

THE FLORA OF SOUTH-EAST YARROWLUMLA

- A PRELIMINARY ASSESSMENT



by
Peter Barrer

BIOSURVEYS

CONSULTANT'S REPORT TO THE SAVE THE BUSH GRANTS SCHEME,
AND THE STONEY CREEK LANDCARE GROUP

1997

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SUMMARY

A survey of native vegetation in the south-east of the Yarrowlumla Shire was carried out to map and describe the existing remnants.

Eight broad vegetation types were found to occur in the study area: wet sclerophyll forest, intermediate sclerophyll forest, dry sclerophyll forest and woodland, savannah (grassy) woodland, shrubland, heathland, grassland and sedgeland (**Section 5.2**). Each vegetation type was divided into communities, with a total of 25 communities defined for the study area (**Section 5.2**).

Condition and extent of the vegetation types in the study area were assessed (**Section 5.3**). Wet and intermediate sclerophyll forests are of limited extent in the study area, and are most threatened by inappropriate burning and grazing. Dry sclerophyll forests are widespread on low ridges and hills and have been subjected to many years of clearing, timber collecting and inappropriate grazing. Savannah woodlands were once widespread across the lower slopes and undulating regions of the study area. Clearing and a long history of grazing has greatly altered this vegetation type, particularly the understorey, so that almost no intact examples remain. The same applies to native grasslands, once widespread across the plains, but now largely replaced by introduced pastures and weeds.

Production of a map of vegetation structural types was attempted using satellite imagery, however the classification techniques used were unable to map the accurate or approximate limits of different structural types (**Section 5.4**). It is recommended that a simpler map of vegetation structure be produced using existing maps and aerial photography.

Plant species and floristic diversity were sampled over 15 sites or localities within the study area, and details of one further site were obtained from the literature. In excess of 350 native plant species have been recorded in the study area, most during the present study (**Section 5.5**). Forty-six plant species are described as being of conservation significance because they are either threatened, rare or uncommon on a national, state, regional or local basis (**Section 5.5**).

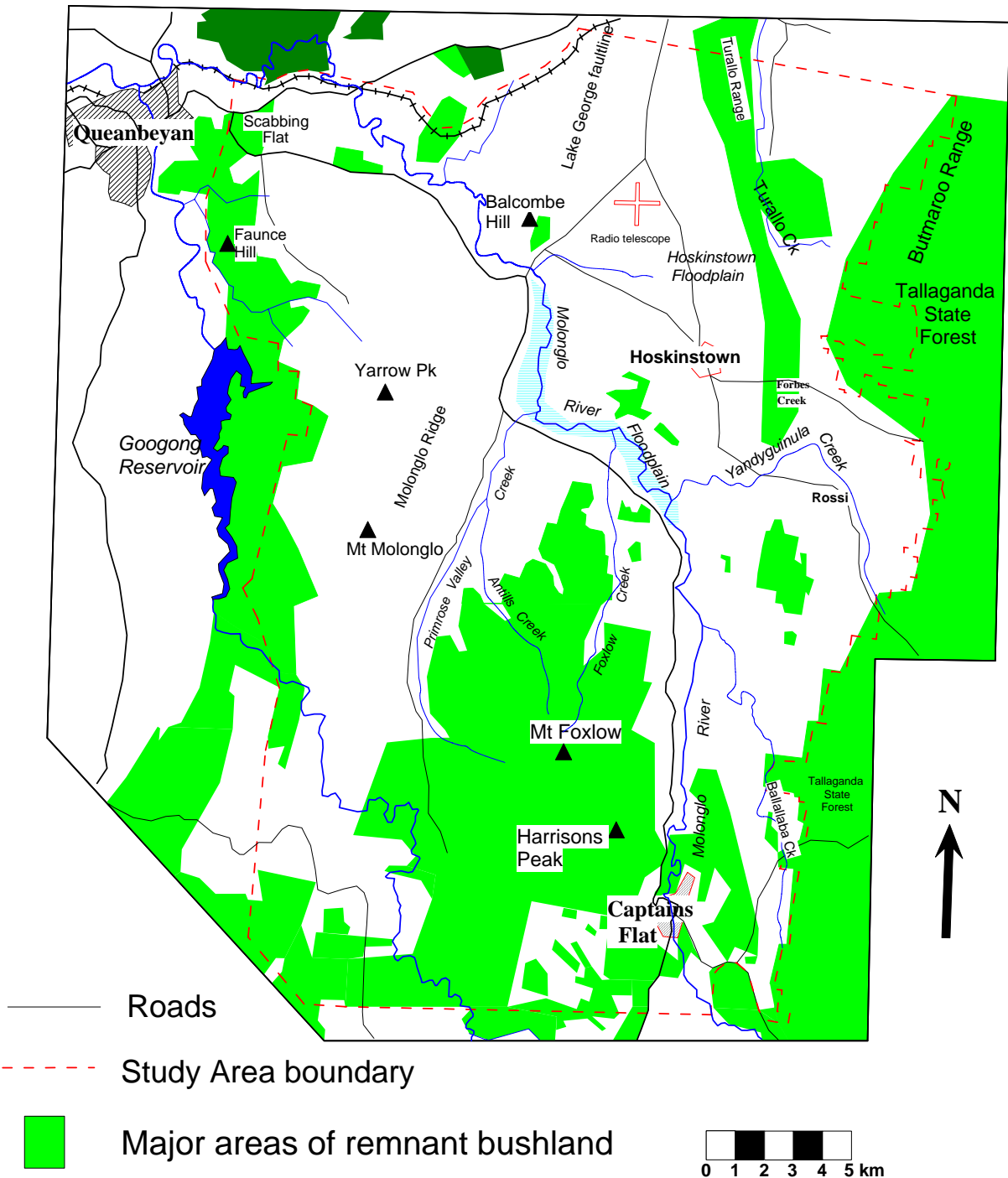
Areas of remnant vegetation were assessed for their significance in terms of size, plant diversity, faunal habitat or potential as a wildlife corridor (**Section 6**). Particularly significant areas were recommended for further ecological assessment.

With a view to identifying existing and potential linkages between remnants, roadside vegetation surveys were carried out by volunteers in parts of the study area (**Section 7**). It is recommended that the results of a broader roadside vegetation survey conducted by Greening Australia be obtained, and existing and future roadside surveys in the area be compatible with this.

A number of recommendations are made regarding the conservation of existing remnant vegetation and areas for further study. (**Section 9**).

ACKNOWLEDGMENTS

This project was carried out with funding from the Australian Nature Conservation Agency through the Save the Bush and One Billion Trees grants scheme. Peter Barrer carried out the majority of field work, and provided the bulk of the text for this report. Guidance and support for the project were provided by the Stoney Creek Landcare Group. Various landholders within the study area assisted Peter Barrer with access to private properties. The following people were involved with the roadside surveys: Stephen Panter, Anne Clifton, Lybbie Hillman, Jane and Jim Cottee, Tim Booth, Deirdre and Alex Smith, Tom Baker, Les Manning, Lynton Bond, Sherryl Greathead, Leonie Schruer and Peter Quinlan. The final report and the maps were compiled by Nicki Taws. Assistance with the report compilation and editing was provided by Lynton Bond, Tom Baker and Tim Booth of the Stoney Creek Landcare Group. Anthony Scott assisted with map production.



Map 1. The Study Area

TABLE OF CONTENTS

SUMMARY									
ACKNOWLEDGMENTS									
1.	INTRODUCTION	..	..	..	..	..	..	..	1
2.	AIMS & OBJECTIVES	..	..	..	..	..	..	..	2
3.	THE STUDY AREA	..	..	..	..	..	..	..	3
4.	METHODS	..	..	..	..	..	..	..	4
5.	RESULTS								
	5.1 LAND SYSTEMS	..	..	..	..	..	..	..	5
	5.2 VEGETATION TYPES, COMMUNITIES AND ASSOCIATIONS								
	1. Wet Sclerophyll Forest.	..	..	..	..	..	..	..	9
	2. Intermediate Sclerophyll Forest	..	..	..	..	..	..	..	11
	3. Dry Sclerophyll Forest and Woodland	..	..	..	..	..	..	..	13
	4. Savannah (Grassy) Woodland	..	..	..	..	..	..	..	15
	5. Shrubland	..	..	..	..	..	..	..	16
	6. Heathland	..	..	..	..	..	..	..	17
	7. Grassland	..	..	..	..	..	..	..	17
	Lowland Native Grassland	..	..	..	..	..	..	..	17
	Secondary (Derived) Native Grasslands	..	..	..	..	..	..	..	18
	8. Sedgeland/Rushland/Reedland	..	..	..	..	..	..	..	19
	5.3 CONDITION OF VEGETATION TYPES	..	..	..	..	..	..	..	20
	5.4 VEGETATION STRUCTURAL TYPES	..	..	..	..	..	..	..	23
	5.5 PLANT SPECIES AND THEIR SIGNIFICANCE	..	..	..	..	..	..	..	26
	5.6 FLORISTIC DIVERSITY	..	..	..	..	..	..	..	31
6.	AREAS OF SIGNIFICANT REMNANT NATIVE VEGETATION IN AND ADJACENT TO THE STUDY AREA	..	..	..	..	..	..	..	33
	6.1 Very Large Areas of Significant Remnant Native Vegetation	..	..	..	..	..	..	..	33
	6.2 Smaller Areas of Significant Remnant Native Vegetation	..	..	..	..	..	..	..	35
	6.3 Unassessed Areas of Remnant Native Vegetation	..	..	..	..	..	..	..	37
7.	ROADSIDE SURVEYS	..	..	..	..	..	..	..	38
8.	UNFINISHED OBJECTIVES..	..	..	..	..	..	..	..	39
9.	RECOMMENDATIONS	..	..	..	..	..	..	..	40
	REFERENCES	..	..	..	..	..	..	..	42

APPENDICES

- Appendix 1. Major Topographic Features of the Study Area
- Appendix 2. Land Systems
- Appendix 3. Plant Species Lists
- Appendix 4. Roadside Vegetation Survey Form and Instructions
- Appendix 5. Rossi to Hoskinstown Roadside Vegetation

MAPS

- | | | | | | | | | |
|---|----|----|----|----|----|----|----|-------------|
| Map 1. The Study Area | .. | .. | .. | .. | .. | .. | .. | after p. 4 |
| Map 2. Land Systems of the Study Area.. | .. | .. | .. | .. | .. | .. | .. | after p. 8 |
| Map 3. Vegetation Types of the Study Area | .. | .. | .. | .. | .. | .. | .. | after p. 12 |

Front cover: Sticky Everlasting (*Bracteantha viscosa*) adds a splash of colour in summer to the dry sclerophyll forests and woodlands of the area.

1. INTRODUCTION

In rural areas, public access and rights-of-way linking public space are limited, and often short term, due to ownership changes and developments. In the Yarrowlumla Shire, there has recently been a movement, particularly from equestrian clubs, to establish a network of public rights-of-way called greenways. A group was formed at Gearys Gap and this prompted Yarrowlumla Shire Council to form a task force to consider proposals for a greenways network.

It was recognised that a plan for a greenways network would need to take into consideration the resources presently available, such as crown road reserves and roadside verges, issues of proximity to residences, privacy for adjacent landholders, maintenance of the greenways and conservation of local flora and fauna.

A similar greenways concept was proposed for the Stoney Creek area of Yarrowlumla Shire, south-east of Queanbeyan. As a major part of the development of a greenways network, a survey of the remnant vegetation and native fauna in the south-east section of the Yarrowlumla Shire was proposed. Funding was sought from the National Landcare Program in 1993 for an ambitious grant to cover the research and planning phase and initial groundwork for the Greenways project. Specifically, the grant was sought for:

- the remnant fauna and flora survey
- soil conservation in Radcliffe area reserves
- a land title search to identify the crown land "resource".

Anticipated outcomes were to be:

- a report on remnant flora and fauna
- a crown land database
- a plan for the next stage of Greenway development
- a pamphlet (with Gearys Gap) on flora and fauna and the Greenway initiative
- erosion control on public land
- increased community awareness
- soil conservation and tree planting.

Funding was received from the Australian Nature Conservation Agency via the Save the Bush and One Billion Trees grants scheme to conduct the project in 1994-6. However the amount received was less than half of that applied for, and accordingly lower priority items were omitted from the project. The survey of remnant flora and fauna was amended to become an overview of the remnant native vegetation. Information gathered during the overview was to be used for the identification of major threats to existing native vegetation, and for preparation of an action plan promoting its conservation. The initiation of volunteer surveys of roadside vegetation was included to encourage public awareness. Project objectives are set out in the next section.

Peter Barrer of Biosurveys was the principal consultant coordinating the project. He undertook most of the fieldwork, and coordinated the volunteer roadside surveys. Funding was not adequate to achieve some of the original objectives of the project, and much of the writing up was done in the consultant's own time. Peter Barrer was unable to complete the writing of the report before his untimely death in May 1997.

This report on the flora of south-east Yarrowlumla has been compiled from sections that Peter Barrer had written, plus the information contained in his extensive plant database, and comments from people who were involved in the project. Some additional mapping was carried out to complete sections of the report.

2. AIMS & OBJECTIVES

The full aims and objectives of the project were:

AIM 1. *To provide an **overview of the remnant native vegetation** of the approximately 70,000 hectare study area, offering as much detail as possible within the constraints of limited resources.*

1.1 FLORISTICS

OBJECTIVE 1.1.1 To assess and describe the identities, locations and distributions of locally common, uncommon and rare native plant overstorey, understorey and groundlayer associations.

OBJECTIVE 1.1.2 To assess and describe the identities, locations and local distributions of plant species of local, regional, state or national significance.

OBJECTIVE 1.1.3 To assess, describe and map the broad qualities and distributions of various classes of intact native, modified native, and introduced vegetation.

1.2 'BROAD ECOLOGICAL ZONES'

OBJECTIVE 1.2.1 To assess, describe and map the qualities and distributions of zones representing distinctive combinations of landform, substrate and micro-climate, where each zone reflects a distinctive group of habitats.

1.3 EXISTING AND POTENTIAL LINKAGES BETWEEN REMNANTS

OBJECTIVE 1.3.1 Using the information from 1.1 and 1.2 to assess, to describe and map existing and potential corridors/linkages between areas of remnant native vegetation within the study area, where possible basing linkages on areas of Crown Land .

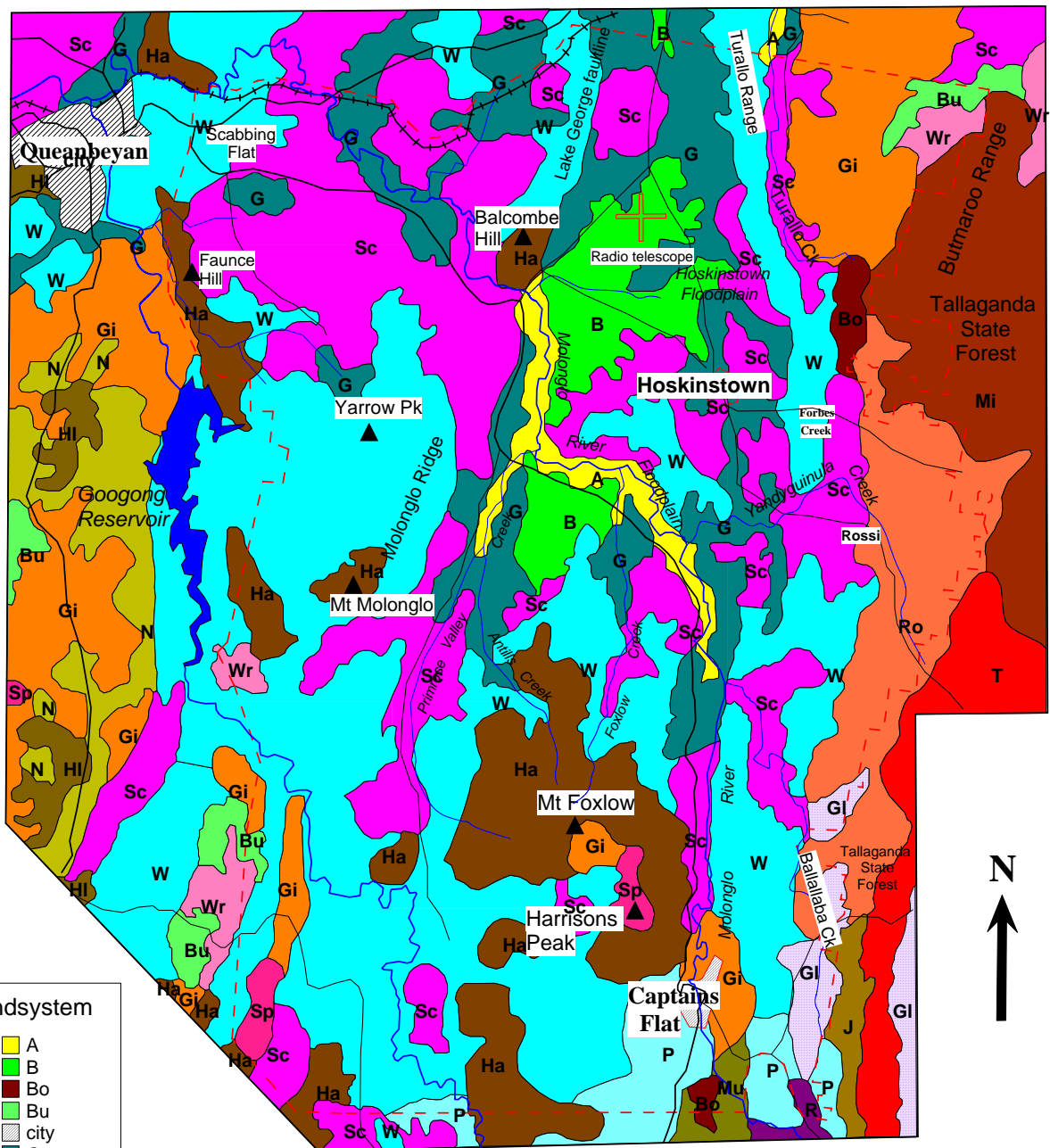
AIM 2. *To use the overview of remnant native vegetation, 'broad ecological zones' and linkages of the study area to define the **major threats and opportunities** for existing native vegetation and its associated native fauna, and to prepare an **action plan** promoting the conservation of this vegetation and its associated fauna.*

OBJECTIVE 2.1 To identify the main players; to assess, describe and prioritise threatening processes and, where possible, specific threats to existing native flora and fauna within the study area.

OBJECTIVE 2.2 To identify and prioritise remnant native vegetation conservation needs within the study area; to propose strategies and community- and local government-based actions (including the establishment of a local network of Greenways) to satisfy these needs.

AIM 3. *As an expected, integral part of the action plan, to plan and help initiate **Volunteer Surveys** of the remnant native vegetation of roadsides, Crown Road Reserves and privately owned lands within the Study Area.*

OBJECTIVE 3.1 To adapt existing and tried Volunteer Survey techniques, including survey forms, to suit local conditions; to trial and demonstrate these techniques to the Steering Committee and to volunteers.



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Map 2. Landsystems of the Study Area
 (from Gunn et al 1969)

3. THE STUDY AREA

The study area covers about 70,000 hectares in the south-east of the Yarrowlumla Shire, roughly between Queanbeyan, Captains Flat and Bungendore.. Map 1 shows the boundaries and other features of the area.

Boundaries

The eastern boundary of the study area is formed by the western edge of Tallaganda State Forest, south to Parkers Gap Road near Captains Flat. From here the southern boundary runs directly west to Mt Bullongong near the Tinderry Nature Reserve. A line north to the Queanbeyan River and then the eastern edge of the Googong Foreshores Reserve forms the western boundary, continuing north to the ACT - NSW border just east of The Ridgeway, Queanbeyan. The northern boundary follows the State border until it leaves the railway line, then the boundary continues directly east to the northern tip of Tallaganda State Forest.

Topography

Topographically the study area is defined by a series of north-south ridges corresponding to major fault lines. The western boundary lies along the top of the Queanbeyan Fault Escarpment at altitudes of 700-800 metres. Further east the Molonglo Ridge rises to 1120 metres at Mt Molonglo and 1080 metres at Yarrow Peak, and then drops abruptly along the Lake George fault into the Hoskinstown - Lake George plains at 730 metres altitude. The Molonglo River, and tributaries Primrose Valley Creek and Yandyguinula Creek, meander across this broad floodplain before cutting westwards through the Lake George faultline near Balcombe Hill.

The floodplain is bordered to the east by the low ridges of the Turallo Range, Forbes Creek Ridge and Thurrallilly Hill before the steep rise up to the top of the Great Dividing Range (outside the study area). The highest peaks are Mt Foxlow (1220 m) and Harrisons Peak (1173 m), part of a major ridge between the Molonglo and Queanbeyan Rivers at the southern edge of the study area.

Climate

Climate of the area is subhumid with rainfall distributed more or less evenly throughout the year. Average annual rainfall is 600 to 650 millimetres for most of the area, but ranging from about 550 mm around Hoskinstown and Queanbeyan, up to 800 mm east of Captains Flat. Rainfall generally decreases from east to west across the study area, with locally higher annual falls on areas of higher elevation. The highest peaks, such as Mt Foxlow and Harrisons Peak, may receive up to 1000 mm per annum, but no records are kept at these locations.

Tenure

Most of the land in the study area is freehold, the only major block of Crown Land being the Mt Foxlow-Harrisons Peak bushlands. Major Crown Lands occur to the west (Googong Foreshores Reserve), east (Tallaganda State Forest) and south-west of the study area (Tinderry Nature Reserve).

Vegetation

The original vegetation has changed dramatically since Europeans settled and brought stock to the area. Nearly all areas of freehold have undergone some form of tree clearing to increase grazing lands, with only very steep slopes or poor rocky soils being spared. Clearing was often unnecessary on areas of savannah woodland and native grassland, however the grazing of these areas has in most cases totally modified the native understorey.

Remnants of the original vegetation, although not necessarily in an undisturbed state, can be found most commonly on Vacant Crown Lands, Timber Reserves, roadsides, cemeteries, riverbanks and other inaccessible places. From these remnants a picture of the distribution and

structure of the original vegetation has been constructed by Story (1969).

