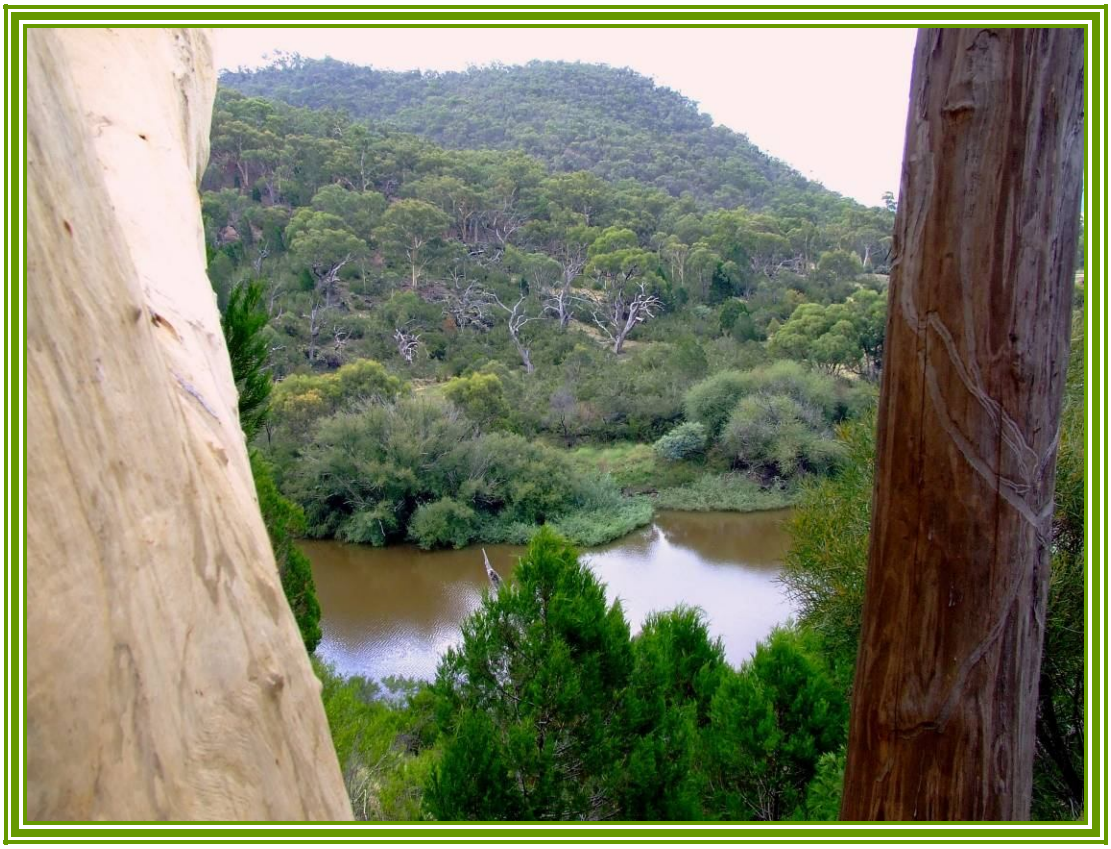
Plant Communities of the South Eastern Highlands and Australian Alps within the Murrumbidgee Catchment of New South Wales

Version 1.1



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Cover photo: Riparian and dry forest plant communities adjacent to the Murrumbidgee River, Scottsdale Reserve (Bush Heritage Australia). Photographer: Rainer Rehwinkel

This report should be cited as:
Office of Environment and Heritage (2011) *Plant Communities of the South Eastern Highlands and Australian Alps within the Murrumbidgee Catchment of New South Wales. Version 1.1.* Technical Report. A Report to Catchment Action NSW. NSW Office of Environment and Heritage; Department of Premier and Cabinet, Queanbeyan.

Released by:
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OEH 2011/0613

August 2011

ACKNOWLEDGMENTS

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All report writers provided a valuable and continuing resource in refining the plant community classification. Additionally, the contribution of advice, assistance and plant community review of Dr John Benson (Botanic Gardens Trust), Greg Baines, Margaret Kitchin, Emma Cook and Luke Johnston (Australian Capital Territory: Territory and Municipal Services – ACT TAMS), and Michael Doherty (CSIRO Sustainable Ecosystems) has been greatly appreciated. Unless otherwise indicated, those acknowledged are employees of the Office of Environment and Heritage NSW.

This project was funded through Catchment Action NSW.

ACT TAMS provided additional funds and survey coordination to fill spatial and thematic gaps in the floristic dataset within the ACT.

EXECUTIVE SUMMARY

The aim of this project was to produce, consistent with the NSW Native Vegetation Mapping Strategy (DECC 2009), a plant community classification to be used in the development of a native vegetation map for the Murrumbidgee catchment. This classification provides robust plant community descriptions for remaining areas of the Murrumbidgee catchment in which the NSW VCA plant community types are yet to be completed (i.e. the South Eastern Highlands and Australian Alps bioregions). The plant community classification developed as part of this report will contribute to the NSW VCA and the NSW Government's assessment tools such as the Property Vegetation Plan (PVP) developer and the Bio-banking Vegetation Types database.

