ *FLORISTIC SUMMARY*

Trees: Height 15-25 metres; 20-40% cover

Eucalyptus tereticornis, Eucalyptus molucanna, Brachychiton populneus subsp. *populneus*

Shrubs: Height 1-4 metres; 10-50% cover

Acacia fulva, Acacia floribunda, Bursaria spinosa, Breynia oblongifolia

Ground Covers: Height 0-1 metres; 30-80% cover

Carex inversa, Microlaena stipoides var *stipoides, Asperula conferta, Echinopogon ovatus, Poa affinis, Dichondra repens, Dianella caerulea, Viola hederacea, Glycine clandestina, Plectranthus parviflorus, Juncus pauciflorus, Lomandra longifolia*

❑ *KEY IDENTIFYING FEATURES*

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

- A grassy and herbaceous open forest and woodland on crests and gentle rises
- Slopes of Mount Wareng and Mount Yengo
- Chocolate coloured basalt soils
- Presence of Grey Box (*E. molucanna*) and Red Gum (*E. tereticornis*)
- Sparse to dense shrub layer of Wattles (*Acacia* spp.)

❑ *EXAMPLE LOCATIONS*

Mount Wareng and Mount Yengo

- ***CONDITION ASSESSMENT***

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	59	20
B Medium	170	59
C High	60	21
Total	**290**	**100**

- ***THREATENED PLANT SPECIES***

Nil recorded

- ***DIAGNOSTIC SPECIES***

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia floribunda	2	50%	1	1%	positive
Acacia fulva	4	100%	2	1%	positive
Asperula scoparia	3	50%	0	0%	positive
Carex inversa	3	50%	2	0%	positive
Commelina cyanea	2	50%	1	8%	positive
Cotula australis	2	50%	2	0%	positive
Desmodium rhytidophyllum	2	50%	1	9%	positive
Desmodium varians	2	50%	2	7%	positive
Dichondra repens	4	50%	2	19%	positive
Echinopogon ovatus	2	50%	2	6%	positive
Eucalyptus moluccana	3	50%	2	4%	positive
Eucalyptus tereticornis	3	100%	3	3%	positive
Galium gaudichaudii	2	50%	2	2%	positive
Geranium solanderi var. solanderi	2	50%	2	3%	positive
Glycine clandestina	2	100%	1	21%	positive
Glycine tabacina	2	50%	2	9%	positive
Juncus pauciflorus	1	50%	0	0%	positive
Lomandra longifolia	2	50%	1	32%	positive
Microlaena stipoides var. stipoides	4	100%	2	29%	positive
Plantago debilis	2	50%	2	5%	positive
Plectranthus parviflorus	2	100%	2	21%	positive
Poa affinis	3	50%	2	11%	positive
Pratia purpurascens	2	100%	2	32%	positive
Ranunculus lappaceus	2	100%	2	0%	positive
Senecio hispidulus	2	50%	1	2%	positive
Solanum stelligerum	2	100%	1	5%	positive
Veronica plebeia	2	50%	1	11%	positive
Viola hederacea	2	50%	2	8%	positive
Wahlenbergia gracilis	2	100%	1	5%	positive

MU10 SYDNEY HINTERLAND DIATREME FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not described
State: Coastal Valley Grassy Woodlands
PVP Biometric Type: Not described
Number of Sites: 3 Number of identified native species per plot: 34

❑ *DESCRIPTION*

Small diatremes or volcanic 'craters' are found amongst the sandstone plateaux. These amphitheatre shaped landforms have a soil that mixes basaltic material with the surrounding sediments to form what is known as breccia. This material is fertile, and was targeted by early European settlers for grazing, particularly if diatemes were near permanent water. There are only a few of these landforms in the reserves and most have been cleared or are highly disturbed. An example of these sites lies in a tributary off Werong Creek and is one of the few that has some native vegetation cover remaining. A regrowth stand of Rough-barked Apple (*Angophora floribunda*), Cabbage Gum (*Eucalyptus amplifolia* subsp. *amplifolia*) and Thin-leaved Stringybark (*E. eugeinoides*) is present. A very sparse shrub layer of *Acacia parramattensis* and *Grevillea mucronulata* grow above what is otherwise a very open grassy and herbaceous ground cover. The site is highly disturbed though an abundance of *Microlaena stipoides* var. *stipoides*, *Echinopogon ovatus* and *Entolasia marginata* remains. Ferns are also common including *Adiantum aethiopicum* and *Pteridium esculentum.* At Pierces Hole an unusual occurrence of remnant Yellow Box (*E. melliodora*) is included amongst the canopy. More commonly a tree of the western Hunter and Central Tablelands, there are few examples of Yellow Box found in the reserves of the northern Sydney Basin Bioregion.

Forests growing on diatremes across the Sydney Basin sandstones are of high conservation value despite many of them being situated within the reserve system. Many were cleared for stock grazing and all are vulnerable to weed infestation. The conservation value of diatreme forests has been recognised in part by the NSW Scientific Committee who have listed a very similar vegetation community Sun Valley Cabbage Gum Forest as an Endangered Ecological Community under Schedule 1 of the NSW Threatened Species Act (1995). While this community applies a very narrow definition to the Sun Valley Diatreme in the lower Blue Mountains only, improved mapping and understanding of diatreme forests are likely to show they warrant similar status across an expanded area.

❑ *FLORISTIC SUMMARY*

Trees: Height 20-30 metres; 15-40% cover

Eucalyptus amplifolia subsp. *amplifolia, Angophora floribunda, E. eugenioides*

Low Trees: Height 1-5 metres; 15-60% cover

Acacia parramattensis

Ground Covers: Height 0-1 metres; 60-80% cover

Microleana stipoides var. *stipoides, Adiantum aethiopicum, Pteridium esculentum*

❑ *KEY IDENTIFYING FEATURES*

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

- Small amphitheatre shaped landforms often at the headwater of streams
- Presence of Rough-barked Apple (*A. floribunda*), Cabbage Gum (*E. amplifolia* subsp.*amplifolia*) and Thin-leaved Stringybark (*E. eugenioides*)
- Open grassy understorey

❑ *EXAMPLE LOCATIONS*

Werong Creek; Devils Hole; Pierces Hole

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	5.9	7
B Medium	24	27
C High	60	67
Total	**90**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia parramattensis	2	100%	2	5%	positive
Adiantum aethiopicum	3	100%	2	16%	positive
Angophora floribunda	3	100%	2	20%	positive
Billardiera scandens	2	100%	1	41%	positive
Cayratia clematidea	2	100%	1	8%	positive
Dichondra repens	2	100%	2	17%	positive
Echinopogon ovatus	2	100%	2	5%	positive
Einadia hastata	2	100%	1	5%	positive
Eucalyptus amplifolia subsp. amplifolia	4	100%	3	1%	positive
Eucalyptus eugenioides	3	100%	2	1%	positive
Glycine microphylla	2	100%	1	5%	positive
Hydrocotyle laxiflora	2	100%	2	2%	positive
Libertia paniculata	2	100%	1	1%	positive
Microlaena stipoides var. stipoides	6	100%	2	22%	positive
Oplismenus imbecillis	3	100%	1	18%	positive
Paspalidium albovillosum	2	100%	3	1%	positive
Pellaea falcata	2	100%	2	11%	positive
Pteridium esculentum	6	100%	2	28%	positive
Rubus parvifolius	2	100%	2	7%	positive
Urtica incisa	2	100%	2	3%	positive
Veronica plebeia	2	100%	1	10%	positive
Viola hederacea	2	100%	1	6%	positive

MU11 HUNTER RANGE FLATS APPLE-STRINGYBARK-GUM FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not previously described
State: Coastal Valley Grassy Woodlands
PVP Biometric Type: Not described
Number of Sites: 21 Number of identified native species per plot: 46.9

❑ *DESCRIPTION*

Colluvial deposition gives rise to small infills at the headwaters of some deeper gully lines across the sandstone plateau. These deposits vary from sandy clay loams to clayey sands (McInnes 1997) depending on the stratum present in the surrounding Narrabeen series geology. Small terraces and benches may form on the footslopes and narrow colluvial fans of a gentle gradient develop on the gully floor. A tall open forest with a grassy and herbaceous understorey and sparse shrub layer is present in these locations. Both Rough-barked Apple (*Angophora floribunda*) and Thin-leaved Stringybark (*Eucalyptus eugenioides*) are present at most sites, although where soils deepen either Cabbage Gum (*E. amplifolia* subsp. *amplifolia)* or Sydney Blue Gum (*E. saligna*) may dominate the canopy. A sparse cover of *Allocasuarina torulosa* is sometimes present just below the canopy. Smaller shrubs are more common and include *Acacia parramattensis*, *Cassinia uncata, Persoonia linearis* and *Breynia oblongifolia.* The ground cover invariably features a patchy cover of grasses such as *Microlaena stipoides* var. *stipoides*, *Oplismenus imbecillus* and *Cyperus laevigatus* amongst ferns *Adiantum aethiopicum* and *Pteridium esculentum.* Commonly encountered herbs include *Dichondra repens* and *Pratia purpurescens*.

These forests are scattered throughout Yengo and Parr reserves. Their value for rough grazing and timber was recognised by graziers and loggers alike, and, despite the remoteness of many locations, evidence of these former activities remains today. Most stands of these forests have been logged where *E. saligna* is present, and cleared where *E. amplifolia* subsp. *amplifolia* occurs. It is no surprise that they share a floristic similarity and disturbance history with the forests found on the riverflats and alluvium of the Macdonald, Wollombi, Putty and Howes Valleys. These forests should be recognised for their conservation value within the reserve, although they are unlikely to qualify as a component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *FLORISTIC SUMMARY*

Trees: **Mean Height 25.8 metres(4.6) ; 32.1% (6) cover**

Angophora floribunda, Eucalyptus eugenioides, Eucalyptus amplifolia subsp. *amplifolia, E. saligna, E.punctata, E. deanii, Melaleuca linariifolia*

Small Trees: **Mean Height 11.3 (5.9) metres; 19.4% (16.7) cover**

Acacia parramattensis, Acacia filicifolia, Persoonia linearis, Cassinia uncata, Breynia oblongifolia, Allocasuarina torulosa, Polyscias sambuccifolia, Exocarpus strictus

Shrubs: **Mean Height 4 (2.9) metres; 16.9% (14) cover**

Acacia parramattensis, Acacia filicifolia, Persoonia linearis, Cassinia uncata, Breynia oblongifolia, Polyscias sambuccifolia, Exocarpus strictus

Ground Covers: Mean Height 1.01 (0.15) metres; 54.5% (30)cover

Microlaena stipoides var. *stipoides*, *Oplismenus imbecillus*, *Cyperus laevigatus, Pteridium esculentum*, *Adiantum aethiopicum*, *Imperata cylindrica* var *major, Dichondra repens, Pratia purpurescens, Cheilanthes sieberi* var *sieberi, Lomandra longifolia,Veronica cinerea, Rubus parvifolius*

Vines & Climbers: no structural data available

Billardiera scandens, Eustrephus latifolius, Stephania japonica var *discolor, Glycine clandestina, Glycine tabacina*

❑ *KEY IDENTIFYING FEATURES*

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

- Colluvial fans and flats, benches and terraces on Narrabeen Sandstone
- Rough-barked Apple (*Angophora floribunda*) and Thin-leaved Stringybark (*Eucalyptus eugenioides*) present often as subdominant trees
- Local abundance of Cabbage Gum (*E. amplifolia* subsp. *amplifolia*) and Sydney Blue Gum (*E. saligna*)
- Prominent ground cover of grasses and ferns

❑ *EXAMPLE LOCATIONS*

Big Yango area; Wallabadah

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	3137	42
B Medium	1640	22
C High	2701	36
Total	**7479**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia parramattensis	2	82%	1	8%	positive
Adiantum aethiopicum	2	91%	2	17%	positive
Allocasuarina torulosa	3	41%	2	33%	positive
Aneilema biflorum	2	5%	0	0%	positive
Angophora floribunda	3	95%	2	19%	positive
Billardiera scandens	2	45%	1	41%	positive
Carex breviculmis	2	5%	0	0%	positive
Cayratia clematidea	2	36%	1	8%	positive
Cheilanthes sieberi subsp. sieberi	2	55%	2	27%	positive
Chenopodium carinatum	1	5%	0	0%	positive
Clematis glycinoides var. glycinoides	2	36%	1	5%	positive
Commelina cyanea	2	41%	1	7%	positive
Cyperus difformis	1	5%	0	0%	positive
Cyperus gunnii subsp. gunnii	3	5%	0	0%	positive
Cyperus laevis	2	64%	2	3%	positive
Dianella tasmanica	2	45%	1	7%	positive
Dichondra repens	2	86%	2	16%	positive
Digitaria ramularis	2	41%	1	7%	positive
Doodia aspera	2	36%	2	15%	positive
Entolasia marginata	2	64%	2	10%	positive
Eucalyptus amplifolia subsp. amplifolia	3	36%	3	2%	positive

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Eucalyptus eugenioides	3	73%	3	2%	positive
Glycine clandestina	2	64%	1	20%	positive
Glycine tabacina	2	59%	2	6%	positive
Glycine tomentella	2	5%	0	0%	positive
Hydrocotyle laxiflora	2	36%	2	6%	positive
Hypoxis hygrometrica var. villosisepala	1	9%	0	0%	positive
Imperata cylindrica var. major	2	45%	2	16%	positive
Lagenifera stipitata	2	45%	1	12%	positive
Lepidosperma elatius	1	5%	0	0%	positive
Mentha satureioides	2	5%	0	0%	positive
Microlaena stipoides var. stipoides	3	95%	2	26%	positive
Oplismenus aemulus	2	36%	2	5%	positive
Oplismenus imbecillis	2	64%	2	18%	positive
Oxalis perennans	2	59%	1	4%	positive
Pratia purpurascens	2	82%	2	30%	positive
Pseuderanthemum variabile	2	36%	2	11%	positive
Pteridium esculentum	2	91%	2	28%	positive
Rubus parvifolius	2	77%	1	5%	positive
Senecio amygdalifolius	4	9%	0	0%	positive
Senecio linearifolius	3	5%	0	0%	positive
Sigesbeckia orientalis subsp. orientalis	2	45%	2	8%	positive
Vernonia cinerea	2	41%	1	11%	positive
Veronica plebeia	2	36%	1	10%	positive
Entolasia stricta	2	55%	2	71%	constant

MU12 HUNTER RANGE FLATS RED GUM-APPLE FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: A component of Wollombi Alluvial River Oak –Red Gum Forest
State: Coastal Floodplain Wetlands
PVP Biometric Type: Not described
Number of Sites: 7 Number of identified native species per plot: 30.1

❑ *DESCRIPTION*

Extensive areas of alluvial soil are found in the Putty, Howes and Garland Valleys. These soils appear to comprise a blend of siliceous sands and finer grained clays. A tall forest of Rough-barked Apple (*Angophora floribunda),* Cabbage Gum (*Eucalyptus amplifolia* subsp. *amplifolia*) and Forest Red Gum (*Eucalyptus tereticornis*) occupy these alluvial infill valley systems. Wattles (*Acacia filicifolia* and *A. parramattensis*) provide a prominent mid strata layer alongside *Persoonia linearis, Bursaria spinosa*, *Exocarpus strictus and Leucopogon muticus.* Sites of poor drainage include a smaller tree layer of *Melaleuca linariifolia*. The ground cover is grassy and herbaceous with most sites recording a very high abundance *of Microlaena stipoides* var. *stipoides,* together with a further four grass species found at over half of the sites. Low growing herbs such as *Dichondra repens* and *Pratia purpurescens* and the ferns *Cheilanthes sieberi* and *Pteridium esculentum* are also common.

Forests found on alluvial flats are amongst the most heavily cleared and poorly reserved vegetation communities in NSW. Very few examples of these forests remain in reasonably good condition, as grazing and other agricultural activities have cleared these fertile soils and introduced exotic species.

This forest shares some floristic affinities with the major riverflat communities to the east along the Wollombi and Macdonald Rivers. However the mesic elements in those communities are not present in this map unit. This is a consequence of the lower mean annual rainfall and the greater exposure associated with the elevated landsystem of the Mellong Plateau. AS is the case with all fertile riverflat communities their distribution primarily occurs on private lands and only small examples are present within the reserves.

This forest forms a component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 27 (2.7) metres ; 27.4% (12) cover

Angophora floribunda, Eucalyptus amplifolia subsp. *amplifolia, E. tereticornis, E. punctata, E.deanii*

Small Tree: Mean Height 13.2 (1.6) metres; 37.6% (24.7) cover

Melaleuca linariifolia, Acacia filicifolia, Acacia parramattensis, Persoonia linearis, Exocarpus strictus, Grevillea mucronulata, Allocasuarina littoralis

Shrubs: Mean Height 3.1 metres(1.5) ; 15.6% (8.6) cover

Persoonia linearis, Exocarpus strictus, Grevillea mucronulata

Ground Covers: Mean Height 0.38 (0.1) metres; 45.2% (16.5) cover

Microlaena stipoides var. *stipoides*, *Pteridium esculentum*, *Imperata cylindrica* var *major, Dichondra repens, Pratia purpurescens, Cheilanthes sieberi* var. *sieberi, Lomandra longifolia, Echinopogon caespitosis* var. *caespitosis, Veronica plebeia*

Vines & Climbers: no structural data available

Billardiera scandens, Glycine clandestina, Glycine tabacina

❑ *KEY IDENTIFYING FEATURES*

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

- Alluvial Flats in the Howes Valley-Putty area
- Rough-barked Apple (*Angophora floribunda*) and Red Gums (*E.amplifolia/E.tereticornis*)

❑ *EXAMPLE LOCATIONS*

Putty Valley: Upper Howes Valley Creek; Burrowell Creek

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	66	34
B Medium	3	2
C High	123	64
Total	**193**	**100**

❑ *THREATENED PLANT SPECIES*

It forms a component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *DIAGNOSTIC SPECIES*

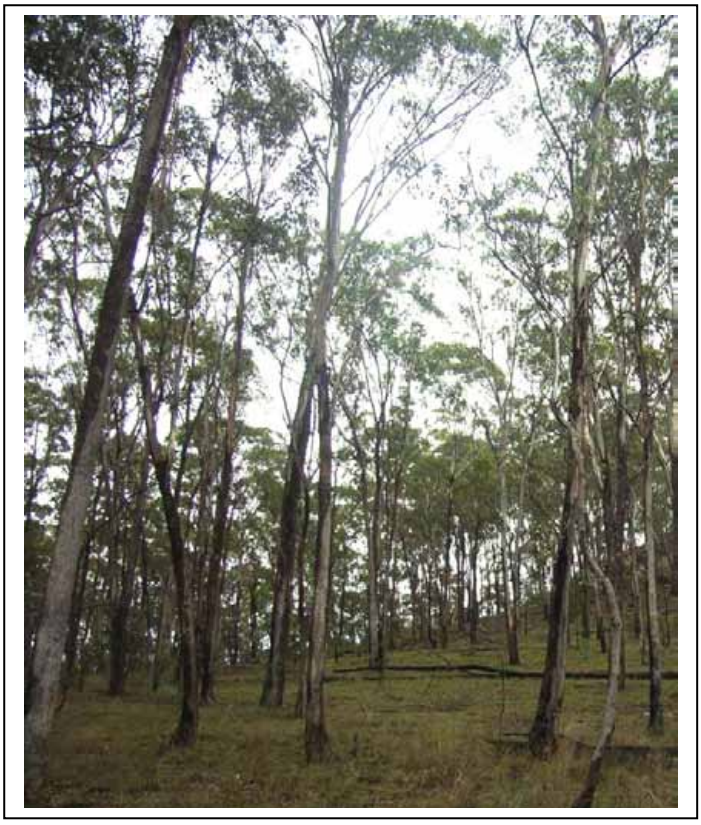
Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia filicifolia	4	100%	2	8%	positive
Angophora floribunda	4	100%	2	21%	positive
Calotis dentex	2	71%	1	6%	positive
Cheilanthes sieberi subsp. sieberi	2	86%	2	27%	positive
Dichondra repens	2	100%	2	18%	positive
Echinopogon caespitosus var. caespitosus	2	43%	2	6%	positive
Echinopogon ovatus	2	43%	2	6%	positive
Eragrostis brownii	2	57%	2	10%	positive
Eucalyptus amplifolia subsp. amplifolia	3	43%	3	3%	positive
Glycine tabacina	2	57%	2	8%	positive
Melaleuca linariifolia	4	57%	4	3%	positive
Microlaena stipoides var. stipoides	5	100%	2	28%	positive
Panicum simile	2	57%	1	18%	positive
Pratia purpurascens	2	100%	2	31%	positive
Pteridium esculentum	2	57%	2	30%	positive
Pultenaea retusa	1	14%	0	0%	positive
Sporobolus elongatus	1	14%	0	0%	positive
Veronica plebeia	2	71%	1	10%	positive
Entolasia stricta	2	57%	2	70%	constant

MU13 HUNTER RANGE SHALE RED GUM-BOX WOODLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not described
State: Coastal Valley Grassy Woodlands
PVP Biometric Type: Not described
Number of Sites: 2 Number of identified native species per plot: 27.5

❑ *DESCRIPTION*



Residual shale soils are found as a capping on a number of small crests in north-western Yengo NP. These soils, which are often only shallow, include higher clay content than the adjoining sandstone ridges. Plant species that prefer these more fertile soils form a forest community of distinctive appearance. The canopy features a moderately tall (c. 25 metres in height) open cover of Grey Box (*Eucalyptus moluccana*), Red Gum (*E. tereticornis*) and less frequently Narrow-leaved Ironbark (*E. crebra*). The understorey is typically very open and grassy. A sparse shrub layer of *Indigofera australis*, *Persoonia linearis* and a number of wattles including the rare *Acacia fulva* have been recorded. More prominent are the abundance of grasses such as *Themeda australis*, *Aristida vagans*, *Echinopogon caespitosis* var. *caespitosis, Entolasia stricta* and *Panicum* spp.

These open grassy and herbaceous woodlands are rare within the reserve, and are restricted to isolated disjunct patches. Despite the remoteness of some of these caps, many show evidence of rough grazing. These small areas of woodlands are vegetation communities of high conservation value. They form part of the Grassy Woodlands complex of Keith (2004) and are recognised as extensively cleared and poorly reserved throughout NSW.