Distribution of the vegetation types is closely linked with climate. Areas with rainfall greater than 1000 millimetres and without extremes of cold or heat support wet sclerophyll forest. Mountains or hills with a lower rainfall support intermediate sclerophyll forests. Dry sclerophyll forests are widespread across lower slopes and rocky hills, giving way to savannah woodland on rolling or undulating country. In low flat situations where cold air drainage causes intense winter frosts, only native grasslands are able to survive.

Landuse

Landuse is predominantly sheep and cattle grazing, which has been carried out in the area for over 100 years. Grazing is likely to remain the major land use as opportunities for cropping are limited by climate, soils and terrain.

4. METHODS

Existing data on the native vegetation of the study area was assembled from published information, and several unpublished local studies. An analysis of satellite imagery was used in an attempt to map vegetation to plant community level. Topographic maps and aerial photographs were also used to locate and characterise the broad structural qualities of remnant native vegetation in the study area.

A representative range of vegetation types on the larger remnants were subject to field assessment. Land tenure and access were determined before field investigations were carried out. Field surveys involved random transects on foot, covering as much of each remnant as possible. All plant species observed were recorded with notes on abundance, habitat and associations. Notes were made on the condition of vegetation in the remnant, and impacts and threats to the integrity of the vegetation. Volunteers assisted with surveys of linear reserves and privately owned remnants in the study area.

Information on plant species locations and habitats, and other features of significance was entered into a database for the study area.

During field work, a number of areas were identified as being of high or potentially high nature conservation significance, and recommended for future, more detailed assessment.

5. RESULTS

5.1 LAND SYSTEMS

In 1969 a report titled “Lands of the Queanbeyan-Shoalhaven Area, A.C.T. and N.S.W” was produced by the CSIRO. The CSIRO report covers the present study area, and has been used to provide background information on the natural resources of the area.

In the report the lands of the Queanbeyan - Shoalhaven area were classified into land systems based on three components: relief (terrain), geology and broad vegetation types. Land systems are a useful way of understanding the factors which influence the distribution vegetation, and can be used as a preliminary step towards mapping broad vegetation types.

In the study area:

Five relief categories were defined:

- mountains
- hills
- rolling terrain
- undulating terrain
- plains

Four major geological groupings were recognised:

- folded sediments
- granite
- acid volcanics
- quaternary alluvium

Vegetation was classified into six types:

- wet sclerophyll forest
- intermediate sclerophyll forest
- dry sclerophyll forest
- savannah woodland
- heath
- grassland

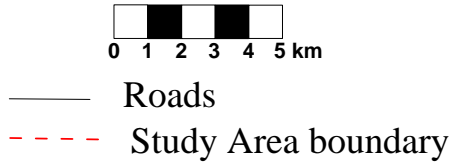
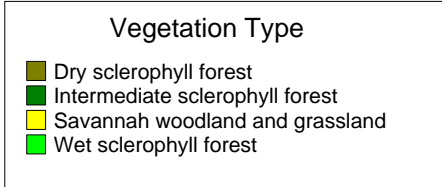
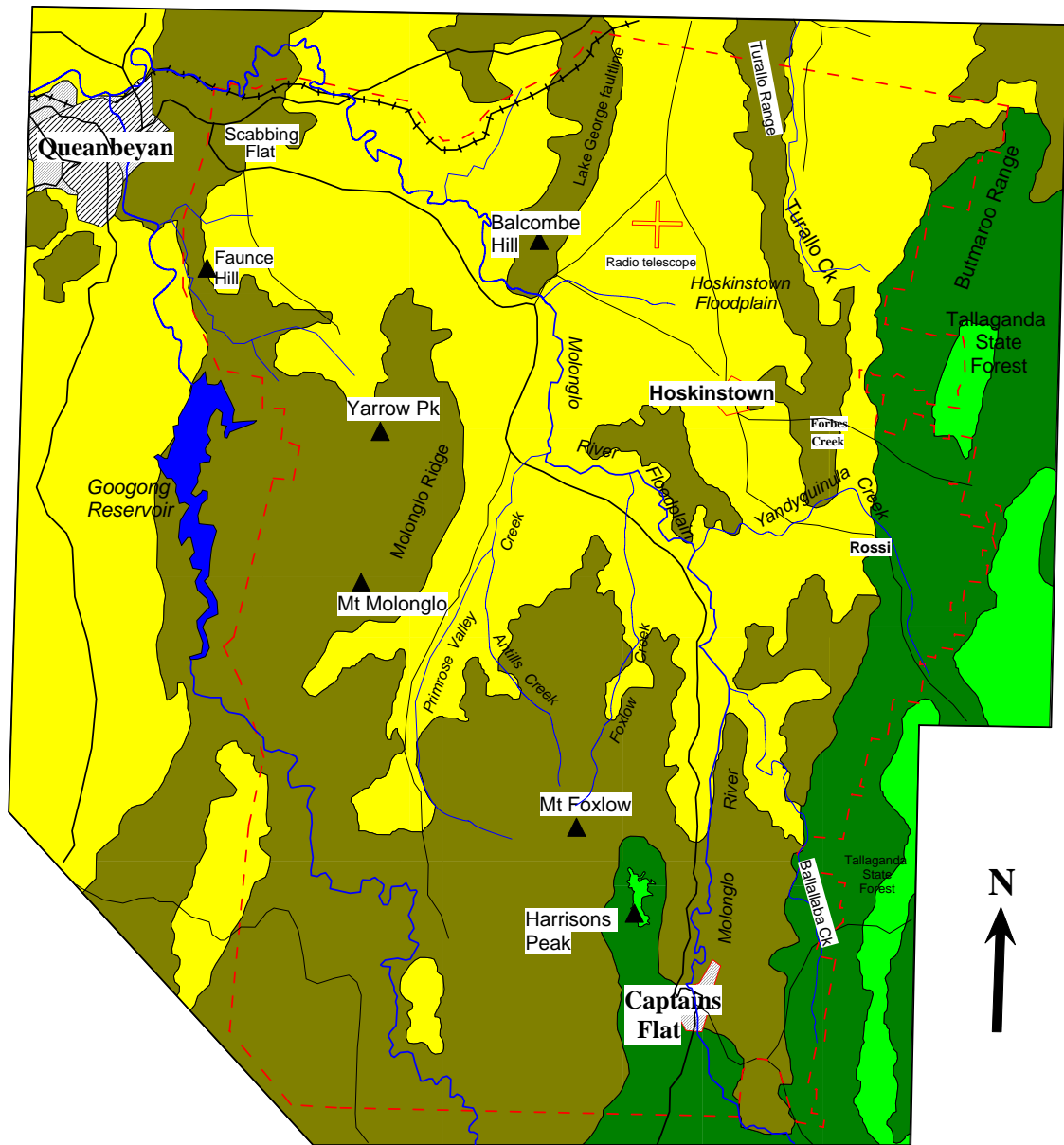
A very brief summary of the land systems in the study area is given below in Table 1, with the distribution of each shown in Map 2. A more detailed description of each land system is provided in Appendix 2, and for further information the reader is referred to the original reference (CSIRO Land Research Series No. 24, 1969).

Table 1. General Characteristics of Land Systems in the Study Area (from Gunn *et al* 1969).

Land System	Relief	Geology	Vegetation types
Harrison	Mountains	folded sedimentary rocks	20% <i>intermediate sclerophyll</i> 70% <i>dry sclerophyll forest</i> 10% <i>savannah woodland</i>
Minuma	Mountains	granite and volcanics	100% <i>intermediate sclerophyll forest</i>
Spring	Mountains	granite and volcanics	60% <i>intermediate sclerophyll</i> 20% <i>dry sclerophyll forest</i> 20% <i>savannah woodland</i>

Land System	Relief	Geology	Vegetation types
Woolcara	Hills	folded sedimentary rocks	<i>60% dry sclerophyll forest 40% savannah woodland</i>
Rossi	Hills	granite and volcanics	<i>50% intermediate sclerophyll 20% dry sclerophyll forest 30% savannah woodland</i>
Gibraltar	Hills	granite and volcanics	<i>10% dry sclerophyll forest 90% savannah woodland</i>
Parkers	Hills	folded sedimentary rocks	<i>70% intermediate sclerophyll 20 % dry sclerophyll forest 10% savannah woodland</i>
Scofield	Rolling country	folded sedimentary rocks	<i>55% dry sclerophyll forest 40% savannah woodland 5% grassland</i>
Glenrock	Rolling country	granite	<i>50% intermediate sclerophyll 35% savannah woodland 15% grassland</i>
Wroxham	Rolling country	granite	<i>55% dry sclerophyll forest 45% savannah woodland</i>
Muskerry	Rolling country	volcanics	<i>65% intermediate sclerophyll 35% savannah woodland</i>
Gundaroo	Undulating country	folded sedimentary rocks	<i>10% dry sclerophyll forest 85% savannah woodland 5% grassland</i>
Burra	Undulating country	granite	<i>33% dry sclerophyll forest 33% savannah woodland 33% grassland</i>
Bombay	Undulating country	volcanics	<i>55% dry sclerophyll forest 45% savannah woodland</i>
Arnprior	Plains	Alluvium	<i>mostly cleared, formerly 100% open savannah woodland</i>
Bungendore	Plains	Alluvium	<i>secondary grassland or cultivation, originally 50% savannah woodland and 50% grassland,</i>

The condition of native vegetation on each of the land systems was briefly assessed during field trips and other travels around the study area. In very general terms, the condition of native vegetation was best on the hill and mountain land systems, and worst on the plains. This is shown in Table 2 which gives the condition of native vegetation in each land system and the sample site. The proportion of each land system in the study area is also shown. Some of the minor land systems were not assessed. The condition of native vegetation is discussed in more detail in later sections.



Map 3. Vegetation Types of the Study Area
(from Storey 1969)

Table 2. Condition of Native Vegetation in the Land Systems

Land System	Relief	% area	Condition	Notes	Sample sites
Harrison	Mountains	9.0	<i>Moderate to very good</i>	Many areas have been cleared in the recent or less recent past, and most have been allowed to regenerate. Some areas appear intact. Some areas are exposed to light grazing.	Mt Foxlow-Harrisons Peak area Balcombe Hill.
Minuma	Mountains	0.6	<i>Moderate to very good</i>	Some of the area has been cleared in the recent or less recent past, and allowed to regenerate. Some areas appear intact. There may be some light grazing.	Portions 228/232/234, Butmaroo, on the western slopes of the Divide.
Spring	Mountains	0.6	<i>Moderate to very good</i>	Some areas have been cleared in the recent or less recent past, and most of these have been allowed to regenerate. Some areas appear intact. Some areas are exposed to light grazing	Harrisons Peak
Woolcara	Hills	35.1	<i>Poor to very good</i>	Some large areas have been cleared in the past, and are still grazed. Other areas remain uncleared, and some are only very lightly grazed.	Far west of Mt Foxlow-Harrisons Peak area, Carwoola Property, Scabbings Flat Woodlands, Weetalabah, Turallo Range, Forbes Creek Ridge.
Rossi	Hills	5.6	<i>Moderate to good</i>	Most cleared and grazed, with small areas that remain uncleared and lightly or moderately grazed.	Western slopes of the Divide, at the area west of Whites Creek, and south of the Mulloon Fire Trail.
Gibraltar	Hills	3.4	<i>Moderate to very good</i>	Moderate areas have been exposed to patchy or extensive past clearing. Some cleared areas have been allowed to regenerate.	Area immediately NNW of Captains Flat. Small part of Mt Foxlow-Harrisons Peak area.
Parkers	Hills	2.7	<i>Moderate to very good</i>	Some past clearing, with subsequent regeneration in places. Other areas currently grazed.	Immediately SSW of Captains Flat Reservoir
Scofield	Rolling	22.7	<i>Poor to good</i>	Generally cleared or part cleared, some areas heavily grazed currently, and other areas subdivided for rural residential. Some regeneration in places. A few small areas remain uncleared.	Widgiewa, Whiskers Creek, Private reserve just north of Bililingra.
Glenrock	Rolling	1.6	<i>not assessed</i>		
Wroxham	Rolling	0.7	<i>not assessed</i>		
Muskerry	Rolling	0.5	<i>Poor to moderate.</i>	Mostly cleared and grazed.	Sampled by Jones (1993) at Captains Flat Cemetery.
Gundaroo	Undulating	11.1	<i>Poor</i>	Most or all cleared and grazed, although often with scattered shade trees remaining.	not formally sampled
Burra	Undulating	0.4	<i>not assessed</i>		
Bombay	Undulating	0.5	<i>not assessed</i>		
Arnprior	Plains	1.6	<i>Poor</i>	Most or all modified by heavy grazing and sometimes pasture improvement and/or tilling.	not formally sampled
Bungendore	Plains	3.6	<i>Poor</i>	Most or all modified by heavy grazing and sometimes pasture improvement and/or tilling.	not formally sampled

5.2 VEGETATION TYPES, COMMUNITIES AND ASSOCIATIONS

The map of broad vegetation types produced by Storey (1969) has been reproduced here (Map 3) with some minor additions. Each of the six broad vegetation types in the study area has been divided into a number of vegetation communities defined by one or more of the dominant species. Most communities found in the study area relate to those described by Storey (1969), however a few additional ones have been defined.

The definition of vegetation types and communities can be somewhat subjective. At times they are distinct and recognisable units, or they may merge and intermingle in a variable mix. At the level of broad vegetation types, this is not often a problem, however at a specific location it may be difficult deciding the most appropriate community classification for a mix of species.

A summary of the vegetation types and communities in the study area is given in Table 3. Following this are descriptions of the vegetation types and communities with notes on the distribution, structure and composition of the communities, and where relevant, the tree associations observed in each.

Table 3. Vegetation Types and Communities of the Study Area

Vegetation type	Vegetation community
1. Wet sclerophyll forest	a. Mountain community b. Narrow-leaved Peppermint community c. Manna Gum community
2. Intermediate sclerophyll forest	a. Gum community b. Intermediate Silver-topped Ash community c. Intermediate Narrow-leaved Peppermint community
3. Dry sclerophyll forest and woodland	a. Brittle Gum - Scribbly Gum community b. Dry Silver-topped Ash community c. Hill Oak community d. Black Cypress Pine community
4. Savannah (grassy) woodland	a. Brittle Gum - Scribbly Gum community b. Apple box - Yellow Box community c. Frost Pocket community d. Swamp Gum community
5. Shrubland	a. Swamp Teatree - Prickly Teatree b. Creek Teatree - River Bottlebrush c. Burgan - Hop Bush - Pomaderris - Silver Wattle
6. Heathland	a. Mountain Heath community
7. Grassland	a. Tussock Poa community b. Kangaroo Grass community c. Red-leg Grass community d. Hygrophilous community e. Mixed mid-height grasses f. Forest Wallaby Grass community g. Forest Poa community
8. Sedgeland / Rushland / Reedland	

1. Wet Sclerophyll Forest

Fully developed wet sclerophyll forest is rare in the study area. It is restricted to sheltered aspects and gully sites in high rainfall areas (usually greater than 1000 mm per annum) on the western slopes of the Dividing Range, with occasional occurrences along sheltered drainage lines high on Mt. Foxlow - Harrisons Peak. It is more abundant immediately to the east of the study area, in parts of Tallaganda State Forest.

Trees of wet sclerophyll forests are typically very tall (20-35 metres). The understorey is fairly uniform, consisting of scattered small trees (*Acacia melanoxylon*) and numerous, mainly broad-leaved tall shrubs (*Hakea*, *Acacia*, *Drimys*, *Coprosma*, *Pomaderris*, *Olearia*, *Lomatia*, *Polyscias*, *Persoonia*, *Oxylobium*, *Bedfordia*, *Astrotricha*). Low climbers (*Smilax* and *Clematis*) are frequent. Ground cover includes grasses, usually *Poa* species, and herbs such as *Acaena*, *Dianella*, *Dichondra*, *Geranium*, *Hydrocotyle*, mosses, *Pteridium*, *Ranunculus*, *Scleranthus*, *Stellaria*, *Veronica*, *Viola*, and daisies.

The map produced by Storey (1969) shows an area of wet sclerophyll forest to the north-east of Forbes Creek. This area was not visited during the present study, however it would appear to represent the largest block of wet sclerophyll forest within the boundaries of the study area.

The small patches of wet sclerophyll forest on Harrisons Peak do not appear on Storey's vegetation type map, either because they were not known of at the time, or they were too small to be mapped. This may be the situation for other patches of wet sclerophyll forest in the study area.

1a. **The Mountain Community: Brown Barrel (*E. fastigata*) - Narrow-leaved Peppermint (*E. robertsonii*)- Manna Gum (*E. viminalis*).**

This community occurs on south and east facing high altitude slopes where rainfall is high and winter snowfalls are regular. The only location in the study area where these conditions are satisfied is on the highest parts and east facing slopes of the Harrisons Peak ridgeline. Geology also plays a role in the occurrence of wet sclerophyll forest at this site, as the granitic soils of Harrisons Peak allow a moister vegetation type to exist than the adjacent finer textured soils which occur on Mt Foxlow. This community is more common to the east of the study area in Tallaganda State Forest.

Tree associations noted or reported in the study area were:

E. fastigata
E. fastigata - *E. robertsonii*
E. fastigata - *E. robertsonii* - *E. pauciflora*
E. robertsonii
E. viminalis - *E. robertsonii*

1b. **The Narrow-leaved Peppermint (*E. robertsonii*) Community**

Pure communities are likely to be rare in the study area, but occur in the foothills of the Great Dividing Range, adjacent to Tallaganda State Forest. *E. robertsonii* is one of the more tolerant of the wet sclerophyll trees and its dominance is an indication that the wet sclerophyll is at its driest limit.

Tree associations noted or reported in the study area were:

E. robertsonii

1c. **The Manna Gum (*E. viminalis*) Community**

Some more or less pure communities could still occur along river flats or on sand in the study area, but are more likely to be mixed with other species, particularly *E. pauciflora* and *E. rubida* or *E. dalrympleana*. These latter may occur in the far south and east of the study area, in the colder rolling or undulating areas with high rainfall.

Tree associations noted or reported in the study area were:

E. viminalis
E. viminalis - *E. bridgesiana*

2. Intermediate Sclerophyll Forest

The term “intermediate” is not commonly used to describe sclerophyll forests, which are more normally known as either “wet” or “dry”. A classification of “intermediate sclerophyll forest” was established by Storey (1969) for the Queanbeyan - Shoalhaven land study to describe vegetation types characterised by *Eucalyptus dalrympleana*, *E. viminalis* and *E. pauciflora* growing where annual rainfall is about 875 mm. This term has been retained for this study as it best describes much of the vegetation occurring in the higher rainfall areas.

The trees of intermediate sclerophyll forests are typically tall to very tall (12-35 metres). The understorey is usually open and grassy with a sparse shrub layer containing species from both wet and dry sclerophyll forests. Those species more typical of wet forest understoreys include *Acacia melanoxylon*, *Polyscias sambucifolia*, *Olearia erubescens*, *O. stellulata*, *Lomatia myricoides*, *Coprosma* spp., and the ferns *Dicksonia antarctica* and *Cyathea australis*.

Three communities occur in the study area.

2a. **The Gum Community: Mountain Gum (*E. dalrympleana*) - White Sallee (*E. pauciflora*) - Manna Gum (*E. viminalis*)**

This community is widespread in higher sections of the Mt. Foxlow - Harrisons Peak area, and on the western slopes of the Dividing Range.

The most common tree species are *E. dalrympleana*, *E. pauciflora*, *E. viminalis*, and *E. rubida*, mixed in varying proportions. *E. pauciflora* tends to be present throughout, but *E. rubida* and *E. viminalis* are lowland species that become more scarce with increasing altitude, whereas the opposite occurs with *E. dalrympleana*. Both peppermints, *E. robertsonii* and *E. dives* are also frequent, except at the upper and lower extremes. *E. bridgesiana* may be present in association with any of the gums or peppermints, although usually only at lower altitudes.

The ground cover is dominated by forest *Poa* species and rarely *Chionochloa pallida*. Shrubs are uncommon but include species common in wet sclerophyll forests such as *Acacia melanoxylon*, *Lomatia myricoides* and *Polyscias sambucifolia*.

The gum species form a topographic sequence over the range of altitude where this community occurs. The sequence from highest altitude to lowest is:

E. pauciflora
E. pauciflora, E. dalrympleana
E. pauciflora, E. dalrympleana, E. viminalis
E. pauciflora, E. dalrympleana, E. rubida, E. viminalis
E. pauciflora, E. rubida, E. viminalis
E. pauciflora, E. rubida, E. stellulata

Tree associations noted or reported in the study area were:

E. dalrympleana - *E. dives*
E. dalrympleana - *E. dives* - *E. pauciflora*
E. dalrympleana - *E. dives* - *E. pauciflora* - *E. viminalis*
E. dalrympleana - *E. pauciflora* - *E. viminalis*
E. dalrympleana - *E. pauciflora*
E. dalrympleana - *E. pauciflora* - *E. robertsonii*
E. dalrympleana - *E. bridgesiana*
E. dalrympleana - *E. bridgesiana* - *E. dives*
E. dalrympleana - *E. bridgesiana* - *E. robertsonii*
E. dives - *E. pauciflora*
E. dives - *E. pauciflora* - *E. viminalis*

E. pauciflora - *E. viminalis*
E. pauciflora - *E. robertsonii*
E. pauciflora - *E. robertsonii* - *E. viminalis*
E. viminalis
E. viminalis - *E. bridgesiana*

2b. **The Intermediate Silver-topped Ash (*E. sieberi*) Community**

This community is present north-east of Hoskinstown, adjacent to the Tallaganda State Forest, where it tends to be associated with ridgelines and spurs. The community is much more widespread on and to the east of the Great Dividing Range. The understorey is open with few shrubs and a sparse herbaceous ground layer.

Tree associations noted or reported in the study area were:

E. dalrympleana - *E. dives* - *E. sieberi*
E. dalrympleana - *E. pauciflora* - *E. sieberi*
E. dives - *E. pauciflora* - *E. sieberi*
E. dives - *E. sieberi*
E. sieberi

2c. **The Intermediate Narrow-leaved Peppermint (*E. radiata*) Community**

This community clothes the upper north-west slopes of the Great Dividing Range, and forms a distinct horizontal band through the gum community, commonly just below the uppermost *E. pauciflora*. It is sharply bounded and uniform, with minor irregularities from strips of *E. dalrympleana* along the drainage lines, and from some probable hybridisation with *E. pauciflora*. When fully exposed to the north-west winds, trees possess dwarf mallee habit (to 1.5 metres), with an abrupt transition to normal 10 metre height related to adjacent shelter. Understorey shrubs are rare and the ground cover is usually grassy.