The study area comprised the South Eastern Highlands and Australian Alps bioregions within the Murrumbidgee catchment of NSW and the ACT, covering 1,741,872 hectares. Although the area had existing plant community classifications, these were localised or focussed on particular types of communities (e.g. forest ecosystems). The current classification used data from previous classifications and new data to create a comprehensive classification for the study area.

Whilst 78% of the State of New South Wales (NSW) is covered by the NSW Vegetation Classification and Assessment plant community classification (NSW VCA, Benson *et al.* 2006, Benson *et al*. 2010), approximately 22% of the State lacks an accepted consistent plant community classification. The vast majority of the States population resides within this area, and as such this part of the State is subject to the vast majority of land development pressures on biodiversity. A consistent plant community classfication forms the backbone of the NSW government's biodiversity regulatory tools and can be used to develop seamless vegetation map products to adequately inform conservation assessment and natural resource management (NRM) decision making.

The project aids in meeting NRM objectives outlined in the State Plan (NSW Government 2010) to "*protect our native vegetation*, *biodiversity*, *land*, *rivers and coastal waterways*", as the information will be used in NSW and ACT government biodiversity regulatory tools, to target investment for conservation outcomes and to provide accurate information for use in local and regional scale planning.

GLOSSARY

ACT	Australian Capital Territory
API	Aerial Photograph Interpretation
CMA	Catchment Management Authority
CRA	Comprehensive Regional Assessment
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EEC	Endangered Ecological Community
EPBC Act 1999	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
GIS	Geographic Information System
IBRA	Interim Bioreographic Region of Australia
NC Act 1980	*Nature Conservation Act 1980* (ACT)
NP	National Park
NR	Nature Reserve
NRM	Natural Resource Management
NSW	New South Wales
NVIS	National Vegetation Information System
SCA	State Conservation Area
SCIVI	South Coast – Illawarra Vegetation Integration
SF	State Forest
TEC	Threatened Ecological Community
TSC Act 1995	*Threatened Species Conservation Act 1995* (NSW)
TSR	Travelling Stock Route
NSW VCA	NSW Vegetation Classification and Assessment
VG	Vegetation Group
VIS	Vegetation Information System

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1. INTRODUCTION

1.1 VEGETATION CLASSIFICATION AND MAPPING IN NSW

Defining plant community types through systematic classification and mapping assists biodiversity conservation and the administration of NRM regulations in NSW. Non-spatial and spatial definition of plant communities underpins environmental land use planning, assessment and monitoring.

Significant effort and resources have been invested in plant community classification and mapping over the past 40 years (refer to Keith 2004 and Benson 2006) but the range of methods, standards, classifications, scales and accuracies has resulted in inconsistent plant community classifications and vegetation mapping datasets across NSW. To address plant community classification inconsistencies, the Royal Botanic Gardens and Domain Trust initiated the NSW VCA database project in 1999 to develop a uniform fine-hierarchical level plant community classification across NSW. At the time of writing, this covers the NSW Western Plains (Version 1), NSW South Western Slopes (Version 2), Brigalow Belt South, Nandewar and west New England Tablelands (Version 3) totalling 11.5 bioregions, or 78% of NSW (Benson *et al*. 2010).

In 2009 the NSW Department of Environment and Climate Change (DECC) prepared the NSW Native Vegetation Type and Mapping Strategy 2009-2013 (DECC 2009), hereafter referred to as the Strategy. The Strategy aims to develop a seamless and full-floristic native vegetation map across NSW using consistent classifications. This data is to be stored in a comprehensive and accessible native vegetation information system (VIS) including a depository of maps in geographical information systems and databases for floristic plot data and the NSW VCA. Key to developing a seamless vegetation map is a consistent statewide plant community classification.

The draft Strategy defines a set of five mapping Product Classes ranging from broad-scale coarse mapping (Product Class 1: Predictive Vegetation Layers) to detailed floristic mapping (Product Class 5: Fine Classification / High Spatial Resolution / Full Floristic Vegetation Map) and stipulates that these products are to be developed in accordance with the Native Vegetation Type Standard (Sivertsen 2009), hereafter referred to as the Standard. The Standard provides the principles that guide the mapping process to ensure that all mapping is scientifically rigorous and defensible.

The Strategy identifies the mapping of regional vegetation communities across the central Catchment Management Areas (CMAs) of NSW as a key priority to collate and catalogue existing vegetation mapping and information, upgrade and convert these to the relevant product class and fill in remaining gaps with new vegetation type and mapping projects. All of this work is to be undertaken in accordance with the Standard. The Murrumbidgee CMA is one of the nine regional priority areas identified in the Strategy based on a risk-assessment of native vegetation extent and conservation status as well as trends in clearing pressures and climate change indicators (DECC 2009).

Within the Murrumbidgee CMA area, the South Eastern Highlands and Australian Alps bioregions are yet to be classified by the NSW VCA database project. In order to satisfy the Strategy and complete a vegetation map of the Murrumbidgee catchment in a timely manner, this project sought to develop a plant community classification for this study area. This plant community classification will be assessed and incorporated into the NSW VCA prior to furure mapping.