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 23.5 (2.1) metres; 29% (1.4) cover

Eucalyptus tereticornis, Eucalyptus moluccana, E. crebra, E. punctata, E. sparsifolia.

Shrubs: Mean Height 4 (1.4) metres; 6% (1.4) cover

Acacia fulva, Acacia parramattensis, Acacia bulgaensis, Persoonia lnearis, Bursaria spinosa, Exocarpus strictus, Indigofera australis, Breynia oblongifolia

Ground Covers: Mean Height 0.45 (0.1) metres; 45% (24.7) cover

Themeda australis, Entolasia stricta, Aristida vagans, Echinopogon ovatus, Dichondra repens, Dianella caerulea, Vernonia cinerea, Clematis aristata, Clematis glycinoides, Panicum simile, Panicum effusum, Plectranthus parviflorus

❑ *KEY IDENTIFYING FEATURES*

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

- A grassy and herbaceous open forest or woodland on crests and gentle rises
- Chocolate coloured clay soils
- Presence of Grey Box (*E. moluccana*) and Forest Red Gum (*E. tereticornis*) or Ironbark (E. crebra)
- Sparse shrub layer of Wattles (*Acacia* spp.)

❑ *EXAMPLE LOCATIONS*

Crests along the south end of old Bulga Road north of Mount Wareng

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	16	16
B Medium	11	10
C High	79	74
Total	**107**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia doratoxylon	1	50%	0	0%	positive
Acacia fulva	3	50%	2	2%	positive
Aristida vagans	2	50%	2	13%	positive
Clerodendrum tomentosum	2	50%	1	7%	positive
Dichondra repens	2	50%	2	19%	positive
Echinopogon ovatus	2	50%	2	6%	positive
Eragrostis leptostachya	2	50%	2	1%	positive
Eucalyptus crebra	2	100%	3	20%	positive
Eucalyptus moluccana	4	50%	2	4%	positive
Eucalyptus tereticornis	4	100%	3	3%	positive
Goodenia ovata	3	50%	1	9%	positive
Indigofera australis	3	100%	1	11%	positive
Myoporum montanum	2	50%	0	0%	positive
Panicum effusum	2	100%	2	2%	positive
Panicum simile	2	100%	1	18%	positive
Paspalidium distans	3	50%	2	5%	positive
Plectranthus parviflorus	4	100%	2	21%	positive
Scutellaria mollis	1	50%	0	0%	positive
Themeda australis	6	50%	2	25%	positive

MU49 HUNTER RANGE FOOTSLOPES IRONBARK-REDGUM FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not previously described
State: Coastal Valley Grassy Woodlands
PVP Biometric Type: Not described
Number of Sites: 10 Number of identified native species per plot: 51

❑ *DESCRIPTION*

Shale enriched soils within the Narrabeen series are exposed on the mid to lower footslopes and benches of the undulating hills and rises of the Hunter Range. These landforms typically mark the grade into adjoining alluvial creek and gully systems. In these exposed environments where rainfall and elevation are relatively low (less than 800 mm per annum; 280-300 metres asl) the vegetation is characterised by a dry grassy-shrub forest. The tree layer often comprises an open cover of Narrow-leaf Ironbark (*Eucalyptus crebra*), Forest Red Gum (*E. tereticornis*) and Rough-barked Apple (*Angophora floribunda*). A small tree layer might include a sparse cover of *Allocasuarina torulosa*, *Acacia parvipinnula* and/ or *Acacia implexa.* A sparse shrub layer is also common with *Persoonia linearis* and *Bursaria spinosa* var. *spinosa* usually present. The ground cover forms a distinctive and diverse cover of grasses with *Microlaena stipoides* var. *stipoides* the most abundant.

The gentle gradients, higher fertility soils and proximity to water have encouraged past widespread clearing of this vegetation community for agricultural landuse. Remnants today are mostly in a state of regeneration from man made disturbance. Grazing pressures are gradually being reduced from these marginal lands however small allotment hobby farms increasingly replace them.

This forest community is poorly conserved in the Sydney Basin Bioregion, with few examples present in the surrounding Yengo and Wollemi reserves. It may be considered as part of the statewide vegetation classification class Coastal Valley Grassy Woodlands described by Keith (2004). This class is recognised as extensively cleared and poorly reserved throughout NSW.

❑ *FLORISTIC SUMMARY*

Trees: Height 20 (2.1) metres; 27.5% (5.2) cover

Angophora floribunda, Eucalyptus tereticornis, E. crebra, E. punctata, E. sparsifolia

Small Trees: Height 6.75 (1.8) metres; 25% (1.4) cover

Allocasuarina torulosa, Acacia implexa, Acacia parvipinnula

Shrubs: Height 2 (0.4) metres; 6% (1.4) cover

Persoonia lnearis, Bursaria spinosa, Exocarpus strictus, Cassinia uncata

Ground Covers: Height 0.55 (0.1) metres; 69% (13.7) cover

Microlaeana stipoides var stipoides, Themeda australis, Entolasia stricta, Aristida vagans, Echinopogon ovatus, Dicelachne micrantha, Poa affinis, Dichondra repens, Dianella tasmannica, Vernonia cinerea, Clematis aristata, Clematis glycinoides, Panicum simile, Panicum effusum, Plectranthus parviflorus

❑ *KEY IDENTIFYING FEATURES*

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

- Gentle gradients on footslopes of the Putty and Howes Valleys
- Forest comprising Ironbark (*E. crebra*), Forest Red Gum (*E. tereticornis*) and Roughbarked Apple (*A. floribunda*)
- Abundant and diverse cover of grasses

- ***EXAMPLE LOCATIONS***

Footslopes Howes Valley adjoining Putty Road

- ***CONDITION ASSESSMENT***

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	153	30
B Medium	64	13
C High	288	57
Total	**505**	**100**

- ***THREATENED PLANT SPECIES***

Nil recorded

- ***DIAGNOSTIC SPECIES***

Species Name	Group score (60 percentile)	Group Freq	Non-group score (60 percentile)	Non-group Freq	Fidelity Class
Acacia parvipinnula	4	100%	2	26%	positive
Aristida ramosa	2	40%	2	28%	positive
Aristida vagans	2	90%	1	28%	positive
Aristida warburgii	1	10%	0	0%	positive
Brachychiton populneus subsp.*populneus*	1	10%	0	0%	positive
Brunoniella australis	2	40%	2	4%	positive
Caesia parviflora	2	40%	2	15%	positive
Calotis dentex	2	70%	1	11%	positive
Cymbopogon refractus	2	60%	1	15%	positive
Dianella longifolia	2	30%	0	0%	positive
Dianella tasmanica	2	50%	1	26%	positive
Dichelachne micrantha	2	80%	2	30%	positive
Digitaria ramularis	2	60%	1	28%	positive
Echinopogon caespitosus var.caespitosus	2	40%	1	19%	positive
Echinopogon ovatus	2	80%	2	32%	positive
Entolasia marginata	2	50%	2	34%	positive
Eragrostis brownii	2	40%	2	17%	positive
Eucalyptus crebra	4	60%	3	26%	positive
Eucalyptus tereticornis	4	70%	3	13%	positive
Glycine microphylla	2	40%	2	13%	positive
Glycine tabacina	2	60%	2	23%	positive
Goodenia rotundifolia	2	40%	2	17%	positive
Hibbertia riparia	2	10%	0	0%	positive
Hypericum gramineum	2	50%	1	6%	positive
Laxmannia gracilis	2	60%	1	13%	positive
Notodanthonia longifolia	1	10%	0	0%	positive
Opercularia diphylla	2	40%	2	19%	positive
Panicum simile	2	40%	1	21%	positive
Phyllanthus virgatus	2	20%	0	0%	positive
Poranthera microphylla	2	40%	2	17%	positive

Species Name	Group score (60 percentile)	Group Freq	Non-group score (60 percentile)	Non-group Freq	Fidelity Class
Prostanthera serpyllifolia subsp.*microphylla*	1	10%	0	0%	positive
Solanum cinereum	1	10%	0	0%	positive
Solanum stelligerum	1	10%	0	0%	positive
Tricoryne simplex	2	10%	0	0%	positive
Vernonia cinerea	2	100%	1	30%	positive
Veronica plebeia	2	60%	2	30%	positive
Wahlenbergia communis	2	40%	1	6%	positive
Angophora floribunda	2	50%	3	40%	constant
Cheilanthes sieberi subsp.*sieberi*	2	100%	2	45%	constant
Dichondra repens	2	80%	2	43%	constant
Entolasia stricta	2	40%	2	55%	constant
Eucalyptus punctata	4	40%	3	40%	constant
Glycine clandestina	2	90%	2	49%	constant
Hydrocotyle laxiflora	2	50%	2	36%	constant
Microlaena stipoides var.stipoides	4	100%	3	77%	constant
Oxalis perennans	2	90%	2	45%	constant
Persoonia linearis	2	100%	2	66%	constant
Pomax umbellata	2	60%	2	49%	constant
Pratia purpurascens	2	90%	2	53%	constant
Themeda australis	2	50%	2	43%	constant

MU14 HUNTER RANGE GREY GUM SHELTERED FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Hunter Range Grey Gum Forest
State: Sydney Hinterland Dry Sclerophyll Forests
PVP Biometric Type: Grey Gum - Smooth-barked Apple open forest of the dry hinterland of the Central Coast, Sydney Basin
Number of Sites: 21 Number of identified native species per plot: 46.1

❑ *DESCRIPTION*

This tall open forest, sometimes reaching 30 metres in height, is common on mid to lower south and east facing slopes on Narrabeen group sediments. Typically Grey Gum (*Eucalyptus punctata*) and Turpentine (*Syncarpia glomulifera*) are present in the canopy along with Smooth-barked Apple (*Angophora costata*), Stringybark (*Eucalyptus sparsifolia*) and Ironbarks (*E. crebra* and/or *E. fibrosa*). There are a number of unusual Eucalypts that occur within this community each of which can present a forest of very distinctive trees. The first of these is *Eucalyptus michaeliana* (a tree resembling Spotted Gum (*Corymbia maculata*)) found in just three locations in NSW of which Yengo NP is one. The other, a tall box tree *E. hypostomatica,* found in the north and east of Yengo NP, has a similarly restricted distribution in NSW. Both these unusual trees can dominate the canopy at individual sites and can be located using the GIS layer to select mapping feature codes 1036 or 1041 for each species respectively.

The charcteristic components of this map unit is linked to an intermediate shrub layer of both dry and mesic shrubs. Almost every site supports a prominent stand of Forest Oak (*Allocasuarina torulosa*), sometimes reaching to the height of the lower canopy. An open layer of taller dry shrubs such as *Persoonia linearis*, *Bursaria spinosa, Indigofera australis, Exocarpus strictus* and *Breynia oblongifolia* is common alongside moister species such as *Rapanea variabilis* and *Polyscias sambuccifolia.* The ground cover is open though it supports a cover of small herbs, vines, ferns and grasses amongst rock boulders and benches. These include *Lepidosperma laterale*, *Plectranthus parviflorus, Cheilanthes sieberi* subsp. *sieberi, Themeda australis* and *Dianella caerulea.* Mesic species are uncommon, though may be found on lower slopes where the community grades into the gully forests dominated by Blue Gums (*E. deanii* and *E. saligna*) (MU4). This forest is extensively distributed across central and northern Yengo NP and western Pokolbin and Corrabare State Forests. It falls within mean annual rainfall bands less than 900 mm and at elevations between 300 and 600 metres above sea level. As the reserves of Yengo and Wollemi NPs comprise large areas of this forest it is considered adequately reserved. While timber harvesting operations persist within State Forests, land clearing for agricultural purposes has not reduced large areas of the original distribution of this community.

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 27.1 (5) metres; 28.3% (6) cover
Eucalyptus punctata, Syncarpia glomulifera, Angophora costata, E. sparsifolia, Eucalyptus crebra, E. fibrosa, Angophora floribunda, E. michaeliana, E. hypostomatica, E.moluccana

Small Trees: Mean Height 11.9 (3.9) metres; 20.1% (23.5) cover
Allocasuarina torulosa, Syncarpia glomulifera subsp. *glomulifera,*

Shrubs: Mean Height 3.1 (1.5) metres; 24.5% (13.9) cover
Persoonia linearis, Podolobium ilicifolium, Rapanea variabilis, Exocarpos strictus, Jacksonia scoparia, Acacia parvipinnula, Breynia oblongifolia, Indigofera australis, Acacia implexa, Bursaria spinosa, Maytenus silvestris

Ground Covers: Mean Height 0.62 (0.27) metres; 30.3% (24.1) cover
Lepidosperma laterale, Chelanthes sieberi subsp. *sieberi, Dianella caerulea, Dichondra repens, Plectranthus parviflorus, Entolasia stricta, Phyllanthus hirtellus, Goodenia ovata, Themeda australis, Microlaena stipoides* var. *stipoides, Platysace lanceolata, Hibbertia obtusifolia, Poa affinis, Hardenbergia violacae*

❑ *KEY IDENTIFYING FEATURES*

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

- Sheltered tall forest dominated by Grey Gum (*E. punctata*), Narrow-leaved Ironbark (*E.crebra*) and Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*). Presence of Hillgrove Gum (*E. michaeliana*) or Boxes (*E. hypostomatica/E. moluccana*)
- Tall stands of Forest Oak (*Allocasuarina torulosa*)

❑ *EXAMPLE LOCATIONS*

Widespread across central and northern Yengo NP

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	8483	84
B Medium	1339	13
C High	288	3
Total	**10110**	**100**

❑ *THREATENED PLANT SPECIES*

Melaleuca deanei *(V);* Melaleuca groveana *(V)*

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia parvipinnula	2	56%	2	15%	positive
Adiantum aethiopicum	3	67%	2	18%	positive
Adiantum hispidulum	2	41%	1	8%	positive
Allocasuarina torulosa	3	81%	2	30%	positive
Asperula conferta	1	4%	0	0%	positive
Botrychium australe	1	4%	0	0%	positive
Brachyscome multifida var. multifida	2	4%	0	0%	positive
Breynia oblongifolia	2	93%	1	21%	positive
Bursaria spinosa	2	81%	2	20%	positive
Calandrinia pickeringii	1	4%	0	0%	positive
Cenchrus caliculatus	2	7%	0	0%	positive
Cheilanthes sieberi subsp. sieberi	2	67%	2	26%	positive
Dianella caerulea	2	85%	1	46%	positive
Dichondra repens	2	70%	2	16%	positive
Dodonaea multijuga	3	4%	0	0%	positive
Doodia aspera	2	52%	2	14%	positive
Eucalyptus punctata	2	37%	2	33%	positive
Eustrephus latifolius	2	52%	1	16%	positive
Hibbertia serpyllifolia	1	4%	0	0%	positive
Indigofera australis	2	48%	1	9%	positive
Lomandra longifolia	2	41%	1	31%	positive
Maytenus silvestris	2	74%	1	20%	positive
Oplismenus imbecillis	2	70%	2	17%	positive
Passiflora herbertiana subsp. herbertiana	1	4%	0	0%	positive
Plectranthus parviflorus	2	74%	2	17%	positive
Polyscias sambucifolia	2	48%	1	15%	positive

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Pratia purpurascens	2	81%	2	29%	positive
Ranunculus collinus	2	4%	0	0%	positive
Rapanea variabilis	2	52%	1	18%	positive
Rubus parvifolius	2	37%	2	7%	positive
Scleria mackaviensis	2	4%	0	0%	positive
Sigesbeckia orientalis subsp. orientalis	2	52%	2	7%	positive
Solanum americanum	1	4%	0	0%	positive
Themeda australis	2	37%	2	24%	positive
Vittadinia triloba	2	4%	0	0%	positive

MU15 SYDNEY HINTERLAND SHALE IRONBARK FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Cumberland Shale Sandstone Transition Forest
State: Coastal Valley Grassy Woodlands
PVP Biometric Type: Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin
Number of Sites: 8 Number of identified native species per plot: 39.4

❑ *DESCRIPTION*

A tall open forest is found on residual patches of fertile Wianamatta Shale along the Putty Road and Wheelbarrow Ridge near Colo Heights. Described as Parr's Brush by early settlers, this forest is characterised by tall Ironbarks *Eucalyptus crebra* and *E. paniculata* above a layer of smaller often dense regenerating Turpentine (*Syncarpia glomulifera* subsp. *glomulifera).* Other tree species include Grey Gum (*E. punctata)*, Blackbutt (*E. pilularis)*, Mountain Mahogany (*E. notabilis)* and Smooth-barked Apple (*Angophora costata)*. The dense ground cover of grass species such as *Aristida vagans*, *Panicum simile*, *Themeda australis* and *Entolasia stricta* also distinguish this forest from the surrounding sandstone woodlands. The cover of taller shrub and small trees can be variable, particularly as disturbance from grazing and clearing is widespread on these shale soils. Where present species include *Acacia parramattensis* and *Allocasuarina torulosa.* Lower growing shrubs such as *Bursaria spinosa* and *Persoonia linearis* may also provide a sparse cover

The depth of the shale soil along these higher ridgelines appears variable; particularly as there are small discontinuous sandstone lenses (McInnes 1997). Deeper soils are likely to have been preferentially cleared by early settlers, with fewer vegetation remnants on these soils now remaining. Remnants on shallower soils are more common and tend to exhibit some sandstone influence on the floristic composition of a site. In the regional analyses, sites demonstrated close floristic affinities with similar shale-sandstone influenced forests found along the lower Blue Mountains on the Woodford Range and Warragamba-Oakdale tableland and elsewhere around the western fringe of the Woronora Plateau. The community forms a component of the Shale Sandstone Transition Forest Endangered Ecological Community listed under the NSW Threatened Species Conservation Act, 1995. One sample site, perhaps on deeper soils, suggests similarities with another EEC, Sydney Turpentine Ironbark Forest.

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 21.4 (3.4) metres; 33.6% (6.6) cover

Eucalyptus crebra, Eucalyptus paniculata, Syncarpia glomulifera subsp. *glomulifera, Eucalyptus punctata, Angophora costata, Eucalyptus pilularis, Eucalyptus notabilis, Allocasuarina torulosa*

Shrubs: Mean Height 6.5 (3.4) metres; 13.7% (9.7) cover

Acacia parramattensis, *Bursaria spinosa*

Ground Covers: Mean Height 0.8 (0.4) metres; 42.2% (22.3) cover

Themeda australis, Aristida vagans, Pomax umbellata, Entolasia stricta, Dianella revoluta var. *revoluta, Dianella caerulea, Hardenbergia violacea, Billardiera scandens, Phyllanthus hirtellus, Cheilanthes sieberi* var *sieberi, Lomandra longifolia, Lomandra multiflora* subsp. *multiflora*

❑ *KEY IDENTIFYING FEATURES*

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

- Taller Ironbarks (*E.crebra/E.paniculata*), Grey Gum (*E.punctata*), Mountain Mahogany (*E.notabilis*), Stringybark (*E. eugenioides*) in Colo Heights area
- Often dense cover of smaller trees of regenerating Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*)
- Grassy ground cover
- Shale soils

❑ *EXAMPLE LOCATIONS*

Colo Heights; Wheelbarrow Ridge

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	11	5
B Medium	92	38
C High	140	57
Total	**244**	**100**

❑ *THREATENED PLANT SPECIES*

A component of the Shale Sandstone Transition Forest Endangered Ecological Community listed under the NSW Threatened Species Conservation Act, 1995

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia paradoxa	2	43%	0	0	positive
Acacia parvipinnula	2	57%	2	17%	positive
Allocasuarina torulosa	2	86%	2	32%	positive
Angophora costata	2	57%	3	27%	positive
Anisopogon avenaceus	3	42%	2	13%	positive
Aristida vagans	3	86%	2	12%	positive
Billardiera scandens	2	100%	1	40%	positive
Bursaria spinosa	2	88%	2	22%	positive
Cheilanthes sieberi subsp. sieberi	2	86%	2	27%	positive
Choricarpia leptopetala	3	14%	0	0	positive
Daviesia ulicifolia	2	57%	1	1%	positive
Eragrostis brownii	2	57%	2	10%	positive
Eucalyptus crebra	1	71%	3	19%	uninformative
Eucalyptus notabilis	2	42%	3	1%	positive
Eucalyptus punctata	3	71%	2	32%	positive
Eucalyptus sparsifolia	2	71%	2	26%	positive
Glycine clandestina	2	86%	1	21%	positive
Glycine tabacina	2	43%	2	1%	positive
Gonocarpus tetragynus	2	86%	1	16%	positive
Goodenia hederacea subsp. hederacea	2	43%	2	1%	positive
Hypericum gramineum	2	43%	1	1%	positive
Lagenifera stipitata	2	71%	2	12%	positive
Lissanthe strigosa subsp. subulata	2	14%	0	0	positive
Microlaena stipoides var. stipoides	3	71%	2	28%	positive
Panicum simile	3	57%	1	18%	positive
Pratia purpurascens	2	100%	2	31%	positive
Senecio hispidulus var. hispidulus	1	14%	0	0	positive

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Stackhousia viminea	2	57%	1	6%	positive
Syncarpia glomulifera subsp. glomulifera	3	86%	3	30%	positive
Themeda australis	4	100%	2	24%	positive
Vernonia cinerea	2	71%	1	11%	positive
Entolasia stricta	2	86%	2	70%	constant
Lepidosperma laterale	2	71%	2	42%	constant
Persoonia linearis	2	71%	2	69%	constant
Pomax umbellata	2	43%	2	41%	constant

MU16 SYDNEY HINTERLAND SHELTERED TURPENTINE-BLACKBUTT FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Sheltered Dry Hawkesbury Woodland
State: Sydney Hinterland Dry Sclerophyll Forests
PVP Biometric Type: Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateaux areas of the Sydney Basin
Number of Sites: 12 Number of identified native species per plot: 44.7

❑ *DESCRIPTION*

This dry shrub forest is found on sheltered Hawkesbury and Narrabeen sandstone slopes in the south east of the study area. Turpentine (*Syncarpia glomulifera* subsp. *glomulifera)* and Smooth-barked Apple (*Angophora costata)* are the most regular members of the canopy, though it is the occurrence of Blackbutt (*Eucalyptus pilularis)*, Narrow-leaved Ironbark (*E. crebra)* or Mountain Mahogany (*E. notabilis)* that most easily distinguishes the community. A sparse cover of tall *Allocasuarina torulosa* is always present above an open sclerophyllous shrub layer typical of sheltered sandstone environments. Wattles, peas, tea-trees and geebungs are all common, with *Leptospermum trinervium*, *Persoonia linearis* and *Acacia linifolia* the most frequently recorded species. A sparse cover of ferns such as *Pteridium esculentum,* and grasses including *Entolasia stricta* and *Themeda australis* are found amongst low growing herbs *Phyllanthus hirtellus* and *Pomax umbellata.*

The overall floristic composition of this forest is closely related to sheltered forests found on Hawkesbury sandstone (MU17 and MU18). However the presence of the desirable timber species *E. pilularis* and the occurrence of grasses *Themeda australis* and *Imperata cylindrica* var *major* are clues to subtle changes in the environment. These subtle changes are not described by available soils mapping (McInnes 1997) and do not appear to relate to climatic or topographic changes. We surmise that the soils where this community occurs are influenced by the down slope movement of shale derived material from shale caps above or by shale bands in the sandstone that are exposed on the slope. Within the study area the distribution is closely tied to the Wheelbarrow Ridge area in Parr SCA where residual shale caps are present along the ridge. Given the value of the timber it is not surprising that a proportion of this forest in the study area remains in Comleroy State Forest. Similar Sydney hinterland sandstone *E. pilularis* forests are found in MacPherson SF, Erskine Range in the lower Blue Mountains as well as the Georges River and the Hornsby Plateau. These forests form part of the Sydney Hinterland Dry Sclerophyll Forests of Keith (2004). Within the study area there are good examples found within Parr SCA and it is considered to be adequately reserved in the region.