The community is widespread in suitable aspects on the western slopes of the Dividing Range, and forms a broad strip of intermediate sclerophyll forest along the eastern boundary of the study area.

Tree associations noted or reported were:

E. radiata
E. radiata - *E. dalrympleana*
E. radiata - *E. pauciflora*
E. radiata - *E. dalrympleana* - *E. pauciflora*
E. radiata - *E. dalrympleana* - *E. pauciflora* - *E. dives*

3. Dry Sclerophyll Forest and Woodland

Trees of dry sclerophyll forest and woodland are not as tall as those of intermediate or wet sclerophyll forest, usually ranging from 6-20 metres in height (mid-high to tall). The most common species are *Eucalyptus mannifera*, *E. rossii*, *E. macrorhyncha* and *E. dives*.

The understorey is characterised by the presence of ericoid (heath-leaved) and sometimes prickly shrubs, rather than the broader and softer-leaved shrubs typical of wet sclerophyll forest. Typical species of the heath shrub component include: the heaths, *Brachyloma daphnoides*, *Leucopogon fletcheri* ssp. *A* and *Melichrus urceolatus*; the pea-flowering shrubs *Bossiaea buxifolia*, *Daviesia mimosoides* (or *D. leptophylla* in the Mt. Foxlow - Harrison's Peak area), *Dillwynia sericea*, *Hardenbergia violacea*, *Hovea linearis*, *Pultenaea microphylla* and/or *P. procumbens*; and the Guinea Flower, *Hibbertia obtusifolia*.

Not infrequently, however, understorey shrubs occur as very sparse or isolated individuals or groups, and the below-tree vegetation is dominated by a ground layer of tall grasses (*Chionochloa pallida*). In some other areas (eg. some exposed slopes of the Turallo Range), both the understorey and ground layer are virtually absent.

Much of the earlier cleared forest has reverted to an immature and dense form of the original forest. Protected areas possess 5 cm or more of litter on the ground, a protective blanket that is easily destroyed by burning or grazing.

3a. **The Brittle Gum (*E. mannifera*) - Scribbly Gum (*E. rossii*) Community**

Widespread in the study area, this community occurs on a range of soil types and aspects. It is the most common community throughout the intermediate altitudes, particularly on low rocky hills, grading into the intermediate sclerophyll Gum community on the tops of higher hills.

The community usually includes *E. mannifera* and *E. rossii* in varying proportions and sometimes *E. macrorhyncha* and *E. dives*. Associations with *E. dives* are particularly common in the Mt. Foxlow - Harrison's Peak area. The community rarely mixes with species of the Gum Community, other than *E. rubida* (usually on cooler aspects).

The community is relatively uniform regarding trees, with most differences occurring in the understorey and ground layer: Grasses are dominant, characteristically *Chionochloa pallida* in rocky places and the *Poa sieberana* in cooler aspects on a less rocky soil. Shrubs of the heath, and wattle and pea families are common.

E. dives has been included with this community as it rarely forms a definite community on its own. It is characteristically dominant or subordinate in mixtures with many other communities in 'average' habitats without extremes of temperature, altitude or rainfall. It is fairly common in all dry sclerophyll communities in the study area, although very few undamaged trees remain because of past use for eucalypt oil. It coppices readily after felling.

E. cinerea ssp. *triplex* occurs on the western footslopes of Mt. Foxlow - Harrison's Peak. It is codominant or subdominant with a number of species of the *E. mannifera* - *E. rossii* community, including *E. bridgesiana*, *E. dives* and *E. rubida*.

Tree associations noted or reported in the study area were:

- E. dalrympleana* - *E. dives* - *E. macrorhyncha* - *E. rossii*
- E. dalrympleana* - *E. dives* - *E. mannifera* - *E. rossii*
- E. dalrympleana* - *E. dives* - *E. mannifera*
- E. dalrympleana* - *E. dives* - *E. rossii*

E. dalrympleana - *E. dives* - (*Allocasuarina littoralis*) - (*Banksia marginata*)
E. dives
E. dives - *E. macrorhyncha* - *E. mannifera*
E. dives - *E. macrorhyncha* - *E. rossii*
E. dives - *E. mannifera*
E. dives - *E. mannifera* - *E. rossii*
E. dives - *E. mannifera* - *E. rubida*
E. dives - *E. mannifera* - *Allocasuarina littoralis*
E. dives - *E. rossii*
E. dives - *E. cinerea* ssp. *triplex*
E. dives - *E. mannifera* - *E. cinerea* ssp. *triplex*
E. dives - *E. mannifera* - *E. bridgesiana*
E. macrorhyncha
E. macrorhyncha - *E. rossii*
E. mannifera
E. mannifera - *E. rossii*
E. bridgesiana
E. bridgesiana - *E. cinerea* ssp. *triplex*
E. rubida - *E. cinerea* ssp. *triplex*

3b. **The Dry Silver-topped Ash (*E. sieberi*) Community**

E. sieberi dry sclerophyll forest occurs in the study area only on Rutledge Ridge at the northern end of the Mt Foxlow - Harrison's Peak bushlands. It is more common to the north-east of the study area.

It is found on rocky hill tops with skeletal soils, and rarely extends far down the slopes. *Allocasuarina littoralis* is a common associate. The understorey is extremely sparse, or often absent. The poor soil and rough country where this community is found has protected it from clearing and grazing.

Tree associations noted or reported in the study area were:

E. sieberi;
E. sieberi - *E. rossii*;
E. sieberi - *E. rossii* - *E. dives*

3c. **The Hill Oak (*Allocasuarina verticillata*) Community**

Allocasuarina verticillata is reported from the slopes of the Molonglo River, downstream from the Molonglo River Floodplain, such as at Balcombe Hill and Douglas Close, Radcliffe. It occurs as an extended, narrow strip, apparently within a very narrow altitudinal range.

3d. **The Black Cypress Pine (*Callitris endlicheri*) Community**

Associations dominated by *Callitris endlicheri* are uncommon in the study area. The species is common on parts of the Ridgeway subdivision and on adjacent Weetalabah, immediately east of Queanbeyan. Here, they are associated with the Molonglo Gorge. The species is reported in Crown lands at the north-east extreme of the Mt. Foxlow - Harrison's Peak bushlands, where it may be uncommon. Very occasional remnants also survive to the south-west of the Mt. Foxlow - Harrison's Peak bushlands, in cleared and regenerating bushlands between the latter and the Googong Foreshores Reserve.

4. Savannah (Grassy) Woodland

Savannah woodland is characterised by a woodland or open woodland structure, an understorey that is very sparse or absent, and a mid-dense to dense groundlayer dominated by native grasses and forbs. It occurs on the deeper soils bordering drainage lines and valley floors, and on gently undulating tablelands.

A species gradient is often evident on the footslopes bordering broad valleys. In the shallower soils higher on the slopes, associations are dominated typically by Red Box and/or Brittle Gum and/or Red Stringybark. Below this, Apple Box and/or Yellow Box tend to dominate. Below these in turn, White Sallee dominates. Black Sallee appears at the extreme cold edge of the treeline. This pattern is attenuated along drainage lines, where Apple Box tends to dominate and where other species occur according to the terrain. Adjacent to drainage lines, a sparse to dense understorey of riverine shrubs sometimes displaces the grassy groundlayer.

4a. **The Brittle Gum (*E. mannifera*) - Scribbly Gum (*E. rossii*) Community**

An open form of the equivalent dry sclerophyll forest, characterising areas of low relief, and usually occurring below the forest community.

Tree associations noted or reported were:

E. mannifera - *E. melliodora*;
E. mannifera - *E. rubida*.
E. dives - *E. mannifera* - *E. pauciflora*;
E. bridgesiana - *E. mannifera* - *E. rubida*;
E. macrorhyncha - *E. melliodora* - *E. polyanthemos* - *E. rubida*
E. macrorhyncha - *E. nortonii* - *E. polyanthemos* - *E. rossii*;
E. macrorhyncha - *E. polyanthemos* - *E. rossii*.

4b. **The Apple Box (*E. bridgesiana*) - Yellow Box (*E. melliodora*) Community**

The community is common in the study area, except where deep frosts occur.

It is characterised by the presence of either of the two main species. Diversity is provided by several associated species, none being consistently present. Besides the two characteristic species, the most common is *E. polyanthemos*. Less common are *E. rubida* and *E. macrorhyncha*. *E. nortonii* and *E. goniocalyx* have been considered as the diagnostic equivalent of *E. bridgesiana*

E. bridgesiana is widely distributed in the study area. Although concentrated on lower slopes and flats, especially along gullies, it tolerates steep slopes and great differences in climate, and extends into dry sclerophyll forest.

Most *E. melliodora* is on lower slopes and flats, but it occurs as a large healthy tree on hill tops and mountain slopes.

E. polyanthemos is usually uppermost in the sequence, occurring on stony slopes or in high valleys. *E. rubida* grows in cold places, often towards the border of the frost pocket community of which it is also a constituent. It is an incidental species, being widespread also in wet and intermediate sclerophyll forests.

E. macrorhyncha is usually in rocky places on upper slopes, and is common to this community and the Brittle Gum - Scribbly Gum community above. It also occurs on cold alluvial flats.

Tree associations noted or reported were:

E. bridgesiana
E. bridgesiana - *E. melliodora*
E. bridgesiana - *E. pauciflora*
E. bridgesiana - *E. pauciflora* - *E. viminalis*
E. bridgesiana - *E. rubida*
E. bridgesiana - *E. macrorhyncha* - *E. melliodora* - *E. polyanthemos*;
E. melliodora - *E. pauciflora* - *E. rubida*.

- 4c. **The Frost Pocket Community - White Sallee (*E. pauciflora*) - Candlebark (*E. rubida*) - Black Sallee (*E. stellulata*) - Black Gum (*E. aggregata*)**

The most low-lying of the savannah woodland communities, it is normally fairly open and becomes more so downslope. The transition to natural grassland is gradual on gentle slopes and abrupt on steep slopes.

E. pauciflora and *E. rubida* are common and occur on the upslope side, sometimes on rocky knolls. *E. stellulata* and *E. aggregata* are rare, usually confined to lower sites along stream banks and damp areas. *E. aggregata* was recorded in the upper Queanbeyan River catchment.

Tree associations noted or reported were:

E. pauciflora - *E. rubida*
E. pauciflora - *E. stellulata*;
E. bridgesiana - *E. pauciflora* - *E. stellulata*
E. rubida - *E. stellulata*
E. dives - *E. pauciflora*;
E. dives - *E. pauciflora* - *E. rubida*;

- 4d. **The Swamp Gum (*E. ovata*) Community**

This community is distinct only in that it is dominated by *E. ovata*. It may include *E. pauciflora*, *E. viminalis*, *E. rubida*, *E. mannifera* and *E. rossii*. Scattered specimens of *E. ovata* have been recorded on the Molonglo River north of Captains Flat.

5. Shrubland

Shrublands are treeless communities dominated by shrubs, usually from 2-6 metres tall. Shrublands are rare in the study area, confined mostly to stream banks, waterlogged soils, or regrowth areas where woodlands and open forests have been cleared.

- 5a. **Swamp Tea-tree (*Leptospermum myrtifolium*) - Prickly Tea-tree (*L. continentale*) Community**

This shrubland community, sometimes comprising both species and sometimes only one, appears to be widespread but not particularly common on drainage lines throughout the study area. It tends to occur in small, localised patches.

- 5b. **Creek Tea-tree** (*Leptospermum obovatum*) - **River Bottlebrush** (*Callistemon sieberi*) **Community**

This riparian shrubland appears to be restricted to rocky sites bordering the Molonglo River and some feeder creeks downstream of the Molonglo River Floodplain. Outside the study area on the Queanbeyan River, it is also associated with the Paperbark *Melaleuca parvistaminea*. This latter species occurs occasionally on the Widgiewa subdivision, but was not located in riparian habitats during the present study. Around Captains Flat, *L. obovatum* is replaced by *L. morrisonii*, and *C. sieberi* appears to be rare or absent.

- 5c. **Burgan** (*Kunzea ericoides*) - **Hop Bush** (*Dodonaea viscosa* ssp.) - **Pomaderris** (*Pomaderris* spp.) - **Native Blackthorn** (*Bursaria lasiophylla*) - **Silver Wattle** (*Acacia dealbata*) **Community**

This shrubland is not uncommon in riparian/riverine/gully habitats through all but the highlands and lowland grassland habitats of the study area. It sometimes is represented by all species together, but more often occurs in a reduced form. The *Pomaderris* component appears not to be common in the study area but, where present, is typically represented by *P. betulina*, *P. angustifolia*, or (downstream of Captains Flat) *P. phyllicifolia* var. *phyllicifolia* (rare in NSW).

6. Heathland

Heathlands are treeless communities characterised by heath shrubs (shrubs with small prickly leaves, usually less than 2 metres tall). Rare in the study area, heathlands are much more common to the east in the Shoalhaven catchment.

- 6a. **Mountain Heath Community: Mountain Baeckea** (*Baeckea utilis*) - **Heath** (*Epacris microphylla*) - **Small-fruited Hakea** (*Hakea microcarpa*)

In its full form, this sub-alpine wet heath was located at one site only in the study area, near the top of the Dividing Range. Reduced forms (always lacking Alpine Bottlebrush and *E. breviflora*) were located rather more widely on drainage lines on the western slopes of the Dividing Range, and in the high parts of the Mt. Foxlow - Harrisons Peak area. In some locations, this wet heath combines with the Swamp and Prickly Tea-tree Community described in the shrubland section.

7. Grassland

Lowland Native Grassland

Grassland is here taken as any grassy area that is treeless for a minimum of 2 hectares, smaller areas being considered as part of the surrounding woody community. Thus defined, the only grasslands before settlement were on river flats, or downslope from the last trees of the frost pocket community. Since settlement, clearing, grazing, fertilising, cultivating and burning have modified the original grasslands and produced additional large areas of secondary (derived) grasslands. Surviving natural grasslands only occur in small patches out of reach of stock. Communities occurring in the study area are:

7a. **The Tussock Poa (*Poa labillardieri*) Community**

Tussock *Poa* occurs naturally on the low alluvial flats in cold areas of high rainfall. It is most abundant in medium-wet areas towards the middle of the range in micro-relief, lower and regularly flooded or waterlogged areas being under the Hygrophilous Community, and higher and better drained areas under *Themeda* (where *Poa* is present but kept in check by this species). Uncontrolled grazing or fertilising allows *Chionochloa* to increase in these adjacent areas and to spread beyond.

7b. **The Kangaroo Grass (*Themeda australis*) Community**

Before settlement, *Themeda* appears to have been common or dominant only in natural grassland or in association with the frost pocket community of savannah woodland, and occurred in other woody communities as individual tussocks or small patches in light breaks. It does not tolerate shade but is extremely tolerant of different climates and soils. It is a successional advanced grass. Held in check by the eucalypts, it invades and dominates most ground that is cleared and protected from grazing. It has a weaker hold on upper slopes and ridges, and is more easily eliminated here by uncontrolled grazing. When undisturbed, this community comprises little else but *Themeda*, with occasional *Poa*, *Danthonia*, *Sorghum* and *Panicum*.

7c. **The Red-leg Grass (*Bothriochloa macra*) Community**

This grassland often occurs as a result of uncontrolled grazing, the first step in the change from the *Themeda* to Mixed Mid-height Grasses Communities. It occurs only in open or very lightly wooded country on slopes and ridges rather than on flats. It is absent above 900 metres altitude, and rare between 750 and 900 metres. Communities are small and are generally mixed with *Themeda*, *Danthonia* and *Stipa*.

7d. **The Hygrophilous Community**

Places too wet for a dominance of *Themeda* have a herbaceous cover, usually with grasses dominant, that varies widely according to the drainage and permanence of the wet conditions. Any of a range of species may dominate, usually over small areas. Common plants are *Hemarthria*, *Phragmites*, *Typha*, *Juncus*, sedges, *Hydrocotyle*, mosses, *Eragrostis*, Asteraceae, *Poa* and various exotics, mainly clovers and occasionally *Holcus*. The cover is dense, of alternating patches of tussock grass and short turf.

Secondary (Derived) Native Grasslands

The woodlands and forests of the major portion of the study area have been cleared in the past, to encourage secondary native grasslands. Grazing has controlled the species composition of these secondary grasslands, and many have been further modified by pasture improvement.

7e. **Mixed Mid-height Grasses**

This occurs as a thin and stalky secondary grassland over most of the undulating to hilly country with an annual rainfall of less than 640 millimetres. Composition varies widely according to local conditions and treatment, but it is characterised by *Danthonia* spp., *Stipa scabra* var. *falcata*, *Panicum effusum* and *Bothriochloa macra*, and gives way to *Themeda* where protected from grazing. It appears to be the natural cover of all savannah woodlands except for the frost pocket community. Heavy grazing favours shorter grass species over mid-height species.

7f. **The Forest Wallaby Grass (*Chionochloa pallida*) Community**

This does not occur as natural grassland, but as a ground cover in dry sclerophyll forest (mostly the *E. rossii* - *E. mannifera* Community). It persists after clearing, but eventually gives way to *Themeda* if grazing is withheld and the slopes are not too steep and rocky.

7g. **The Forest Poa (*Poa sieberana*) Community**

This community is not a naturally occurring grassland but is the common understorey in intermediate sclerophyll forests, and in all but the driest of the dry sclerophyll forests.

The community is purest and densest in intermediate sclerophyll forest. *Poa sieberana* is mixed with herbs typified by *Acaena*, Asteraceae, *Dianella*, *Dichondra*, *Geranium*, *Hydrocotyle*, mosses, *Pteridium*, *Ranunculus*, *Scleranthus*, *Stellaria*, *Veronica* and *Viola*. In dry sclerophyll forest, the community covers at least as much ground as the shrub communities, it is sparser, it has a richer grass flora (characterised by *Aristida*, *Danthonia*, *Dichelachne* and *Stipa*), and it has fewer non-grasses (characterised by *Lomandra*, *Hibbertia* and *Melichrus*).

The community may persist where these forests are cleared although the resultant decrease in shading will cause the loss of some species.

8. Sedgeland/Rushland/Reedland

Sedgelands and rushlands are common on the Molonglo River Floodplain, adjacent to the main river channels. Not uncommon elsewhere, they are usually restricted to seepage areas, drainage lines and gully flats. Some extensive areas of *Restio australis* sedgeland occur in one part of the study area near the top of the Dividing Range. Sedgelands of *Carex* sp., nearly always *C. appressa*, are widespread but not common, usually occurring as narrow interrupted ribbons bordering the lower sections of drainage lines. Rushlands of *Juncus* spp. are widespread and common, and can sometimes be extensive in seepage areas and near the Molonglo River. Small *Typha* sp. rushlands tend to be uncommon, and *Phragmites australis* reedlands are less so.

5.3 CONDITION OF VEGETATION TYPES

The original vegetation has changed dramatically since the settlement of Europeans in the area. Nearly all areas of freehold have undergone some form of tree clearing to increase grazing lands, with only very steep slopes or poor rocky soils being spared. In some areas previously cleared or partly logged for timber, the trees are growing back but the forest is very young with a distinct lack of large mature trees. Even where tree cover has been retained, the understorey has usually been severely modified by stock grazing. This is particularly so in the grassy woodlands and grasslands where grazing has been the heaviest.

Remnants of the original vegetation, although not necessarily in an undisturbed state, can be found most commonly on Vacant Crown Lands, Timber Reserves, roadsides, cemeteries, riverbanks and other inaccessible places.

Following is a summary of the present extent and condition of the vegetation types.

1. Wet and Intermediate Sclerophyll Forests

Wet and intermediate sclerophyll forests are the least modified of the vegetation types of the study area, partly due to the protection afforded by land tenure, and partly due to inaccessibility.

The intermediate sclerophyll forests of Mt Foxlow - Harrisons Peak area are somewhat protected by their Crown Land status, although illegal and inappropriate clearing has occurred on some leasehold land. The understorey of these forests, particularly the wetter elements may be adversely affected by fuel reduction burning regimes.

The condition of intermediate and wet sclerophyll forests along the eastern edge of the study area (ie. outside the boundary of Tallaganda State Forest), is moderate to poor, because of grazing and/or inappropriate fuel reduction burning regimes. The boundary fence between grazed lands and State Forest often marks an abrupt transition from a sparse and impoverished vegetation to a dense and diverse one.

The impacts of grazing and inappropriate fuel reduction burning on remaining wet and intermediate sclerophyll forests within SE Yarrawluma Shire are matters for concern. Where land tenure allows, reservation of these wet and intermediate sclerophyll forests is desirable.

2. Dry Sclerophyll Forests and Woodlands

The Mt Foxlow - Harrisons Peak bushland is the largest remnant in the study area, and is predominantly dry sclerophyll forest and woodland. These forests and woodlands are in relatively good condition despite patches of clearing and grazing by feral animals, and occasionally stock.

The majority of other remnants in the study area are also dry sclerophyll forests or woodlands. However, relatively few dry sclerophyll remnants possess a 'normal' complement of mature and senescing trees. A significant proportion of remnants have been cleared or part-cleared in the past, and have since regenerated. Many remnants continue to be used, periodically or regularly, for rough hill grazing. **Extensive areas of mature remnant dry sclerophyll vegetation are uncommon in the study area and, where possible (eg Crown lands), should be protected from further grazing or other destructive activities.**

Remnants tend to be restricted to the mid and upper slopes of knolls, ridges, hills and ranges - landforms with skeletal soils. Other than occasional small patches, dry sclerophyll remnants on deeper, colluvial soils appear to be uncommon or rare. This is partly because dry sclerophyll vegetation tends to give way to savannah woodland on deeper soils, and partly because most



Intermediate sclerophyll forest of *Eucalyptus dives*, *E. viminalis* and *E. pauciflora* on the western edge of Tallaganda State Forest. The understorey contains a range of shrubs which are often absent from adjacent freehold lands in the study area due to inappropriate grazing and burning regimes.