1.2 PROJECT AIMS

The specific aims of this project are:

1. To collate and review all existing floristic survey data within the study area (the South Eastern Highlands and Australian Alps bioregions within the Murrumbidgee catchment) and immediate surrounds;
2. To undertake a spatial and thematic gap analysis, and undertake further survey to systematically and quantitatively sample native vegetation of the study area;
3. Based on existing and new survey data, to derive a Level D (plant

community association) numerical plant community classification for the study area;

4. To describe all plant communities occurring within the study area to Level D; and
5. To provide this information for incorporation into the NSW VCA and subsequent mapping programs within the Murrumbidgee catchment within both NSW and the ACT.

2. STUDY AREA

The study area is defined as the South Eastern Highlands and Australian Alps bioregions within the the Murrumbidgee catchment within NSW and the ACT (hereafter referred to as the study area), covering an area of 1,741,701 hectares. Bioregions are defined in Thackway and Cresswell (1995), with relative areas within the study area shown in Figure 1. The biophysical character of each sub-region within the study area is described in Section 2.2.

The study area encompasses parts of 11 local government areas: Cooma-Monaro, Goulburn Mulwaree, Greater Hume, Gundagai, Palerang, Queanbeyan City, Snowy River, Tumbarumba, Tumut, Upper Lachlan and Yass Valley councils, as well as the territory jurisdiction of the ACT. Cities within the study area include Canberra and Queanbeyan, with regional centres including Adaminaby, Batlow, Bungendore, Captains Flat, Cooma and Yass. The study area is primarily within the Southern Tablelands botanical subdivision, with parts of the north-west including the South Western Slopes botanical subdivision (Anderson 1961).

In developing a plant community classification for the study area, it was recognised that many plant community boundaries continue beyond the edge of the Murrumbidgee catchment. In order to address this issue, floristic plot data from a *broader study area* was included. Th8is encompassed the Australian Alps and South Eastern Highlands from the Victorian border north to the Oberon Shire. As similar plant communities are known to occur in the upper slopes subregion of the South Western Slopes bioregion, a 10 kilometre buffer was applied to the western edge of the study area, and the Boorowa Shire was included to address this issue.

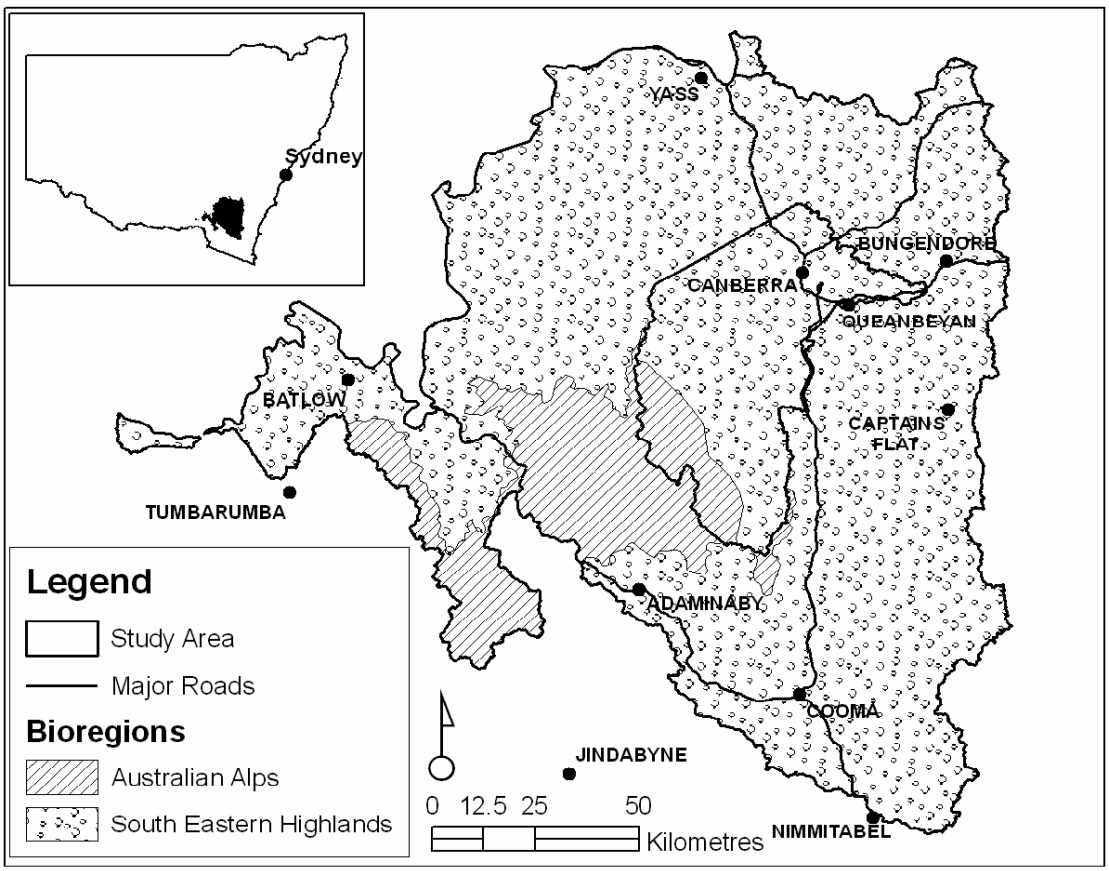


Figure 1: The study area including major population centres, roads and bioregions.