❑ *FLORISTIC SUMMARY*

Trees: **Mean Height 26.6 (5.2) metres; 35% (5.5) cover**

Eucalyptus pilularis, Angophora costata, Syncarpia glomulifera subsp. *glomulifera, Corymbia gummifera, Eucalyptus punctata, Eucalyptus piperita, E. crebra, E. notabilis*

Small Trees: **Mean Height 14 (4.2) metres; 12.2% (5.1) cover**

Allocasuarina torulosa, Xylomeleum pyriforme, Cerapetalum gummiferum

Shrubs: **Height 3.3 (1.6) metres; 25.3% (18.5) cover**

Persoonia levis, Gompholobium latifolium, Acacia linifolia, Persoonia linearis, Monotoca scoparia, Acacia linifolia, Leptospermum trinervium, Podolobim illicifolium,

Ground Covers: Mean Height 0.64 (0.3) metres; 24.6% (23.1) cover

Phyllanthus hirtellus, Pteridium esculentum, Lomandra longifolia, Dianella caerulea, Lomatia silaifolia, Platysace linearifolia, Gonocarpus teucrioides, Entolasia stricta, Themeda australis, Imperata cylindrica var. *major*

Vines & Climbers: no structural data available

Hardenbergia violacae, Billardiera scandens

❑ *KEY IDENTIFYING FEATURES*

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

- Presence of Blackbutt (*E.pilularis*) with Smooth-barked Apple (*A. costata*) and Turpentine *(Syncarpia glomulifera* subsp. *glomulifera*) on Hawkesbury and Narrabeen Sandstone
- Forest Oak (*Allocasurina torulosa*)
- Diverse range of sclerophyllous shrubs from Wattles (*Acacia* spp.), Geebungs (*Persoonia* spp.) and Tea-Tree (*Leptospermum* spp.).
- Generally has a cover of Bracken Fern (*Pteridium esculentum*) on the forest floor

❑ *EXAMPLE LOCATIONS*

Sheltered slopes off Wheelbarrow Ridge Rd; South arm track Parr SCA; Butlers crossing Parr SCA; Comleroy SF

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	706	59
B Medium	318	26
C High	179	15
Total	**1204**	100

❑ *THREATENED PLANT SPECIES*

Zieria involucrata (E1)

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia linifolia	2	77%	2	23%	positive
Acacia ulicifolia	2	62%	1	20%	positive
Allocasuarina torulosa	3	92%	2	31%	positive
Angophora bakeri	2	54%	3	22%	positive
Angophora costata	2	38%	2	27%	positive
Anisopogon avenaceus	2	38%	2	13%	positive
Billardiera scandens	2	85%	1	40%	positive
Blandfordia nobilis	1	8%	0	0%	positive
Bossiaea obcordata	2	54%	2	7%	positive
Brachyscome angustifolia var. angustifolia	1	8%	0	0%	positive
Callistemon pinifolius	1	8%	0	0%	positive
Dianella caerulea	2	62%	1	48%	positive
Dillwynia juniperina	1	8%	0	0%	positive
Dodonaea triquetra	3	38%	2	17%	positive
Eucalyptus pilularis	4	77%	4	2%	positive
Imperata cylindrica var. major	2	46%	2	17%	positive
Lasiopetalum parviflorum	1	15%	0	0%	positive
Lepidosperma laterale	2	85%	1	41%	positive
Leucopogon biflorus	1	8%	0	0%	positive
Lomandra obliqua	2	38%	2	34%	positive
Lomatia silaifolia	2	38%	1	23%	positive

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Microlaena stipoides var. stipoides	2	38%	2	29%	positive
Muellerina celastroides	1	8%	0	0%	positive
Nematolepis squamea subsp. squamea	2	8%	0	0%	positive
Notothixos subaureus	1	8%	0	0%	positive
Platycerium bifurcatum	1	8%	0	0%	positive
Pteridium esculentum	3	69%	2	30%	positive
Syncarpia glomulifera subsp. glomulifera	3	85%	3	30%	positive
Themeda australis	2	46%	2	25%	positive
Xanthorrhoea arborea	2	54%	2	2%	positive
Pomax umbellata	1	23%	2	41%	negative
Entolasia stricta	2	100%	2	69%	constant
Persoonia linearis	2	100%	2	69%	constant
Phyllanthus hirtellus	2	92%	2	45%	constant
Podolobium ilicifolium	2	46%	2	36%	constant

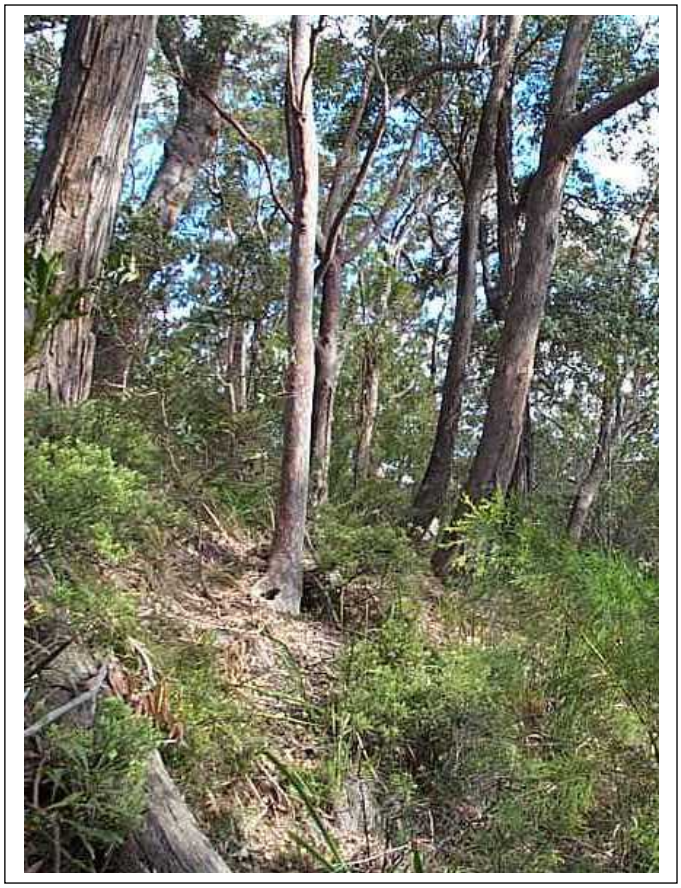
MU17 SYDNEY HINTERLAND PEPPERMINT-APPLE FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Sheltered Dry Hawkesbury Woodland
State: Sydney Hinterland Dry Sclerophyll Forests
PVP Biometric Type: Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest in sandstone gullies of western Sydney, Sydney Basin
Number of Sites: 18 Number of identified native species per plot: 45.2

❑ *DESCRIPTION*

This sheltered dry shrub forest is one of the most extensive and widespread vegetation communities of the study area. It is a forest of moderate height (c. 22 metres) and is characterised by Smooth-barked Apple (*Angophora costata*), Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*), Sydney Peppermint (*Eucalyptus piperita*) and Red Bloodwood (*Corymbia gummifera*). The understorey is generally shrubby with *Persoonia linearis, Persoonia levis*, *Gompholobium latifolium*, *Acacia linifolia*, *Leptospermum trinervium* and *Banksia spinulosa* var. *collina* common species. Sites with greater shelter may include sparse stands of *Allocasuarina torulosa*. The ground cover includes *Pteridium esculentum*, *Dianella caerulea*, *Lomatia silaifolia*, and *Platysace linearifolia*.



This forest is particularly common in central and southern Yengo NP where the thick Hawkesbury sandstone bedrock dominates the landscape. It is a feature of most mid to upper slope situations in these areas, particularly on sheltered to semi sheltered aspects. Sandstone outcropping and benches occupy a dominant proportion of the ground layer.

The community is widespread throughout the Sydney hinterland where it is adequately conserved within the existing reserve system.

❑ *FLORISTIC SUMMARY*

Trees: **Mean Height 19.5 (4) metres; 32.5%(10.3) cover**

Angophora costata, Syncarpia glomulifera, Eucalyptus piperita, Corymbia gummifera, Eucalyptus punctata, Angophora bakeri, Eucalyptus agglomerata

Small Trees: **Mean Height 4.5 (1.2) metres; 21.25%(29) cover**

Allocasuarina torulosa, Xylomelum pyriforme, Cerapetalum gummiferum

Shrubs: **Mean Height 2.1(0.36) metres; 35% (22) cover**

Persoonia levis, Gompholobium latifolium, Acacia linifolia, Persoonia linearis, Monotoca scoparia, Banksia spinulosa var. *collina, Acacia linifolia, Leptospermum trinervium, Podolobim illicifolium, Acacia terminalis*

Ground Covers: Mean Height 0.82 (0.2) metres; 40% (38) cover

Pteridium esculentum, Dianella caerulea, Lomatia silaifolia, Platysace linearifolia, Gonocarpus teucrioides, Entolasia marginata

Vines & Climbers: no structural data available

Hardenbergia violacae, Billardiera scandens, Smilax glyciphylla

❑ *KEY IDENTIFYING FEATURES*

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

- Sheltered to semi sheltered Hawkesbury Sandstone slopes
- Taller forest of Smooth-barked Apple (*A. costata*), Peppermint (*E. piperita*) and Turpentine *(Syncarpia glomulifera* subsp. *glomulifera*) and sometimes Forest Oak (*Allocasurina torulosa*).
- Diverse range of sclerophyllous shrubs including Wattles (*Acacia* spp.), Geebungs (*Persoonia* spp.) and Tea-Tree (*Leptospermum* spp.).

❑ *EXAMPLE LOCATIONS*

Throughout Southern Yengo and Parr reserves

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	29719	75
B Medium	9157	23
C High	595	2
Total	**39472**	**100**

❑ *THREATENED PLANT SPECIES*

Lasiopetalum joyeace (V); Melaleuca deanei (V); Olearia cordata (V); Persoonia hirsuta (E1); Tetratheca glandulosa (V); Zieria involucrata (E1)

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia linifolia	2	56%	2	23%	positive
Acacia obliquinervia	2	4%	0	0%	positive
Acacia terminalis	2	52%	1	7%	positive
Acacia ulicifolia	2	41%	1	20%	positive
Allocasuarina torulosa	2	48%	2	32%	positive
Angophora costata	3	81%	2	24%	positive
Anisopogon avenaceus	2	37%	2	13%	positive
Atkinsonia ligustrina	1	4%	0	0%	positive
Banksia spinulosa	2	59%	2	17%	positive
Bossiaea heterophylla	2	52%	2	16%	positive
Ceratopetalum gummiferum	2	63%	1	7%	positive
Conospermum longifolium	2	52%	2	15%	positive
Corymbia gummifera	3	74%	2	18%	positive
Epacris microphylla var. microphylla	2	4%	0	0%	positive
Eucalyptus piperita	3	67%	2	9%	positive
Gompholobium latifolium	2	74%	2	13%	positive
Gonocarpus teucrioides	2	52%	2	16%	positive
Leptospermum trinervium	2	81%	2	29%	positive
Lindsaea microphylla	2	41%	1	9%	positive
Lomandra glauca	2	41%	2	30%	positive
Lomandra obliqua	2	59%	2	33%	positive
Lomatia silaifolia	2	89%	1	20%	positive
Pimelea linifolia	2	70%	2	23%	positive
Platysace linearifolia	2	81%	2	23%	positive
Pteridium esculentum	2	70%	2	28%	positive

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Smilax glyciphylla	2	44%	1	9%	positive
Stylidium graminifolium	2	48%	2	5%	positive
Syncarpia glomulifera subsp. glomulifera	3	63%	3	29%	positive
Xanthosia pilosa	2	37%	1	4%	positive
Xylomelum pyriforme	2	78%	1	15%	positive
Entolasia stricta	2	93%	2	69%	constant
Lepidosperma laterale	2	52%	2	42%	constant
Persoonia linearis	2	70%	2	69%	constant
Phyllanthus hirtellus	2	74%	2	45%	constant
Podolobium ilicifolium	2	41%	2	36%	constant

MU18 SYDNEY HINTERLAND SHELTERED TURPENTINE-APPLE FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Sheltered Dry Hawkesbury Woodland
State: Sydney Hinterland Dry Sclerophyll Forests
PVP Biometric Type: Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateaux areas of the Sydney Basin
Number of Sites: 18 Number of identified native species per plot: 44.7

❑ *DESCRIPTION*

A tall forest to 30 metres in height, found on south and east facing lower slopes and gullies of the Hawkesbury Sandstone stratum. Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*) was recorded in the canopy at most sites with Smooth-barked Apple (*Angophora costata)*, Blue-leaved Stringybark (*Eucalyptus agglomerata)* and Sydney Peppermint (*Eucalyptus piperita)* occuring less frequently. A smaller tree layer provides a low to moderate cover with *Allocasuarina torulosa, Backhousia mytifolia* and *Elaeocarpus reticularis* most prevalent. A moderately dense and diverse shrub layer comprises *Persoonia linearis, Dodonea triquetra*, *Pultenaea flexilis* and *Podolbium ilicifolium.* The ground layer is a mixed cover of outcropping and surface sandstone rocks, dense leaf litter from the *Allocasuarina* needles and patches of grasses, ferns, twiners and lillies. *Entolasia stricta*, *Lepidosperma laterale, Lindsaea microphylla, Billardiera scandens* and *Dianella caerulea* are common.

This forests grades into Map Unit 17 as shelter decreases, particularly as position changes from lower to upper slope. Also characteristic of this forest is the greater diversity, frequency and cover of mesic species found amongst the shrub and small tree layers compared to more exposed Hawkesbury Sandstone vegetation. *Backhousia myrtifolia*, *Rapanea variabilis*, *Polyscias sambucifolia, Pandorea pandorana* are examples of such species.

This community is common across the dissected Hawkesbury Sandstone plateaux along the coast and hinterland of the Sydney Basin. It is prominent across the southern and eastern areas of Yengo and Parr reserves. It forms a component of the Sydney Hinterland Dry Sclerophyll Forests (Keith 2004) and is considered adequately conserved.

❑ *FLORISTIC SUMMARY*

Trees: **Mean Height 26.2 (5.8) metres; 36.2% (5) cover**

Syncarpia glomulifera subsp. *glomulifera, Angophora costata, Eucalyptus agglomerata, Eucalyptus piperita, Corymbia gummifera, Eucalyptus punctata, Angophora bakeri*

Small Trees: **Mean Height 15 (2.1) metres; 15% (8) cover**

Allocasuarina torulosa, Elaeocarpus reticularis, Backhousia myrtifolia, Rapanea variabilis, Cerapetalum gummiferum, Polyscias sambucifolia

Shrubs: **Mean Height 3.3 (1.1) metres; 25.3% (6) cover**

Persoonia linearis, Dodnea triquetra, Podolobim illicifolium, Acacia ulicifolia, Pultanaea flexilis

Ground Covers: Mean Height 0.64 (0.2) metres; 24.6% (6) cover

Dianella caerulea, Lomandra longifolia, Lepidosperma laterale, Platysace lanceolata, Gonocarpus teucrioides, Entolasia stricta, Linsaea microphylla, Pteridium esculentum

Vines & Climbers: no structural data available

Pandorea pandorana, Smilax australis, Hardenbergia violacae, Billardiera scandens, Smilax glyciphylla

❑ *KEY IDENTIFYING FEATURES*

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

- Mid-lower slopes and gullies on south facing aspects on Hawkesbury Sandstone
- Tall forest of Turpentine *(Syncarpia glomulifera* subsp. *glomulifera*) Smooth-barked Apple (*A. costata*), Sydney Peppermint (*E. piperita*)
- Forest Oak (*Allocasurina torulosa*) present in the small tree layer
- Mesic species such as Grey Myrtle (*Backhousia myrtifolia*) and Blueberry Ash (*Elaeocarpus reticularis*) in the shrub or small tree layer

❑ *EXAMPLE LOCATIONS*

Widespread across southern and eastern Yengo NP and Parr SCA

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	8387	71
B Medium	3244	27
C High	238	2
Total	**11869**	**100**

❑ *THREATENED PLANT SPECIES*

Olearia cordata (V); Tetratheca glandulosa (V); Zieria involucrata (E1)

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia linifolia	2	47%	2	24%	positive
Acacia schinoides	1	5%	0	0%	positive
Allocasuarina torulosa	3	100%	2	30%	positive
Angophora costata	3	79%	2	25%	positive
Billardiera scandens	2	74%	1	40%	positive
Calochlaena dubia	3	37%	2	6%	positive
Dianella caerulea	2	100%	1	46%	positive
Dodonaea triquetra	3	74%	2	15%	positive
Eucalyptus piperita	3	53%	3	10%	positive
Goodenia heterophylla	2	53%	1	22%	positive
Goodia lotifolia	1	5%	0	0%	positive
Hypericum gramineum	2	42%	1	5%	positive
Imperata cylindrica var. major	2	42%	2	16%	positive
Lepidosperma urophorum	1	5%	0	0%	positive
Lobelia gibbosa	2	5%	0	0%	positive
Lomatia silaifolia	2	63%	1	22%	positive
Pandorea pandorana	2	58%	1	22%	positive
Patersonia glabrata	2	37%	2	9%	positive
Platysace lanceolata	2	47%	2	13%	positive
Poa affinis	2	42%	2	10%	positive
Prostanthera rotundifolia	1	5%	0	0%	positive
Pteridium esculentum	2	63%	2	29%	positive
Syncarpia glomulifera subsp. glomulifera	3	95%	2	29%	positive

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Xanthorrhoea macronema	2	5%	0	0%	positive
Entolasia stricta	2	79%	2	70%	constant
Lepidosperma laterale	2	58%	2	42%	constant
Persoonia linearis	2	95%	2	68%	constant
Phyllanthus hirtellus	2	68%	2	46%	constant
Pomax umbellata	2	47%	2	40%	constant

MU19 HUNTER ESCARPMENT SHELTERED IRONBARK FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: n/a
State: Sydney Hinterland Dry Sclerophyll Forest
PVP Biometric Type: Not Described
Number of Sites: 10 Number of identified native species per plot: 29.5

❑ *DESCRIPTION*

Sheltered narrabeen sandstones found in the low rainfall environments of the Hunter Escarpment and plateau support a dry open forest with a cover of a prostrate form of Grey Myrtle (*Backhousia myrtifolia*) in the understorey. This moderately tall forest (c.12-20 metres) is dominated by Grey Gum (*Eucalyptus punctata*), Stringybark (*E. sparsifolia*) and Broad-leaved Ironbark (*E. fibrosa*). The prominence of the low growing Grey Myrtle is variable, but nonetheless it contrasts the range of dry sclerophyll shrub species such as *Persoonia linearis, Leucopogon muticus* and *Pultanaea scabra.* The forest floor is rocky and supports only a sparse cover of hardy grasses (*Entolasia stricta*), forbs (*Dianella caerulea*) and herbs (*Pratia purpurascens*).

Most gullies of the escarpment perimeter are north or west facing and this contributes to the limited development of a diverse mesic shrub layer. The composition of the forest is closely aligned to other sheltered escarpment forests that extend west across northern Wollemi NP and north into Manobalai Nature Reserve. The rugged topography and infertile soil have resulted in only limited areas being depleted by clearing, with the majority of the forest located within the current reserve system.

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 15 (7) metres; 22.5% cover

Eucalyptus punctata, E. sparsifolia, E. fibrosa, E. moluccana, E.crebra, Angophora costata

Small Trees: Mean Height 2.3(6) metres; 30.1% (20) cover

Backhousia myrtifolia, Acacia bulgaensis, A. binervia

Shrubs: Mean Height 0.5-2 (2) metres; 20% (1.4) cover

Persoonia linearis, Bursaria spinosa, Leucopogon muticus, Correa reflexa var. *reflexa, Podolobium ilicifolium, Cassinia cunninghamii, Grevillea mucronulata*

Ground Covers: Mean Height 0.89 (0.35) metres; 20.2 (17.6) cover

Entolasia stricta, Cheilanthes sieberi subsp. *sieberi, Lepidosperma laterale, Pratia pubscens, Poa affinis,*

Vines & Climbers: no structural data available

Cassytha pubescens, Billardiera scandens, Pandorea pandorana

❑ *KEY IDENTIFYING FEATURES*

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

- Narrabeen Sandstone sheltered slopes and gullies in the Hunter Escarpment area
- Dense shrub or small tree layer of Grey Myrtle (*Backhousia myrtifolia)*
- Grey Gum (*E.punctata*), Stringybark (*E. sparsifolia*) and Ironbarks (*E. fibrosa/E.crebra*).
- Blue-leaved Wattles (*Acacia binervia/A. bulgaensis*).