Savannah (grassy) woodland of *Eucalyptus melliodora*, *E. bridgesiana* and *E. pauciflora* on undulating terrain between Bungendore and Hoskinstown. The understorey contains a wide variety of native herbs and grasses and is relatively free of introduced species, a rare situation for savannah woodland in the study area.

areas of deeper soils have been cleared in the past and are currently grazed. Deeper hillslope soils and their associated dry sclerophyll vegetation are known to offer plant and animal habitat opportunities lacking in shallow and skeletal soils. **Because they are so uncommon, remaining areas of dry sclerophyll vegetation on deeper soils should be given high priority for reservation where possible.**

3. Savannah (Grassy) Woodlands

Almost all of the savannah woodlands of the study area are under freehold tenure because of their accessible nature and relatively fertile soils. As a result, most of the woodlands have been cleared or thinned in the past for pastoral or agricultural purposes. Scattered mature shade trees and occasional small patches remain through most of the lower altitudes of the study area, but regeneration typically is inhibited or prevented by grazing, and the majority of existing trees are unlikely to be replaced by further generations unless landowners take active measures. Even where trees remain the understorey has been altered by many years of grazing or by pasture improvement from native grasses and herbs to introduced grasses and weeds.

Only one area of relatively good quality savannah woodland was located, a privately owned but unfenced reserve with a species-rich groundlayer at 'Bililingra' in the far north of the study area. Other good quality woodlands, if they exist, are likely to be rare, but may occur on some private land with a history of minimal grazing. **Opportunities for protection of these remnants is mostly limited to consultation with the landowners, and this is strongly recommended where possible.**

4. Grasslands

Now rare throughout their range in SE Australia, lowland native grasslands and their associated fauna would have been quite common in the study area before European settlement. They must have occupied nearly all of the Molonglo River Floodplain, the Hoskinstown Plain, the lower and middle reaches of Yandyguinula, Primrose Valley, Antill and Foxlow Creeks, as well as having localised occurrences adjacent to the Molonglo River upstream and downstream of the Floodplain. All of these lowland native grassland areas appear to be privately owned, and none were visited during the present study.

Casual observations suggest that all of these areas have been grazed for many years, often intensively, and that many parts have been subjected to drainage works, tillage, invasion by introduced plant species and/or pasture improvement. However, other areas, sometimes extensive, appear to retain an impoverished native pasture with few introduced species. Given recent discoveries of threatened grassland fauna in disturbed grassland habitats within the ACT and Queanbeyan, it is not beyond the realm of probability that threatened plants and animals survive in the grazed lowland grasslands of the study area. This view is reinforced by the recent discovery of the endangered Button Wrinklewort (*Rutidosis leptorhynchoides*) in a disturbed road reserve within that part of the study area originally occupied by lowland native grasslands or fringing grassy woodlands.

It could be appropriate, then, to approach a UCAN or ANU undergraduate looking for an honours project, with a view to the student undertaking a pilot faunal study of one or more accessible and promising sections of the area.

5.4 VEGETATION STRUCTURAL TYPES:

One major objective of this study was to assess, describe and map the broad structural qualities and distributions of various types of intact native, modified native, and introduced vegetation within the study area. This was to be achieved primarily by the use of satellite imagery, supplemented by aerial photographs and field visits.

Satellite Imagery:

A classified satellite image of the study area was prepared by Environmental Research and Information Consortium P/L (ERIC).

Although providing a broad overview of the study area, field visits demonstrated that the satellite image classification techniques were unable to report accurately or with a significant degree of certainty on the vegetation structures at any particular site or in any particular area. For example (Table 4, overleaf), pine forest occurred in 5 of ERIC's 17 land cover classes, and ERIC's land cover classes included a number of quite distinct vegetation structural types (10 and 9 for ERIC land cover classes 5 and 6, respectively).

In other words, the classification techniques were able to provide a very rough guide to the broad scale distribution of forest/woodlands and of grasslands, but they were unable to map the accurate or approximate limits of these very different structural types, and were incapable of meaningful structural distinctions within either of them.

Field surveys:

The following vegetation structural types were identified in the study area in the course of field surveys:

Intact Native Vegetation:

- **Tall - Very Tall (12-35m) Open Forest (Wet Sclerophyll & Intermediate Sclerophyll)** - protected slopes & gullies of far E & far SE
- **Mid-high - Tall (6-20m) Open Forest (Dry Sclerophyll)** - protected slopes
- **Mid-high Woodland or Open Woodland (Dry Sclerophyll)** - exposed slopes
- **Mid-high - Very Tall (0.5-6m) Shrubland or Heathland** - riparian and wet sloping sites, drier inhospitable sites such as rockland
- **Mid-high - Very Tall (0.5-6m) Seral Shrubland** - seral communities following natural catastrophic events
- **Tall - Very Tall (12-35m) Woodland or Open Woodland (Savannah Woodland)** - lower colluvial slopes and some broad upland valleys
- **Low - Mid-high (3-12m) Woodland or Open Woodland (Savannah Woodland)** - bordering frost hollows and other areas of impeded cold air drainage
- **Lowland Native Grassland** - frost hollows, areas of impeded cold-air drainage
- **Sedgeland/rushland** - seasonally or permanently damp or wet sites, often areas of impeded cold-air drainage

Modified Native Vegetation:

(Uncleared, but grazed and with limited regeneration)

- (as for "Intact Native Vegetation")

TABLE 4 The Distribution of Vegetation Structural Types within ERIC Land Cover Classes:

VEGETATION STRUCTURAL TYPES (AND OTHER FEATURES)	ERIC LAND COVER CLASSES*																
	(NOTE: The presence of a “+” indicates that the vegetation structural type is represented within that class)																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Pine forest	+	+	+	+	+												
Wet sclerophyll forest	+	+	+	+													
Intermediate sclerophyll forest	+	+	+	+	+												
Dry sclerophyll forest	+	+	+	+	+												
Dry sclerophyll woodland, heath &/or grass understorey			+	+	+	+											
Dry sclerophyll woodland, understorey sparse or absent				+	+	+											
Dry sclerophyll open woodland, heath &/or grass understorey				+	+	+											
Dry sclerophyll open woodland, understorey sparse or absent					+	+											
Grassy (savannah) open woodland					+	+											
Dense sedgeland, rushland, <i>Poa</i> tussock grass-land, tall exotic grasses							+										
Sparse sedgeland, rushland, <i>Poa</i> tussock grass-land, tall exotic grasses								+									
Grassland					+	+			+	+	+	+	+	+			
Highly disturbed sites with weeds (eg cleared pine forest)						+			+	+		+	+				
Sparse shrubland on rock-strewn slope						+				+		+	+				
Seral shrubland w/wo young regenerating timber					+	+						+	+				
Quarries, pits, bare rock, buildings, surfaced roads, urban areas															+		
Dams, swamps, rivers, creeks, lakes, reservoirs																+	+

(Part or fully cleared, now ungrazed and regenerating)

- Seral moist shrubland, with scattered mature shade trees and regenerating young/immature trees
- Seral dry shrubland, with scattered mature shade trees and regenerating young/immature trees

(Part cleared and grazed, little regeneration)

- Derived native grassland with scattered shade trees, and native shrubs confined mainly to rocky sites (lightly grazed, or not currently grazed)
- Derived native grassland with scattered shade trees, and native shrubs confined mainly to rocky sites (moderately to heavily grazed)

(Cleared and grazed, no regeneration)

- Derived native grassland with few or no shade trees (lightly grazed, or not currently grazed)
- Derived native grassland with few shade trees (moderately to heavily grazed)
- Derived native grassland with no shade trees (moderately to heavily grazed)

Pasture Improved (moderately to heavily grazed):

- Mixed native/introduced grasses and weeds with scattered shade trees
- Mixed native/introduced grasses and weeds with no shade trees
- Predominantly introduced grasses and weeds with scattered shade trees
- Predominantly introduced grasses and weeds with no shade trees

Shrublands and Forests of Introduced Species:

- Tall/Extremely Tall Shrublands of 'feral' species (Hawthorn, Briar, Bramble)
- Conifer Plantation
- Poplar Plantation
- Willows

Due to the limitations of the satellite imagery mentioned above, these structural types could not be translated onto a map. Aerial photograph interpretation was not used but may provide a more satisfactory result than satellite imagery. This approach was adopted for the subsequent assessment of the Mt Foxlow - Harrisons Peak area and achieved a very satisfactory determination of vegetation types and structure. The satellite imagery is still available in digital format, and a re-interpretation at some future date may provide a more accurate map than is currently available.

A map of vegetation structure and the distribution of intact, modified and introduced vegetation was a major aim of the project. An initial step has been taken using the vegetation already mapped on the 1:25,000 topographic maps of the area. This has been used very broadly to achieve the simple depiction of remnant vegetation shown in Map 1. This provides a basis for more detailed mapping as time and funds permit using existing aerial photography or satellite imagery and ground truthing.

5.5 PLANT SPECIES AND THEIR SIGNIFICANCE

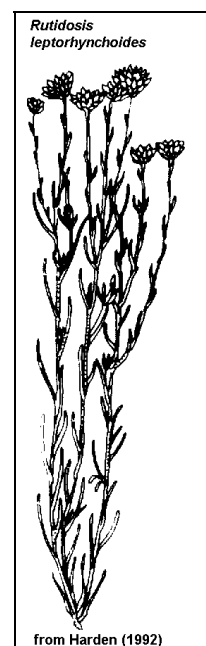
Plant species and floristic diversity were sampled over 15 sites or localities within the study area, mainly out of season, but in sufficient detail to provide a reasonable indication as to the significance of the sampled localities. Details of one further site were obtained from the literature (Jones, 1993).

In excess of 350 native plant species have been recorded in the study area, most during the present study. This could be expected to represent between one half and two thirds of the total number of native species present. Species occurrences and distributions are detailed in Appendix 3. Species of significance are listed below:

Species of local, regional, state or national significance

Nationally endangered:

Rutidosia leptorhynchoides (Button Wrinklewort - Asteraceae) (3ECa) - A medium-sized population of this endangered species was recently discovered during an ANCA survey in a periodically disturbed roadside verge bordering the Molonglo River Floodplain. Detailed information on the location of this population is available from ANCA, or from Yarrowlumla Council.



Nationally Rare:

Discaria pubescens (Anchor Plant - Rhamnaceae) (3RCa) - Individuals of this species were located at "Woodend", Rossi (L. Bond, pers. comm., 1996), and in *Eucalyptus stellulata* - *E. pauciflora* grassy woodland near "The Springs" at the western edge of the Mt Foxlow - Harrison's Peak area (Taws 1998). The species is considered to be nationally rare, but not currently at risk of disappearing as a species from the wild. It can be found scattered sparsely across the NSW Southern Tablelands, with some populations conserved in Kosciusko and Namadgi National Parks.

Eucalyptus cinerea ssp. *triplex* (Argyle Apple - Myrtaceae) (2RCi) - A large population of undetermined extent occurs in the western section of the Mt Foxlow - Harrison's Peak area, from Corner Hill south through "The Springs" to "Silver Hills". This is a newly described subspecies, and the only known populations occur here and at Blue Gum Hill in the ACT. This is the only known NSW population, and it appears to be considerably larger than that at Blue Gum Hill.

New to NSW:

Thelymitra holmsii (a Sun Orchid - Orchidaceae) - Collected by Sandie Jones (1994) in Captains Flat Cemetery. Known otherwise from NT; QLD; VIC (Hnatiuk, 1990)

Rare in NSW (Harden, 1990-93):

Pomaderris phyllicifolia var. *phyllicifolia* (a Pomaderris - Rhamnaceae) - Species not uncommon in riparian habitats on Molonglo River immediately downstream of Captains Flat, and on the higher slopes of the Mt. Foxlow - Harrison's Peak area. Recorded in NSW (CC, CT, ST); VIC (location unknown) (Harden, 1990-93; Hnatiuk, 1990). The known Southern Tablelands population extends south to the Braidwood area. The study area population appears to represent the new south-western limit to the existing range of species.

Uncommon in NSW (Harden, 1990-93):

Lepidium pseudotasmanicum (a Peppercross - Brassicaceae) - A single specimen was located near the Molonglo River upstream of the Captains Flat Reservoir. The species is described as uncommon in NSW, occurs on the CC and SC, and is not formally known for the Southern Tablelands (Harden, 1990-93). However, other specimens have been located by Barrer (unpublished) in Jumping Creek south-east of Queanbeyan, in the Molonglo Gorge, and in the Kowen Escarpment. These occurrences represent the inland limit to the species' known NSW distribution. It is known also from QLD; VIC; TAS; WA; NZ.

Dillwynia cinerascens (Grey Parrot Pea - Fabaceae) - A limited population of this species was noted in a burnt area on a broad drainage line above the Molonglo River upstream of the Captains Flat Reservoir. Local populations are known in Queanbeyan and on Mt. Ainslie in the ACT. The species' NSW distribution extends northwards to the Bathurst district (Harden, 1990-93). It is known also from VIC; SA; TAS.

Possible Undescribed Species:

Gastrodea sp. (a Potato Orchid - Orchidaceae) - Collected by Sandie Jones (1994) in Captains Flat Cemetery.

Microtis sp. aff. *rara* (an Onion Orchid - Orchidaceae) - Collected by Sandie Jones (1994) in Captains Flat Cemetery.

Microtis sp. aff. *unifolia* (an Onion Orchid - Orchidaceae) - Collected by Sandie Jones (1994) in Captains Flat Cemetery.

Hydrocotyle sp. aff. *laxiflora* (a Pennywort - Apaiceae) - Collected on Lot 31, Widgiewa subdivision (AMG ref. # (7)137(60)780) on a broad moist drainage line below a dam. The same species has been collected by Barrer (unpublished) at several places in Wamboin, in the Molonglo Gorge, and in the Kowen Escarpment.

Regionally Rare (sometimes = new record for region):

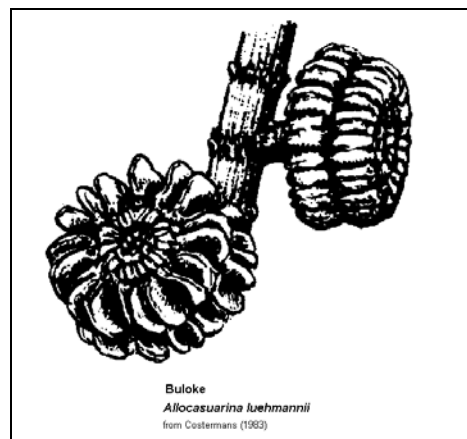
Polystichum australiense (a Shield Fern - Dryopteridaceae) - This species is not uncommon adjacent to the Molonglo River, upstream of the Captains Flat Reservoir. It also occurs on the higher slopes of the Mt. Foxlow - Harrisons Peak area (sometimes in the vicinity of the more common *P. proliferum*), and in the general vicinity of White's Creek on the western slopes of the Dividing Range. Outside the study area, the species has been located by Barrer (unpublished) on the Queanbeyan Fault Escarpment, south-east of Queanbeyan. The species was not previously known from the Southern Tablelands (ST), but is known from the NC, CC, SC, CT, CWS (Harden, 1990-93).

Hypolepis rugulosa (Ruddy Ground Fern - Dennstaedtiaceae) - A large patch of this species was located in an intermediate sclerophyll gully on the western slopes of Mt. Foxlow. According to Harden (1990-93), the species has not been recorded in ST, but is known from CT, CWS, SWS; QLD; VIC; TAS; SA; WA. However, the species has been recorded in the ACT (Hogg, 1990).

Einadia hastata (Saloop - Chenopodiaceae) - Saloop appears to have a ST stronghold in the Queanbeyan area, and was recorded occasionally in the study area in the Molonglo Gorge section of Weetalabah. The species was known only from SC and SWP in southern NSW but, further north, occurs in NC, CC, NT, CT, NWS, CWS, NWP, CWP (Harden, 1990-93).

Bossiaea prostrata (Creeping Bossiaea - Fabaceae) - A large, scattered population of this species was recorded on a west-facing slope overlooking the Molonglo River immediately downstream (north-west) of Captains Flat. One further small population was noted on a rockland to the west, high on the east-facing slopes of the ridgeline extending north from Harrisons Peak. Creeping Bossiaea is listed as ?ST in Harden (1990-93), and as a rare local species in Burbidge & Gray (1970). It is a coastal and tablelands species in NSW.

Allocasuarina luehmannii (Bull Oak - Casuarinaceae) - At least one small population of Bull Oak occurs within the study area section of the Molonglo Gorge, on both sides of the railway line and in Weetalabah. It also occurs further upstream, as at least one very small population in a rocky site beside the Molonglo River in Molonglo River Park. The species has a local stronghold in the Molonglo Gorge - Kowen Escarpment area, just outside the study area, and a small population occurs on Black Mountain Peninsula (ACT). These disjunct populations appears to represent the only ST occurrences of the species, and the SE limit of its range. It is more typical of SWS and SWP in southern NSW, although further north it extends eastwards from NFWP, NWP, NWS, NT, CWS, CT to NC and CC (Harden, 1990-93).



Buloke
Allocasuarina luehmannii
from Costermans (1983)

Leptospermum scoparium (Manuka - Myrtaceae) - The identity of this species was confirmed from specimen collected for the Australian National Herbarium. A population occurs along a drainage line together with *Melaleuca parvistaminea* and *Kunzea parvifolia* on Lot 31, Widgiewa subdivision. The species' range in NSW is otherwise restricted to SC, extending southwards into VIC and TAS (also NZ) from Mt. Imlay (Harden, 1990-93).

Rare in Study Area:

Xanthorrhoea glauca ssp. *angustifolia* (a Grass Tree - Xanthorrhoeaceae) - One specimen, apparently of this species, was noted on the lower western slopes of the Dividing Range (AMG Ref. # (7)277(60)788). Probably as a result of grazing, the species appears to have become uncommon or rare within much of the broader sub-region.

Eucalyptus aggregata (Black Gum - Myrtaceae) - A small scattered population of this species was located bordering sedgeland and wet heath near the top of the Dividing Range (AMG Ref # (7)296(60)787), and occurs in Portion 73 on Mt Foxlow - Harrisons Peak (Taws 1998). The species was also recorded by Sandie Jones (1994) at Captains Flat Cemetery. It was recorded by Storey (1969) from the upper Queanbeyan catchment but it is uncertain whether this was within the study area. It is considered rare in the ACT, and appears to be subregionally uncommon.

Eucalyptus elata (River Peppermint - Myrtaceae) - This species occurs occasionally along at least one drainage line on the western slopes of the Dividing Range (AMG Ref. # (7)285(60)789). It is not known in the ACT, and appears to be subregionally uncommon or rare.

Eucalyptus ovata (Swamp Gum - Myrtaceae) - Swamp Gum was not located during the current study, but scattered specimens were recorded by Storey (1969) on the Molonglo River, downstream of Captains Flat. It is not known in the ACT, and appears to be subregionally rare.

Melaleuca parvistaminea (Swamp Paperbark - Myrtaceae) - Scattered populations of this species are a common feature of seasonally damp sites east of the Dividing Range towards Braidwood. The species also occurs as a disjunct population in riparian habitats along the lower reaches of the Queanbeyan River, to the west of the study area and downstream of Googong. Within the study area, scattered very small remnant populations occurred until recently on Widgiewa subdivision, and still occur on a broad shallow drainage line in Lot 31 (AMG Ref. # (7)138(60)782). These can be considered part of the Queanbeyan River metapopulation. The metapopulation marks the western limit of the species' NSW range.

Uncommon in Study Area:

Allocasuarina littoralis (Black She-oak - Casuarinaceae) - One moderately large but localised population of Black She-oak was located above the abandoned pit (converted to a dam) on the east facing mid slopes south-east of Harrison's Peak. A much larger population was located by Taws (1998) on Rutledge Ridge with *Eucalyptus sieberi*, an association much more common to the east of the study area. A small population also occurs to the west of the study area, in the ACT. Both the ACT and study area populations are disjunct from the species' main range, and the ACT population appears to be at the W limit of the species' NSW ST range.

Leptospermum morrisonii (a Tea-tree - Myrtaceae) - This species was recorded in riparian habitats bordering the Molonglo River, downstream and upstream of Captains Flat. According to Harden (1990-93), the species occurs between the southern Blue Mtns to the Corang River. The study area occurrence extends the species' known range considerably to the south-west.

Not Recorded in ACT, and may be Uncommon or Rare, Locally or Subregionally:

Doodia aspera (a Rasp Fern - Sinopteridaceae) - A small population, apparently of this species, was collected in a fern-rich, eroded drainage line on Carwoola property. The collected material did not have fruiting bodies, so that the species' identification is not certain.

Cyperus gunnii ssp. *gunnii* (an Umbrella Sedge - Cyperaceae) - Collected on Lot 31, Widgiewa subdivision (AMG ref. # (7)137(60)780) on a broad moist drainage line below a dam.

Dipodium roseum (a Hyacinth Orchid - Orchidaceae) - Recorded by Sandie Jones (1994) in Captains Flat Cemetery.

Brachycome cardiocarpa (Swamp Daisy - Asteraceae) - Recorded by Sandie Jones (1994) in Captains Flat Cemetery.

Bracteantha bracteata sp. complex (Golden Everlasting - Asteraceae) - Not uncommon on the highest slopes of Mt. Foxlow - Harrison's Peak.

Hovea purpurea (Alpine Hovea - Fabaceae) - Recorded by Sandie Jones (1994) in Captains Flat Cemetery.

Pultenaea polifolia (a Bush Pea - Fabaceae) - Populations, apparently of this species (although flowers and pods were absent) were located on a drainage line on the western slopes of the Dividing Range (AMG Ref. # (7)285(60)789), and adjacent to the Molonglo River immediately downstream of Captains Flat.

Persoonia asperula (a Geebung - Proteaceae) - Recorded near and at the top of the Dividing Range, above and adjacent to areas of wet heath (AMG Ref. # (7)298(60)786).

Persoonia linearis (Narrow-leaf Geebung - Proteaceae) - Recorded on the western slopes of the Dividing Range (AMG Ref. # (7)285(60)789).

Persoonia sylvatica (Forest Geebung - Proteaceae) - Recorded at the top of the Dividing Range, above areas of wet heath (AMG Ref. # (7)298(60)786).

Uncommon/Rare in ACT, and may be Uncommon Locally or Subregionally:

Cheilanthes distans (Bristly Cloak Fern - Sinopteridaceae) - Listed as rare in the ACT, this species was located near the Molonglo River at Weetalabah (immediately east of Queanbeyan) and also near the Molonglo River, immediately north-west of Captains Flat.