2.1 CLIMATE

Climate varies greatly across the study area, primarily due to topographic variation and its effect on atmospheric pressure, wind, precipitation, light and cloud. The Australian Alps bioregion contains areas of alpine, sub-alpine and montane landforms, with the South East Highlands being primarily tablelands with occasional montane features (Costin 1954).

Mean annual precipitation ranges from 533 mm per year at Cooma within the Monaro rainshadow, to 1115 mm per year at Cabramurra on the main Kosciuszko range. Precipitation is higher on peaks at greater altitude (lacking weather stations), where much of it falls as snow in cooler months. Cooma has the highest recorded temperature variation, with a maximum mean daily temperature of 27.2°C and a minimum mean daily temperature of - 2.8°C (Bureau of Meteorology 2011).

Table 1: Climate data for the study area.

Location	Altitude (m)	Highest mean max. mean daily temp. (°C)	Lowest mean max. mean daily temp. (°C)	Frost days (ave. no. days/year of daily min. ≤ 0°C)	Ave. annual precipitation (mm)	Lowest mean monthly rainfall (mm)	Highest mean monthly rainfall (mm)
Cabramurra	1482	21.4 (Jan)	- 0.9 (Jul)	81	1155	43 (Jan)	135(Aug)
Canberra Airport	578	28.0 (Jan)	- 0.1 (Jul)	60	616	40 (Jun)	64 (Nov)
Cooma (Visitors centre)	778	27.2 (Jan)	- 2.8 (Jul)	104	533	27 (Aug)	66 (Nov)
Thredbo AWS *	1957	16.3 (Feb)	- 5.3 (Jul)	167	1355	85 (June)	151 (Sep)
Tumbarumba PO	655	28.7 (Jan)	- 0.2 (Jul)	60	976.4	54 (Feb)	107 (Aug)
Yass	520	29.5 (Jan)	1.1 (Jul)	46	651	46 (Feb)	65 (Oct)

Source: Bureau of Meteorology (2011)

* Thredbo is located outside the Murrumbidgee catchment, but is included as an indication of the climate of alpine areas within the study area.

2.2 BIOPHYSICAL LANDSCAPES

The study area is characterised by two distinctive bioregions (or IBRAs), the Australian Alps and the South Eastern Highlands (Thackway and Cresswell 1995). Using Version 6.1 of the IBRA classification, the South Eastern Highlands covers approximately 86% of the study area, with the Australian Alps occurring over the remaining 14% of the study area. Most bioregions contain multiple subregions, based on finer differences in biophysical attributes such as vegetation, geology and soil type (NPWS 2003). The Australian Alps bioregion contains only one subregion, which occurs across the Alps in NSW, Victoria and the ACT. The South Eastern Highlands bioregion contains 10 IBRA subregions, and five of these (Bondo, Crookwell, Kybean - Gourock, Monaro and Murrumbateman) occur within the upper Murrumbidgee catchment. The distribution of IBRA subregions across the study area is shown in figure 2.