❑ *EXAMPLE LOCATIONS*

Northern end of the old Bulga Road on lower escarpment slopes

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	405	87
B Medium	62	13
C High	0	0
Total	**486**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia bulgaensis	3	40%	2	2%	positive
Austrostipa rudis subsp. rudis	1	10%	0	0%	positive
Austrostipa setacea	1	10%	0	0%	positive
Backhousia myrtifolia	3	70%	3	21%	positive
Bursaria spinosa	2	60%	2	23%	positive
Cheilanthes sieberi subsp. sieberi	2	80%	2	27%	positive
Choretrum species A	2	50%	1	3%	positive
Dianella caerulea	2	40%	1	48%	positive
Eucalyptus fibrosa	3	90%	3	7%	positive
Eucalyptus fracta	4	10%	0	0%	positive
Eucalyptus punctata	3	70%	2	32%	positive
Eucalyptus sparsifolia	2	70%	2	27%	positive
Grevillea montana	2	40%	1	1%	positive
Lasiopetalum ferrugineum var. cordatum	2	10%	0	0%	positive
Parsonsia lanceolata	1	10%	0	0%	positive
Pultenaea microphylla	3	50%	2	4%	positive
Wikstroemia indica	1	10%	0	0%	positive
Lomandra obliqua	0	0%	2	35%	negative
Phyllanthus hirtellus	2	10%	2	47%	negative
Pomax umbellata	2	30%	2	41%	negative
Entolasia stricta	2	100%	2	70%	constant
Lepidosperma laterale	2	70%	2	42%	constant
Persoonia linearis	2	90%	2	69%	constant

MU20 HUNTER RANGE IRONBARK FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Macdonald Exposed Ironbark Woodland
State: Sydney Hinterland Dry Sclerophyll Forests
PVP Biometric Type: Yellow Bloodwood - Ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin
Number of Sites: 25 Number of identified native species per plot: 39.8

❑ *DESCRIPTION*

The Narrabeen Group geology exposed throughout central and northern Yengo NP contains interbanding quartz sandstone and thin layers of shale. The combination of these coarse and fine grain sediments produce an enriched soil. These more fertile soils are revealed on gentle slopes, ridges and benches that lie beneath the harder residual sandstones found on primary ridgelines. A dry open shrub and grass forest is found on these slightly enriched soils and is characterised by one or more Ironbark species *Eucalyptus crebra*, *Eucalyptus fibrosa, E. fergusonii* subsp. *dorsiventralis* or *E. beyeriana*. Other tree species, such as Yellow Bloodwood (*Corymbia eximia*), Smoothbarked Apple (*Angophora costata*) and Grey Gum (*E. punctata*) are less frequently recorded. Sparse stands of Forest Oak (*Allocasurina torulosa*) may be included in the lower canopy. A moderate cover of sclerophyllous shrubs are found above a number of grasses more commonly associated with clay soils. The shrub layer comprises a number of species mostly found in this community such as *Pultanea scabra* and *Acacia parvipinnula* with the widely occurring *Persoonia linearis, Podolbium ilicifolium, Exocarpus strictus* and *Bursaria spinosa.* Ground cover may include grasses such as *Entolasia stricta*, *Themeda australis* and *Aristida vagans*. Low growing forbs such as *Dianella caerulea*, *Pomax umbellata and Lomandra* spp. are also present.

As with other shale/sandstone transition forests in the Sydney Basin Bioregion, Hunter Range Ironbark Forest can be variable as a result of the degree of sandstone or shale influence in the soil. This can produce a forest of either a shrubby or grassy appearance. Timber harvesting targeted better stands of this forest prior to the dedication of the reserve (Sanders *et al.,* 1988). While past evidence of disturbance is present within Yengo NP, continued threats have abated and extensive areas are now protected within the reserve system. The community forms part of the Sydney Hinterland Dry Sclerophyll Forests of Keith (2004)

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 26 (4.4) metres; 36% (9.4) cover

Eucalyptus crebra, Angophora costata, Eucalyptus fibrosa, Corymbia eximia, Eucalyptus punctata, Syncarpia glomulifera subsp. *glomulifera, Eucalyptus fergusonii* subsp. *dorsiventralis*

Small Trees: Mean Height 5.5 (2.8) metres; 8% (3.5) cover

Allocasuarina torulosa, Angophora floribunda

Shrubs: Mean Height 1.9 (1.2) metres; 26% (14.8) cover

Podolobium ilicifolium, Pultenaea scabra, Persoonia linearis, Acacia parvipinnula, Bursaria spinosa

Ground Covers: Mean Height 0.58 (0.5) metres; 14.2% (8.2) cover

Themeda australis, Aristida vagans, Pomax umbellata, Entolasia stricta, Dianella revoluta var. *revoluta, Dianella caerulea, Hardenbergia violacea, Billardiera scandens, Phyllanthus hirtellus, Cheilanthes sieberi* var *sieberi, Lomandra longifolia, Lomandra multiflora* subsp. *multiflora*

❑ *KEY IDENTIFYING FEATURES*

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

- Taller dry sclerophyll forest dominated by Ironbarks (*E.crebra/E.fibrosa*).
- Mix of grass and shrub species. Presence of *Pultanea scabra* and *Acacia parvipinnula*
- Shale influenced soils on sandstone benches

❑ *EXAMPLE LOCATIONS*

Widespread.

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	33176	82
B Medium	4775	12
C High	2295	6
Total	**40247**	**100**

❑ *THREATENED PLANT SPECIES*

Melaleuca groveana (V); *Velleia perfoliata* (V);

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia falciformis	1	2%	0	0%	positive
Acacia parvipinnula	2	58%	2	13%	positive
Allocasuarina torulosa	2	44%	2	32%	positive
Aristida vagans	2	40%	2	10%	positive
Bursaria spinosa	2	46%	2	21%	positive
Cheilanthes sieberi subsp. sieberi	2	71%	2	23%	positive
Crassula colorata var. acuminata	1	2%	0	0%	positive
Dianella caerulea	2	63%	1	46%	positive
Dianella revoluta var. revoluta	2	65%	1	26%	positive
Digitaria brownii	1	2%	0	0%	positive
Eucalyptus crebra	3	67%	2	14%	positive
Eucalyptus fibrosa	3	42%	3	5%	positive
Eucalyptus punctata	2	40%	2	32%	positive
Exocarpos strictus	2	50%	1	19%	positive
Fimbristylis dichotoma	2	4%	0	0%	positive
Grevillea mucronulata	2	42%	2	23%	positive
Lepidosperma laterale	2	63%	1	40%	positive
Lomandra longifolia	2	35%	1	31%	positive
Panicum simile	2	48%	1	15%	positive
Paspalidium gracile	2	4%	0	0%	positive
Platysace ericoides	2	35%	2	17%	positive
Plectranthus parviflorus	2	38%	2	19%	positive
Podolobium ilicifolium	3	69%	2	32%	positive
Pomaderris velutina	2	2%	0	0%	positive
Pratia purpurascens	2	46%	2	31%	positive
Pultenaea scabra	3	40%	2	11%	positive
Rulingia dasyphylla	2	2%	0	0%	positive
Senecio velleioides	1	2%	0	0%	positive

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Sida trichopoda	1	2%	0	0%	positive
Themeda australis	2	42%	2	23%	positive
Entolasia stricta	2	73%	2	70%	constant
Persoonia linearis	2	96%	2	66%	constant
Phyllanthus hirtellus	2	58%	2	45%	constant
Pomax umbellata	2	85%	2	35%	constant

MU21 SYDNEY HINTERLAND BLOODWOOD-MAHOGANY TRANSITION FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Sydney Hinterland Transition Woodland
State: Sydney Hinterland Dry Sclerophyll Forests
PVP Biometric Type: Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin
Number of Sites: 25 Number of identified native species per plot: 39.8

❑ *DESCRIPTION*

The undulating ridges and crests around Colo Heights and Putty Road are typical examples of sandstone soils that have some shale influence sourced from the interbanding and residual shale layers within the Hawkesbury and Mittagong formations. These soils support a forest that is slightly taller and grassier than the surrounding sandstone woodlands found on skeletal and rocky substrates. The most commonly recorded tree species are Red Bloodwood (*Corymbia gummifera)* and Smooth-barked Apple (*Angophora costata)* often with a sparse cover of Mountain Mahogany (*Eucalyptus notabilis*). The understorey features a high number of sclerophyllous shrub species typical of sandstone ridge tops. These include *Banksia spinulosa* var. *collina*, *Leptospermum trinervium*, *Acacia linifolia*, *Persoonia levis*, *P. linearis* and *Bossiaea obcordata.* The ground cover however expresses shale influence in the soil through a high grass component with *Entolasia stricta, Austrostipa pubescens* and *Themeda australis* the most common. A variety of sedges and forbs are also present.

This forest is common across the lower Blue Mountains between the Burragorang Tableland and Colo Heights. It forms a component of the Sydney Hinterland Transition Woodlands of Tozer *et al*. (2006), a community that encircles the Cumberland Plain near the interface of shale and sandstone geologies. These authors suggest that about one-third of the original distribution has been cleared, though around a third of the original area is situated within reserves. A high proportion of the community found within the study area has been disturbed. It is likely this map unit meets the definition of Shale/Sandstone Transition Forest, an Endangered Ecological Community listed under the *NSW Threatened Species Conservation Act (1995)*.

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 20.4 (1.5) metres 30% (8.0) cover

Corymbia gummifera, Eucalyptus notabilis, Angophora costata, Eucalyptus sparsifolia, Corymbia eximia, Eucalyptus punctata

Small Trees: Mean Height 9 (5.2) metres; 13% (9.2) cover

Syncarpia glomulifera subsp*. glomulifera, Allocasuarina torulosa*, *Angophora bakeri*

Shrubs: Mean Height 2.1 (1.1) metres; 23% (20.1) Cover

Persoonia linearis, Acacia linifolia, Acacia ulicifolia, Banksia spinulosa var. *collina, Hovea linearis, Leptospermum trinervium, Pimelea linifolia* subsp*. linifolia, Phyllanthus hirtellus, Lissanthe strigosa, Grevillea mucronulata, Bossiaea obcordata*

Ground covers: Mean Height 0.47 (0.22) metres; 33% (20.2) Cover

Lepidosperma laterale, Entolasia stricta, *Austrostipa pubescens*, *Themeda australis*, *Lomandra multiflora* subsp. *multiflora, Lomandra obliqua, Pomax umbellata, Panicum simile, Cheilanthes sieberi* subsp. *sieberi, Pratia purpurascens, Echinopogon caespitosus* var. *caespitosus, Themeda australis*, *Austrostipa pubescens*, *Glycine clandestina, Billardiera scandens*

❑ *KEY IDENTIFYING FEATURES*

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

- The canopy is dominated by Red Bloodwood (*Corymbia gummifera*), Stringybarks (*E. sparsifolia*) and Mountain Mahogany (*E. notabilis*)
- Small tree layer of Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*) and Forest Oak (*Allocasuarina torulosa*)
- Diverse shrub layer of hard leaved and spiky species such as Wattles, Tea-trees and Banksias
- The ground cover includes a diverse cover of grasses

❑ *EXAMPLE LOCATIONS*

Colo Heights; Wheelbarrow Ridge

❑ *CONDITION ASSESSMENT*

Forms a component of the Shale/Sandstone Transition Forest, an Endangered Ecological Community listed under the *NSW TSC Act (1995)*.

CONDITION ASSESSMENT

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	75	8
B Medium	262	28
C High	600	64
Total	**938**	**100**

❑ *THREATENED PLANT SPECIES*

Melaleuca deanei (V); *Tetratheca glandulosa (V);*

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia myrtifolia	2	43%	1	5%	positive
Angophora bakeri	2	43%	3	22%	positive
Angophora costata	3	71%	2	27%	positive
Anisopogon avenaceus	3	57%	2	13%	positive
Aristida vagans	3	43%	2	13%	positive
Bossiaea obcordata	2	57%	2	8%	positive
Brunoniella australis	2	57%	1	5%	positive
Corymbia gummifera	3	100%	2	20%	positive
Dampiera stricta	2	43%	2	22%	positive
Eucalyptus notabilis	3	43%	2	1%	positive
Eucalyptus punctata	2	57%	2	33%	positive
Eucalyptus sparsifolia	3	100%	2	26%	positive
Gompholobium latifolium	2	43%	2	16%	positive
Goodenia hederacea subsp. hederacea	2	57%	2	6%	positive
Grevillea mucronulata	2	43%	2	24%	positive
Hovea linearis	2	43%	1	29%	positive
Joycea pallida	2	43%	2	3%	positive

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Leptospermum trinervium	2	57%	2	32%	positive
Lomandra confertifolia subsp. pallida	2	57%	2	12%	positive
Lomandra cylindrica	2	100%	2	15%	positive
Lomandra filiformis subsp. coriacea	2	43%	1	13%	positive
Lomandra multiflora subsp. multiflora	2	57%	1	17%	positive
Lomandra obliqua	2	71%	2	34%	positive
Panicum simile	3	43%	1	18%	positive
Pimelea linifolia	2	43%	2	25%	positive
Pultenaea scabra	2	100%	2	12%	positive
Themeda australis	2	71%	2	24%	positive
Xanthorrhoea resinifera	2	71%	2	4%	positive
Entolasia stricta	3	100%	2	70%	constant
Lepidosperma laterale	2	57%	2	42%	constant
Persoonia linearis	2	100%	2	69%	constant
Phyllanthus hirtellus	2	71%	2	46%	constant
Pomax umbellata	2	57%	2	40%	constant

MU22 SYDNEY HINTERLAND EXPOSED RED BLOODWOOD-STRINGYBARK FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Exposed Yellow Bloodwood Woodland
State: Sydney Hinterland Dry Sclerophyll Forests
PVP Biometric Type: Yellow Bloodwood - Narrow-leaved Apple heathy woodland on hinterland plateaux of the Central Coast, Sydney Basin
Number of Sites: 15 Number of identified native species per plot: 51

❑ *DESCRIPTION*

One of several communities associated with exposed Hawkesbury sandstone environments, this map unit describes a taller forest situated on deeper, less rocky soils. It is dominated by Red Bloodwood (*Corymbia gummifera*) and Stringybark (*E.sparsifolia*) with lower growing Yellow Bloodwood (*C. eximia),* Turpentine *(Syncarpia glomulifera* subsp. *glomulifera)* and Narrow-leaved Apple (*A. bakeri*) less frequent. The open shrub layer comprises *Leptospermum trinervium*, *Banksia spinulosa* var. *collina* and *Monotoca scoparia.* The ground cover is an array of forbs and grasses such as *Lomandra* spp., *Cyathochaeta diandra* and *Entolasia stricta.*

There is considerable overlap in the floristic composition of this map unit and MU30. MU30 is a more open woodland of lower height situated amongst rocky outcrops with skeletal soil. They are likely to integrade with one another as ridges become narrower or broader. This patterning is evident across southern Yengo NP particularly around the Wallaby Swamp Fire Trail and Woomerah Range Track.

This forest forms part of the Sydney Hinterland Dry Sclerophyll Forests of Keith (2004). Large areas of this community are present in the Yengo and Parr reserves as well as in the eastern area of Wollemi National Park.

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 14.5 (1) metres; 31% (12.4) cover

Corymbia gummifera, Eucalyptus sparsifolia, Eucalyptus punctata, Angophora costata, Corymbia eximia, Eucalyptus piperita

Shrubs: Mean Height 3.2 (1.2) metres; 23.2% (11) cover

Leptospermum trinervium, Persoonia linearis, Hovea linearis, Monotoca scoparia, Persoonia levis, Acacia ulicifolia, Pimelia linifolia subsp. *linifolia, Grevillea buxifolia* subsp. *buxifolia, Lambertia formosa, Acacia suaveloens, Acacia linifolia, Xylomelum pyriforme*

Ground Covers: Mean Height 0.75 (0.27) metres; 50% (10) cover

Entolasia stricta, Cyathochaeta diandra, Lomandra filiformis subsp. *coriacae, Pomax umbellata, Patersonia sericea, Lomandra obliqua, Lomandra glauca, Pomax umbellata, Dianella revoluta* var. *revoluta, Lomatia silaifolia, Dampiera stricta*

❑ *KEY IDENTIFYING FEATURES*

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

- Exposed woodlands on broad Hawkesbury sandstone ridges
- Low outcropping rock
- Dominance of Red Bloodwood (*Corymbia gummifera*)

❑ *EXAMPLE LOCATIONS*

Woomerah Range Fire Trail

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	11660	62
B Medium	6398	34
C High	6145	3
Total	**18671**	**100**

❑ *THREATENED PLANT SPECIES*

Lasiopetalum joyeace (V); Melaleuca deanei (V); Olearia cordata (V); Persoonia hirsuta (E1); Tetratheca glandulosa (V); Zieria involucrata (E1)

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia linifolia	2	60%	2	23%	positive
Acacia ulicifolia	2	65%	1	20%	positive
Angophora bakeri	3	35%	3	22%	positive
Angophora costata	2	65%	3	26%	positive
Anisopogon avenaceus	2	65%	2	12%	positive
Austrostipa pubescens	2	35%	1	1%	positive
Banksia spinulosa	2	70%	2	17%	positive
Bossiaea heterophylla	2	95%	2	15%	positive
Caustis flexuosa	2	80%	2	16%	positive
Conospermum longifolium	2	70%	2	14%	positive
Corymbia gummifera	3	100%	2	17%	positive
Cyathochaeta diandra	2	40%	2	7%	positive
Dampiera purpurea	1	5%	0	0%	positive
Dampiera stricta	2	80%	2	19%	positive
Dillwynia floribunda	2	50%	0	0%	positive
Dillwynia retorta	2	35%	3	5%	positive
Eucalyptus punctata	2	35%	2	33%	positive
Eucalyptus sparsifolia	3	65%	2	26%	positive
Goodenia heterophylla	2	75%	1	20%	positive
Haemodorum planifolium	2	35%	1	4%	positive
Hardenbergia violacea	2	50%	1	31%	positive
Hibbertia obtusifolia	2	45%	2	19%	positive
Hovea linearis	2	90%	1	26%	positive
Lambertia formosa	2	65%	2	15%	positive
Leptospermum trinervium	3	90%	2	30%	positive
Logania pusilla	2	10%	0	0%	positive
Lomandra cylindrica	3	75%	2	13%	positive
Lomandra filiformis subsp. coriacea	2	60%	1	11%	positive
Lomandra filiformis subsp. filiformis	2	75%	2	8%	positive
Lomandra glauca	3	95%	2	27%	positive
Lomandra obliqua	2	100%	2	31%	positive

Species Name	Group Score (60 percentile	Group Freq	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Monotoca scoparia	2	85%	1	29%	positive
Patersonia sericea	2	70%	1	16%	positive
Pimelea linifolia	2	75%	2	23%	positive
Platysace ericoides	3	60%	2	17%	positive
Platysace linearifolia	2	85%	2	24%	positive
Pultenaea stipularis	3	10%	0	0%	positive
Schoenus ericetorum	1	5%	0	0%	positive
Thysanotus tuberosus	1	30%	0	0%	positive
Xanthorrhoea media	2	80%	2	9%	positive
Lepidosperma laterale	1	55%	2	42%	negative
Entolasia stricta	2	100%	2	69%	constant
Persoonia linearis	2	90%	2	69%	constant
Phyllanthus hirtellus	2	95%	2	44%	constant
Podolobium ilicifolium	2	55%	2	35%	constant
Pomax umbellata	2	70%	2	39%	constant

MU23 HUNTER ESCARPMENT FOOTSLOPES IRONBARK-BOX WOODLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: n/a
State: Western Dry Sclerophyll Forests
PVP Biometric Type: Not described
Number of Sites: 5 Number of identified native species per plot: 46.1

❑ *DESCRIPTION*

The steep escarpment slopes that descend down onto the floor of the Hunter Valley mark a change in geology. The Triassic sandstone plateaux of the Sydney Basin end on the cliffs of the Bulga Range and are replaced by underlying Permian sandstones siltstones and mudstones. Here, a dry shrubby Ironbark woodland emerges on the change in geology. A number of overstorey species are present, though it is Narrow-leaved Ironbark (*Eucalyptus crebra*), Black Cypress (*Callitris endlicheri*) and Grey Box (*E. moluccana*) that are most conspicuous. Others include Rough-barked Apple (*Angophora floribunda*) and Grey Gum (*E. punctata*). The distinctive *Acacia bulgaensis* may occur with *Bursaria spinosa, Olearia elliptica* and *Breynia oblongifolia* as the characteristic species of the shrub layer. Taller Kurrajong (*Brachychiton populneus* subsp. *populneus*) and Bull Oak (*Allocasuarina luehmannii*) may be also be present. The latter species is indicative of the change in geology and landscape associated with the Hunter Valley floor. Similar patterns are revealed by the grassiness of the understorey with species from genera *Aristida*, *Cymbopogon*, *Austrostipa*, *Dichelachne*, *Danthonia* and *Bothriochloa* all recorded from sites used to classify this community. Many of these were recorded from no other communities in Yengo NP. Low growing herbs, hardy ferns and twiners are also found.

The habitat is dry with mean annual rainfall of around 650 millimetres per annum. Sites are often rocky from the eroding cliff lines above, though the soil is a moderately fertile grey loam. This woodland is widespread along the dry escarpment slopes that extend from Broken Back Range west across the northern Wollemi escarpment. Clearing has removed better stands of this woodland on gentle grades of the escarpment footslopes. Considerable areas are likely to be retained on steeper slopes. However, these sites are still affected by frequent fires and rough grazing. Much of the distribution of this community falls on private lands and as aresult is considered poorly conserved.