Doodia media (a Rasp Fern - Blechnaceae) - Also listed as rare in the ACT, the species was located beside a waterfall on the Molonglo River immediately upstream of the Captains Flat Reservoir.

Cyathea australis (Rough Tree-fern - Cyatheaceae) - Listed as uncommon in the ACT, this species was encountered in a wet sclerophyll gully on the western slopes of Mt. Foxlow, in an eroded, fern-rich gully on Carwoola Property, and near

White's Creek and south of the Mulloon Fire Trail on the western slopes of the Dividing Range. It appears to be uncommon in the study area, but may be more common in Tallaganda State Forest immediately to the east.

Pellaea falcata var. *falcata* (Sickle Fern - Sinopteridaceae) - Listed as rare in the ACT, Sickle Fern was encountered relatively widely in suitable habitats in the study area. Habitats appear to be moist, protected, rocky sites, usually near seasonal or permanent running water.

Arthropodium minus (Small Vanilla Lily - Liliaceae) - Listed as uncommon in the ACT, this small lily has been recorded on Lot 31, Widgiewa subdivision, and was tentatively recorded (from out of season material) on the rocklands on the upper slopes of the ridgeline extending north from Harrisons Peak.

Dianella longifolia var. *longifolia* (a Flax Lily - Liliaceae) - Also listed as uncommon in the ACT, this Flax Lily was encountered uncommonly but relatively widely in the study area, nearly always as single plants. It is rather more abundant near the Molonglo River, upstream and downstream of Captains Flat. The species appears to decline and disappear in areas subjected to grazing.

Thysanotus patersonii (Twining Fringe Lily - Liliaceae) - Listed as uncommon in the ACT, this species was recorded on Lot 31, Widgiewa subdivision, prior to the 1985 bushfire. It is a relatively cryptic species, and may be more common than this single old record suggests.

Olearia myrsinoides (a Daisy Bush - Asteraceae) - Listed as uncommon in the ACT. Recorded by Sandie Jones (1994) in Captains Flat Cemetery.

Ozothamnus conditus (a Bush Everlasting - Asteraceae) - Listed as uncommon in the ACT, a single plant was located on the upper slopes of Mt. Foxlow. The ACT region is considered the northern limit of the species range, which extends southwards into VIC (Harden, 1990-93).

Sigesbeckia australiensis (Asteraceae) - Listed as uncommon in the ACT, this species was located near the Molonglo River immediately downstream of Captains Flat.

Viola caleyana (a Violet - Violaceae) - Listed as uncommon in the ACT, this species was tentatively recorded from leaf material only, collected in a moist gully on Forbes Creek Ridge, immediately to the north of the Hoskinstown - Forbes Creek Road.

Not Uncommon, but at or near Limit of Range:

Acacia siculiformis (Dagger Wattle - Mimosaceae) - Dagger Wattle is not uncommon adjacent to the Molonglo River, upstream and downstream of Captains Flat. The species here is at the southern limit of its range (Harden, 1990-93).

Eucalyptus sieberi (Silver-topped Ash - Myrtaceae) - The species is relatively common in the north-east, on ridgelines and spurs of the western slopes of the Dividing Range, and extending at least as far south as the White's Creek area. These occurrences represent the western limit of the species' main range in the subregion, although there is a small disjunct population further west in the ACT.

5.6 FLORISTIC DIVERSITY

Areas of unusually high or low floristic diversity

Grazed Bushlands:

Much of Forbes Creek Ridge and the Turallo Range to the north are notable because plant species richness is extremely low (45 and 38 native plant species recorded, respectively). This apparently reflects the impact of inappropriate grazing in an area dominated by skeletal soils and a relatively low rainfall. A similar, but less extreme pattern is apparent in periodically grazed bushlands in higher rainfall sections of the study area, particularly in parts of the western slopes of the Dividing Range (eg White's Creek area) where there is a marked contrast between the state of the vegetation and the species richness of the grazed bushlands, and those of the immediately adjacent Tallaganda State Forest.

Most of the study area's remaining woodlands and forests have not been cleared because of their vulnerable soil conservation and water catchment status, combined with their marginal status as land for grazing. The use of these remaining bushlands for rough hill grazing nevertheless removes the ground cover, and progressively degrades their soils and water catchment qualities. **There is a strong case to end grazing in these areas, and particularly to terminate or not to renew Crown leaseholds granted for grazing purposes. To support this process, there is a need for Yarrolumla Council to provide protection for these same areas by appropriately exclusive zoning.**

The Captains Flat Area:

In contrast to Forbes Creek Ridge and the Turallo Range (with a total of 60 native plant species recorded), remnant bushlands near Captains Flat showed evidence of unusually high species richness (a total of 185 native plant species recorded).

In the 8 hectares of Captains Flat Cemetery, Sandie Jones recorded 88 native plant species, including an extraordinarily high proportion of species significant for one reason or another (see Section above). In a small section of the bushlands immediately upstream of Captains Flat Reservoir, 109 native plant species were recorded out of season during the present study. In a similarly small section of the bushlands bordering the Molonglo River immediately downstream of Captains Flat, 86 native plant species were recorded. The latter two sites yielded a number of species of significance, also.

Although affected by past land use and recent illegal fuel reduction activities, these three species rich sites are likely to be typical of any ungrazed or lightly grazed bushlands surrounding Captains Flat. Aerial photographs suggest that these bushlands are relatively extensive, and although many are freehold, some are Crown Lands. **The significance of the sampled areas suggests that bushlands throughout the Captains Flat area should be subjected to a more comprehensive ecological assessment, as a first step towards conservation of the more intact and valuable remnants.**

The Private Reserve North of 'Billingra':

The roadside verges of a privately owned, grassy woodland reserve at the beginning of Neils Creek Road were assessed during the study. Despite being out of season, these verges produced a total of 58 native plant species, an extraordinarily high number for such a small area. The reserve represents the only significant remnant found in the study area of a once much more widespread community. It would be appropriate to **open discussions with the landholder with a view to ensuring the preservation of this valuable, unfenced remnant.**

Portions 228, 232, 233, 234 Butmaroo, on the Western Slopes of the Divide:

This large area extends from the top of the Divide to the ridgeline separating the Turallo and Forbes Creek catchments. It was subjected to a brief, roadside assessment, out of season. The roadside assessment produced a total of 77 native plant species, which is likely to represent only a fraction of the species in the area. Many of the species located are uncommon, rare, or not otherwise known in the study area. The area supports a range of communities that are similarly poorly represented or unrepresented in the wider study area.

Land tenure is uncertain, but the area was leasehold Crown Land until recently, and may still be so. It represents the only large section of the western slopes of the Divide that is not part of Tallaganda State Forest. **The land tenure of the area should be checked and, if it proves to be Crown Land, the area should be subjected to a more comprehensive ecological assessment as a first step towards possible reservation.**

6. AREAS OF SIGNIFICANT REMNANT NATIVE VEGETATION IN AND ADJACENT TO THE STUDY AREA

6.1. VERY LARGE AREAS OF SIGNIFICANT REMNANT NATIVE VEGETATION:

FAR EAST:

The Dividing Range

Proportion within study area Mainly outside *study area*.

Location & extent North-south continuous. Very extensive, very broad strip.

Vegetation Dry/intermediate/wet sclerophyll forests, sedgeland and wet heaths

CSIRO Land systems represented (Mountains) Jinden, Minuma, Tallaganda, (Hills) Rossi (Rolling terrain) Glenrock, Snowball

Land Tenures Mainly Tallaganda State Forest, and some privately owned or Crown leasehold timbered lands bordering the forest to the west.

Linkages Loosely linked with Forbes Creek Ridge - Turallo Range to north-west. Loosely linked with the Deua and Wadbilliga National Parks to the east and south-east?

Significance

- MODERATELY HIGH TO EXTREMELY HIGH
- Three non-State Forest areas assessed very superficially, only.
- The State Forest is almost certainly of extremely high significance.
- Adjoining, privately owned or Crown leasehold properties appear to be of very high to moderately high significance, depending on past and current landuses. All assessed areas have a high capacity to return to a completely natural state.
- Grazing and timber-getting have been the major degrading influences of these west-facing slopes.
- Some areas retain patches of wet heath, and wet sclerophyll forest, and plant species and communities not otherwise found in the study area. Their proximity to Tallaganda State Forest makes them particularly valuable.

FAR WEST:

The Queanbeyan Fault Escarpment

Proportion within Study Area Mainly outside study area. Within the study area, includes the Scabbing Flat woodlands, and some smaller timbered areas associated with Taliesin and Woolcara.

Location & extent Extensive. North-south continuous strip, associated with a scarp rising immediately east of the Queanbeyan River/Burra Creek, including occasional remnants on the plateau above, extending from north of the future Kowen Nature Reserve (ACT), southwards to the Googong Foreshores Reserve and further south to the Tinderry Nature Reserve

Vegetation Dry sclerophyll woodlands/open forests, small areas of grassy woodland and wet sedgeland, includes extensive aquatic, riparian and riverine habitats.

CSIRO Land systems represented (Mountains) Harrison, Spring, (Hills) Woolcara, Gibraltar, (Rolling Terrain) Schofield, Wroxham, (Undulating Terrain) Gundaroo, Burra.

Land Tenures ACT Forests, Commonwealth, ACT Parks & Conservation, VCL, Crown leaseholds, some privately owned.

Linkages Loosely linked with Goorooyaroo Nature Reserve, bushlands of Majura Field Firing Range and Mounts Ainslie & Majura in north. In south, intimately linked with extensive bushlands of Tinderry Nature Reserve, Tinderry Range and bushlands still further to south (and south-east?). More or less intimately linked to Mt. Foxlow - Harrisons Peak Area.

Significance

- LOW? TO VERY HIGH

- Nearly all of the Escarpment is excluded from the study area for strategic reasons.
- As a single entity, the Escarpment is of very high to extremely high significance, with several nationally rare or vulnerable species and a number of plants of biogeographic significance. Faunal habitat qualities are potentially very high. Existing qualities are extremely vulnerable.
- The Scabbing Flat Woodlands can be considered part of the Escarpment, and have been very briefly assessed. Part-modified (ie part-cleared and probably grazed) sections of Taliesin and Carwoola have not been assessed. These latter include the upper reaches of Bradleys Creek, and of an unnamed creek to the south.
- Strategically, the Scabbing Flat Woodlands are highly significant in helping link the northern, Kowen/Molonglo Gorge section of the Escarpment with sections to the south.
- The Scabbing Flat woodlands are in relatively good condition considering their landuse history, have a high capacity to return to a more completely natural state, and possess moderately high plant species diversity and faunal habitat qualities at the present time.

SOUTH-CENTRAL:

The Mount Foxlow - Harrisons Peak Area

Proportion within Study Area Nearly all within study area.

Location & extent Extensive. A compact area. Lies between the Molonglo and Queanbeyan Rivers.

Vegetation Dry sclerophyll woodlands/open woodlands, dry/intermediate sclerophyll open forests, small areas of wet heath.

CSIRO Land systems represented (Mountains) Harrison, Spring, (Hills) Woolcara, Gibraltar, (Rolling Terrain) Schofield, (Undulating Terrain) Gundaroo.

Land Tenures Approximately 2/3 under Crown leases, 1/3 freehold.

Linkages Loosely linked to Tallaganda State Forest in the east, and intimately linked with the Queanbeyan Fault Escarpment - Tinderry NR in the west).

Significance

- HIGH TO EXTREMELY HIGH
- Broadly, is of high significance, with areas to the south-west and possibly elsewhere being of extremely high significance.
- Consists of a very large area of semi-intact to late-stage regenerating heathy/grassy woodland and open forest. Possesses potentially high faunal habitat qualities.
- A large population of *Eucalyptus cinerea* ssp. *triplex* in the south-west is of national significance, and one or more populations of *Allocasuarina littoralis* are of regional biogeographic significance. At least one locally uncommon plant species is considered rare in NSW.
- Serves a potentially important linking role between the bushlands of the Dividing Range and those of the Queanbeyan Fault Escarpment.

This area is a priority for more detailed ecological assessment.

FAR NORTH-EAST TO CENTRAL-EAST:

Forbes Creek Ridge - Turallo Range

Proportion within Study Area Approximately half within study area.

Location & extent Less extensive. North-east to central-east, continuous strip.

Vegetation Predominantly dry sclerophyll woodland.

CSIRO Land systems represented (Hills) Woolcara.

Land Tenures Privately owned, VCL and Crown leaseholds?

Linkages Loosely linked with the Tallaganda State Forest to the east.

Significance

- LOW TO HIGH?
- Assessed very superficially over two days.

- Forbes Creek Ridge is of high to very high significance because it retains large areas of 'old-growth' dry sclerophyll woodland. May possess significant faunal habitat qualities for this reason.
- Understorey and groundlayer virtually absent throughout, except in areas with early-stage regeneration.
- Assessed parts of the Turallo Range, further to the north, are mid- to late-stage regeneration.

The vegetation and soils of much of Forbes Creek Ridge and the Turallo Range to the north appear to have been seriously mistreated in the recent and more distant past. The area is notable because:

- The understorey and groundlayer are very sparse to almost entirely absent through many of the higher parts of the area. A well developed understorey and groundlayer occurs only in some low-lying parts. It is likely that this vegetation structure is a consequence of low rainfall and skeletal soils in much of the area, exacerbated by inappropriate grazing by domestic or feral animals.
- The natural vegetation of much of the Turallo Range is a patchwork of intact and recently cleared but regenerating woodland/open forest. The upper, exposed slopes of Forbes Creek Ridge are largely intact woodlands/open woodlands, sometimes dominated by fine, mature trees, whereas much of the open forest of protected slopes and drainage lines appears to have been cleared in the more distant past, but has regenerated well.
- Plant species richness is typically low, reflecting the impact of inappropriate grazing.

6.2 SMALLER AREAS OF SIGNIFICANT REMNANT NATIVE VEGETATION

Captains Flat Area

Proportion within Study Area Mostly within the study area

Location, extent & disposition A patchwork of timbered remnants and cleared areas, centred on Captains Flat, lying mainly west and south of Ballallaba Ridge, and distributed between Tallaganda State Forest in the east and the Mt. Foxlow - Harrison's Peak Area in the west.

Vegetation Dry sclerophyll/grassy woodlands, dry/intermediate sclerophyll forests.

CSIRO Land systems represented (Hills) Woolcara, Gibraltar, Parkers, Rossi, (Rolling Terrain) Schofield, Muskerry, Glenrock, (Undulating Terrain) Gundaroo, Burra.

Land Tenures Privately owned, VCL and Crown leaseholds?

Linkages Links Mt. Foxlow - Harrison's Peak (and ultimately the Queanbeyan Fault Escarpment) with the Tallaganda State Forest.

Significance

- VERY HIGH?
- Probable very high significance as a wildlife corridor between Tallaganda SF and Mt. Foxlow - Harrison's Peak.
- Eastern Wallaroo present in Molonglo River Corridor, probably a good indication of the area's corridor functions.
- The more intact areas appear to support unusually high levels of floristic diversity.
- Supports at least three possibly new species of terrestrial orchid.
- Supports at least four plant species considered rare or uncommon in NSW, and at least one very large population of a species which is regionally uncommon or rare.
- Otherwise virtually unknown.

This area is a priority for more detailed ecological assessment.

Queanbeyan River Corridor

Proportion within Study Area A short section.

Location, extent & disposition Narrow section of remnant native vegetation between Mt.

- Foxlow - Harrisons Peak and upstream end of Googong Foreshores Reserve.
- Vegetation Not assessed on the ground, but should be riparian and riverine.
- CSIRO Land systems represented (Hills) Woolcara.
- Land Tenures Privately owned?
- Linkages Linked with the Queanbeyan Fault Escarpment to the west, and the Mt. Foxlow - Harrisons Peak Area to the east.
- Significance
- HIGH?
 - Probable high significance as a wildlife corridor between the Queanbeyan Fault Escarpment to the west, and the Mt. Foxlow - Harrisons Peak Area to the east.
 - Otherwise unknown.

This area is a priority for more detailed ecological assessment.

The Scabbings Flat Woodlands

(See Queanbeyan Fault Escarpment, above)

Part of Carwoola Property

Proportion within Study Area All

Location, extent & disposition Some of the fenced-off and only occasionally grazed areas between Carwoola and Antill Hills, east of the Molonglo River Floodplain, on the eastern side of Carwoola Property.

Vegetation Dry sclerophyll woodland and open forest.

CSIRO Land systems represented (Hills) Woolcara, (Rolling Terrain) Schofield.

Land Tenures Privately owned?

Linkages Linked with timbered, grazed parts of Foxlow Property. Extremely loosely linked with Mt. Foxlow - Harrisons Peak, and with Forbes Creek Ridge.

- Significance
- UNCERTAIN, could be MODERATE, but possibly EXTREMELY HIGH
 - Four species of macropod reported by manager, two of which are of uncertain identification. Could be Eastern Wallaroo and Red-necked Wallaby, but the latter in particular (referred to as "Sandy Wallaby") should be investigated as the described animal sounds too small and much too light in colour for Red-necked Wallaby.
 - Feathertail Glider noted whilst spotlighting some years ago - most unexpected in this habitat. Also one adult and several young animals, probably moving through, that looked like Tasmanian Devils.

Thuralilly Hill

Proportion within Study Area All

Location, extent & disposition South of Forbes Creek Ridge and Yandyguinula Creek. Compact and of reasonable size.

Vegetation Timbered, but otherwise unknown.

CSIRO Land systems represented (Hills) Woolcara

Land Tenures Unknown, probably Crown leasehold.

Linkages Strongly linked with part-cleared areas immediately to south, and through these, to Tallaganda State Forest. Also, loosely linked directly with Tallaganda State Forest.

- Significance
- UNKNOWN

6.3 UNASSESSED AREAS OF REMNANT NATIVE VEGETATION

The following areas of remnant native vegetation within the study area were not able to be assessed during the course of the study, however were recognised as warranting survey when time and funds were available and access was permitted.

Map: Bungendore 8727-II-N:

Three medium-sized **remnant woodlands to the east of the Escarpment.**
Several medium-sized **remnant woodlands to the east of Turallo Ck.**

Map: Hoskingtown 8727-II-S:

Several medium-sized **remnant woodlands to the east of Foxlow Ck.**
Several medium-sized **remnant woodlands on the eastern slopes of Balcombe Hill.**
Extensive **swampy areas in the Molonglo River and Yandyquinula Creek Floodplains, including seasonal wetlands** (e.g. Molonglo Lagoon).
Several medium-sized **remnant woodlands immediately to the east of the Molonglo River Floodplain.**
Several medium-small **remnant woodlands immediately to the east of Hoskingtown.**

Map: Captains Flat 8726-I-N:

Part of the **Queanbeyan Fault Escarpment**, including part of the Googong Foreshores Reserve, and extending south into the Tinderry Nature Reserve and east into the Mount Bullongong area.
The **Queanbeyan River corridor** east of the Googong Foreshores Reserve, linking up with the Mt Foxlow - Harrison's Peak area.

7. ROADSIDE SURVEYS

One of the aims of the project was to undertake mapping of roadside vegetation in the study area. Approximately 14 adults attended a preliminary training session and form testing in Widgewa Road on 18 September 1994. A more thorough training session was carried out in Wanna Wanna Road on 9 October 1994.

Two forms, one for roadsides and another for crown road reserves, were developed but only the roadside form was put to use. These were based on forms designed by the Victorian Roadside Conservation Committee Inc. (July 1992). The forms and explanatory notes for the surveys are included in Appendix 4.

Over the period from October 1994 until March 1995, teams of volunteers mapped approximately 30 km of roadside, at about 1:5,000 scale, covering the Ridgeway, Wanna Wanna Road, Captains Flat Road from Wanna Wanna Road to Douglas Close, Radcliffe (stages 1, 2 and 6) and Rossi Road from Hoskinstown to Rossi; the sections mapped being a reflection of the location of the volunteers' residences.

Shortly after the mapping was completed, Greening Australia (GA) undertook to map roadside verges in the Upper Murrumbidgee catchment at a much broader scale, the data being entered into a GIS of the catchment. The forms developed for the south-east Yarrowlumla roadside survey were provided to GA to assist with the layout of forms for their survey. To avoid duplication in the light of the broader GA survey, the Yarrowlumla roadside surveys were not collated and a master map was not produced. The intention was to amalgamate the two surveys at a later date.

The original roadside mapping could not be located amongst Peter Barrer's papers following his death, so much of this work is now lost. However, the Rossi to Hoskinstown section had been loaned to the Hoskinstown Landcare Group in order to produce an information leaflet as this road provides a good cross-section of the vegetation communities of the study area. The results of this roadside survey have been summarised and are reproduced in Appendix 5.

The GA roadside survey, although carried out a broader scale, provides a basis for more detailed mapping of roadside vegetation in the study area. **It is strongly recommended that Yarrowlumla Shire council acquire the GIS data from the Greening Australia survey. Any future roadside surveys in the area should be carried out in a format compatible with the GA survey so that all information can be included on the one GIS.**

8. UNFINISHED OBJECTIVES

A number of objectives defined at the beginning of the project were not completed due to funding constraints, and then more importantly, due to Peter Barrer's untimely death. The original aims and objectives are listed here for reference should resources become available in future to complete the project aims. Where the objectives have been completed in this report, the relevant section is referred to.

AIM 1. *To provide an **overview of the remnant native vegetation** of the approximately 70,000 hectare study area, offering as much detail as possible within the constraints of limited resources.*

1.1 FLORISTICS

OBJECTIVE 1.1.1 To assess and describe the identities, locations and distributions of locally common, uncommon and rare native plant overstorey, understorey and groundlayer associations. **(Section 5.2).**

OBJECTIVE 1.1.2 To assess and describe the identities, locations and local distributions of plant species of local, regional, state or national significance. **(Section 5.5).**

OBJECTIVE 1.1.3 To assess, describe and map the broad qualities and distributions of classes of intact native, modified native, and introduced vegetation. **(Attempted, but not completed, Section 5.4).**

1.2 'BROAD ECOLOGICAL ZONES'

OBJECTIVE 1.2.1 To assess, describe and map the qualities and distributions of zones representing distinct combinations of landform, substrate and micro-climate, where each zone reflects a distinctive group of habitats.