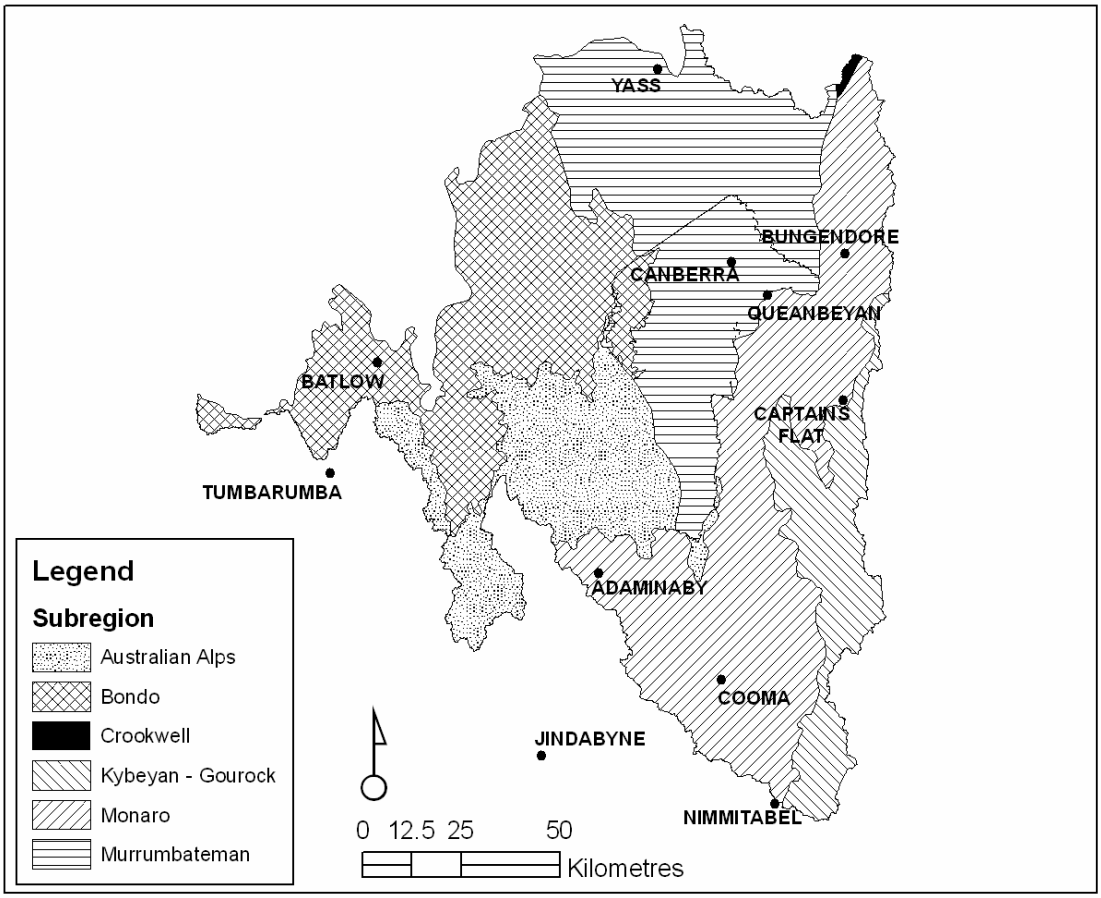


Figure 2: IBRA subregions of the study area.

Subregions of the study area are characterised by Morgan (2001; summarsed in NPWS 2003a) and Mitchell (2003) as per the below table.

Table 2: Characteristics of IBRA subregions of the study area.

Subregion	Area (ha)	Geology	Characteristic Landforms	Typical Soils	Vegetation
Australian Alps	200,947 (NSW) 40,378 (ACT)	Block faulted granites and Palaezoic metamorphic rocks. Small areas of Tertiary basalt with buried river gravels and lake sediments. Quaternary glacial landforms and sediments above 1,800 m, more extensive periglacial features above 2,100 m.	Low-relief high plains with steep margins and slopes and fault aligned river valleys with deep gorges and waterfalls. Relic cirque glaciers, blockstreams and periglacial solifluction lobes in highest regions.	Soils change with altitude. At lower levels in forests texture contrast soils are the norm. In the sub-alpine forests areas deep gradational soils with moderate amounts if organic matter are common. Above the treeline, wet alpine humus soils with abundant organic matter are widespread. Steep slopes have stonier, shallow profiles.	Vegetation changes with altitude, aspect, cold air drainage and soil saturation. Low elevations with dry aspects carry *Eucalyptus macrorhyncha*, *E. rossii*, *E. dives*, *E. rubida* and *E. mannifera*. Moist sites have *E. delegatensis*, *E. dalrympleana*, *E. viminalis*, *E. radiata*, and E. *fastigata.* Between 1,000 and 1,500 m *E. delegatensis* and *E. dalrympleana* dominate and abruptly change to subalpine *E. pauciflora* and *E. niphophila* woodlands, heaths, grasslands and bogs between 1,500 and 1,800 m. Alpine herbfields and rare feldmark communities are found above the treeline.

Bondo	363,210 (NSW) 20,224 (ACT)	Silurian and Devonian acid intrusive, fine grained Palaeozoic sedimentary and metasedimentary rocks and areas of granite.	Rugged hills, with small plateau areas. Steep stony slopes and string structural control on ridge lines.	Red earths and red texture contrast soils. Typically thin and stony on slopes, thickening on footslopes, and becoming yellow and harsh on valley floors.	*E. robertsonnii*, *E. macrorhyncha*, *E. viminalis* and *E. dalrympleana* open forests.
Crookwell	2,488 (NSW)	Fine grained Ordovician and Silurian sedimentary rocks, with some granites. Tertiary basalts with buried river gravels along ridges well above present streams.	Hilly, with some rugged areas and steep valleys. Hill tops may be small plateaus or capped by basalt and showing inverted relief.	Red and yellow texture contrast soils, thin and stony on steep slopes. Stony brown structured loams on basalts.	*E. bridgesiana*, *E. dalrympleana* with *E. blakelyi* and E. melliodora. E. *macrorhyncha*, *E. albens*, *E. dives* and *E. mannifera* on stony ridges in the north. Small patches of *E. cinerea*.
Kybeyan – Gourock	155,107 (NSW)	Devonian quartz-rich sedimentary rocks with minor areas of limestone, and areas of Silurian-Devonian granitoids at higher elevations in the south. Ordovician quartz-rich sedimentary and metamorphic rocks in the west.	Rocky ranges, moderate to steep lower to and mid slopes. Stony outcrops along ridgelines.	Red and yellow texture contrast soils, becoming deeper and more poorly drained down slope. Thin brown stony loams and transitional alpine humus derived from granitoids at higher elevations in the south.	*E. fastigata*, *E. viminalis*, and *E. radiata* on hillslopes, with *E. melliodora E. blakelyi* and *E. mannifera* at lower elevations. Some west facing patches of *Allocasuarina nana* heathland. Strong aspect influences on plant associations.
Monaro	530,798 (NSW) 882 (ACT)	Block faulted ranges and closed lake basins in Silurian and Devonian acid fine grained sedimentary and metamorphic rocks with some granites. Extensive areas of thin Tertiary basalt flows over lake and river sediments.	Sloping plateau rising from 600 to 1300 m north to south. Structural ridges of more resistant rock. Stepped plains on basalt with intervening low areas of granite or sedimatary rocks. Numerous shallow lakes and swamps, a few permanent. Many and closed basins and periodically dry. Area is in rainshadow with rainfall 450 - 750 mm.	Harsh yellow texture contrast soils in general. Shallow red brown to black stony loams on basalt.	*E. pauciflora*, *E. viminalis*, *E. rubida*, *E. dives* and *E. dalrympleana* woodlands with *Themeda australis* understorey. *E. rossii*, *E. mannifera* on hills. Extensive grasslands of *Poa* spp., *Austrostipa* spp. and *Austrodanthonia* spp on the driest plains with clumps of *Poa* spp. amongst rocky outcrops.
Murrumb-ateman	280,798 (NSW) 174,316 (ACT)	Fine-grained Palaezoic sedimentary and metasedimentary rocks, with minor areas of course acid volcanics. Tertiary alluvial terraces along main streams.	Undulating plateau with rounded hills and peaks, entreched meandering streams with chain of pond tributaries.	Mottled yellow and brown texture contrast soils with strongly bleashed topsoils. Dark organic loams and clay loams on valley floors. Saline patches present.	*E. blakelyi* and *E. melliodora* on lower slopes. *E. macrorhyncha*, *E. rossii* and *E. nortonii* on ridges. Areas of *E. bridgesiana* and *E. mannifera*. Limited swampy flats and valley floor grasslands.