❑ *FLORISTIC SUMMARY*

Trees: Height 12-25 metres; 15-35% cover

Eucalyptus crebra, E. punctata, E. moluccana, Angophora floribunda, Callitris endlicheri, Allocasuarina luehmannii, Brachychiton populneus subsp. *populneus*

Shrubs: Height 2-5 metres; 20-50% cover

Bursaria spinosa, Acacia bulgaensis, Olearia elliptica, Bertya oleifolia, Cassinia uncata, Indigofera australis, Dodonea viscosa

Ground Covers: Height 0-1 metres; 50-70% cover

Cheilanthes sieberi var *sieberi, Desmodium varians, Einadia hastata, Lomandra longifolia, Aristida ramosa, Cymbopogon refractus, Themeda australis, Bothriochloa macra, Echinopogon ovatus, Plantago debilis, Veronica plebia*

❑ *KEY IDENTIFYING FEATURES*

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

- Northern escarpment slopes and foothills
- Narrow-leaved Ironbark (*E. crebra*), Black Cypress Pine (*Callitris endlicheri*) and Grey Box (*E. moluccana*)
- Blue-leaved Acacia (*A. bulgaensis*) and Daisy Bush (*Olearia elliptica*)
- Grassy understorey

❑ *EXAMPLE LOCATIONS*

South of Milbrodale Road

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	139	33
B Medium	42	10
C High	241	57
Total	**422**	**100**

❑ *THREATENED PLANT SPECIES*

Pterostylis gibbosa (V);

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Abutilon oxycarpum	2	40%	0	0%	positive
Acacia bulgaensis	2	60%	3	3%	positive
Ajuga australis	2	40%	1	1%	positive
Allocasuarina luehmannii	3	40%	0	0%	positive
Amyema pendulum subsp. pendulum	2	40%	0	0%	positive
Angophora floribunda	2	40%	2	20%	positive
Aristida ramosa	3	40%	2	6%	positive
Austrodanthonia bipartita	2	20%	0	0%	positive
Austrostipa scabra subsp. scabra	2	20%	0	0%	positive
Austrostipa verticillata	2	40%	0	0%	positive
Bertya oleifolia	4	40%	1	3%	positive
Bothriochloa macra	2	20%	0	0%	positive
Breynia oblongifolia	2	100%	1	24%	positive
Brunoniella australis	2	40%	1	1%	positive
Bursaria spinosa subsp. spinosa	3	100%	0	0%	positive
Callitris endlicheri	2	60%	2	3%	positive
Calotis lappulacea	2	40%	0	0%	positive
Cayratia clematidea	2	40%	1	7%	positive
Cheilanthes distans	2	100%	2	6%	positive
Cheilanthes sieberi subsp. sieberi	3	100%	2	28%	positive
Choretrum species A	2	80%	2	5%	positive
Chrysocephalum apiculatum	2	40%	1	1%	positive
Clematis aristata	2	40%	1	17%	positive
Commelina cyanea	2	40%	2	7%	positive
Cymbopogon refractus	3	40%	1	7%	positive
Cynodon dactylon	2	40%	2	2%	positive
Cynoglossum suaveolens	2	20%	0	0%	positive
Cyperus trinervis	2	20%	0	0%	positive
Danthonia linkii	3	20%	0	0%	positive
Desmodium brachypodum	2	40%	1	0%	positive

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Desmodium varians	2	80%	1	8%	positive
Dichondra species A	3	40%	2	0%	positive
Dodonaea viscosa subsp. spatulata	3	40%	0	0%	positive
Einadia hastata	3	80%	1	4%	positive
Einadia nutans subsp. nutans	2	40%	0	0%	positive
Einadia trigonos	2	40%	2	1%	positive
Eragrostis brownii	2	40%	2	12%	positive
Eremophila debilis	2	40%	1	0%	positive
Eucalyptus blakelyi	1	20%	0	0%	positive
Eucalyptus crebra	3	80%	2	19%	positive
Eucalyptus dawsonii	3	20%	0	0%	positive
Eucalyptus punctata	3	40%	2	35%	positive
Gahnia aspera	2	40%	1	3%	positive
Glossogyne tannensis	2	20%	0	0%	positive
Hardenbergia violacea	2	40%	1	33%	positive
Isopogon dawsonii	1	20%	0	0%	positive
Leucopogon muticus	2	40%	1	28%	positive
Lomandra filiformis subsp. filiformis	2	40%	2	7%	positive
Lomandra longifolia	2	60%	1	27%	positive
Lomandra multiflora subsp. multiflora	2	40%	1	17%	positive
Melichrus urceolatus	2	40%	1	11%	positive
Olearia elliptica	2	60%	3	3%	positive
Oplismenus aemulus	2	40%	2	5%	positive
Oxalis exilis	3	40%	2	1%	positive
Pimelea curviflora var. sericea	2	20%	0	0%	positive
Plantago debilis	2	80%	2	4%	positive
Plectranthus parviflorus	2	40%	1	23%	positive
Podolepis jaceoides	2	40%	0	0%	positive
Pomaderris aspera	1	20%	0	0%	positive
Pomaderris ferruginea	2	40%	1	2%	positive
Pratia purpurascens	2	40%	1	33%	positive
Senecio diaschides	2	20%	0	0%	positive
Sida filiformis	2	40%	0	0%	positive
Solanum brownii	2	80%	0	0%	positive
Spartothamnella juncea	2	60%	3	1%	positive
Trema tomentosa var. viridis	2	40%	1	6%	positive
Veronica plebeia	2	60%	1	10%	positive
Vittadinia cervicularis var. subcervicularis	2	20%	0	0%	positive
Wahlenbergia luteola	2	20%	0	0%	positive

MU25 HUNTER RANGE EXPOSED STRINGYBARK-GREY GUM WOODLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Exposed Narrabeen Woodland
State: Sydney Hinterland Dry Sclerophyll Forests
PVP Biometric Type: Grey Gum - Narrow-leaved Stringybark heathy open forest on the hinterland ranges of the Central Coast, Sydney Basin
Number of Sites: 18 Number of identified native species per plot: 34.3

❑ *DESCRIPTION*

Narrabeen group lithic sandstone forms the primary geological stratum of northern Yengo NP. Exposed situations on these coarse-grained sandstones carry a low open woodland (c. 18 metres in height) of Yellow Bloodwood (*Corymbia eximia*), Stringybark (*Eucalyptus sparsifolia*), Grey Gum (*Eucalyptus punctata*), Smooth-barked Apple (*Angophora costata*) and occasionally Broad-leaved Ironbark (*E. fibrosa*). These infertile skeletal soils support a less diverse community compared to other exposed sandstone woodlands. A shrub layer of variable density features *Persoonia linearis*, *Podolobium illicifolium*, *Leucopogon muticus*, *Pomax umbellata* and *Phyllanthus hirtellus.* Ground cover is generally very sparse and rocky with grasses such as *Entolasia stricta*, and forbs such as *Dianella caerulea* and *Lomandra* spp.

This map unit can be distinguished from other exposed sandstone woodlands (MU30 and MU22) by understanding the differences in the composition of the shrub layer. The community is found outside of the study area in north eastern Wollemi NP and north western Pokolbin State Forest.

It forms part of Sydney Hinterland Dry Sclerophyll Forests of Keith (2004) state-wide vegetation classification. It is adequately conserved in the current reserve system.

❑ *FLORISTIC SUMMARY*

Trees: **Mean Height 18 (0) metres; 15-% (3.5) cover**

Corymbia eximia, Eucalyptus sparsifolia, Eucalyptus punctata, Angophora costata, Eucalyptus crebra, Eucalyptus fibrosa, Eucalyptus fergusonii subsp. *dorsiventralis,*

Shrubs: **Mean Height 2.1 (2.4) metres; 23.5% (3.5) cover**

Persoonia linearis, Podolobium illicifolium, Leucopogon muticus, Grevillea mucronulata, Hibbertia obtusifolia, Hovea linearis, Acacia linifolia, Pultanea microphylla

Ground Covers: Mean Height 0.35 (0.2) metres; 17.5% (10.6) cover

Entolasia stricta, Pomax umbellata, Lomandra obliqua, Lomandra glauca, Dianella revoluta var. *revoluta, Lomatia silaifolia, Lepidosperma laterale, Lomandra confertifolia, Cassytha pubescens, Cheilanthes sieberi*

❑ *KEY IDENTIFYING FEATURES*

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

- Low open woodland on skeletal Narrabeen sandstone soils
- Predominant canopy species are Stringybark (*E. sparsifolia*) and Grey Gum (*E. punctata*) with localised co-dominance with Yellow Bloodwood (*Corymbia eximia*) and Ironbarks (*E. fibrosa*)
- Shrubby understorey and rocky ground cover

❑ *EXAMPLE LOCATIONS*

Widespread across northern Yengo NP: including Settlers Fire Trail

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	12707	75
B Medium	3213	19
C High	940	6
Total	**16859**	**100**

❑ *THREATENED PLANT SPECIES*

Dillwynia tenuifolia(V); Eucalyptus fracta (V) Olearia cordata (V); Rutidosis heterogama (V)

❑ *DIAGNOSTIC SPECIES*

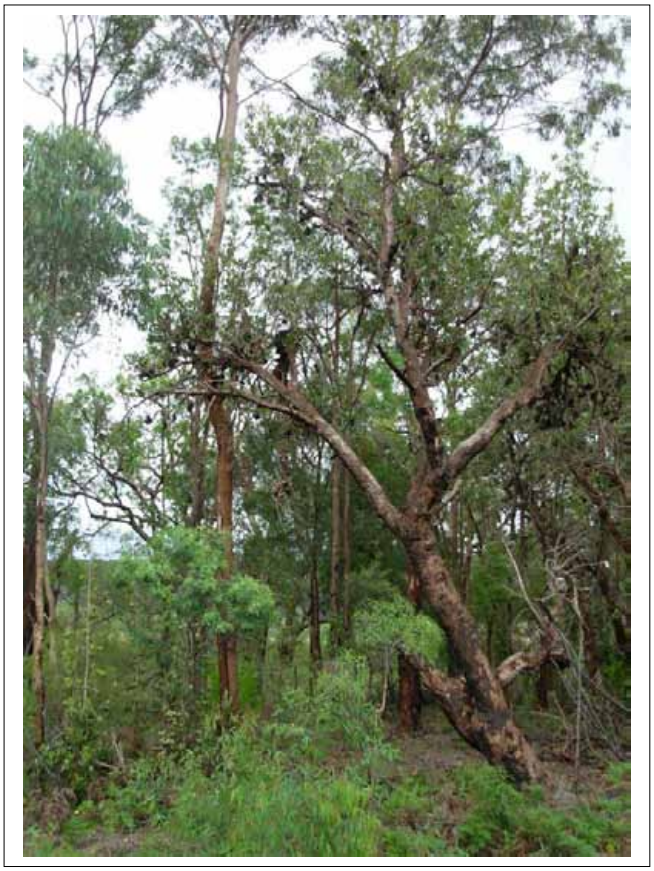
Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Angophora bakeri	2	46%	3	21%	positive
Angophora costata	3	36%	2	27%	positive
Austrodanthonia setacea	2	4%	0	0%	positive
Billardiera scandens	2	39%	1	42%	positive
Boronia rubiginosa	1	4%	0	0%	positive
Bossiaea buxifolia	3	4%	0	0%	positive
Brachyscome microcarpa	1	14%	0	0%	positive
Cassinia compacta	1	4%	0	0%	positive
Cheilanthes lasiophylla	1	4%	0	0%	positive
Corymbia eximia	3	61%	2	27%	positive
Dianella revoluta var. revoluta	2	79%	2	27%	positive
Dillwynia crispii	2	4%	0	0%	positive
Eucalyptus crebra	2	39%	3	19%	positive
Eucalyptus punctata	3	68%	2	31%	positive
Eucalyptus sparsifolia	3	64%	2	25%	positive
Exocarpos cupressiformis	2	50%	1	9%	positive
Gompholobium inconspicuum	2	4%	0	0%	positive
Goodenia heterophylla	2	64%	1	20%	positive
Grevillea triternata	1	4%	0	0%	positive
Hardenbergia violacea	2	71%	1	29%	positive
Helichrysum collinum	1	11%	0	0%	positive
Hibbertia obtusifolia	2	68%	1	17%	positive
Hibbertia pedunculata	1	4%	0	0%	positive
Leucopogon muticus	2	54%	1	23%	positive
Lomandra cylindrica	2	46%	2	14%	positive
Lomandra glauca	2	57%	2	28%	positive
Lomandra obliqua	2	93%	2	31%	positive
Monotoca scoparia	2	46%	1	30%	positive
Pimelea linifolia	2	46%	2	24%	positive
Platysace ericoides	2	61%	2	16%	positive
Podolobium ilicifolium	2	89%	2	32%	positive
Rutidosis heterogama	2	7%	0	0%	positive
Themeda australis	2	54%	2	23%	positive
Xylomelum pyriforme	2	36%	1	17%	positive
Entolasia stricta	2	86%	2	69%	constant
Lepidosperma laterale	2	36%	2	43%	constant
Persoonia linearis	2	96%	2	68%	constant
Phyllanthus hirtellus	2	93%	2	43%	constant
Pomax umbellata	2	82%	2	38%	constant

MU26 MELLONG SANDS APPLE-BANKSIA WOODLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not described
State: Sydney Sand Flats Dry Sclerophyll Forests
PVP Biometric Type: Not described
Number of Sites: 2 Number of identified native species per plot: 36

❑ *DESCRIPTION*



Several of the perched alluvial infills of the Garland Valley area retain a high proportion of sand in the soil. Around the gentle grades of minor creeks the soils are well drained and remain dry. Here an open woodland dominated by large Rough-barked Apple (*Angophora floribunda*) with tall Old Man Banksia (*Banksia serrata*) is found. Unusually tall examples of *Xylomelum pyriforme* and *Persoonia linearis* form the prominent components of the small tree layer. The shrub layer is of moderate density and shares many species with the open woodlands that are found on the adjoining perched sand mass (MU28). These include *Leptospermum trinervium*, *Hakea dactyloides*, *Banksia spinulosa* var. *collina* and *Monotoca scoparia*. Likewise the ground covers are similar with *Lomatia silaifolia*, *Pteridium esculentum* and *Entolasia stricta.*

This community is one of several found on the Garland Valley-Mellong land system. As a result it is a naturally rare vegetation community with a very restricted distribution. It forms a component of the Sydney Sand Flats Dry Sclerophyll Forests of Keith (2004) and is considered to be of high conservation value. In the study area almost half of the community distribution is highly disturbed by tracks, trails and agricultural land use. The best stands are found in the west of the reserve on Back Swamp Creek, at Halfway House.

❑ *FLORISTIC SUMMARY*

Trees: Height 12-25 metres; 25 -40% cover

Angophora floribunda, Banksia serrata, Eucalyptus sclerophylla, E. parramatensis subsp. *parramattensis*

Small Trees: Height 6-12 metres; 5 -40% cover

Xylomelum pyriforme, Persoonia linearis, Allocasuarina littoralis

Shrubs: Height 2-5 metres; 25-45% cover

Leptospermum trinervium, *Hakea dactyloides*, *Banksia spinulosa* var. *collina, Monotoca scoparia, Bossaiea heterophylla, Hibbertia obtusifolia, Persoonia oblongata, Acacia brownii, Acacia filicifolia, Leucopogon muticus, Isopogon anemonifolius, Dillwynia glaberrima, Brachyloma daphnoides*

Ground Covers: Height 0-1; 35-70% cover

Entolasia marginata, Aristida benthamii, Gonocarpus tetragynus, Lomandra glauca, Pteridium esculentum, Lomatia silaifolia, Wahlenbergia stricta

Vines & Climbers: no structural data available

Cassytha pubescens, Hardenbergia violacea

❑ *KEY IDENTIFYING FEATURES*

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

- Perched dry sandy alluvium in the Garland Valley Area
- Open woodland of Rough-barked Apple (*A. floribunda*) and Old Man Banksia (*Banksia serrata*)

- Shrubby understorey of Banksias (*Banksia* spp), Tea-tree (*Leptospermum* spp.) and Epacrids (*Styphelia* spp., *Leucopogon* spp. and *Brachyloma* spp.)

❑ *EXAMPLE LOCATIONS*

Back Swamp Creek, Garland Valley

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	272	38
B Medium	91	13
C High	250	49
Total	**712**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia myrtifolia	2	50%	1	5%	positive
Angophora floribunda	4	100%	2	23%	positive
Aristida benthamii	2	100%	1	9%	positive
Banksia serrata	3	100%	1	8%	positive
Bossiaea heterophylla	2	100%	1	14%	positive
Bossiaea obcordata	2	50%	1	8%	positive
Brachyloma daphnoides subsp. daphnoides	2	100%	1	10%	positive
Cassytha pubescens	2	100%	2	12%	positive
Daviesia alata	2	50%	0	0%	positive
Digitaria parviflora	2	50%	1	5%	positive
Entolasia marginata	2	100%	1	44%	positive
Eucalyptus sclerophylla	2	50%	3	3%	positive
Hakea dactyloides	2	100%	1	11%	positive
Hardenbergia violacea	2	100%	1	33%	positive
Hibbertia obtusifolia	2	100%	1	23%	positive
Isopogon anemonifolius	2	50%	1	8%	positive
Leptospermum trinervium	2	100%	2	30%	positive
Leucopogon muticus	2	50%	1	28%	positive
Leucopogon virgatus	2	100%	2	0%	positive
Lomandra glauca	2	100%	1	29%	positive
Lomatia silaifolia	2	100%	1	22%	positive
Monotoca scoparia	3	100%	1	30%	positive
Persoonia linearis	2	100%	1	73%	positive
Persoonia oblongata	2	100%	1	7%	positive
Platysace ericoides	2	100%	1	18%	positive
Pomax umbellata	2	100%	1	42%	positive
Pteridium esculentum	3	100%	2	28%	positive
Wahlenbergia stricta subsp. stricta	2	100%	1	4%	positive
Xanthorrhoea media	2	100%	2	7%	positive
Xanthosia atkinsoniana	2	50%	1	1%	positive
Xylomelum pyriforme	2	50%	1	17%	positive
Podolobium ilicifolium	2	50%	2	40%	constant

MU27 MELLONG SANDS DROOPING RED GUM SEDGE WOODLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: not described
State: Sydney Sand Flats Dry Sclerophyll Forests
PVP Biometric Type: Not Described
Number of Sites: 5 Number of identified native species per plot: 23

❑ *DESCRIPTION*

Drainage lines found amongst the gentle gradients of the Mellong sand mass are characterised by a damp heath-woodland dominated by Drooping Red Gum (*Eucalyptus parramattensis* subsp. *parramattensis)*. The water table permanently remains in proximity to the surface, resulting in periodic flooding during heavy rains. The high soil moisture levels and peaty soils encourage swamp loving heath species such as *Melaleuca thymifolia*, *Callistemon citrinus*, *Leptospermum juniperinum* and the small tree *Melaleuca linariifolia.* Sedges and rush species are common and often locally abundant. These include *Juncus continuus*, *Schoenus brevifolius* and *Leptocarpus tenax*.

This community borders wider alluvial flats and as a result many stands are dissected by minor tracks that lead to grazing areas and power line easements. These swampy woodlands are part of a unique land system within the state. They are a component of the Sydney Sand Flats Dry Sclerophyll Forests of Keith (2004) are recognised as being patchily distributed throughout the Sydney Basin Brioregion. While large areas are now situated within Yengo and Wollemi National Parks where clearing has not been extensive, it remains a naturally rare and isolated community and consequently should be recognised as a vegetation community of high conservation value.

❑ *FLORISTIC SUMMARY*

Trees: Height 12-25 metres; 25% -35% cover

Eucalyptus parramattensis subsp. *parramattensis, E. tereticornis, E. sclerophylla, Melaleuca linariifolia*

Shrubs Height 3-8 metres; 35% -50% cover

Melaleuca thymifolia, Leptospermum juniperinum, Callistemon citrinus, Banksia spinulosa var. *collina, Acacia filicifolia, Hakea dactyloides,*

Ground Covers: Height 0-2 metres; 50-70% cover

Entolasia stricta, Juncus continuus, Schoenus brevifolius, Centella asiatica, Leptocarpus tenax, Lepyrodia scariosa, Dianella caerulea, Gonocarpus tetragynus, Panicum simile, Dampiera stricta, Pteridium esculentum

❑ *KEY IDENTIFYING FEATURES*

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

- Drainage lines of the Garland Valley and Mellong Swamps
- Open shrub/heath woodland dominated by Drooping Red Gum *(E. parramattensis* subsp. *parramattensis*)

❑ *EXAMPLE LOCATIONS*

Howes Waterhole, Mellong Swamps, Running Creek near Halfway House.

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	110	17
B Medium	483	73
C High	67	10
Total	**660**	**100**

❑ *THREATENED PLANT SPECIES*

Ancistrachne maidenii (V),

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Banksia spinulosa	3	40%	2	20%	positive
Callistemon citrinus	2	40%	1	0%	positive
Callistemon rigidus	1	20%	0	0%	positive
Centella asiatica	2	40%	2	0%	positive
Eragrostis brownii	2	40%	2	11%	positive
Eucalyptus parramattensis subsp. parramattensis	4	80%	1	1%	positive
Eucalyptus tereticornis	3	60%	3	3%	positive
Gonocarpus micranthus	2	40%	1	0%	positive
Goodenia paniculata	3	40%	0	0%	positive
Hemarthria uncinata var. uncinata	2	20%	0	0%	positive
Hypericum japonicum	2	20%	0	0%	positive
Imperata cylindrica var. major	3	60%	2	17%	positive
Juncus continuus	2	60%	1	1%	positive
Juncus prismatocarpus	2	20%	0	0%	positive
Lagenifera gracilis	2	40%	1	2%	positive
Leptocarpus tenax	4	40%	3	0%	positive
Leptospermum juniperinum	2	60%	3	1%	positive
Lepyrodia muelleri	2	20%	0	0%	positive
Lomandra longifolia	3	40%	1	32%	positive
Melaleuca linariifolia	2	40%	4	3%	positive
Melaleuca thymifolia	4	100%	2	2%	positive
Panicum simile	3	40%	1	18%	positive
Philydrum lanuginosum	2	40%	0	0%	positive
Pratia purpurascens	2	40%	2	32%	positive
Ptilothrix deusta	3	40%	3	6%	positive
Schoenus brevifolius	2	60%	1	0%	positive
Stylidium graminifolium	2	40%	2	7%	positive
Themeda australis	4	40%	2	25%	positive
Viminaria juncea	2	20%	0	0%	positive
Lepidosperma laterale	0	0%	2	43%	negative
Persoonia linearis	0	0%	2	70%	negative
Phyllanthus hirtellus	0	0%	2	47%	negative
Podolobium ilicifolium	0	0%	2	36%	negative
Pomax umbellata	0	0%	2	41%	negative
Entolasia stricta	2	60%	2	70%	constant

MU28 MELLONG SANDS SCRIBBLY GUM WOODLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: not described
State: Sydney Sand Flats Dry Sclerophyll Forests
PVP Biometric Type: Not Described
Number of Sites: 8 Number of identified native species per plot: 40.2

❑ *DESCRIPTION*

The low relief of the Mellong Plateau and Garland Valley stand in stark contrast to the adjoining rugged sandstone ridge and gully systems. Deep sandy soils are present and have the appearance of a depositional 'in-fill'. On the better-drained sites extensive areas of open sclerophyll shrub woodlands occur. Large Scribbly Gum (*Eucalyptus sclerophylla*) form tall open woodlands sometimes including smaller trees such as Narrow-leaved Apple (*Angophora bakeri*) and Drooping Red Gum (*Eucalyptus parramattensis* subsp. *parramattensis*). A moderately dense heath layer comprises species such as *Leptospermum trinervium*, *Hakea dactyloides*, *Monotoca scoparia*, *Lambertia formosa*, *Banksia spinulosa* var. *collina* and *Persoonia oblongata*. Sites situated near areas with impeded drainage will include the shrub *Melaleuca thymifolia*, and sedges *Lepyrodia scariosa* and *Schoenus brevifolius*. Elsewhere common ground covers include *Pteridium esculentum* and *Entolasia stricta*.