1.3 EXISTING AND POTENTIAL LINKAGES BETWEEN REMNANTS

OBJECTIVE 1.3.1 Using the information from 1.1 and 1.2 to assess, to describe and map existing and potential corridors/linkages between areas of remnant native vegetation within the study area, where possible basing linkages on areas of Crown Land. **(Partly completed, see Section 7.)**

AIM 2. *To use the overview of remnant native vegetation, 'broad ecological zones' and linkages of the study area to define the **major threats and opportunities** for existing native vegetation and its associated native fauna, and to prepare an **action plan** promoting the conservation of this vegetation and its associated fauna.*

OBJECTIVE 2.1 To identify the main players; to assess, describe and prioritise threatening processes and, where possible, specific threats to existing native flora and fauna within the study area.

OBJECTIVE 2.2 To identify and prioritise remnant native vegetation conservation needs within the study area; to propose strategies and community- and local government-based actions (including the establishment of a local network of Greenways) to satisfy these needs. (Partly completed, see **Sections 5.3, 6 and 7).**

AIM 3. *As an expected, integral part of the action plan, to plan and help initiate **Volunteer Surveys** of the remnant native vegetation of roadsides, Crown Road Reserves and privately owned lands within the study area.*

OBJECTIVE 3.1 To adapt existing and tried Volunteer Survey techniques, including survey forms, to suit local conditions; to trial and demonstrate these techniques to the Steering Committee and to volunteers. **(Section 7).**

9. RECOMMENDATIONS

1. The five main types of native vegetation in the study area face various threats for which the following actions are recommended (ref. **Section 5.4**):
 - a) **Wet and intermediate sclerophyll forests** are of limited extent in the study area, and in some parts are impacted by grazing and inappropriate fuel reduction burning. *Where land tenure allows, reservation of these wet and intermediate sclerophyll forests is desirable.*
 - b) **Dry sclerophyll forests** are widespread across the study area, although they have been impacted to a varying extent by clearing and grazing practices. Most of the study area's dry sclerophyll forests occur on areas vulnerable to soil erosion and of marginal value as grazing land. The use of these bushlands for rough hill grazing removes the ground cover, and progressively degrades their soils and water catchment qualities. *There is a strong case to end grazing in these areas, and particularly to terminate or not to renew Crown leaseholds granted for grazing purposes. To support this process, there is a need for Yarrowlunla Council to provide protection for these same areas by appropriately exclusive zoning. Extensive areas of mature dry sclerophyll vegetation are uncommon in the study area and, where possible (eg Crown lands), should be protected from destructive activities, particularly clearing or firewood collecting. Dry sclerophyll vegetation on deeper fertile soils is particularly rare and should be given high priority for reservation where possible.*
 - c) **Savannah woodlands** are widespread across the study area but have been heavily modified since European settlement. Only one area of relatively good quality savannah woodland was located, a privately owned but unfenced reserve with a species-rich groundlayer at 'Bililingra' in the far north of the study area. Other good quality woodlands, if they exist, are likely to be rare, but may occur on some private land with a history of minimal grazing. *Opportunities for protection of these remnants is mostly limited to consultation with the landowners, and this is strongly recommended where possible.*
 - d) **Native grasslands** of the study area have been heavily impacted by European settlement, and all appear to have been grazed for many years, some more heavily than others. Recent discoveries of threatened grassland fauna in disturbed grassland habitats within the ACT and Queanbeyan indicate that it is possible that threatened plants and animals survive in the grazed lowland grasslands of the study area. *It may be appropriate to approach a UCAN or ANU undergraduate looking for an honours project, with a view to the student undertaking a pilot faunal study of one or more accessible and promising sections of the native grasslands.*
2. A number of areas of remnant vegetation were identified as being of particular conservation significance (ref. **Section 6**). These are listed below with recommendations for protecting their significant values.
 - a) **Bushlands of the Mt Foxlow - Harrison's Peak area.** Limited information is now available to suggest that these bushlands are of conservation significance. Further information is required to determine whether the bushlands are significant enough to warrant reservation, and to provide data for ecological resource management. *It is recommended that an application be made for funds to support a more detailed study of the flora and fauna of this area.*
 - b) **Bushlands of the Captains Flat area.** Remnants which were sampled proved to be rich in native plant species, and are likely to be typical of other ungrazed or

lightly grazed bushlands surrounding Captains Flat. ***The significance of the sampled areas suggests that bushlands throughout the Captains Flat area should be subjected to a more comprehensive ecological assessment, as a first step towards conservation of the more intact and valuable remnants.***

- c) **Private reserve north of 'Bililingra'.** The roadside verge of a privately owned, grassy woodland reserve at the beginning of Neils Creek Road is the only significant remnant found in the study area of a once more widespread community, and is very rich in native plant species. ***It would be appropriate to open discussions with the landholder with a view to ensuring the preservation of this valuable, unfenced remnant.***
 - d) **Portions 228, 232, 233, 234 Butmaroo.** These bushlands support a rich variety of native plant species, many of which are uncommon or rare in the study area. It represents the only large section of the western slopes of the Divide that is not part of Tallaganda State Forest. ***The land tenure of the area should be checked and, if it proves to be Crown Land, the area should be subjected to a more comprehensive ecological assessment as a first step towards possible reservation.***
3. A major aim of the project was to provide an overview of the remnant native vegetation of the study area. An integral part of any such overview is a map showing at least the location of the remnants, and usually the structure or vegetation type of the remnants. This was attempted using satellite imagery, however the results were somewhat inaccurate and only useful at a very broad scale. Vegetation type was mapped by Storey (1969), however this only shows the original distribution of vegetation types and not that of existing remnants. Vegetation type and structure of many of the remnants, particularly the larger ones and those on Crown Land, was assessed during field visits. However, many small patches, particularly those on private land were not surveyed, and there is no overall map of existing remnant vegetation type and structure. ***A map of vegetation structure (including the distribution of native and introduced vegetation) would still be a useful and achievable aim of the project. Using the classification of vegetation communities defined in this project and a fairly simple classification of vegetation structure, a map could be readily produced from existing aerial photography. This would provide the basis for more detailed mapping as time and funds permitted.***
4. Once a map of existing remnants is produced, potential and existing linkages between the remnants can be defined. This was partly attempted by the volunteer surveys of roadside vegetation. However these were not finalised, partly to avoid duplication of effort with the larger roadside survey being undertaken by Greening Australia. ***It is strongly recommended that Yarrolumla Shire Council acquire the GIS data from the Greening Australia roadside survey to supplement existing data collected by volunteers and to provide the basis for more detailed surveys if necessary. Any future roadside surveys in the area should be carried out in a format compatible with the GA survey so that all information can be included on the one GIS.***

The roadside vegetation data forms the basis for a network of corridors linking patches of remnant vegetation. ***Crown Road Reserves also form potential corridors and it is recommended that a survey of these and other potential links is carried out at some stage to achieve one of the initial objectives of establishing a local network of Greenways.***

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Appendix 1. Major Topographic Features of the Study Area

The western boundary of the study area

The western boundary of the study area is marked by the eastern boundary of the Googong Foreshores Reserve and, immediately north of the Reserve, by the eastern boundary of the Nungurra Wildlife Refuge. Still further north, the western boundary of the study area is taken as the eastern boundary of Portion 139, the fire trail extension of the Old Sydney Road from Queanbeyan, and the last 1.2 kilometre stretch of the Captains Flat Rd..

The Molonglo Ridge

The Molonglo Ridge defines the boundary between the Molonglo River catchment, to the east, and the Queanbeyan River catchment, to the west. The Ridge extends approximately north-south for the full length of the map sheet, although it becomes somewhat attenuated in the far north (810 meters ASL) and south (915-990 meters ASL). It includes Taliesin Hills (1006 meters ASL), Yarrow Peak (1081 meters ASL, and slightly west of the main ridgeline) and Mount Molonglo (approx. 1125 meters ASL).

West of the Molonglo Ridge

Immediately to the west of the Molonglo Ridge, several well-developed subcatchments (interspersed with relatively minor gullies and gully systems) drain into the Queanbeyan River. The most northerly of these, the Jumping Valley Creek subcatchment, is the largest and most complex and drains from the south-south-east to the north-north-west into the Molonglo River within the City of Queanbeyan. The northern part of this subcatchment in the study area has been subdivided for rural residential purposes, and is served by the Wanna Wanna Road.

South of the Jumping Valley Creek subcatchment is the somewhat smaller and more compact Bradleys Creek subcatchment, which drains from the south-east to the north-west, directly into the Googong Reservoir. This subcatchment is relatively strongly dissected, with an altitudinal range in the study area from 1125 to approximately 747 meters ASL.

Still further south, one further unnamed subcatchment drains into the Queanbeyan River from the north-east to the south-west, just upstream of the Reservoir (on the Captains Flat map sheet).

East of the Molonglo Ridge

Several well-developed subcatchments and a larger number of minor gully systems drain the eastern slopes of the Molonglo Ridge, ultimately feeding into the Molonglo River. Towards the south and south-west of the map sheet, Chimney Creek forms an extensive subcatchment which drains the southern section of the ridgeline. The major creekline flows approximately parallel to the ridgeline in a north-north-easterly direction, until it enters the Primrose Valley Creek Floodplain approximately 2 kilometres upstream of the confluence between Primrose Valley Creek and the Molonglo River. A minor ridgeline runs parallel to the main Molonglo Ridge and separates the Chimney Creek subcatchment from the rest of the Primrose Valley Creek subcatchment.

North of these two subcatchments and east or south-east of Widgiewa, one minor unnamed subcatchment and several small gully systems drain directly into the Molonglo River Floodplain. These drain the eastern and south-eastern slopes towards the southernmost limit of the ridgeline formed along the Whiskers and Lake George Faults.

Immediately north of the Whiskers Fault, most of the Widgiewa property and rural residential subdivision are drained by the Whiskers Creek subcatchment, where the creek flows in an approximately north-east direction into the Molonglo River downstream of the Molonglo River Floodplain.

North of the Molonglo Ridge

Two moderately sized gully systems lie north of the Whiskers Creek subcatchment, and drain into the Molonglo River from the north-eastern slopes of Molonglo Ridge. The westernmost of these is the (East) Stoney Creek subcatchment. West and north-west of these lies the larger (West) Stoney Creek subcatchment, which marks the northern limit of the Molonglo Ridge. These gully systems and the Stoney Creek subcatchment drain the Radcliffe subdivision. North of these lie the Scabbing Flat Creek subcatchment, draining into the eastern end of the Molonglo Gorge, and a second subcatchment comprised of gullies and gully systems draining largely from Burbong Hill into the Molonglo River upstream and downstream of the Burbong Bridge.

The Southern Extension of the Lake George Range, and Areas to the West

The Lake George Range continues southwards as far as Widgiewa, immediately south-west of which it links up with the Molonglo Ridge. The Molonglo River (at around 728 meters ASL) cuts through the Range immediately south of Balcombe Hill (953 meters ASL). The southern and western slopes of Balcombe Hill are drained by a group of gullies and minor gully complexes which feed into the Molonglo River at a number of points to the south and west.

Immediately west of this subcatchment is the downstream section of a large subcatchment based on Dairy Station Creek, which drains into the Molonglo River a little upstream of (East) Stoney Creek. Still further west is one further catchment comprised series of gullies and minor gully complexes that feed into the Molonglo River at a series of points.

The Eastern Slopes of the Lake George Range Extension

To the east of Balcombe Hill and the ridgeline to the north, a series of minor gully complexes and gullies drains east-south-eastwards (and southwards in the far north) towards the Hoskinstown Plain east and south of Mills Cross.

The Hoskinstown Plain & Molonglo River Floodplain

Except at its far downstream and far upstream ends, the Hoskinstown Plain and Molonglo River Floodplain lie above 730 and below 740 meters ASL. The plains extend from just north of Mills Cross in the north, southwards towards Captains Flat for a distance of more than 15 kilometres. Additional areas of Floodplain occur along the far downstream ends of Primrose Valley Creek, Foxlow Creek, Yandyguinula Creek, and the unnamed creek that flows northwards just west of Hoskinstown. An area of old lacustrine plain lies between Primrose Valley and Foxlow Creeks, and a much larger area at and south of Mills Cross.

Intermittent lakes occur on Yandyguinula Creek and at Molonglo Lagoon, and dry lakes occur periodically along the Molonglo River and west of Molonglo Lagoon. Swamps and marshes are widespread along the main drainage lines.

"Halfway" Ridge

An unnamed ridgeline (here called Halfway Ridge) runs in an east-west direction immediately north of Mills Cross, and connects the Lake George Extension in the west with the Turallo Range in the east. Although lower than both these ranges (it lies at around 800 meters ASL, and below) and possessing little in the way of steeper slopes, it separates the Molonglo River catchment to the south and west from the Lake George catchment to the north and east. Halfway Hill is the highest point at 834 meters ASL. A series of minor gully complexes and gullies drains south towards the Hoskinstown Plain immediately north of Mills Cross.

The Turallo Range, Forbes Creek Ridge, and the "Carwoola" Ridge

The Turallo Range lies along an approximately north-south axis, rising from immediately south-east of Bungendore, continuing southwards to Lawless Hill (immediately west of the Mills Cross Radio Telescope), and swinging progressively further east until it merges with the Dividing Range

(at South Black Range), well east of Hoskinstown and north-east of Rossi. Although the southern part of the Range eventually travels towards the south-east, a secondary ridge (Forbes Creek Ridge) continues southwards until immediately north of Yandyguinula Creek.

The Turallo Range is low to the north (ie Byron rises around 75 meters to 775 meters ASL), and becomes progressively higher as it progresses southward (Neils Tent rises 90 meters to 812 meters ASL; Lynch Hill lies at 865 meters ASL; Lawless Hill, at 878 meters; near where the Forbes Creek-Turallo Creek Road crosses the Range, at 977 meters; where the Range joins the Divide, at 1225 meters). As it continues southwards, Forbes Creek Ridge descends from 977 meters where it separates off from the Turallo Range, to 954 meters ASL at Hosking Hill.

The "Carwoola" or "Hoskinstown Ridge" comprises the remains of an westwards branch of Forbes Creek Ridge, and separates the Molonglo River Floodplain from all but the most westerly part of the Hoskinstown Plain. Hoskinstown lies towards the northern limit of this generally low and broad ridgeline which nevertheless, in its central portion, rises to as much as 145 meters above the bordering Floodplain. Slopes are steeper to the south, and gentler to the north. The more southerly slopes are drained by short gullies or gully systems which discharge either into the Molonglo River, or its tributary, Yandyguinula Creek. An intermittent creek drains the southern slopes, directly south of Hoskinstown. The more north-facing slopes are drained by a complex of gully systems.

At its northern end (outside the study area), the Turallo Range is bordered on the east by Turallo Creek, and on the west by Halfway Creek (both creeks at between 740 & 700 meters ASL). Both creeks feed into Lake George. A series of short gullies and gully systems drain into these two creeks from slopes of the Range. In the study area, south of Halfway Ridge and including the northern section of Forbes Creek Ridge, the western slopes drain directly into the Hoskinstown Plain through a series of short gullies, short gully systems and (towards the south), progressively longer gully systems and intermittent creeks. To the east, the Turallo Range is drained by short gullies or a progressively complex set of gully systems into Turallo Creek, at or below 820 meters ASL. The more southerly section of Forbes Creek Ridge and the southern slopes of the south-eastern section of the Turallo Range drain into Yandyguinula Creek, either *via* Forbes Creek, or directly through gullies or gully systems.

Butmaroo

Turallo Creek lies to the east of the northern section of the Turallo Range. A dissected upland area lies immediately to the east of this part of Turallo Creek, the headwaters of which drain its southern slopes and gullies. The north-eastern part of the upland area is drained by Butmaroo Creek, and the eastern section, by a tributary, Massey Creek. In the study area, upland elevations are as high as 1035 meters ASL to the east, or 905 meters ASL to the west, and descend to as low as 890 meters ASL to the west, or 740 meters ASL to the west.

The Butmaroo & Dividing Ranges, north of the Divide's connection with the Turallo Range

The Divide continues northwards from the junction between the Turallo and Dividing Ranges. Around 3.5 kilometres further north, the Dividing Range turns towards the north-east, but gives rise to the Butmaroo Range which continues directly north to North Black Range and beyond. Some of the western mid- and foot-slopes of the Butmaroo Range lie within the study area, outside Tallaganda State Forest. For one short stretch further south, the study area extends eastwards to the top of the Dividing Range at between 1126 and 1220 meters ASL. The west-facing slopes of the Butmaroo and Dividing Ranges drain into Turallo Creek to the south, and Massey Creek (a tributary of Butmaroo Creek) to the north. In turn, each of these creeks drains into Lake George.

Appendix 2. Land Systems of the Study Area (from Gunn et al 1969)

1. Mountains

- Harrison** Mountains on folded sedimentary rocks; shallow gravelly or stony uniform coarse- to medium-textured soils.
Vegetation types = 20% *intermediate sclerophyll forest*, 70% *dry sclerophyll forest* and 10% *savannah woodland*.
Communities = 70% *E. rossii* - *E. mannifera*; 20% gum; 10% frost pocket.
Occurrences:
- Limited area along the Queanbeyan Fault Escarpment, south-east of Queanbeyan and extending south to Nungurra Wildlife Refuge.
 - Smaller areas immediately east of the central portion of the Googong Foreshores Reserve and east of that, in the Mt. Molonglo area.
 - Small area at Balcombe Hill, immediately north of the Molonglo River adjacent to the Whiskers Fault.
 - Small area at Corner Hill, immediately to the north of the Queanbeyan River and west of Mt. Foxlow.
 - Much more extensive area to the east of Corner Hill, between Rutledge Ridge-Rutledge Sugarloaf in the north, and Mt. Foxlow and Harrison's Peak further south.
- Condition *Moderate to very good*. Many areas have been cleared in the recent or less recent past, and most of these have been allowed to regenerate. Some areas appear intact. Some areas are exposed to light grazing.
Sample sites sampled as the major part of the Mt. Foxlow-Harrison's Peak area, and at Balcombe Hill.
- Minuma** Mountains and hills on granite and volcanics; gravelly and stony yellow massive earths.
Vegetation types = 75% *intermediate sclerophyll forest*, 25% *wet sclerophyll forest*.
Communities = 45% gum; 30% intermediate *E. sieberi*; and 25% mountain.
Occurrences:
- On the western slopes of the Divide, north-east of Forbes Creek settlement.
- Condition *Moderate to very good*. Some of the area has been cleared in the recent or less recent past, and allowed to regenerate. Some areas appear intact. There may be some light grazing.
Sample sites sampled at Pos.228/232/234, Butmaroo, on the western slopes of the Divide.
- Spring** Rocky mountains on granite and volcanics; shallow uniform coarse-textured soils.
Vegetation types = 60% *intermediate sclerophyll forest*, 20% *dry sclerophyll forest* and 20% *savannah woodland*.
Communities = 60% gum; 20% *E. melliodora* - *E. bridgesiana*; 20% dry sclerophyll forest mixed
Occurrences:
- Small area centred on Harrison's Peak
 - Small area lying to the south-east of Urialla Creek and west of the Queanbeyan River - the most northern extension of the Tinderry Range.
- Condition *Moderate to very good*. Some areas have been cleared in the recent or less recent past, and most of these have been allowed to regenerate. Some areas appear intact. Some areas are exposed to light grazing.
Sample sites sampled as the Harrison's Peak part of the Mt. Foxlow-Harrison's Peak area.

2. Hills

- Woolcara** Hills on folded sedimentary rocks; shallow gravelly uniform medium-textured soils.
Probably the largest single land system of the study area.
Vegetation types = 60% dry sclerophyll forest and 40% savannah woodland.
Communities = 60% *E. rossii* - *E. mannifera*; 5% frost pocket; 10% *E. melliodora* - *E. bridgesana*; 25% dry sclerophyll forest mixed; 30% savannah woodland mixed.
- Occurrences:
- One area immediately east of Queanbeyan and south of the Kings Highway, including the Scabbing Flat Creek area.
 - A large area south-south-east of this, adjacent to the northern and eastern boundary of the Googong Foreshores Reserve, extending eastwards to immediately west of Widgiewa and Radcliffe, and south to the southern border of the study area. It includes the Queanbeyan River and much of its catchment.
 - Further areas surround much of the Mt Foxlow area.
 - Additional areas north-north-east of Captains Flat and west of Ballallaba Ck., north of Ballalaba Ck., north of the Molonglo River floodplain at Carwoola (the hill), and south-east to north of Hoskinstown to include Forbes Creek Ridge and the Turallo Range.
- Condition *Poor to very good*. Some large areas have been cleared in the past, and are still grazed. Other areas remain uncleared, and some are only very lightly grazed.
- Sample sites sampled in the far western part of the Mt Foxlow-Harrisons Peak area, as part of Carwoola Property, in the Scabbings Flat Woodlands, at Weetalabah, in the central section of the Turallo Range, and on Forbes Creek Ridge.
- Rossi** Rocky hills on granite and volcanics; texture-contrast soils and massive earths.
Vegetation types = 10% wet sclerophyll forest, 50% intermediate sclerophyll forest, 10% dry sclerophyll forest and 30% savannah woodland.
Communities = 10% *E. rossii* - *E. mannifera*; 30% frost pocket; 40% gum; 10% intermediate *E. sieberi*; 10% *E. robertsonii*.
- Occurrence:
- Single large area, extending north and south of Rossi, and bordered to the east by the Tallaganda State Forest.
- Condition *Moderate to good*. Most cleared and grazed, with small areas that remain uncleared and lightly or moderately grazed.
- Sample sites sampled on the western slopes of the Divide at the area west of Whites Creek and the area south of the Mulloon Fire Trail.
- Gibraltar** Rocky hills on granite and volcanics; texture-contrast soils and massive earths.
Vegetation types = 10% dry sclerophyll forest, 90% savannah woodland.
Communities = 10% *E. rossii* - *E. mannifera*; 30% frost pocket; 60% *E. melliodora* - *E. bridgesana*.
- Occurrences:
- A number of relatively small occurrences towards the south of the study area, including much of Captains Flat, immediately north-west of Harrisons Peak, and two areas to the east and west of Urialla Creek near where it enters the Queanbeyan River.
 - A small part of a much larger area is included in the north-east corner of the study area.
- Condition *Moderate to very good*. Where only moderate, has been exposed to patchy or extensive past clearing. Some cleared areas have been allowed to regenerate.
- Sample sites range of communities sampled immediately NNW of Captains Flat, and more generally as a small part of the Mt Foxlow-Harrisons Peak area.
- Parkers** Hills on folded sedimentary rocks; massive earths and shallow gravelly uniform medium-textured soils.