Source: NPWS (2003a) and Mitchell (2003)

2.3 SETTLEMENT AND LANDUSE

The study area was occupied by Aboriginal people for an estimated 21,000 years before European settlement (Lennon 2003, Hancock 1972). Walgulu and Djilamatang people generally utilised the alpine areas, with Ngunnawai and Ngarigo people on the slopes and tablelands. Wiradjuri people may have extended eastward into western sections of the study area (Tindale 1974). European settlers started arriving in the mid-1820's, with squatters establishing pastoral camps over much of the Monaro by the 1830's (Hancock 1972). Pastoralism commenced in the Australian Alps in the 1820s (HO and DUAP 1996), and by the 1850's most of the alps were occupied by pastoralists during the warmer months (Lennon 1999).

The natural environment of the Australian Alps and South Eastern Highlands provides for a varied landuse history across the study area. Climate, remoteness and difficulty in accessing rugged terrain influenced both Aboriginal and European settlement and landuse patterns. In particular, alpine areas were subject to seasonal use on account of the harsh climatic conditions in cooler months (Lennon 2003).

The study area has primarily been developed as a pastoral district with a major emphasis on wool and beef production. Apart from pastoralism, other main land management practices include urban development in the lowlands of the ACT and major towns including Yass, Tumut and Cooma; forestry; cereal cropping (Hancock 1972) and broad-scale conservation in areas such as Kosciusko NP. Other

developments include gold mining, the Snowy Mountains Hydro-Electric scheme and recreational ski-field development in the Alps, as well as orcharding across the central and western parts of the highlands.

Such changes to the natural ecosystems have subjected the vegetation of the study area to threats such as introduced grazing, clearing (including ringbarking and logging), cultivation, altered hydrology and altered fire regimes. Introduced herbivores and omnivores including rabbit (*Oryctolagus cuniculus*), hare (*Lepus* spp.), horse (*Equus caballus*), deer (numerous genus of the *Cervidae* family), pig (*Sus scrofa*) and goat (*Capra hircus*) continue to have a negative impact on the structure and floristic composition of plant communities. The severity of impacts varies depending on ecosystem resilience and the timing and intensity of the threats (Costin 1954).

2.4 PREVIOUS BOTANICAL STUDIES

The number of past qualitative and quantitative botanical studies undertaken in the upper Murrumbidgee are too numerous to mention in great detail. Noteworthy studies include:

- An ecological study of the "Monaro" (which included the Monaro as it is defined today as well as much of the Australian Alps), focussing on vegetation and soils undertaken by Costin (1954). This includes a qualitative vegetation alliance description which is still highly regarded today.
- A classification of the wetlands of the Monaro undertaken by Benson and Jacobs (1994). Surveys undertaken as part of this study were based on whole-lake samples.
- The Southern CRA Forest Ecosystem classification and mapping project undertaken by Thomas *et al*. (2000). This major work was focused on forest ecosystems on public lands.
- Refinement of *Thomas et al.* (2000) undertaken by Gellie (2005), which focused on collecting additional survey quadrats across jnew conservation reserves to refine the Forest Ecosystem classification and mapping.
- A classification of vegetation of the treeless alps in NSW and Victoria undertaken by McDougall and Walsh (2007). Plant communities described by those authors are strongly correlated with plant communities defined in this study, with some refinement through merging of fine-scale plant community sub-associations and floristic alterations resulting from the exclusion of Victorian floristic datasets.
- The vegetation classification and mapping project of Tozer *et al.* (2010), integrating previous work by Tindall *et al.* (2004), Keith and Bedward (1999) and others. This study sampled and described vegetation across all tenures, and overlaps eastern and northern edges of the current study area.
- A number of regional vegetation studies in the ACT, including numerous studies lead by Frank Ingwersen, and a review of existing plant community classifications by Johnston *et al.* (2008).

For a complete compendium of quadrat-based botanical information used as part of this study refer to Table 3 in section 3.2.2.

Benson and Maguire (2011) provide a recent review of qualitative and quantitative classification and mapping exercises. All suitable and accessible quadrat-based datasets noted in Benson and Maguire (2011) were used in the analysis for this study.