A large proportion of this community is situated within Yengo and Wollemi National Parks. Clearing has impacted on the extent of the community in adjoining private lands to support sand mining and grazing. Despite the high levels of protection by inclusion in the reserve system, this community should be recognised as one of high conservation value. It forms a component of Sydney Sand Flats Dry Sclerophyll Forests of Keith (2004) a unique vegetation class in NSW. Many of the communities that comprise this class are unique, isolated and limited in area.

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 19 (5.2) metres; 27.5% (23.9) cover

Eucalyptus sclerophylla, Angophora bakeri, Eucalyptus parramattensis subsp. *parramattensis, Angophora floribunda, E.sparisfolia*

Shrubs Mean Height 3.5 (3.1) metres; 32.5% (4.8) cover

Acacia brownii, Leptospermum trinervium, Dillwynia glaberrima, Melaleuca thymifolia, Banksia spinulosa, Acacia filicifolia, Grevillea mucronulata, Hakea dactyloides, Isopogon anemonofolius, Pimelia linifolia, Persoonia oblongata

Ground Covers: Mean Height 1(0.4) metres; 48.7% (35.6) cover

Entolasia stricta, Themeda australis, Lepyrodia scariosa, Dianella caerulea, Dianella revoluta var. *revoluta, Gonocarpus tetragynus, Panicum simile, Dampiera stricta, Pteridium esculentum*

❑ *KEY IDENTIFYING FEATURES*

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

- Deep, well drained alluvial sand flats of Garland Valley and Mellong Plateau
- Open shrub/heath woodland with Scribbly Gum (*E. sclerophylla*) and Drooping Red Gum *(E. parramattensis* subsp. *parramattensis*)
- Presence of Old Man Banksia (*Banksia serrata*)

❑ *EXAMPLE LOCATIONS*

Wallaby Swamp area; Tinda Creek

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	781	36
B Medium	1168	54
C High	213	10
Total	**2161**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Angophora bakeri	2	75%	3	22%	positive
Aristida ramosa	2	50%	2	7%	positive
Banksia spinulosa	2	88%	2	19%	positive
Brachyloma daphnoides subsp. daphnoides	2	38%	1	11%	positive
Cyathochaeta diandra	2	63%	2	8%	positive
Dampiera stricta	2	63%	2	21%	positive
Daviesia genistifolia	2	13%	0	0%	positive
Dianella caerulea	2	50%	1	48%	positive
Dianella revoluta var. revoluta	2	50%	2	30%	positive
Dillwynia glaberrima	2	75%	1	1%	positive
Drosera burmannii	1	13%	0	0%	positive
Eragrostis brownii	2	50%	2	10%	positive
Eragrostis elongata	1	13%	0	0%	positive
Eucalyptus parramattensis subsp. parramattensis	2	50%	4	1%	positive
Eucalyptus sclerophylla	3	88%	3	2%	positive
Gompholobium uncinatum	2	13%	0	0%	positive
Gonocarpus tetragynus	2	75%	1	16%	positive
Grevillea mucronulata	2	75%	2	24%	positive
Hakea dactyloides	2	38%	2	11%	positive
Hibbertia obtusifolia	2	38%	1	20%	positive
Leptospermum trinervium	3	75%	2	31%	positive
Lepyrodia scariosa	2	63%	2	2%	positive
Lomandra cylindrica	2	50%	2	16%	positive
Lomandra glauca	2	50%	2	30%	positive
Melaleuca thymifolia	2	75%	4	1%	positive
Mitrasacme alsinoides	1	13%	0	0%	positive
Monotoca scoparia	2	50%	1	31%	positive
Persoonia oblongata	2	75%	1	5%	positive
Pimelea linifolia	2	75%	2	25%	positive
Platysace ericoides	2	38%	2	19%	positive
Pteridium esculentum	2	63%	2	30%	positive
Stylidium graminifolium	2	50%	2	7%	positive
Themeda australis	2	75%	2	24%	positive
Xanthorrhoea media	2	38%	2	12%	positive
Xanthosia atkinsoniana	2	50%	2	1%	positive
Entolasia stricta	2	88%	2	70%	constant

MU29 SYDNEY HINTERLAND EXPOSED SCRIBBLY GUM WOODLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Scribbly Gum-Dwarf Apple Woodland
State: Sydney Coastal Dry Sclerophyll Forests
PVP Biometric Type: Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin
Number of Sites: 13 Number of identified native species per plot: 41.9

❑ *DESCRIPTION*

This eucalypt dominated low woodland with diverse heath understorey is common across the lower elevations and higher rainfall areas of the south-eastern corner of the study area. Low growing Scribbly Gums (*Eucalyptus haemastoma, E. racemosa* and *E. sclerophylla*) are the most distinctive member of the canopy, although a wide variety of other species can occur including Yellow Bloodwood (*Corymbia eximia),* Red Bloodwood *(C.gummifera),* Stringybark *(E.sparsifolia)* and more rarely Scalybark (*E. squamosa)*. A very diverse heath and shrub layer is present often including the distinctive *Angophora hispida.* Other common species associated with the heath include *Isopogon anemnofolius, Leptospermum trinervium, Petrophile pulchella* and *Lambertia formosa.* Four Banksia species have been recorded: *Banksia serrata, B.spinulosa* var. *collina, B. oblongifolia and B. ericifolia,* the latter mainly in the east. A sparse ground cover includes grasses, sedges and low growing herbs.

This community intergrades with the open scrub and heath community dominated by *Angophora hispida* (MU32). This pattern extends east across Dharug and Popran NP's and north into the Mangrove Creek catchment. Large areas are represented in these reserves. Within the Yengo and Parr reserves, this community and MU32 represent a distinctive assemblage of species as there are over twenty species recorded which are not found in any other Map Units. It forms part of the Sydney Coastal Dry Sclerophyll Forests state-wide classification of Keith (2004).

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 11.2 (2.8) metres; 26.8% (8) cover

Eucalyptus haemastoma, E.sclerophylla, E.squamosa, Eucalyptus sparsifolia, Corymbia gummifera, Eucalyptus punctata

Shrubs: Mean Height 3.2 (1.5) metres; 44.8 (23.9) cover

Angophora hispida, Isopogon anemonifolius, Leptospermum trinervium, Petrophile pulchella, Banksia spinulosa var. *collina, Persoonia linearis, Hovea linearis, Monotoca scoparia, Hakea dactyloides, Pimelia linifolia* subsp. *linifolia, Grevillea buxifolia* subsp. *buxifolia, Lambertia formosa, Acacia suaveolens*

Ground Covers: Mean Height 0.42 (0.2) metres; 34% (24) cover

Entolasia stricta, Patersonia sericea, Lomandra obliqua, Lomandra glauca, Platysace linearifolia, Lomatia silaifolia, Dampiera stricta, Epacris pulchella, Cyathochaeta diandra, Schoenus imberbis

❑ *KEY IDENTIFYING FEATURES*

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

- Low open woodland dominated by Scribbly Gums (*E. haemastoma, E. racemosa*)
- Exposed Hawkesbury Sandstone sites in Parr SCA
- Presence of Dwarf Apple (*Angophora hispida*)

❑ *EXAMPLE LOCATIONS*

Parr SCA

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	3335	60
B Medium	2255	40
C High	3	0.01
Total	**5594**	**100**

❑ *THREATENED PLANT SPECIES*

Acacia byoeana (V); Hibbertia procumbens (E1); Lasiopetalum joyeace (V); Persoonia hirsuta (E1); Tetratheca glandulosa (V)

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Angophora bakeri	2	47%	3	22%	positive
Angophora hispida	3	73%	5	1%	positive
Astrotricha longifolia	1	7%	0	0%	positive
Austrostipa rudis	3	7%	0	0%	positive
Baeckea linifolia	1	7%	0	0%	positive
Banksia oblongifolia	2	47%	2	1%	positive
Banksia serrata	2	40%	1	9%	positive
Banksia spinulosa	3	53%	2	19%	positive
Caustis flexuosa	2	73%	2	17%	positive
Conospermum longifolium	2	40%	2	16%	positive
Cyathochaeta diandra	2	53%	2	7%	positive
Dampiera stricta	2	93%	2	20%	positive
Dillwynia elegans	2	53%	2	7%	positive
Dodonaea pinnata	1	7%	0	0%	positive
Epacris pulchella	2	60%	1	7%	positive
Eucalyptus haemastoma	2	40%	3	1%	positive
Eucalyptus sparsifolia	2	47%	2	27%	positive
Gleichenia microphylla	4	7%	0	0%	positive
Goodenia bellidifolia subsp. bellidifolia	2	40%	1	2%	positive
Grevillea buxifolia subsp. buxifolia	2	67%	2	12%	positive
Hakea dactyloides	2	87%	1	8%	positive
Hibbertia procumbens	2	7%	0	0%	positive
Hybanthus vernonii	1	7%	0	0%	positive
Isopogon anemonifolius	2	93%	1	9%	positive
Lambertia formosa	2	93%	2	14%	positive
Leptospermum arachnoides	3	7%	0	0%	positive
Leptospermum trinervium	3	93%	2	30%	positive
Lepyrodia scariosa	2	40%	2	2%	positive
Leucopogon appressus	1	7%	0	0%	positive
Leucopogon microphyllus	2	40%	1	0%	positive
Lomandra glauca	2	87%	2	28%	positive
Lomandra obliqua	2	60%	2	34%	positive
Mirbelia rubiifolia	2	40%	2	3%	positive
Patersonia sericea	2	87%	1	16%	positive
Persoonia lanceolata	1	7%	0	0%	positive
Petrophile pulchella	2	73%	2	4%	positive

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Platysace ericoides	2	40%	2	18%	positive
Platysace linearifolia	2	73%	2	25%	positive
Pseudanthus orientalis	2	7%	0	0%	positive
Ptilothrix deusta	3	73%	2	4%	positive
Pultenaea euchila	1	7%	0	0%	positive
Pultenaea ferruginea	2	40%	2	7%	positive
Schoenus imberbis	2	53%	1	8%	positive
Sprengelia incarnata	2	7%	0	0%	positive
Tetratheca ericifolia	1	7%	0	0%	positive
Xanthorrhoea glauca subsp. glauca	2	7%	0	0%	positive
Entolasia stricta	2	80%	2	70%	constant
Phyllanthus hirtellus	2	60%	2	46%	constant

MU30 SYDNEY HINTERLAND ROCKY YELLOW BLOODWOOD WOODLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Exposed Yellow Bloodwood Woodland
State: Sydney Hinterland Dry Sclerophyll Forests
PVP Biometric Type: Yellow Bloodwood - Narrow-leaved Apple heathy woodland on hinterland plateaux of the Central Coast, Sydney Basin
Number of Sites: 47 Number of identified native species per plot: 40

❑ *DESCRIPTION*

This community is the most extensive in the study area and makes up a large proportion of the Yengo and Parr reserves. It occupies dry rocky exposed ridges and upper slopes on Hawkesbury sandstone. The low growing shrubby open woodland is dominated by Yellow Bloodwood (*Corymbia eximia*) and Narrow-leaved Apple (*Angophora bakeri*), rarely growing over twelve metres in height. Other tree species include Grey Gum (*Eucalyptus punctata*), Stringybark (*E. sparsifolia*) and Smooth-barked Apple (*Angophora costata*). A diverse sclerophyllous shrub layer provides a moderately dense cover and is characterised by *Leptospermum trinervium*, *Persoonia linearis*, *Hovea linearis*, *Monotoca scoparia*, *Persoonia levis*, and *Acacia ulicifolia*. Ground layer vegetation is dominated by *Entolasia stricta*, with *Lomandra obliqua*, *Lomandra glauca*, *Pomax umbellata*, *and Dianella revoluta* var. *revoluta*.

This community is typical of the fire prone vegetation found on skeletal sandy soils of the hinterlands of the Sydney. It is widespread throughout Yengo, Parr, Dharug and eastern Wollemi National Parks. As a result it is considered adequately conserved in the Sydney Basin Bioregion. It forms part of the Sydney Hinterland Dry Sclerophyll Forests state-wide classification of Keith (2004).

❑ *FLORISTIC SUMMARY*

Trees: **Mean Height 13.3 (2.8) metres; 18.1% (2.8) cover**

Corymbia eximia, Angophora bakeri, Eucalyptus sparsifolia, Corymbia gummifera, Eucalyptus punctata, Angophora costata, Eucalyptus prominula

Shrubs: **Mean Height 1.1 (1.5) metres; 46.2% (17.5) cover**

Leptospermum trinervium, Persoonia linearis, Hovea linearis, Monotoca scoparia, Persoonia levis, Acacia ulicifolia, Pimelia linifolia subsp. *linifolia, Grevillea buxifolia* subsp. *buxifolia, Lambertia formosa, Acacia suaveloens, Acacia linifolia, Xylomelum pyriforme*

Ground Covers: Mean Height 0.45 (0) metres; 19% (5.7) cover

Entolasia stricta, Pomax umbellata, Patersonia sericea, Lomandra obliqua, Lomandra glauca, Pomax umbellata, Dianella revoluta var. *revoluta, Lomatia silaifolia, Dampiera stricta*

❑ *KEY IDENTIFYING FEATURES*

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

- Exposed rocky crests and ridges on skeletal sandstone soils
- Low growing open tree cover of Narrow-leaved Apple (*A. bakeri*) and Yellow Bloodwood (*C. eximia*)
- Moderately dense shrub layer including Tea-tree (*Leptospermum trinervium*)

❑ *EXAMPLE LOCATIONS*

Widespread across ridges south of Settlers Fire Trail. Examples include Mount Murwin and Southern Link Trail

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	36494	70
B Medium	14464	28
C High	1404	3
Total	**52363**	**100**

❑ *THREATENED PLANT SPECIES*

Lasiopetalum joyeace (V); Leucopogon fletcheri subsp. *fletcheri (E1); Olearia cordata (V); Persoonia hirsuta (E1); Tetratheca glandulosa (V)*

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia linifolia	2	60%	2	20%	positive
Acacia ulicifolia	2	63%	1	17%	positive
Angophora bakeri	3	85%	2	15%	positive
Aristida acuta	1	2%	0	0%	positive
Banksia spinulosa	2	42%	2	17%	positive
Bossiaea heterophylla	2	46%	2	15%	positive
Brachyloma daphnoides subsp. daphnoides	2	40%	1	8%	positive
Caustis flexuosa	2	73%	2	12%	positive
Choretrum pauciflorum	1	2%	0	0%	positive
Conospermum longifolium	2	71%	2	10%	positive
Corymbia eximia	3	81%	2	23%	positive
Corymbia gummifera	2	48%	2	18%	positive
Dampiera stricta	2	81%	2	15%	positive
Dianella revoluta var. revoluta	2	56%	2	27%	positive
Dillwynia elegans	2	40%	2	5%	positive
Eriostemon australasius	1	2%	0	0%	positive
Eucalyptus punctata	2	56%	2	30%	positive
Grevillea buxifolia subsp. buxifolia	2	52%	2	9%	positive
Lambertia formosa	2	54%	2	13%	positive
Leptospermum trinervium	3	94%	2	25%	positive
Leucopogon muticus	2	38%	1	24%	positive
Lomandra brevis	2	4%	0	0%	positive
Lomandra glauca	2	79%	2	24%	positive
Lomandra obliqua	2	85%	2	28%	positive
Monotoca elliptica	1	2%	0	0%	positive
Pimelea linifolia	2	56%	2	22%	positive
Platysace linearifolia	2	73%	2	21%	positive
Pultenaea divaricata	1	2%	0	0%	positive
Pultenaea echinula	2	2%	0	0%	positive
Pultenaea ferruginea	2	40%	2	4%	positive
Allocasuarina torulosa	2	6%	2	36%	negative
Lepidosperma laterale	1	33%	2	44%	negative
Podolobium ilicifolium	2	29%	2	37%	negative
Pomax umbellata	1	67%	2	38%	negative
Pratia purpurascens	0	0%	2	36%	negative
Entolasia stricta	2	92%	2	68%	constant
Persoonia linearis	2	77%	2	69%	constant
Phyllanthus hirtellus	2	90%	2	41%	constant

MU31 HUNTER ESCARPMENT *ACACIA* SCRUB

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Bulga Wattle Woodland
State: Western Slopes Dry Sclerophyll Forests
PVP Biometric Type: Not described
Number of Sites: 3 Number of identified native species per plot: 22.6

❑ *DESCRIPTION*

The distinctive blue leaves of *Acacia bulgaensis* and *A. binervia* provide an easy diagnostic feature for this low growing scrub found on the northern escarpment of Yengo NP. These thickets appear to mark areas of previous disturbance by intense fire (Hunter 2005). A sparse overstorey of Black Cypress (*Callitris endlicheri*), Narrow-leaved Ironbark (*Eucalyptus crebra*), Grey Box (*E. moluccana*) and Grey Gum (*E. punctata*) may be present. Other shrubs include *Bursaria spinosa, Bertya oleifolia* and *Leucopogon muticus.* The ground cover is very sparse as a result of the dense scrub layer with only small ferns such as *Cheilanthes distans*, and grasses *Paspalidium distans* and *Aristida* spp. and *Cymbopogon* spp.

This community grows on the steep exposed Permian sediments and colluvial sandstone boulders within the driest zone of Yengo NP. The floristic composition of the community is interesting in that it reflects the influence of the dry Hunter Valley environments and those found west of the Great Dividing Range. A small shrub with a distinctive purple flower *Hibiscus sturtii* var. *sturtii* has been recorded at a number of sites in this community. Elsewhere in NSW this species is known from the Narrabri area and from the Burragorang Valley in the southern Blue Mountains where it occurs amongst similar Ironbark-Cypress Pine woodlands.

The community is primarily found on private lands that border the northern and eastern perimeter of the reserve. These dense wattle scrubs are uncommon in NSW with similar scrubs found elsewhere supporting different taxa (Hunter 2005). This author also suggests that these communities are reliant on one-off extreme fire events. Management that precludes such events through too frequent low intensity burns may reduce the persistence of the community into the future.

❑ *FLORISTIC SUMMARY*

Trees: **Height 5-10 metres; 10-25% cover**

Callitris endlicheri, Eucalyptus crebra, Eucalyptus moluccana, Eucalyptus punctata

Shrub: **Height 4-8 metres; 60-90% cover**

Acacia bulgaensis, Bursaria spinosa, Leucopogon muticus, Bertya oleifolia, Cassinia leptocephala

Ground Covers: **Height 0-1 metres; 2-20% cover**

Cheilanthes distans, Paspalidim distans, Aristida ramosa, Hibiscus sturtii var. *sturtii, Einadia hastata, Entolasia stricta*

❑ *KEY IDENTIFYING FEATURES*

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

- Abundant distinctive blue-leaved *Acacia* on northern escarpment and plateau cliffs

❑ *EXAMPLE LOCATIONS*

Hunter Escarpment south of Milbrodale Road

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low		
B Medium		
C High	133	100
Total	**100**	**100**

❑ *THREATENED PLANT SPECIES*

Pterostylis gibbosa (E1)

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia bulgaensis	6	67%	2	3%	positive
Bertya oleifolia	2	67%	1	3%	positive
Bursaria spinosa	3	67%	2	24%	positive
Callitris endlicheri	3	100%	2	3%	positive
Cassinia leptocephala	1	67%	0	0%	positive
Cheilanthes distans	2	100%	2	6%	positive
Chenopodium pumilio	2	33%	0	0%	positive
Entolasia stricta	2	67%	2	32%	positive
Eucalyptus crebra	3	67%	2	20%	positive
Eucalyptus moluccana	2	100%	2	6%	positive
Melichrus urceolatus	2	67%	1	10%	positive
Notelaea microcarpa	1	33%	0	0%	positive
Paspalidium distans	2	67%	2	4%	positive

MU32 SYDNEY HINTERLAND DWARF APPLE SCRUB

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Hawkesbury Dwarf Apple Scrub
State: Sydney Coastal Heaths
PVP Biometric Type: Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin
Number of Sites: 7 Number of identified native species per plot: 40.1

❑ *DESCRIPTION*

The profuse post fire flowering habit of Dwarf Apple (*Angophora hispida*) provides a readily identifiable feature of this floristically diverse scrub community. Found on skeletal soils associated with exposed Hawkesbury Sandstone rock plates and benches, this community forms a low growing scrub (c. 3 metres tall). It is characterised by a dense cover of heath species though the leathery grey-green leaves of the small tree *A. hispida* dominate. Other common species associated with the heath include *Isopogon anemonifolius, Leptospermum trinervium, Banksia oblongifolia, Petrophile pulchella* and *Lambertia formosa.* A sparse ground cover comprised of grasses, sedges and low growing herbs is found often amongst exposed rock plates. The community forms a mosaic with the surrounding low growing eucalypt woodland (MU29).