Vegetation types = 70% intermediate sclerophyll forest, 20 % dry sclerophyll forest, 10% savannah woodland.

Communities = 40% gum; 30% intermediate sclerophyll forest mixed; 20% dry sclerophyll forest mixed; 10% frost pocket.

Occurrences:

- Relatively small area west, south-west and south of Captains Flat.
- Two small areas south-east of Captains Flat.

Condition Moderate to very good. Some past clearing, with subsequent regeneration in places. Other areas currently grazed.

Sample sites range of communities sampled immediately SSW of Captains Flat Reservoir

3. Rolling Terrain

Scofield Rolling country on folded sedimentary rocks; shallow gravelly uniform medium-textured soils, massive earths, and texture-contrast soils.

The second most extensive land system in the study area.

Vegetation types = 55% dry sclerophyll forest, 40% savannah woodland and 5% grassland.

Communities = 55% *E. rossii* - *E. mannifera*; 10% frost pocket; 30% *E. melliodora* - *E. bridgesana*; 5% grassland.

Occurrences:

- One large area extends south from a section of the Kings Highway to include most of Wanna-Wanna, Radcliffe and Widgiewa. With a brief interruption, this continues south to include much of the Primrose Creek area.
- Additional small areas are associated with the peripheries of Foxlow, Carwoola (hill) and the Turallo Range, and occur along Ballallaba Creek.

Condition Poor to good. Generally cleared or part cleared, some areas heavily grazed currently, and other areas subdivided for rural residential. Some regeneration in places. A few small areas remain uncleared.

Sample sites sampled at Widgiewa, Whiskers Creek, and in the private reserve just north of Bililingra.

Glenrock Rolling uplands and basins on disaggregated granite; yellow massive earths and texture-contrast soils.

Vegetation types = 15% wet sclerophyll forest, 45% intermediate sclerophyll forest, 30% savannah woodland and 10% grassland.

Communities = 30% frost pocket; 35% gum; 20% grassland; 15% *E. robertsonii*.

Occurrences:

- Two very small areas to the east and north-east of Captains Flat, along the eastern border of the study area.

Condition: (not assessed)

Sample sites: (not sampled)

Wroxham Rolling country on granite; texture-contrast soils.

Vegetation types = 55% dry sclerophyll forest and 45% savannah woodland.

Communities = 25% *E. rossii* - *E. mannifera*; 10% frost pocket; 10% *E. melliodora* - *E. bridgesana*; 25% dry sclerophyll forest mixed; 30% savannah woodland mixed.

Occurrence:

- Two small areas on and east of the Queanbeyan Fault Escarpment near the far south-west corner of the study area.

Condition: (not assessed)

Sample sites: (not sampled)

Muskerry Rolling to undulating country with frequent outcrops on volcanics; texture-contrast soils.

Vegetation types = 65% intermediate sclerophyll forest, 35% savannah

woodland.

Communities = 65% gum; 35% frost pocket.

Occurrence:

- One small area south-south-east of Captains Flat.

Condition *Moderate to good?* Mostly (part?) cleared?

Sample sites frost pocket? community sampled by Sandie Jones at Captains Flat Cemetery.

4. Undulating Terrain

Gundaroo Undulating lowlands on folded sedimentary rocks; texture-contrast soils and massive earths.

Vegetation types = 10% *dry sclerophyll forest*, 85% *savannah woodland* and 5% *grassland*.

Communities = 10% *E. rossii* - *E. mannifera*; 35% frost pocket; 50% *E. melliodora* - *E. bridgesana*; 5% *grassland*.

Occurrences:

- Occurs widely in the north-east of the study area, along and near the lower reaches of the Molonglo River and Primrose Valley Creek, and adjacent to the Molonglo River Floodplain.
- Two small areas in the north-west of the study area, adjacent to the Wanna-Wanna Rd..

Condition *Poor*. Most or all cleared and grazed, although often with scattered shade trees remaining.

Sample sites (not formally sampled)

Burra Undulating lowlands on granite; texture-contrast soils.

Vegetation types = 33% *savannah woodland*, 33% *dry sclerophyll forest* and 33% *grassland*.

Communities = 33% *E. rossii* - *E. mannifera*; 17% frost pocket; 17% *E. melliodora* - *E. bridgesana*; 33% *grassland*.

Occurrences:

- Two small areas on and adjacent to the Queanbeyan Fault Escarpment near the south-west corner of the study area.

Condition: (not assessed)

Sample sites (not sampled)

Bombay Rocky lowlands and rises on partially weathered volcanics; massive earths and texture-contrast soils.

Vegetation types = 5% *intermediate forest*, 45% *dry sclerophyll forest*, 35% *savannah woodland* and 15% *heath*.

Communities = 45% *E. rossii* - *E. mannifera*; 15% frost pocket; 5% gum; 20% *E. melliodora* - *E. bridgesana*; 15% *Baekia*.

Occurrence:

- Only one small area along Forbes Creek, some distance north of the village.

Condition: (not assessed)

Sample sites (not sampled)

5. Plains

- Arnprior** Alluvial flats subject to flooding in lower parts; uniform medium-textured alluvial soils.
Vegetation types = *mostly cleared, formerly 100% open savannah woodland.*
Communities = 50% frost pocket, 50% *E. melliodora* - *E. bridgesiana*.
Occurrences:
- Occurs along the middle section of the Molonglo River (upstream from the Whiskers Fault) and the lower section of each of Primrose Valley and Foxlow Creeks.
- Condition *Poor.* Most or all modified by heavy grazing and sometimes pasture improvement and/or tilling.
Sample sites (not formally sampled)
- Bungendore** Lacustrine plains generally inundated; old lacustrine plains and riverine plains with alkaline texture-contrast soils.
Vegetation types = *originally 50% savannah woodland and 50% grassland, now all secondary grassland or cultivation.*
Communities = 50% frost pocket, 50% grassland.
Occurrences:
- Two significant areas occur to the east and west of the middle section of the Molonglo River.
- Condition *Poor.* Most or all modified by heavy grazing and sometimes pasture improvement and/or tilling.
Sample sites (not formally sampled)

Appendix 3. Plant Species List

Stoney Creek Study - Overview of Species Abundances and Distributions amongst Surveyed Sites

Key to sites

Grid ref	Locality
1	706560867 Weetalabah, east of the Ridgeway and north of the Queanbeyan-Bungendore road
2	706860857 Scabbings Flat Creek Crown Lands, east of the Queanbeyan-Captains Flat road and south of the Queanbeyan-Bungendore road
3	713860782 Lot 31, Widgiewa Subdivision on Whiskers Creek
4	715460804 roadside reserve incorporating Whiskers Pit, immediately north of the Widgiewa subdivision and the Queanbeyan-Captains Flat road
5	716060819 Portion 11, between the Molonglo River and Balcombe Hill
6	717560650 bushlands of Mount Foxlow - Harrisons Peak
7	720260761 hill country in the eastern part of Carwoola property
8	720660861 privately owned reserve north of 'Billillingra', on both sides of the Neals Creek road,, north of Mills Cross
9	721660563 upstream part of the reserve surrounding Captains Flat Reservoir
10	721660601 reserve immediately north-west of Captains Flat
11	722760561 Captains Flat cemetery (surveyed by Sandy Jones)
12	723260848 central section of the Turallo Range, both sides of the Neals Creek rd
13	725460778 Forbes Creek Ridge, north of the Hoskinstown - Forbes Ck Rd
14	727960680 Portions 14, 15, 107 on the western slopes of the dividing Range, west of Whites Creek
15	729060787 Portions 228, 232, 233 and 234 (Butmaroo area) on the western slopes of the Dividing Range
16	730260740 Portion 156, south of Mulloon Fire Trail, on the western slopes of the Dividing Range

Note: Introduced species are indicated by the species name, followed by (I). Non-indigenous native species are followed by (#).

Abundance:(r) = (rare) = 1-2 localised individuals or small groups, depending on size of site only

(u) = (uncommon) = occasional scattered individuals/groups

(n) = (not uncommon) = individuals/groups encountered widely, but not as a dominant component of the site's flora

(c) = (common) = individuals/groups encountered widely, often as co-dominant species in its stratum

(a) = (abundant) = species often the only dominant in its stratum

(l) = localised in the site

(w) = widespread in the site

Division and class	Family	Genus and species	706560867	706860857	713860782	715460804	716060819	717560650	720260761	720660861	721660563	721660601	722760561	723260848	725460778	727960680	729060787	730260740
PTERIDOPHYTA - Felicopsida																		
ADIANTACEAE																		
		<i>Adiantum aethiopicum</i>			r		n,l	u?			c,l	n-u,l						n,l
ASPLENIACEAE																		
		<i>Asplenium flabellifolium</i>	n,l	n,l			n-u,l	n?	u,l?		n,l	n				n,l (boulders)	u?	c-n
		<i>Pleurosorus rutifolius</i>	n,l				r?											
BLECHNACEAE																		
		<i>Blechnum minus</i>						u?			n-u,l					u,l (drain. line)		
		<i>Blechnum nudum</i>					n-u,l	r?	r		u,L							
		<i>Doodia aspera</i>							r									
		<i>Doodia media</i>									u,l							
CYATHEACEAE																		
		<i>Cyathea australis</i>						r?	r							u,l (drain. line)		r?
DENNSTAEDTIACEAE																		
		<i>Hypolepis rugulosa</i>						u?										
		<i>Pteridium esculentum</i>						n-u	u?,l							c-n	c-n	c,l
DICKSONIACEAE																		
		<i>Dicksonia antarctica</i>						n/u								u,l (drain. line)		
DRYOPTERIDACEAE																		
		<i>Polystichum australiense</i>						u?			n,l					n-u		
		<i>Polystichum proliferum</i>						n-u?	u,l		n,L							
OPHIOGLOSSACEAE																		
		<i>Ophioglossum lusitanicum ssp. coriaceum</i>			r													
SINOPTERIDACEAE																		
		<i>Cheilanthes austrotenuifolia</i>	u,l	u?,l				u?(-n, rockland)			n-u?	u?						
		<i>Cheilanthes distans</i>	n-u,l										u?,l					
		<i>Cheilanthes sieberi ssp. sieberi</i>	n,w	c-n,l	n		n	u(-c, rockland)		n	n							n-u
		<i>Pellaea falcata var. falcata</i>	n,l		r		u?,l	u(rockland)			n-u,l	n,l						
GYMNOSPERMAE - Coniferopsida																		
CUPRESSACEAE																		
		<i>Callitris endlicheri</i>	c-n,l															
PINACEAE																		
		<i>Pinus radiata (l)</i>		u,l		u-r,w	u-r					r						
ANGIOSPERMAE - Monocotyledonae																		
ANTHERICACEAE																		
		<i>Arthropodium minus</i>			u			u?(rockland)										
		<i>Caesia calliantha</i>																?
		<i>Laxmannia gracilis</i>						n-u(rockland)										
		<i>Thysanotus patersonii</i>			u													?
		<i>Thysanotus tuberosus</i>			u				n,l (reported)									?
		<i>Tricoryne elatior</i>			u													
ASPHODELACEAE																		
		<i>Bulbine bulbosa</i>			n/u	n,l				u?								

Division and class	Family	Genus and species	706560867	706860857	713860782	715460804	716060819	717560650	720260761	720660861	721660563	721660601	722760561	723260848	725460778	727960680	729060787	730260740
COLCHICACEAE																		
		<i>Wurmbea dioica</i>	n,l		c													
CYPERACEAE																		
		<i>Baumea rubiginosa</i>														c,l (drain. line)		
		<i>Carex appressa</i>	n,l	c,l	n	n,l	n		u-r							c,l (drain. lines)	n,l	
		<i>Carex inversa</i>						u?,l										
		<i>Carex sp.</i>	n,l															
		<i>Cyperus eragrostis (l)</i>	n-u,l					u,l					u?,l					
		<i>Cyperus gunnii ssp. gunnii</i>			u													
		<i>Cyperus sanguinolentus</i>			r													
		<i>Cyperus sp.</i>			u							c-n,w						
		<i>Eleocharis sp.</i>			u													
		<i>Gahnia subaequiglumis</i>														u-r		
		<i>Lepidosperma laterale</i>	n,w	c-n	n	u,w	n-u?	u(-n, rockland)					u?					n
		<i>Schoenoplectus validus</i>			u				n,l									
		<i>Schoenus apogon</i>			n	r?,l		n,l					n?,l					
HYDROCHARITACEAE																		
		<i>Ottelia ovalifolia</i>			u													
HYPOXIDACEAE																		
		<i>Hypoxis hygrometrica</i>			n													
JUNCACEAE																		
		<i>Juncus articulatus (l)</i>			c													
		<i>Juncus australis</i>			n	n,l												
		<i>Juncus fockei</i>			u													
		<i>Juncus homalocaulis</i>												n?,l				
		<i>Juncus sarophorus</i>							u?,l							n,l (drain. lines)		
		<i>Juncus sp. (not flowering)</i>	n-u	c-n,l			n,l		c		n		?	n,l	n,l			n,l
		<i>Juncus subsecundus</i>			n	n,l		n?					?					
		<i>Luzula densiflora</i>											?					
		<i>Luzula flaccida form A</i>			n													
		<i>Luzula sp.</i>		n?l					c,l									
ORCHIDACEAE																		
		<i>Caladenia cucullata</i>						n										
		<i>Caladenia gracilis</i>											?					
		<i>Caladenia praecox</i>			r													
		<i>Dipodium roseum</i>											?					
		<i>Diuris lanceolata</i>											?					
		<i>Diuris lanceolata X sulphurea</i>											?					
		<i>Diuris sulphurea</i>			u								?					
		<i>Eriochilus cucullatus</i>			u								?					
		<i>Gastrodea sp.</i>											?					
		<i>Microtis aff. rara</i>											?					
		<i>Microtis aff. unifolia</i>											?					
		<i>Microtis sp. (not flowering)</i>			n								?					
		<i>Prasophyllum sp.</i>			r								?					
		<i>Thelymitra holmesii</i>											?					
		<i>Thelymitra ixioides</i>						n/u,l?					?					
		<i>Thelymitra pauciflora</i>			r								?					
		<i>Thelymitra sp.</i>							n-u,l (reported)				?					

Division and class	Family	Genus and species	706560867	706860857	713860782	715460804	716060819	717560650	720260761	720660861	721660563	721660601	722760561	723260848	725460778	727960680	729060787	730260740
PHORMIACEAE																		
		<i>Dianella longifolia</i> var. <i>longifolia</i>	u,l		r			u			n,l	n-u,l				u	u-r	
		<i>Dianella revoluta</i>	n,w	c-n	n	n-u,w		c(-n, rockland)	u?	n-u	c	c		n				
		<i>Dianella tasmanica</i>						n								n	a-c	c,l
		<i>Phormium tenax</i> (l)				r,l												
POACEAE																		
		<i>Anthoxanthum odoratum</i> (l)											?					
		<i>Aristida ramosa</i>	n,l		n	c-n,w	n			n	c,l							
		<i>Bothriochloa macra</i>	n?,l															
		<i>Briza minor</i> (l)		n-u,l														
		<i>Bromus</i> sp. (l)				u,l												
		<i>Chionochloa pallida</i>	c-n,w	c	c	a-c,w	n	a-u	a	c-n	c	a-c,l	?	a	n-u			
		<i>Cymbopogon refractus</i>		c-n,l														
		<i>Danthonia caespitosa</i>			n								?					
		<i>Danthonia laevis</i>			c-n?					n								
		<i>Danthonia</i> sp.	c-n,w	n	n	n,l?	n	n	n-u	n				n-u?	c,l	n		
		<i>Dichelachne micrantha</i>				n,l							?					
		<i>Dichelachne</i> sp.								n-u?								
		<i>Echinopogon intermedius</i>			n													
		<i>Elymus scaber</i> var. <i>scaber</i>	u?,l		u	u?,l							?					
		<i>Enneapogon nigricans</i>											?					
		<i>Microlaena stipoides</i>	u?,l	c,l	n		n,l?								c,l			
		<i>Nassella trichotoma</i> (l)							n (pasture)									
		<i>Panicum effusum</i>	c,l?		n	n-u,l	n?,l			n?								
		<i>Phalaris aquatica</i> (l)	n-u,l			n-u,l												
		<i>Phragmites australis</i>	u,l		u		n,l				n-u,l	n,l						u,l
		<i>Poa helmsii</i>														u?,l (drain. line)		
		<i>Poa labillardieri</i>	c,l	n-u,l	c	c-n,w	n	n	c,l		c-n,l	c,l	?	n,l	c,l	n,l (creek)		
		<i>Poa meionectes</i>				n-u?,l		n					?					
		<i>Poa sieberiana</i>				n,w												
		<i>Poa</i> sp. (forest)	n-u,l?	c					n-u,l	c	c	c			n,l	c-n		c-n
		<i>Sorghum leiocladum</i>			u													
		<i>Stipa densiflora</i>	n,l	n,l			n,l											
		<i>Stipa scabra</i> var. <i>falcata</i>	c-n?,w		n		n							n,l				
		<i>Themeda triandra</i>	n,l	n,l	n	c-r,w	n	u(rockland)	n,l	c-n	n	n	?					u?,l
POTAMOGETONACEAE																		
		<i>Potamogeton tricarlinatus</i>			r													
RESTIONACEAE																		
		<i>Restio australis</i>																c
TYPHACEAE																		
		<i>Typha</i> sp.	r,l						n,l									
XANTHORRHOEACEAE																		
		<i>Lomandra filiformis</i> ssp. ?	c-n?,w										?					
		<i>Lomandra filiformis</i> ssp. <i>coriacea</i>		c?	c	c-n,w	n		c-n					n				
		<i>Lomandra filiformis</i> ssp. <i>filiformis</i>		n-u,l											n			
		<i>Lomandra longifolia</i>	n,l	c,l	n	u?,l	n	c-n	n-u,l		c	n	?	n-u?	n-u	n	a-c	n
		<i>Lomandra multiflora</i>	n-c,w	c-n?	n	n,w	u?	n		c-n?	c	u?	?	c-n			c-n	
		<i>Xanthorrhoea glauca</i> ssp. <i>angustifolia</i>															u? (lower slope)	
ANGIOSPERMAE - Dicotyledonae																		
APIACEAE																		
		<i>Daucus glochidiatus</i>			n													
		<i>Hydrocotyle laxiflora</i>		c,l	c	n-u,w	n	n	n	n-u	n-u?	n?l			u	n		c
		<i>Hydrocotyle peduncularis</i>			n/u			u										
		<i>Hydrocotyle</i> sp. aff. <i>laxiflora</i>			n,l													
		<i>Hydrocotyle tripartita</i>									n,l							
		<i>Oreomyrrhis eriopoda</i>			n,L													

Division and class	Family	Genus and species	706560867	706860857	713860782	715460804	716060819	717560650	720260761	720660861	721660563	721660601	722760561	723260848	725460778	727960680	729060787	730260740
ARALIACEAE																		
		<i>Astrotricha ledifolia</i>						n-u,l?			n-u?	n						
		<i>Polyscias sambucifolius</i>						u			n					n-u	n	n
ASTERACEAE																		
		<i>Bedfordia arborescens</i>						r?!										
		<i>Brachycome aculeata</i>											?					
		<i>Brachycome cardiocarpa</i>											?					
		<i>Brachycome decipiens</i>			r													
		<i>Brachycome rigidula</i>		n				n-u		n	n-u?	n,w	?					
		<i>Brachycome sp.</i>			u												n?	
		<i>Brachycome spathulata</i>						u?,l			n				n,l			
		<i>Bracteantha bracteata sp. complex</i>						n,l										
		<i>Bracteantha subundulata</i>											?					
		<i>Bracteantha viscosa</i>	c,w	n-u,l	n	n,w				n-u								
		<i>Calocephalus citreus</i>								n-u?								
		<i>Calotis scabiosifolia var. integrifolia</i>								n-u?								
		<i>Cassinia aculeata</i>		u?l	u	r,l	u?	n		n	n	n			n-u	n-u	n	n
		<i>Cassinia longifolia</i>		n	u	r,l		c,l		c	n				n-u	r?	n	c-n
		<i>Cassinia quinquefaria</i>	n,w	c,l	u	c-u,w				n-u								
		<i>Centipeda cunninghamii</i>			u													
		<i>Centipeda minima</i>			u													
		<i>Chrysocephalum apiculatum</i>	c-n		n	n-u,w			n-u	n								
		<i>Chrysocephalum apiculatum (intermediate)</i>											u?					
		<i>Chrysocephalum semipapposum</i>	u,l	c-n	u	u,w		u?l	u-r?		c-n,l	n,l						n,l
		<i>Chrysocephalum semipapposum (intermediate)</i>										u?						
		<i>Conyza sp. (l)</i>			n	u,l			u?									
		<i>Craspedia canens</i>			n			n										
		<i>Craspedia sp.</i>								n-u?								
		<i>Craspedia variabilis</i>																
		<i>Cymbonotus sp.</i>		n					n-u?		n					n		n
		<i>Gnaphalium gymnocephalum</i>			n													
		<i>Gnaphalium involucreatum</i>		u?	n													
		<i>Gnaphalium sp.</i>										n						
		<i>Helichrysum scorpioides</i>								n-u?								
		<i>Helichrysum sp.</i>																c-n
		<i>Hypochaeris radicata (l)</i>				c-n,w			n									
		<i>Leptorhynchus squamatus</i>			n	n-u,w				n-u?	u?							
		<i>Leucochrysum albicans ssp. albicans var. albicans</i>			u													
		<i>Leucochrysum albicans ssp. albicans var. tricolor</i>		n,l		u?,l?				n		u?l						
		<i>Microseris lanceolata</i>			n	u?,w			n-u?		n-u?	u?						
		<i>Olearia argophylla</i>														r?		
		<i>Olearia erubescens</i>								u?	n-u	n-u					n,l?	
		<i>Olearia myrsinoides</i>																
		<i>Olearia phlogopappa</i>																
		<i>Olearia stellulata</i>								u?								
		<i>Ozothamnus conditus</i>								r?								
		<i>Podolepis sp.</i>									c-n							
		<i>Pseudognaphalium luteoalbum</i>	r?,l		u			n-u										
		<i>Senecio diaschides</i>			u													
		<i>Senecio hispidulus var. dissectus</i>	n,w															
		<i>Senecio hispidulus var. hispidulus</i>											u?					
		<i>Senecio linearifolius</i>										c-n,l						
		<i>Senecio minimus</i>						n?								n,l (creek)		
		<i>Senecio quadridentatus</i>	n,w		c	n-u,w	n											
		<i>Senecio sp.</i>						n		n-u								
		<i>Sigesbeckia australiensis</i>											r?					
		<i>Solenogyne dominii</i>			n													
		<i>Solenogyne sp.</i>								u?								
		<i>Tolpis umbellata (l)</i>			n													
		<i>Triptilodiscus pygmaeus</i>			c-u			c-u,l										
		<i>Vittadinia cuneata var. cuneata</i>	c-n,w		n													
		<i>Vittadinia gracilis</i>			n													
		<i>Vittadinia muelleri</i>			n	c-n,w												
		<i>Vittadinia sp.</i>		c-n,l				c(rockland)		n-u?	u?							