3. METHODS

3.1 TERMINOLOGY

Plant taxa nomenclature in this report follows the Australian Plant Census (ANBG 2011). Where the authors were aware of recent accepted taxonomic changes yet to be incorporated into the Australian Plant Census, the latest nomenclature was used.

Plant community nomenclature follows rules set out in the NSW VCA (described in Benson 2008 and used in Benson *et al.* 2010). For plant community common names this includes one or more of the dominant / diagnostic plant species, the most prevalent structural formation and height class of upper stratum (based on Walker and Hopkins 1990), a reference to soil, substrate or climate and reference to the main geographic occurrence of the plant community, such as a location or bioregion. The scientific name contains up to 12 binomial Latin names for characteristic taxa, broken up into as many as three vegetation layers. All plant community names are in line with Commonwealth NVIS classification rules (ESCAVI 2003 and Sivertsen 2009) and the classification has been developed to association level as defined by ESCAVI (2003) which is congruent with NVIS Level 5 in the NVIS information hierarchy.

Plant communities are categorised into NSW Vegetation Formations and Vegetation Classes (Keith 2004). With the exception of four plant communities containing the letter 'q' after the Keith Formation prefix, and NSWVC344, all plant communities were derived through quantitative analysis of floristic data. Plant communities without a strong correlation to plant communities developed as part of previous major classifications undertaken in the study area (refer to Benson and Jacobs 1994; Gellie 2005; McDougall and Walsh 2007 and Tozer *et al.* 2010) contain a 'u' in the code directly after the Keith Formation prefix. Where there is a strong correlation with an existing group the code reflects that of the previous classification (e.g. g36 is equivalent to VG36 from Gellie 2005), and where there is moderate correlation the letter 'r' for 'revised' is included (e.g. rp24 is a revised version of GWp24, Tozer *et al*. 2010).

3.2 FLORISTIC AND OTHER INFORMATION

3.2.1 USE OF EXISTING CLASSIFICATIONS

Various parts of the study area have been subject to recent vegetation studies involving numerical classification of quantitative field survey data. Most studies have been carried out at a fine scale and focussed on particular tenures (eg. conservation reserves) or habitats (eg. lakes). A small number of regional plant community classifications have been undertaken which overlap parts of the current study area. These are:

- Benson and Jacobs (1994) plant community classificiation of the Monaro lakes, which was developed from whole-lake vegetation description samples.
- Gellie (2005) plant community classification of vegetation groups, a revision of the Forest Ecosystem classification of Thomas *et al.* (2000) focussed on forested vegetation on public lands;
- McDougall and Walsh (2007) plant community classification of treeless vegetation of the Australian Alps bioregion;
- Tozer *et al.* (2010) 'SCIVI' plant community classification and mapping, which integrated previous work by Tindall *et al.* (2004), Keith and Bedward (1999) and Beukers (unpublished), and covers eastern parts of the current study area;
- Rehwinkel (unpub.) classification of southern tableland natural temperate grasslands, which was analysed seperate to this study and accepted as the grassland plant community classification.

The current project aimed to build on these existing plant community classifications, and where appropriate, identify equivalences to improve compatibility with classifications extending beyond the current study area boundary. As these studies involved numerical classification of quantitative field survey data, their classification groups (plant communities) were defined by a set of identifiable field survey quadrats with unique identifying quadrat labels; the allocations of survey quadrats to classification groups by all previous regional studies was obtained, and relationships between the current classification and previous studies were identified by comparing the survey quadrat

allocations to plant community groups (i.e. group membership).

Study area or spatial context influences the ability of any classification process to recognise and describe vegetation communities or types. Types which occur predominantly outside a study area, with only a small area of overlap and consequently few samples in the classification dataset, are less likely to be identified as distinct types. The current study area overlaps the study area of Tozer *et al.* (2010) to the east and north, and a number of eastern escarpment and central tablelands vegetation types identified by that study are peripheral to the current study area, with just a small portion of their distribution overlapping. For example, of the 30 field samples allocated to map unit e11 [*Tantawangalo Wet Shrub Forest*] by Tozer *et al.* (2010), only one was located within the current study area; of 131 samples of p40 [*Temperate Dry Rainforest*], three were in the current study area; and of 125 samples allocated to p144 [*Wingecarribee-Burragorang Sandstone Forest*], only two were within the current study area. Where the majority of an original group's membership was outside the current study area, included samples were automatically allocated to the original SCIVI classification.

3.2.2 USE OF EXISTING DATASETS

The data audit aimed to collate all available and suitable vegetation field survey data relevant to the broader study area, and in a format useful for plant community classification analyses. One component of the audit focussed on assessing survey datasets already stored within the OEH corporate database known as 'YETI' (or 'Yet Another Vegetation Survey Database') developed by Bedward *et al.* (2011). This relational database runs in Microsoft Access software and has been tailored for storage, manipulation and customised export of floristic survey data. The other component of audit involved identifying other available survey datasets not yet 'captured' within YETI, assessing their suitability, and where appropriate ensuring their addition to the database through data entry or transfer from other databases.

All available survey datasets were reviewed and assessed for suitability of inclusion in the classification process based on the following criteria (adapted from Keith and Bedward 1999):

i) complete list of vascular plant species within the plot (full-floristic survey);

ii) plot location recorded with a precision of at least 100m;

iii) species importance values recorded on a scale which could be transformed to a reasonable equivalent of the six-point Braun-Blanquet cover-abundance scale;

iv) area of plot within the range 0.04 to 0.1 hectare.