Sydney Hinterland Dwarf Apple Scrub is patchily distributed across Parr SCA and Wrights Creek catchment in Yengo NP. Outside of the study area it extends east into Dharug National Park and McPherson State Forest. Elsewhere in the Sydney Basin Bioregion, Dwarf Apple Scrubs are found in Dharawal SCA, Woronora Catchment, Royal National Park and in northern Sydney. It forms part of the Sydney Coastal Dry Sclerophyll Forests state-wide classification of Keith (2004). Large areas are protected with the current reserve system.

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 9.1 (2.1) metres; 7.8% (1.2) cover

Eucalyptus haemastoma, E.sclerophylla, E.squamosa, Eucalyptus sparsifolia, Corymbia gummifera, Eucalyptus punctata,

Shrubs: Mean Height 3.1 (1.3); 57.5% (15.8) cover

Angophora hispida, Isopogon anemonifolius, Leptospermum trinervium, Petrophile pulchella, Banksia spinulosa var. *collina, Persoonia linearis, Hovea linearis, Monotoca scoparia, Hakea dactyloides, Pimelia linifolia* subsp. *linifolia, Grevillea buxifolia* subsp. *buxifolia, Lambertia formosa, Acacia suaveolens*

Ground Covers: Mean Height 0.42 (0.2) metres; 35.2% (10.2) cover

Entolasia stricta, Patersonia sericea, Lomandra obliqua, Lomandra glauca, Platysace linearefolia, Lomatia silaifolia, Dampiera stricta, Epacris pulchella, Cyathochaeta diandra, Schoenus imberbis

❑ *KEY IDENTIFYING FEATURES*

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

- Open scrub on sandstone rockplates
- Abundance of Dwarf Apple (*Angophora hispida*)

❑ *EXAMPLE LOCATIONS*

Great North Road north and south of Sampson Pass; Left Arm fire trail Parr SCA; Pierces Valley Track

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	713	61
B Medium	451	39
C High	0	0
Total	**1165**	**100**

❑ *THREATENED PLANT SPECIES*

Acacia byoeana (V); Hibbertia procumbens (E1); Lasiopetalum joyeace (V)

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia echinula	2	75%	1	1%	positive
Angophora hispida	5	100%	3	3%	positive
Anisopogon avenaceus	2	75%	2	14%	positive
Baeckea diosmifolia	2	50%	2	1%	positive
Banksia oblongifolia	3	50%	2	2%	positive
Bossiaea ensata	2	50%	2	2%	positive
Bossiaea heterophylla	2	100%	2	18%	positive
Calytrix tetragona	3	50%	5	0%	positive
Cassytha glabella forma glabella	2	100%	1	6%	positive
Caustis flexuosa	3	50%	2	19%	positive
Corymbia gummifera	2	50%	2	21%	positive
Cyathochaeta diandra	2	100%	2	8%	positive
Dampiera stricta	2	50%	2	22%	positive
Epacris pulchella	2	50%	1	9%	positive
Eucalyptus haemastoma	3	75%	2	2%	positive
Gompholobium glabratum	2	75%	1	3%	positive
Gompholobium grandiflorum	2	50%	1	5%	positive
Gompholobium pinnatum	1	25%	0	0%	positive
Grevillea buxifolia subsp. buxifolia	2	75%	2	13%	positive
Haemodorum corymbosum	2	25%	0	0%	positive
Hakea laevipes subsp. laevipes	2	100%	2	1%	positive
Hakea propinqua	2	50%	0	0%	positive
Hemigenia purpurea	2	50%	0	0%	positive
Hibbertia empetrifolia subsp. empetrifolia	2	75%	1	2%	positive
Hibbertia rufa	2	25%	0	0%	positive
Hovea linearis	2	50%	1	29%	positive
Isopogon anemonifolius	2	100%	1	11%	positive
Lambertia formosa	2	100%	2	16%	positive
Laxmannia compacta	2	75%	0	0%	positive
Leptospermum trinervium	3	100%	2	32%	positive
Leucopogon attenuatus	3	25%	0	0%	positive
Lindsaea linearis	2	50%	1	5%	positive
Lomandra cylindrica	2	50%	2	16%	positive
Lomandra glauca	2	75%	2	30%	positive
Lomandra obliqua	2	75%	2	34%	positive
Mirbelia pungens	2	25%	0	0%	positive
Monotoca scoparia	2	50%	1	31%	positive
Patersonia sericea	2	75%	1	18%	positive
Petrophile pulchella	3	100%	2	6%	positive
Pimelea linifolia	2	75%	2	25%	positive
Platysace linearifolia	2	100%	2	26%	positive

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Ptilothrix deusta	3	100%	3	5%	positive
Schoenus imberbis	2	50%	1	9%	positive
Xanthorrhoea resinifera	2	75%	2	4%	positive

MU33 SYDNEY HINTERLAND ROCK COMPLEX

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not described
State: Sydney Coastal Heath
PVP Biometric Type: Not described
Number of Sites: 5 Number of identified native species per plot: 27.8

❑ *DESCRIPTION*

Massive rock outcropping is found scattered across the sandstone plateaux of dry central Yengo and Parr reserves often in areas that receive less than 800 millimetres of rainfall per year. These sites are comprised of open rock plates and boulders with a very low open cover of vegetation. Typically there is a complex of shrubs and trees that have a variable composition including *Leptospermum trinervium*, *Calytrix tetragona* and *Acacia uncinata.* Stunted trees including *Corymbia eximia, Angophora bakeri* and occasionally *Callitris endlicheri* grow from the rock itself. A further indicator of the dry and harsh environment is the unusual occurrence of the Western Wedding Bush (*Ricinocarpus bowmanii*), a species more common amongst mallees and scrubs of the western plains of NSW.

Unlike other exposed rock outcropping in the Sydney Basin sandstone plateaux, Yengo and Parr reserves do not support Mallee and Banksia heath communities. Rather a dry and depauperate form of the surrounding woodland is typical. As a result the community is aligned to the Sydney Hinterland Dry Sclerophyll Forests state-wide classification of Keith (2004).

❑ *FLORISTIC SUMMARY*

Trees: Height 3-8 metres; 2-15% cover

Corymbia eximia, Angophora bakeri, Eucalyptus sparsifolia, Eucalyptus punctata, Callitris endlicheri

Shrubs: Height 1-3 metres; 5-30% cover

Leptospermum trinervium, Persoonia linearis, Hakea dactyloides, Pimelia linifolia subsp. *linifolia, Grevillea buxifolia* subsp. *buxifolia, Lambertia formosa, Acacia suaveolens*

Ground Covers: Height 0-1 metres; 5-40% cover

Entolasia stricta, Patersonia sericea, Lomandra obliqua, Lomandra glauca, Platysace linearefolia, Dampiera stricta, Epacris pulchella, Schoenus imberbis

❑ *KEY IDENTIFYING FEATURES*

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

- Massive sandstone outcropping with very open vegetation cover

❑ *EXAMPLE LOCATIONS*

Scattered occurences southern and central Yengo NP

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	144	84
B Medium	27	16
C High		
Total	**171**	**100**

❑ *THREATENED PLANT SPECIES*

Velleia perfoliata (v);

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia suaveolens	2	40%	1	17%	positive
Acacia uncinata	2	40%	1	2%	positive
Angophora bakeri	2	40%	3	23%	positive
Boronia ledifolia	2	40%	1	10%	positive
Coopernookia barbata	2	40%	3	0%	positive

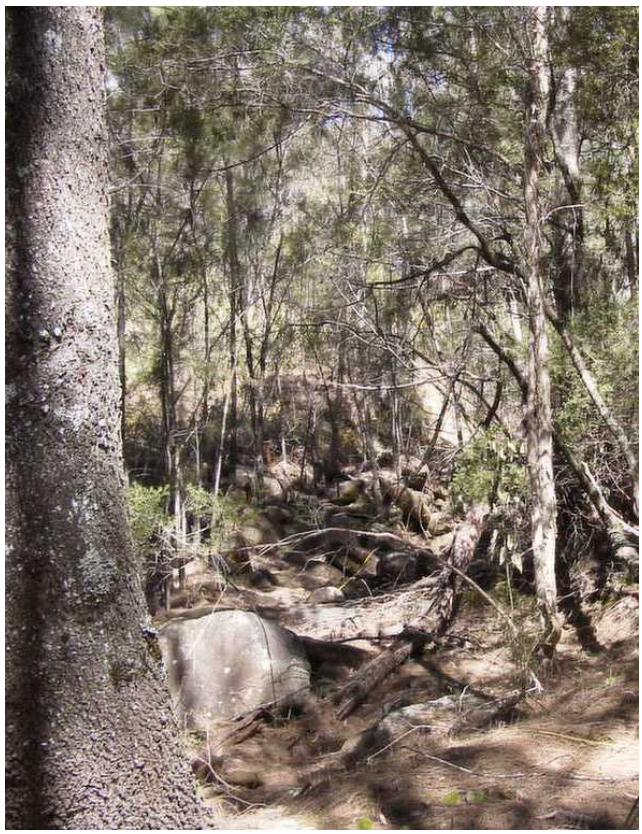
Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Corymbia eximia	3	80%	2	29%	positive
Dianella revoluta var. revoluta	2	40%	2	30%	positive
Dillwynia sericea	2	60%	2	3%	positive
Eragrostis brownii	2	40%	2	11%	positive
Euryomyrtus ramosissima subsp. ramosissima	2	20%	0	0%	positive
Grevillea buxifolia subsp. buxifolia	2	60%	2	13%	positive
Grevillea mucronulata	2	40%	2	25%	positive
Hakea dactyloides	2	40%	2	11%	positive
Hovea linearis	2	60%	1	29%	positive
Lepidosperma viscidum	3	40%	1	2%	positive
Leptospermum trinervium	2	100%	2	31%	positive
Leucopogon muticus	2	40%	1	25%	positive
Lomandra glauca	2	100%	2	29%	positive
Patersonia glabrata	2	40%	2	10%	positive
Patersonia sericea	2	100%	1	18%	positive
Platysace ericoides	2	60%	2	19%	positive
Pultenaea ferruginea	2	40%	2	8%	positive
Pultenaea flexilis	3	40%	2	8%	positive
Ricinocarpos bowmanii	2	20%	0	0%	positive
Schoenus imberbis	2	40%	1	9%	positive
Syncarpia glomulifera subsp. glomulifera	3	40%	3	31%	positive
Velleia perfoliata	1	20%	0	0%	positive
Xylomelum pyriforme	2	60%	1	18%	positive
Entolasia stricta	2	100%	2	70%	constant
Persoonia linearis	2	40%	2	70%	constant
Pomax umbellata	2	40%	2	41%	constant

MU34 COASTAL RIVER OAK FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: A component of Wollombi River Oak –Red Gum Forest
State: Eastern Riverine Forests
PVP Biometric Type: River Oak riparian woodland of the North Coast and northern Sydney Basin
Number of Sites: 4 Number of identified native species per plot: 39

❑ *DESCRIPTION*



Coastal River Oak Forest occurs on the pebbly and sandy banks of the Wollombi Brook and its tributaries. It is characterised by stands of River Oak (*Casuarina cunninghamiana* subsp. *cunninghamiana*) along high-energy banks. The forest understorey is highly variable, mostly because human related disturbance has removed and fragmented much of its original cover. Many of the small remnants carry an abundance of succulent and invasive weeds dispersed by water and/or cattle. Where native species are present, the ground cover is grassy with *Microlaena stipoides* var. *stipoides* and *Oplismenus imbecillus* the most common. A wide variety of herbs such as *Commelina cyanea* and sedges (*Juncus* spp.) may also be encountered. The shrub layer can be highly variable depending on site disturbance. Thickets of the thorny shrubs *Hymenanthera dentata* or *Bursaria spinosa* may dominate alongside weeds such as *Lantana camara.* Traces of mesic species such as *Backhousia myrtifolia*, *Alphitonia excelsa* will occur occasionally hosting the vine *Pandorea pandorana*.

Larger stands of this forest are present along narrow flats at the junction of the sandstone escarpment and the wider open valleys. These sheltered situations afford a greater diversity and abundance of mesic species in the understorey. Such situations at times may more closely resemble riparian scrubs and dry rainforest communities (MU3).

Coastal River Oak Forest forms part of the Eastern Riverine Forests of Keith (2004). These alluvial forests are amongst the most heavily depleted and poorly reserved vegetation communities in NSW. Coastal River Oak Forest forms a component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *FLORISTIC SUMMARY*

Trees: Mean Height 21.3 (2.7) metres; 21% (12.8) cover

Casuarina cunninghamiana subsp. *cunninghamiana, Angophora floribunda,*

Shrubs: Mean Height 8.25 (4.6) metres; 40.2 % (28.7) cover

Hymenanthera dentata, Claoxylon australis, Bursaria spinosa, Breynia oblongifolia, Alphitonia excelsa, Backhousia myrtifolia, Melaleuca linarifolia, Acacia maidenii, Melia azederach

Ground Covers: Mean Height 1 (0) metres; 85% (10) cover

Urtica incisa, *Hydroctyle laxiflora*, *Microlaena stipoides* var *stipoides*, *Oplismenus aemulus, Sigesbeckia orientalis, Commelina cyanea, Solanum prinophyllum, Entolasia marginata, Einadia hastata, Geranium solanderi*

Vines & Climbers: no structural data available

Pandorea pandorana, Stephania japonica var. *discolor*

❑ *KEY IDENTIFYING FEATURES*

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

- River and stream banks of major valleys
- Stands of River Oak (*Casuarina cunninghamiana* subsp. *cunninghamiana*) and Rough-barked Apple (*Angophora floribunda*)

❑ *EXAMPLE LOCATIONS*

Wollombi Valley

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	6	6
B Medium	37	31
C High	77	64
Total	**121**	**100**

❑ *THREATENED PLANT SPECIES*

It forms a component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Alphitonia excelsa	4	67%	1	3%	positive
Brachyscome angustifolia	1	33%	0	0%	positive
Casuarina cunninghamiana subsp. cunninghamiana	5	100%	4	0%	positive
Echinopogon ovatus	2	67%	2	6%	positive
Einadia trigonos	5	67%	2	1%	positive
Euroschinus falcata var. falcata	1	33%	0	0%	positive
Leptospermum polygalifolium	3	33%	0	0%	positive
Melia azedarach	2	67%	3	0%	positive
Oplismenus aemulus	3	100%	2	6%	positive
Sigesbeckia orientalis subsp. orientalis	5	67%	2	10%	positive
Stephania japonica var. discolor	2	67%	1	7%	positive
Zieria adenodonta	5	100%	2	0%	positive

MU35 SYDNEY HINTERLAND SANDSTONE RIPARIAN COMPLEX

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not described
State: Eastern Riverine Forests
PVP Biometric Type: Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin
Number of Sites: 2 Number of identified native species per plot: 35.5

❑ *DESCRIPTION*

A complex of vegetation structures is found alongside major streams and creeks that dissect the sandstone plateaux of the study area. On the larger waterways such the Macdonald River, the stream banks form a narrow channel where open water, sand deposits, and rock outcropping combine with a cover of open to dense mesic scrubs and tall overhanging eucalypts. The species composition of this map unit is highly variable as the river meanders create exposed and sheltered environments over very short distances. The riverbank is also a highly unstable environment, where rapid floodwaters can remove the vegetation cover and alter the placement of sandbanks and gravel deposits. Many of the sheltered situations reveal scrubs dominated by Water Gum (*Tristaniopsis laurina*), Coachwood (*Ceratopetalum apetalum*) and Black Wattle (*Callicoma serratifolia)*. The shallow sand deposits provide cover for a mix of ferns such as *Calochlaena dubia* and sedges including *Schoenus melanostachys* and *Gahnia clarkei*.

Small scrubs also develop along minor streams at the base of Hawkesbury sandstone gullies where rocks and/or sand deposits gather. Here the scrubs are less mesic and are dominated by a dense cover of Coral Ferns (*Gleichenia dicarpa*) and Saw Sedge (*Gahnia clarkei).* The shrub layer may also include Tea tree (*Leptospermum polygalifolium* subsp. *polygalifolium*) and *Banksia serrata.*

Riparian scrub complexes are often overlooked as they are difficult to map at the scale of aerial photography used to define vegetation patterns. Typically the community is no more than ten metres wide and often is situated underneath an overhanging eucalypt canopy. At other times (see photo) the community is broader and more readily discernable. The community is widespread throughout the sandstone reserve system and is considered well protected.

❑ *FLORISTIC SUMMARY*

Emergents: **Height to 25 metres; 5 % Cover**

E.deanei, E. punctata, Syncarpia glomulifera subsp. *glomulifera, Angophora floribunda, E. michaeliana, Allocasuarina torulosa*

Small Trees: **Height 6-8 metres; 45% Cover**

Tristaniopsis laurina, Callicoma serratifolia, Acacia elata, Cerapetalum apetalum, Elaeocarpus reticularis Leptospermum polygalifolium subsp *polygalifoilum*

Low Shrubs: **Height 1.5 metres; 80% cover**

Dodonaea triquetra, Todea barbara

Ground Covers: **Height 0.4 metres; 5% cover**

Blechnum cartilagenium, Adiantum aethiopicum, Calochlaena dubia, Pteridium esculentum, Gleichenia dicarpa, Entolasia marginata, Schoenus melanostachys

Vines & Climbers: **no structural data available**

Smilax glyciphylla, Cissus hypoglauca

❑ *KEY IDENTIFYING FEATURES*

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

- Major river banks and streamsides with sandy and rocky soil
- Scrubs and ferny scrambles on minor sandstone streams

❑ *EXAMPLE LOCATIONS*

Webbs Creek; Upper Macdonald River

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	318	100
B Medium	0	0
C High	0	0
Total	**318**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Acacia elata	2	100%	2	2%	positive
Adiantum aethiopicum	2	50%	2	20%	positive
Allocasuarina torulosa	3	100%	2	32%	positive
Angophora euryphylla	2	50%	2	1%	positive
Blechnum cartilagineum	2	100%	2	6%	positive
Callicoma serratifolia	4	50%	2	2%	positive
Calochlaena dubia	2	100%	2	7%	positive
Ceratopetalum gummiferum	3	100%	2	10%	positive
Crowea exalata subsp. exalata	2	50%	0	0	positive
Dillwynia retorta	2	50%	2	6%	positive
Dodonaea triquetra	2	100%	2	17%	positive
Elaeocarpus reticulatus	2	100%	1	10%	positive
Entolasia marginata	2	50%	2	0.121	positive
Gahnia clarkei	6	100%	2	1%	positive
Gleichenia dicarpa	2	100%	1	1%	positive
Hibbertia dentata	2	100%	2	2%	positive
Leptospermum polygalifolium	2	50%	0	0	positive
Logania albiflora	3	50%	1	3%	positive
Lomatia silaifolia	2	50%	1	23%	positive
Prostanthera linearis	2	50%	3	1%	positive
Prostanthera rhombea	2	50%	1	1%	positive
Pteridium esculentum	2	100%	2	30%	positive
Pultenaea flexilis	3	50%	2	7%	positive
Schelhammera undulata	2	50%	2	3%	positive
Schizomeria ovata	2	50%	1	1%	positive
Schoenus melanostachys	2	50%	2	1%	positive
Smilax glyciphylla	2	100%	1	11%	positive
Stylidium lineare	2	50%	1	1%	positive
Syncarpia glomulifera subsp. glomulifera	4	50%	3	31%	positive
Tristaniopsis laurina	2	50%	2	4%	positive
Zieria pilosa	2	50%	1	1%	positive
Persoonia linearis	1	0.5	2	0.6963	negative

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Phyllanthus hirtellus	0	0	2	0.468	negative
Podolobium ilicifolium	0	0	2	0.3607	negative
Pomax umbellata	0	0	2	0.4087	negative
Entolasia stricta	2	0.5	2	0.7032	constant
Lepidosperma laterale	2	0.5	2	0.4269	constant

MU36 COASTAL ESTUARINE SWAMP OAK FOREST

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Estuarine Swamp Oak-Rush Forest
State: Coastal Floodplain Wetlands
PVP Biometric: Swamp Oak swamp forest fringing estuaries, Sydney Basin and South East Corner
Number of Sites: 0 Number of identified native species per plot: n/a

❑ *DESCRIPTION*

Brackish water at the junction of Webbs Creek and the Hawkesbury River limits the development of vegetation communities to those that support species with some salt tolerance. The most profuse of these is Swamp Oak (*Casuarina glauca*), forming dense swathes or ribbons alongside creek lines. The composition of this community can be variable depending on the degree of saline influence. At times, *Melaleuca ericifolia* may form a dense sub canopy some distance from the riverbank. More often there are tall reeds and rushes such as *Phragmites australis* and *Cladium procerum* that may reach two metres in height. The dense ground layer is characterised by salt tolerant rushes, grasses and herbs including *Baumea juncea*, *Juncus kraussii* subsp. *australiensis*, *Sporobolus virginicus* and *Apium prostratum.*

This community is widespread though patchy and limited in area along the coastal plains of the Sydney Basin. As with all vegetation associated with floodplains it has been extensively cleared and modified. It is under ongoing threat of clearing and weed invasion. This community is recognised as a component of Swamp Oak Floodplain Forest, an endangered ecological community, listed under Schedule 3 of the Threatened Species Conservation Act, 1995.

❑ *FLORISTIC SUMMARY*

Trees: **Height 7-15 metres; 62% cover**

Casuarina glauca, Melaleuca ericifolia

Small trees: **Height 1-3 metres; 10-45% cover**

Casuarina glauca, Melaleuca linariifolia, Melaleuca ericifolia, Melaleuca styphelioides

Ground Covers: Height 0.5-2 metres (mean 1.13); 80-95% cover (mean 80.63)

Baumea juncea, Phragmites australis, Juncus kraussii subsp. *australiensis, Sporobolus virginicus, Apium prostratum* var. *prostratum, Apium prostratum* var. *filiforme, Mimulus repens, Gratiola pedunculata, Pratia pedunculata*

❑ *KEY IDENTIFYING FEATURES*

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

- River and stream banks of major valleys
- Stands of Swamp Oak (*Casuarina glauca*) and Paperbark (*Melaleuca ericifolia*)

❑ *EXAMPLE LOCATIONS*

Lower Webbs Creek; Hawkesbury River

- ***CONDITION ASSESSMENT***

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	0	0
B Medium	16	23
C High	55	77
Total	**71**	**100**

- ***THREATENED PLANT SPECIES***

It forms a component of Swamp Oak Floodplain Forest, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

- ***DIAGNOSTIC SPECIES***

Community not sampled in study area. No diagnostic species generated.