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BORAGINACEAE																		
		<i>Cynoglossum suaveolens</i>						n?			u?							
BRASSICACEAE																		
		<i>Lepidium pseudotasmanicum</i>									r?							
CAMPANULACEAE																		
		<i>Pratia</i> sp.											?					
		<i>Wahlenbergia communis</i>				n						c?	?					
		<i>Wahlenbergia gracilentia</i>				u												
		<i>Wahlenbergia multicaulis-tadgelii</i> complex				u												
		<i>Wahlenbergia</i> sp.	n,w										?					
		<i>Wahlenbergia stricta</i>				n												
CAPRIFOLIACEAE																		
		<i>Lonicera</i> sp. (l)										r,l						
CARYOPHYLLACEAE																		
		<i>Scleranthus biflorus</i>				c	n,w	n-u?	c-n		n-u?							
		<i>Scleranthus diander</i>		n,l								n						
		<i>Stellaria pungens</i>	n,w						n	c-n	n-u,l	n,l			n	n,l	n?	
CASUARINACEAE																		
		<i>Allocasuarina littoralis</i>						r,l (100+plants)										
		<i>Allocasuarina luehmannii</i>	r,l															
CHENOPODIACEAE																		
		<i>Chenopodium</i> sp.																
		<i>Einadia hastata</i>																
		<i>Einadia nutans</i> ssp. <i>nutans</i>	n-u,l	n-u,l	u	r?,l		u(rockland)	n		n-u,l	n-u				u (boulder)		
CONVOLVULACEAE																		
		<i>Convolvulus erubescens</i>				n												
		<i>Dichondra repens</i>				n		n-u?			n,l	r?	?		n-u	n-u		
CRASSULACEAE																		
		<i>Crassula sieberana</i>	n-u,l								u?							
DILLENIAEAE																		
		<i>Hibbertia obtusifolia</i>	n,w	n	n	c-n,w	n	a-c	n	n	c-n	c-n	?	c	n	c-n	c	c-n
DROSERACEAE																		
		<i>Drosera peltata</i>				u		n										
		<i>Drosera spatulata</i>																
EPACRIDACEAE																		
		<i>Acrotriche serrulata</i>		n,l	n		r,l	n-u?			c-n	c			n-u	n	c-n	c
		<i>Astroloma humifusum</i>		n,l	u						u?				u-r		n (lower slope)	
		<i>Brachyloma daphnoides</i>	n,w	n	c		n-u,w	n	n		c	c	?	n				
		<i>Epacris breviflora</i>															n,l	
		<i>Epacris microphylla</i> var. <i>microphylla</i>						n,l								n-u,l (drain.line)	c	
		<i>Leucopogon attenuatus</i>						n?l			n,l?							
		<i>Leucopogon fletcheri</i> ssp. <i>A</i>	n,l	n-u	c	c-n,(NE) u,w	n	c-n	c-n	c-n	c-n			n	u?			
		<i>Leucopogon fraseri</i>						r?	r							n-u	c-n	c
		<i>Leucopogon lanceolatus</i>						n-c					?		n	n	c	c
		<i>Leucopogon</i> sp.											?					
		<i>Leucopogon virgatus</i> ssp. <i>virgatus</i>				c	n,l (SW)				c-n	c	?				c (lower slope)	
		<i>Lissanthe strigosa</i>				u	n-u,l (NE)	n	n	n-u					c-n		c (lower slope)	
		<i>Melichrus urceolatus</i>		n-u	n		c-n,w	n-u	c-n	n	n	c-n	?	n	n	n-u?	u?	n-u
		<i>Monotoca elliptica</i>											?					
		<i>Monotoca scoparia</i>				u					n-u	u-r?						
		<i>Styphelia triflora</i>	n-u,w	c							c-n	n				n-u	c-n	n-u?
EUPHORBIACEAE																		
		<i>Chamaesyce drummondii</i>				n,l												
		<i>Poranthera microphylla</i>	n,w			n				n-u,l								

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FABACEAE																		
		<i>Bossiaea buxifolia</i>	c-n,w	n,l	n	c-u,w		n(-u, rockland)	u?,l	u?	n	a-c				n-u?	n	c-n
		<i>Bossiaea prostrata</i>						u(rockland)				a-c,l						
		<i>Cytisus scoparius (l)</i>				u,l												
		<i>Daviesia genistifolia</i>	n,l	n		c-u,w												
		<i>Daviesia leptophylla</i>						a			c	a						
		<i>Daviesia mimosoides</i>	n,l	n-u,l	n	c-r,w		u?l	n	n	n-u?		?	n		u	n-u?	
		<i>Daviesia ulicifolia</i>						n-u						c		n	c	c-n
		<i>Desmodium varians</i>			n			n										
		<i>Dillwynia cinerascens</i>						n,l				n?,l?						
		<i>Dillwynia juniperina</i>		c-n,l		r,l (NE)												
		<i>Dillwynia sericea</i>	c-n,w	c-n	c	c-n,w	n	n	n-u?	n-u	c			n		r?		
		<i>Glycine clandestina</i>	c-n,w		n			n			n?	n	?		n-u	n-u		
		<i>Gompholobium huegelii</i>	r,l	n-u		r,l		u?l	r?								u?	
		<i>Hardenbergis violacea</i>	c-n,w		n	u-r,l		n	n,l (reported)	n	n	n	?	n-u		u?	c	c-n
		<i>Hovea linearis</i>	n,w	n,l	n	c-n,w		n	c-n		n	u?	?			u?		
		<i>Hovea purpurea</i>											?					
		<i>Indigofera australis</i>	n-u,l	n-u	u			n-u	n-u			n			u		n	
		<i>Mirbelia oxyloboides</i>						n			c							
		<i>Platylobium formosum</i>																c-n
		<i>Psoralea adscendens</i>			c													
		<i>Pultenaea humilis</i>											?					
		<i>Pultenaea microphylla var. microphylla</i>	n,l	a-c,l		r,l (N)		n-u?l	c-n									
		<i>Pultenaea polifolia</i>										n-u,l						u?,l
		<i>Pultenaea procumbens</i>		c-n	c	n,w		n	u?		n							
		<i>Pultenaea subspicata</i>						c-n,l		n				c		c-n,l	c-n	
		<i>Trifolium repens (l)</i>											?					
GENTIANACEAE																		
		<i>Centaurium erythraea (l)</i>			n								?					
GERANIACEAE																		
		<i>Geranium potentilloides</i>						u?(rockland)										
		<i>Geranium retrorsum</i>			n	n,l												
		<i>Geranium solanderi var. solanderi</i>	c-n,w	c-n,l	n	n-u,l		n	n-u,l	n	c	n,l?	?					
		<i>Geranium sp.</i>					n?,l?									n	c-n	n
		<i>Pelargonium australe</i>	n-u,l								n,l	u?l						
		<i>Pelargonium sp.</i>						n(rockland)										
GOODENIACEAE																		
		<i>Goodenia hederacea ssp. hederacea</i>	c-n,w	c-n	c	n,w	n?		c-n	n			?	n		n		
		<i>Velleia paradoxa</i>								n-u?								
HALORAGACEAE																		
		<i>Gonocarpus tetragynus</i>	u-c,w	c-n	c	c-n,w	n	c	c	n-u	c	c	?	n	c-n	n	c,l?	c
		<i>Haloragis heterophylla</i>		u?,l	u													
		<i>Myriophyllum aquaticum (l)</i>			u													
		<i>Myriophyllum sp.</i>										u-r,l						
HYPERICACEAE																		
		<i>Hypericum gramineum</i>	n,w	n,l	n	u?,l	u?	u?	u?	u?	u?	n-u	?		n,l			
		<i>Hypericum japonicum</i>			u													
		<i>Hypericum perforatum var. angustifolium (l)</i>	u															
LAMIACEAE																		
		<i>Ajuga australis sens. lat.</i>	u,l		n		u?,l	n			n?	n				n		
		<i>Lamium amplexicaule (l)</i>				u,l												
		<i>Marrubium vulgare (l)</i>	n-u,w						u? (pasture)									
		<i>Mentha laxiflora</i>														r?		
		<i>Scutellaria humilis</i>			u						u?							
		<i>Thymus sp. (l)</i>			r													

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Lauraceae																		
		<i>Cassytha pubescens</i>			r			u			r?							u
Linaceae																		
		<i>Linum marginale</i>											?					
Lobeliaceae																		
		<i>Isotoma fluviatilis</i>			u													
		<i>Pratia pedunculata</i>						u,l										u?
Loranthaceae																		
		<i>Amyema miquelii</i>	n,w										?					
		<i>Amyema pendulum</i>					n	c	n			c-n		n-u	n			n
Malvaceae																		
		<i>Cotoneaster sp. (l)</i>										u						
		<i>Crataegus monogyna (l)</i>	u-n,l	u?,l		r,l	n,l						?					
		<i>Pyracantha sp. (l)</i>	u?,l									r						
Malvaceae																		
		<i>Gynatrix pulchella</i>																n,l (creek)
		<i>Malva parviflora (l)</i>	u?,l															
Mimosaceae																		
		<i>Acacia baileyana (#)</i>	r,l															
		<i>Acacia buxifolia</i>						u?										
		<i>Acacia dawsonii</i>	u,l	c,w														
		<i>Acacia dealbata</i>	u-r,l	n-u,l	c	n,w	c-n	a-c	n	n	n	c	?	n,l	n	n	n	n,l
		<i>Acacia genistifolia</i>	u,l	n,l					n	n-u				c	u-r			
		<i>Acacia gunnii</i>	u-r,l	u?,l	n	n-u,w	r?	c-u?	n-u	u?	c-n	n		n	u			
		<i>Acacia implexa</i>						n?										
		<i>Acacia meamsii</i>		n,l		n,w	u	u,w						u,l				
		<i>Acacia melanoxydon</i>						a-c			c-n	n	?			c-n	c	n-u
		<i>Acacia pycnantha</i>						c				n			n,l			c
		<i>Acacia rubida</i>	u-a	c,w			n	n	n		n-u	c		n,l				n-u
		<i>Acacia sicutiformis</i>	c,l								n	n						c
		<i>Acacia sp.</i>											?					
		<i>Acacia ulicifolia</i>	u-r,l															

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MYRTACEAE																		
		<i>Baeckea utilis</i>						r?								n,l (drain. lines)	c	
		<i>Callistemon pityoides</i>																c
		<i>Callistemon sieberi</i>	n,l															
		<i>Eucalyptus aggregata</i>											?					n,l
		<i>Eucalyptus bridgesiana</i>	n,l	c,l	n	r,l (1 seedling)	r?	n,l	n,l	c,l	c,l	a-c			c,l			
		<i>Eucalyptus cinerea ssp. triplex</i>						u?!										
		<i>Eucalyptus dalrympleana</i>			r			u?			u?	c-n			c		c-n	
		<i>Eucalyptus dives</i>		n-u,l	n	c,w	n	a	a-c	c-n	n	c-n		a	c	a-c	c (lower slope)	c
		<i>Eucalyptus elata</i>																u?
		<i>Eucalyptus macrorhyncha</i>	c-n,w	a	a-c	u,l (NE)	c	n-r	n-u				r?					
		<i>Eucalyptus mannifera ssp. mannifera</i>	r-n	n,l	c-n	c,w	c	c,l	c-n					c	c			
		<i>Eucalyptus melliodora</i>	a-u,w		c-n	n,w	r?		n-u,l	c-n								
		<i>Eucalyptus nortonii</i>	c,w	c,l	n-u			u?,l										
		<i>Eucalyptus pauciflora</i>			r	c,l	u	c	n,l		c	n	?		c,l	c-n	c	c-n
		<i>Eucalyptus pauciflora x dives</i>							r?									
		<i>Eucalyptus polyanthemus</i>	n-a,w	a-c	c		n-u,l	u,l						c,l?				
		<i>Eucalyptus radiata ssp. ?</i>			u			n,l	u,l? (reported)								c,l	c,l
		<i>Eucalyptus radiata x pauciflora</i>						n,l										
		<i>Eucalyptus rossii</i>	c,w	a-c	n-u		n,l	a	c	c		n,l		c	a-c			
		<i>Eucalyptus rossii x dives</i>													u?			
		<i>Eucalyptus rubida</i>	c-u	n-u,l	n	u,l (NW)		c	c,l	n-u?	c				c,l	n,l	c (lower slope)	
		<i>Eucalyptus sieberi</i>														n,l	n	c
		<i>Eucalyptus stellulata</i>						u?!										
		<i>Eucalyptus viminalis</i>						c-r			r?	u,l				c	n,l?	c-n
		<i>Kunzea ericoides</i>	c,w	n,l	c	c,l	a,w	n(-c, rockland)	n-u,l			n,l				u		
		<i>Kunzea parvifolia</i>			r			u,w										n (lower slope)
		<i>Leptospermum brevipes</i>																
		<i>Leptospermum continentale</i>			r							n-u,l				n,l (drain. lines)	n?	n,l
		<i>Leptospermum juniperinum</i>						n										
		<i>Leptospermum lanigerum</i>										c,l	n,l					
		<i>Leptospermum multicaule</i>						c/n-n										
		<i>Leptospermum myrtifolium</i>		c-n,l	n			n	n-u?,l		n,l	r?				n,l (drain. lines)	c	
		<i>Leptospermum obovatum</i>						r?										
		<i>Leptospermum scoparium</i>			u,l													
		<i>Melaleuca parvistaminea</i>			u													
OLEACEAE																		
		<i>Ligustrum lucidum (l)</i>		r														
ONAGRACEAE																		
		<i>Epilobium billardierianum ssp. cinereum</i>	n,l?	c,l	c	u,l		n-u?	u?,l		n-u?	n						
OXALIDACEAE																		
		<i>Oxalis corniculata sens. lat.</i>			n				u?						n			
PITTOSPORACEAE																		
		<i>Billardiera scandens</i>			u					u?	n					u?	c-n?	c-n
		<i>Bursaria lasiophylla</i>	u-c	c,l	n	n,l (W)	c-n,l	n,l			c,l	a-c						n,l
PLANTAGINACEAE																		
		<i>Plantago lanceolata (l)</i>				c-n,w					n?,l							
		<i>Plantago sp.</i>						u?										
		<i>Plantago varia</i>			n	r?,l				n	u?							u,l

Division and class	Family	Genus and species	706560867	706860857	713860782	715460804	716060819	717560650	720260761	720660861	721660563	721660601	722760561	723260848	725460778	727960680	729060787	730260740	
POLYGALACEAE																			
		<i>Comesperma ericinum</i>			u			c-n						n					
		<i>Comesperma retusum</i>											?						
POLYGONACEAE																			
		<i>Acetosella vulgaris (l)</i>	n,w	u?,l	u		n,l		n (pasture)										
		<i>Rumex brownii</i>			n,l														
		<i>Rumex sp.</i>	n-u?,l																
PRIMULACEAE																			
		<i>Anagallis arvensis ssp. arvensis (l)</i>			u														
PROTEACEAE																			
		<i>Banksia marginata</i>						n?l								a-n	a-n		
		<i>Conospermum taxifolium</i>											?						
		<i>Grevillea lanigera</i>	r,l		r			u?l											
		<i>Hakea decurrens</i>						n,L											
		<i>Hakea microcarpa</i>		r (3 plants)				n,l			c-n,l		?			n,l (drain. line)	c		
		<i>Lomatia myricoides</i>						n-u?			n-u,w	n,l				u?	c-n,l	n,l	
		<i>Persoonia asperula</i>															n		
		<i>Persoonia chamaepeuce</i>						r?			u?						n-u		
		<i>Persoonia linearis</i>															n-u		
		<i>Persoonia rigida</i>						c-n						n-u					
		<i>Persoonia sylvatica</i>															c,l		
RANUNCULACEAE																			
		<i>Clematis aristata</i>						n,l			c						n	c-n	n
		<i>Clematis microphylla var. leptophylla</i>						u?			n,l	r?							
		<i>Ranunculus inundatus</i>									u-r,l								
		<i>Ranunculus lappaceus</i>						n-u			u?						u?		
		<i>Ranunculus pimpinellifolius</i>																	
		<i>Ranunculus sp.</i>																n	
RHAMNACEAE																			
		<i>Cryptandra amara var. floribunda</i>					u?												
		<i>Cryptandra amara var. longiflora</i>	n,w?	n,l	n	n-u,l			r?,l	n-u	n,l	u							
		<i>Cryptandra propinqua</i>	n-u,l																
		<i>Pomaderris andromedifolia</i>	u,l																
		<i>Pomaderris angustifolia</i>	u,l			n,l (adj. to rd.)													
		<i>Pomaderris asper</i>						u									u?,l (creek)		
		<i>Pomaderris betulina</i>						n-u?l											
		<i>Pomaderris phyllicifolia var. phyllicifolia</i>						n-u				c,l							
ROSACEAE																			
		<i>Acaena echinata</i>			c-n														
		<i>Acaena novae-zelandiae</i>		c,l	c	n-u?,w	n	c	n,l		c					c-n,l	c	c	
		<i>Acaena ovina</i>																	
		<i>Acaena sp. (not flowering)</i>	n-c,w							u?									
		<i>Acaena X anserovina</i>			u														
		<i>Rosa rubiginosa (l)</i>	n,w	u?l	n	n-u,w	u			u	n,l	u?							
		<i>Rubus fruticosus sens. lat. (l)</i>	u-n,l		n	n-u,w	u,l		r?								u (lower slope)		
		<i>Rubus parvifolius</i>		c,l	u			n,l	u(rockland)		n	n-u,l	?			n-u		n,l	
		<i>Rubus sp.</i>																n	
		<i>Sanguisorba minor ssp. muricata (l)</i>				n,w													
RUBIACEAE																			
		<i>Asperula conferta</i>			n	c-n,l		c-r			n?,l?		?						
		<i>Asperula scoparia</i>	n?,l																
		<i>Coprosma hirtella</i>						n-u								u?	n	n	
		<i>Coprosma quadrifida</i>														n			
		<i>Galium gaudichaudii</i>	n,w		n	n-u,w			n-u?		n?								
		<i>Galium sp.</i>		n?l															
		<i>Opercularia hispida</i>	u?,l		n	u?,w	u?	u		n		n							
RUTACEAE																			
		<i>Boronia nana var. hyssopifolia</i>						n/u,L?											

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SALICACEAE																		
		<i>Populus sp. (l)</i>	u,l															
		<i>Salix babylonica (l)</i>	u,l															
		<i>Salix sp. (l)</i>					c,l				n-u,l							
SANTALACEAE																		
		<i>Choretrum pauciflorum</i>						n-u										
		<i>Exocarpos cupressiformis</i>	n-u,w	n-u	n-u		n-u	n/u,w	n-u			u		n	n	n	n	n
		<i>Exocarpos strictus</i>	r,l					c			c-n	c	?	u?,l		n	c	c
		<i>Omphacomeria acerba</i>						n-u			n-u?						n-u?	
SAPINDACEAE																		
		<i>Dodonaea viscosa ssp. ?</i>	c-n,l	u,l														
		<i>Dodonaea viscosa ssp. angustissima</i>					n(rockland)				n-u,l	c						
SCROPHULARIACEAE																		
		<i>Derwentia derwentiana</i>						n?l			n	n,l					u?	u?,l
		<i>Derwentia perfoliata</i>		u?,l		r,l		n-u			n-u?	n,l						
		<i>Verbascum thapsus (l)</i>	n-u			u,l	u,l?											
		<i>Verbascum virgatum (l)</i>	u?,l?															
		<i>Veronica calycina sens. lat.</i>		c	c	n,w	n	n?	n	n-u	n	n				n	c-n	c
		<i>Veronica gracilis</i>			n,l													
		<i>Veronica serpyllifolia (l)</i>												?				
SOLANACEAE																		
		<i>Lycium ferocissimum (l)</i>	u,w															
		<i>Solanum cinereum</i>	u,l															
		<i>Solanum linearifolium</i>		r														
STACKHOUSIACEAE																		
		<i>Stackhousia monogyna</i>	u?,l			u,w		n-u	n,l		n							
		<i>Stackhousia viminea</i>																
STYLIDIACEAE																		
		<i>Stylidium graminifolium</i>			u	n,w		n-u	n,l?	n-u	c	n		?	c-n		c-n	
THYMELIACEAE																		
		<i>Pimelia curviflora var. sericea</i>	n,w		n	r?,l	u?	u?,l		n-u	n-u?							
		<i>Pimelia glauca</i>	u?,l															
		<i>Pimelia linifolia ssp. linifolia</i>							n,l			n-u			n-u			
TREMANDRACEAE																		
		<i>Tetratea bauerifolia</i>			u							u?						
		<i>Tetratea sp.</i>						n			n						u?	
VIOLACEAE																		
		<i>Viola betonicifolia</i>	u?,l		c			u?	n,l (reported)		u?				u?,l	u?		u?,l
		<i>Viola caleyana</i>													u?,l			
		<i>Viola hederacea</i>						u?								c-n	c-n	c
WINTERACEAE																		
		<i>Tasmannia lanceolata</i>														u?		