MU37 HUNTER RANGE BASALT PAPERBARK THICKET

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Not described
State: Coastal Valley Grassy Woodlands
PVP Biometric Type: Not described
Number of Sites: 1 Number of identified native species per plot: 28

❑ *DESCRIPTION*

A closed low forest of Paperbark (*Melaleuca styphelioides*) occurs on a minor drainage line off Mount Wareng. Permanently damp soils arise from seeping water that appears to emerge between the geological strata of the overlying basalt flow and the sandstone bedrock. The floristic composition of the community more closely resembles the forests growing on the nearby basalt-enriched soils and the abundance of the paperbark make it easily identifiable to travellers along Howes Trail. There is an open cover of herbs and grasses such as *Dichondra repens* and *Microlaena stipoides* var. *stipoides*. Vines and climbers are also present in good numbers including *Pandorea pandorana* and *Stephanica japonica* var. *discolor*.

Floristically it should be considered a component of MU9 and recognised as a community that is poorly conserved within the Sydney Basin Bioregion.

❑ *FLORISTIC SUMMARY*

Emergents:

Eucalyptus tereticornis

Trees:

Melaleuca styphelioides, Allocasuarina torulosa

Shrubs:

Breynia oblongifolia, Rapanea variabilis, Bursaria spinosa, Acacia fulva, A. implexa, Polyscias sambuccifolia

Ground Covers: Mean Upper

Pellaea falcata, Desmodium gunnii, Dichondra repens, Doodia aspera, Adiantum aethiopicum

Vines & Climbers: no structural data available

Clematis aristata, Eustrephus latifolius, Pandorea pandorana, Stephania japonica var. *discolor*

❑ *KEY IDENTIFYING FEATURES*

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

- Dense stand of Prickly-leaved Paperbark (*Melaleuca styphelioides)*

❑ *EXAMPLE LOCATIONS*

Mount Wareng

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low		
B Medium	1	100
C High		
Total	**1**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Adiantum aethiopicum	4	100%	2	16%	positive
Breynia oblongifolia	2	100%	1	25%	positive
Bursaria spinosa	3	100%	2	24%	positive
Cissus antarctica	2	100%	2	5%	positive
Desmodium gunnii	2	100%	1	2%	positive
Dichondra repens	2	100%	2	17%	positive
Eucalyptus tereticornis	3	100%	3	4%	positive
Eustrephus latifolius	2	100%	1	13%	positive
Galium propinquum	2	100%	2	3%	positive
Lepidosperma laterale	2	100%	1	37%	positive
Libertia paniculata	5	100%	1	1%	positive
Maytenus silvestris	2	100%	1	22%	positive
Melaleuca styphelioides	6	100%	2	2%	positive
Microlaena stipoides var. stipoides	2	100%	2	22%	positive
Oplismenus imbecillis	2	100%	1	18%	positive
Pellaea falcata	2	100%	2	11%	positive
Pseuderanthemum variabile	2	100%	1	8%	positive
Rubus parvifolius	2	100%	2	7%	positive
Sarcopetalum harveyanum	2	100%	1	6%	positive

MU38 HUNTER RANGE FLATS PAPERBARK THICKET

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Freshwater Wetland Complex
State: Coastal Floodplain Wetlands
PVP Biometric Type: Melaleuca linariifolia - Swamp Mahogany swamp forest in drainage lines of the edges of the Cumberland Plain, Sydney Basin
Number of Sites: 1 Number of identified native species per plot: 25

❑ *DESCRIPTION*

Groves of the Paperbark *Melaleuca linariifolia* are found in long narrow ribbons tracing creeklines and poorly drained alluvial soils. Found throughout the dry areas of the Hunter Range these dense stands form a low growing closed forest. They are one of a number of vegetation communities found on alluvial flats. Many sites are highly disturbed by grazing or clearing, while other stands are profuse regrowth forests that re-emerge following the cessation of these impacting processes.

The composition of the understorey appears to vary considerably depending on the presence of standing water, disturbance or fire. While the wettest sites will include sedges such as *Carex appressa* found in MU42, drier sites are grassy and herbaceous and are most similar to the alluvial grassy forests described by MU12.

Groves of this forest are between 5-10 metres tall and generally more than 50 percent cover. Occasional emergent eucalypt such as Cabbage Gum (*Eucalypt amplifolia* var. *amplifolia*) or Rough-barked Apple (*Angophora floribunda)* may be present. Smaller wattles such as *Acacia filicifolia* or *A. parramattensis* occur above grasses including *Microlaena stipoides* var *stipoides,* herbs *Dichondra repens* and *Calotis* sp.

This community forms a component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *FLORISTIC SUMMARY*

Trees: Height 3-9 metres; 30-80% cover

Melaleuca linariifolia, Angophora floribunda, Eucalyptus amplifolia subsp. *amplifolia*

Shrubs: Height 1-2 metres; 5-30-% cover

Acacia parramattensis, Acacia filicifolia

Ground Covers: Height 0-1 metres; 30-90% cover

Carex appressa, Microlaena stipoides var. *stipoides, Entolasia marginata, Pteridium esculentum, Dichondra repens*

❑ *KEY IDENTIFYING FEATURES*

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

- Alluvial Soils
- Groves of Paperback (*Melaleuca linariifolia*)

❑ *EXAMPLE LOCATIONS*

Peter Huffs Creek, Putty Road area, Boggy Swamp Creek

- ***CONDITION ASSESSMENT***

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	12	25
B Medium	10	21
C High	28	55
Total	**51**	**100**

- ***THREATENED PLANT SPECIES***

It forms a component of River-flat Eucalypt Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

- ***DIAGNOSTIC SPECIES***

No diagnostic species generated for this community. Diagnostic species from Map Unit 12 will be highly informative in areas of the Putty and Howes Valleys.

MU39 COASTAL RIVERFLAT PAPERBARK SCRUB

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Freshwater Wetland Complex
State: Coastal Floodplain Wetlands
PVP Biometric Type: Melaleuca linariifolia - Swamp Mahogany swamp forest in drainage lines of the edges of the Cumberland Plain, Sydney Basin
Number of Sites: 0 Number of identified native species per plot: n/a

❑ *DESCRIPTION*

A low open scrub dominated by the Paperbark *Melaleuca linariifolia* is common along the major river flats of the Macdonald and Wollombi Valleys. These coastal valleys are dotted with remnant paperbark scrubs and thickets that highlight drainage depressions and minor creeklines along the flats. Some sites may include emergent trees such as Cabbage Gum (*Eucalyptus amplifolia* subsp. *amplifolia*), Rough-barked Apple (*Angophora floribunda*) and Swamp Oak (*Casuarina glauca*). The ground cover is generally herbaceous (*Centella asiatica*, *Pratia purpurescens* and *Viola hederacae)* and ferny *(Adiantum aethiopicum* and *Hypolepis muelleri*). Wetter sites will include a great diversity and abundance of sedges including *Juncus continuus* and *Carex appressa.*

This community has been extensively cleared along coastal valleys, and remnants present in the study area appear to have a long disturbance history. There are few examples of this community found within the reserve system, and threatening processes continue to operate on private lands.

Coastal Riverflat Paperbark Scrub forms a component of Swamp Sclerophyll Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *FLORISTIC SUMMARY*

Trees: **Height 3-9 metres; 30-80% cover**

Melaleuca linariifolia, Angophora floribunda, Eucalyptus amplifolia

Shrubs: **Height 1-2 metres; 5-30-% cover**

Acacia parramattensis, Acacia filicifolia

Ground Covers: **Height 0-1 metres; 30-90% cover**

Carex appressa, Microlaena stipoides var. *stipoides, Entolasia marginata, Pteridium esculentum, Dichondra repens*

❑ *KEY IDENTIFYING FEATURES*

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

- Alluvial Soils
- Groves of Paperback (*Melaleuca linariifolia*)

❑ *EXAMPLE LOCATIONS*

Peter Huffs Creek, Putty Road area, Boggy Swamp Creek

- ***CONDITION ASSESSMENT***

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	36	18
B Medium	30	15
C High	130	66
Total	**196**	**100**

- ***THREATENED PLANT SPECIES***

It forms a component of Swamp Sclerophyll Forest on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

- ***DIAGNOSTIC SPECIES***

No diagnostic species generated for this community.

MU40 COASTAL ESTUARINE PAPERBARK THICKET

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Estuarine Swamp Oak-Rush Forest
State: Coastal Floodplain Wetlands
PVP Biometric Type: Swamp Oak - Prickly Tea-tree - Swamp Paperbark swamp forest on coastal floodplains, Sydney Basin and South East Corner
Number of Sites: 0 Number of identified native species per plot: N/A

❑ *DESCRIPTION*

This low growing and patchily distributed scrub community is situated on floodplains proximate to brackish water. It is dominated by the fine leaved Swamp Paperbark (*Melaleuca ericifolia*) forming scrubs that rarely exceed five metres in height. At times it includes scattered emergent Swamp Oaks (*Casuarina glauca*) marking a transition into stands dominated by this taller species (MU36). Below the upper canopy, dense covers of salt tolerant grasses (*Sporobulus virginicus)*, reeds (*Phragmites australis*) and rushes (*Juncus kraussii* subsp. *australiensis)* are typical.

Within the study area there are only a few remnant patches found at the junction of the Macdonald and Hawkesbury Rivers. As with all vegetation associated with floodplains this community has been extensively cleared and modified. It is recognised as a component of Swamp Oak Floodplain Forest, an endangered ecological community, listed under Schedule 3 of the Threatened Species Conservation Act, 1995.

❑ *FLORISTIC SUMMARY*

Trees: Height 10-15 metres; 2-10% cover

Casuarina glauca

Small trees: Height 1-5 metres; 45-80% cover

Melaleuca ericifolia

Ground Covers: Height 0.5-2 metres 80-95% cover

Baumea juncea, Phragmites australis, Juncus kraussii subsp. *australiensis, Sporobolus virginicus, Apium prostratum* var. *prostratum, Apium prostratum* var. *filiforme, Mimulus repens, Gratiola pedunculata, Pratia pedunculata*

❑ *KEY IDENTIFYING FEATURES*

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

- River and stream banks of major valleys
- Stands of Swamp Paperbark (*Melaleuca ericifolia*)

❑ *EXAMPLE LOCATIONS*

Webbs Creek, Hawkesbury River

- ***CONDITION ASSESSMENT***

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low		
B Medium	1	20
C High	4	80
Total	**5**	**100**

- ***THREATENED PLANT SPECIES***

A component of Swamp Oak Floodplain Forest, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

- ***DIAGNOSTIC SPECIES***

Community not sampled in study area. No diagnostic species generated.

MU41 COASTAL FLOODPLAIN WETLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Freshwater Wetland Complex
State: Coastal Floodplain Wetlands
PVP Biometric Type: Coastal floodplain sedgelands, rushlands, and forblands of the North Coast

Number of Sites: 1 Number of identified native species per plot: 5

❑ *DESCRIPTION*

The major floodplains of the Hawkesbury and Macdonald Rivers support remnant wetlands. These low-lying treeless communities are characterised by a mosaic of reeds, sedges and herbs occupying back swamps that are frequently inundated during rainfall events. Many sites form a network with permanent to semi-permanent open water. Individual sites may vary in species composition, given local disturbance and water level. At the only site sampled, tall reeds of *Eleocharis sphacelata* and the more slender rush *Fimbristylis velata* were dominant. Other common wetland species such as *Perseicaria* spp., *Juncus* spp. and *Cyperus* spp. were less abundant on site though were common or present in areas adjoining.

These wetlands are mostly situated outside of the reserve system, with only small fringing examples found in Parr SCA. On the floodplains, these wetlands are situated amongst rural and semi rural land uses. Past clearing for grazing has resulted in a significant reduction of their original extent, and those that remain today are often highly disturbed as a result of weed infestation and continued grazing pressure.

This community forms a component of Freshwater Wetlands on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *FLORISTIC SUMMARY*

Trees: Height 4.6 metres; 5% cover

Melaleuca linariifolia

Ground Covers: Height 3 metres; 75% cover
Elaeocharis sphacelatus, Fimbristylis velata, Persicaria decipiens, Juncus usitatus, Carex appressa, Cyperus odoratus, Ludwigia peploides subsp. *montevidensis*

❑ *KEY IDENTIFYING FEATURES*

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

- Treeless open reedlands on coastal floodplains

❑ *EXAMPLE LOCATIONS*

St Albans Common, Macdonald River; Greens Swamp near Hawkesbury River

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	0	0
B Medium	12	14
C High	75	86
Total	**87**	**100**

❑ *THREATENED PLANT SPECIES*

A component of Freshwater Wetlands on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Cyperus odoratus	2	100%	0	0%	positive
Eleocharis sphacelata	6	100%	2	0%	positive
Fimbristylis velata	6	100%	0	0%	positive
Typha orientalis	2	100%	0	0%	positive

MU42 HUNTER RANGE FLATS FRESHWATER WETLAND

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Freshwater Wetland Complex
State: Coastal Floodplain Wetlands
PVP Biometric Type: Prickly Tea-tree - sedge wet heath on sandstone plateaux, central and southern Sydney Basin

Number of Sites: 1 Number of identified native species per plot: 16

❑ *DESCRIPTION*

Small areas of permanent water occur on poorly drained alluvial flats of the Howes and Garland Valleys. The tall sedge *Carex appressa* forms very dense clumps in and around the permanent water. Scattered tall *Melaleuca linariifolia* and lower growing shrubs including *Leptospermum juniperinum* and *Acacia filicifolia* fringe drier margins of the wetland. A number of other moisture loving sedges, ferns and herbs are present.

Although this wetland community is dominated by a single species, it remains of high conservation value. Sites of permanent water have been extensively used as cattle watering holes or have been drained and cleared to encourage the growth of palatable grasses. There are few examples of these types of wetlands present within the reserve system of the Sydney Basin Bioregion although most are in a highly disturbed condition

It forms a component of Freshwater Wetlands on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *FLORISTIC SUMMARY*

Trees: Height 6 metres; 5% cover

Melaleuca linariifolia, Angophora floribunda, Eucalyptus amplifolia subsp. *amplifolia*

Shrubs: Height 2 metres; 30% cover

Leptospermum juniperinum, Acacia parramattensis, Acacia filicifolia, Callistemon citrinus

Ground Covers: Height 1 metres; 90% cover

Carex appressa, Entolasia marginata, Rununculus inundatus, Blechnum nudum, Centella asiatica, Hypolepis muelleri

❑ *KEY IDENTIFYING FEATURES*

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

- Permanent water on poorly drained alluvial flats of the Howes, Putty and Garland Valleys
- Dense cover of tall sedges (*Carex* spp.)

❑ *EXAMPLE LOCATIONS*

Howes Valley Area

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	9	15
B Medium	29	48
C High	22	37
Total	**60**	**100**

❑ *THREATENED PLANT SPECIES*

A component of Freshwater Wetlands on Coastal Floodplains, an Endangered Ecological Community listed under Schedule 3 of the NSW Threatened Species Conservation Act (1995).

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq.	Non-group Score (60 Percentile)	Non-group Freq.	Fidelity Class
Blechnum nudum	2	100%	2	1%	positive
Carex appressa	6	100%	2	1%	positive
Centella asiatica	2	100%	2	1%	positive
Gratiola peruviana	2	100%	3	0%	positive
Histiopteris incisa	2	100%	0	0%	positive
Hydrocotyle peduncularis	2	100%	2	2%	positive
Leptospermum juniperinum	4	100%	2	1%	positive
Lycopus australis	2	100%	0	0%	positive
Persicaria praetermissa	2	100%	0	0%	positive
Pseudoraphis paradoxa	1	100%	0	0%	positive
Ranunculus inundatus	2	100%	2	0%	positive
Villarsia exaltata	1	100%	0	0%	positive

MU43 SYDNEY HINTERLAND SANDSTONE UPLAND SWAMP

❑ *CORRESPONDING CLASSIFICATIONS*

Regional: Hinterland Sandstone Hanging Swamp
State: Coastal Heath Swamps
PVP Biometric Type: Prickly Tea-tree - sedge wet heath on sandstone plateaux, central and southern Sydney Basin
Number of Sites: 2 Number of identified native species per plot: n/a

❑ *DESCRIPTION*

Only two small areas of this sedge and rush dominated community are present within the reserves. They are situated on seepage zones where periodically waterlogged peat and sandy loam soil gathers above Hawkesbury Sandstone bedrock. A dense cover of *Lepyrodia scariosa, Schoenus brevifolius, Leptocapus tenax* and *Ptilothrix deusta* may be found. Shrubs are sparsely distributed, often near the fringes of the community. In the reserves *Banksia oblongifolia*, *Leptospermum juniperinum* and *Hakea teretifolia* are the prominent shrub species.

Hanging swamps are prevalent across the Sydney Basin on Hawkesbury and Narrabeen sandstone mostly where rainfall exceeds 1000 mm per year. The majority of Yengo and Parr reserves are too dry to support this community however two small examples are found near the eastern boundary, a zone of higher rainfall approaching 950 mm per annum. It is here, near the Great North Road, that these hanging swamps are located.

❑ *FLORISTIC SUMMARY*

Shrubs: Height 1 metre; 5-25% cover

Banksia oblongifolia, Leptospermum juniperinum, Callistemon citrinus

Ground Covers: Height 0-1 metre; 70-95% cover

Lepyrodia scariosa, Empodisma minus, Leptocarpus tenax, Schoenus brevifolius, Entolasia marginata, Rununculus inundatus

❑ *KEY IDENTIFYING FEATURES*

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

- Open sedgeland on sandstone
- Damp to waterlogged peaty and sandy soil

❑ *EXAMPLE LOCATIONS*

Below Mt Lockyer, Great North Road area

❑ *CONDITION ASSESSMENT*

Disturbance Class	Area (ha)	Proportion Extant (%)
A Low	3	100
B Medium		
C High		
Total	**3**	**100**

❑ *THREATENED PLANT SPECIES*

Nil recorded

❑ *DIAGNOSTIC SPECIES*

Species Name	Group Score (60 percentile)	Group Freq	Non GroupScore (60 Percentile)	Non-group Freq	Fidelity Class
Aristida warburgii	2	100%	1	1%	positive
Baeckea diosmifolia	3	100%	2	2%	positive
Banksia oblongifolia	4	100%	2	2%	positive
Banksia serrata	1	50%	1	10%	uninformative
Bossiaea heterophylla	1	50%	2	17%	uninformative
Caesia parviflora var. parviflora	1	50%	2	4%	uninformative
Callistemon citrinus	1	50%	2	1%	uninformative
Cassytha glabella forma glabella	1	50%	1	6%	uninformative
Dampiera stricta	1	100%	2	20%	uninformative
Drosera spatulata	2	50%	1	0%	positive
Entolasia stricta	2	50%	2	67%	constant
Genoplesium filiforme	1	50%	0	0%	positive
Goodenia dimorpha var. dimorpha	1	50%	0	0%	positive
Haemodorum corymbosum	2	100%	2	0%	positive
Hibbertia riparia	2	50%	2	1%	positive
Lepyrodia scariosa	6	100%	2	3%	positive
Lomandra longifolia	1	50%	1	30%	uninformative
Olax stricta	1	50%	1	1%	uninformative
Panicum simile	2	50%	1	19%	positive
Persoonia isophylla	1	50%	1	1%	uninformative
Petrophile pulchella	3	50%	2	6%	positive
Ptilothrix deusta	3	100%	3	6%	positive
Schoenus brevifolius	4	100%	2	1%	positive
Xyris operculata	1	50%	0	0%	positive

OTHER MAP FEATURES

❑ *MAP UNIT 44: ACACIA REGENERATION*

Regenerating Wattle (*Acacia* spp.) scrubs often mark sites of recovery following heavy disturbance to native vegetation cover. This disturbance may arise from a wide range of impacts including fire, clearing, grazing and logging. This map unit includes a number of different wattle scrubs each with their own identifiable taxa. This includes *Acacia fulva* on Mount Yengo, *Acacia filicifolia* and *Acacia parramattensis* on alluvial soils and *Acacia binervia* or *Acacia bulgaensis* on rocky sandstone in northern Yengo NP. These sites of regenerating vegetation often retain components of the original vegetation community. In landscapes that have been subject to clearing, careful review of regenerating vegetation is required to ensure that the species present do not consititute a component of an Endangered Ecological Community listed under the NSW *TSC Act, 1995* or the Commonwealth EPBC Act, 1999.

❑ *MAP UNIT 45: REGENERATING TREES AND SHRUBS*

This map unit includes pioneering species that are not dominated by Wattle (*Acacia* spp.) and represent sites of very high disturbance. Floristic composition is highly varied and might include regenerating Eucalypts, Casuarina and Melaleuca species. These sites of regenerating vegetation often retain components of the original vegetation community. In landscapes that have been subject to clearing, careful review of regenerating vegetation is required to ensure that the species present do not consititute a component of an endangered ecological community listed under the NSW *TSC Act, 1995* or the Commonwealth EPBC Act, 1999.

❑ *MAP UNIT 46: CLEARED LANDS*

Clearing of native vegetation has occurred on high fertility soils, particularly on lower slopes valleys associated with major river flats. These features include pastures and paddocks, transmission lines, roads, former cleared areas, residential areas etc. Cleared and severely disturbed lands can include patches of native vegetation that retain less than three percent canopy cover. These are widely spaced and/or isolated paddock trees. Other patches of native vegetation may be too small to map at the scale of mapping undertaken for this project . Careful review of vegetation on these landscapes is required to ensure that the species present do not consititute a component of an endangered ecological community listed under the *NSW TSC Act, 1995* or the Commonwealth EPBC Act, 1999.

❑ *MAP UNIT 47: EXOTIC SPECIES*

Small areas of exotic species have been mapped. These include Willows (*Salix* spp.), Blackberry (*Rubus* spp.), and Poplars (*Populus* sp.) as well as plantations of species not native to the study area.

❑ *MAP UNIT 48: WATER*

Department of
Environment &
Climate Change NSW