The only exceptions made to criterion (iv) were the compilation dataset of McDougall and Walsh (2007), which included quadrat samples of between 0.002 and 0.05ha, and the data of Benson and Jacobs (1994), which involved whole-lake samples, up to 215 hectares. These datasets represented the only survey data available for specific habitats within the study area (treeless alpine vegetation and Monaro lake vegetation).

The review process involved an element of data cleansing including correction of obvious data entry errors, exclusion of records which were clearly not full-floristic (e.g. canopy only or API-checking plots) or were lists from unbounded meander searches, and correction of a small number of obvious plot location errors (where grid reference did not match text location description). Review also identified and corrected some survey details in YETI (e.g. ensuring that the scoring system recorded in the database for each survey matched the methods described in the relevant survey report).

Audit of field survey data previously captured in the YETI database identified 55 different past surveys from across the broader study area which met the criteria for inclusion in the classification analysis. These surveys provided a total of 3,594 samples.

The audit process identified a further 13 previous projects uncaptured by YETI, with survey data available from the broader study area including large numbers of plots from private land in poorly-sampled parts of the tablelands and western slopes. Unfortunately a large amount of this previous work either did not meet the criteria for inclusion, or was not available in YETI format by the time of the initial analysis. A total of three previously uncaptured surveys met the criteria for inclusion and were entered into the YETI database, providing an additional 193 field samples for classification. Additional datasets not meeting the criteria for this study were also incorporated into the YETI database. A further 319 full-floristic quadrat samples were collected as part of this study (total 4,106).

Table 3 summarises the sources of the 4,106 field survey samples obtained and used as part of developing this plant community classification, including data from past surveys and work completed for the current project.

Table 3: Datasets used as part of the floristic analysis.

YETI Survey identifier	No. of plots used	Reference
ACT_GUD	188	Ingwersen (2001)
ACT_MT.WD	106	Gilmour, Helman and Osborne (1987)
ACT_UC	107	Helman *et al.* (1988)
ALP_ASH	61	DECCW (2010a)
AUSALPS	359	McDougall and Walsh (2007)
BALLNDCARE	29	Crawford (1999)
CS_CLYDE	22	Helman (1983)
EA_TSR	83	Hibberd and Taws (1993)
EDENVI	9	Keith and Bedward (1999)
FLOYDRF	3	Floyd (1990)
kosc_xtra	19	Miles and Robertson (2008)
KOWMUNG	110	Steenbeeke (1990)
KOWMUNGHAK	5	Steenbeeke (1996)
KTWETQUD	4	Turner (2007)
MER_SR	6	DECCW (2010b)
MILES_06	16	Miles (2006)
MONWET	65	Benson and Jacobs (1994)
NADGIG_NR	12	Miles (2010a)
NALBAUGH	62	Binns and Kavanagh (1990)
NP_BONDI	24	Fanning and Rice (1989)
NP_BRIN	130	Doherty (1997a)
NP_BUR	33	Doherty (1998; 2004)
NP_DEUA	20	Gilmour (1985)
NP_ECRA	66	Keith and Bedward (1999)
NP_GOULB	36	Miles (2010b)
NP_KOSI	39	AALC (no date)
NP_MONGA	11	Miles (2007)
NP_MUND	17	Doherty (1996)
NP_SCQBYN	10	NPWS Queanbeyan (undated a)
NP_SCRA	788	Thomas, Gellie and Harrison (2000)
NP_TIND	1*	Doherty (1997b)
NP_WADAN	5	Mackenzie *et al.* (1998)
NP_WOGWO	12	Fanning and Fatchen (1990)
NPA_ABER	32	Togher (1996)
P_MONARFB4	33	Crawford (2002a)
P5MA	506	Tindall *et al*. (2004)
P5MA_XTRAS	2	Tindall *et al*. (2004)
RH	43	NPWS Queanbeyan (undated b)
SCRA_NTH	39	Thomas, Gellie and Harrison (2000)
SEFCOMB	100	Keith and Bedward (1999)
SF_BAGO	26	Binns (1997)
SF_BM	4	Binns (1997)
SF_BMFLS	64	Binns (1997)
SF_MAR	5	Binns (1997)
SF_QFS	100	Jurskis, Shields and Binns (1995)
SFTUMB04	24	Binns (2004)
SWS_Gellie	133	EcoGIS (2004)
TARAL	15	Fisher and Ryan (1994a)
TOL_BUN_BN	35	Miles (2005)
UMC_ACT	31	ACT CP&R (2010)
UMC_GA	54	this study
UMC1	40	this study
UMC2	26	this study
UMC3	46	this study
UMC4	29	this study
UMC5	25	this study
UMC6	32	this study
UMC7	36	this study
V_BOMBFB4	19	Miles (2005)
V_BONDIFB4	10	Crawford (2002b)
V_COOLAFB4	9	Miles (2002)
V_COOLUFB4	9	Crawford (2002c)
V_COOMAFB4	27	Miles and McPherson (2004)
V_MONGAFB4	6	Gellie (2002)
V_TANTYFB3	13	Miles (2001)
V_TBLD_FB4	5	Miles (2004)
WARRAGAMBA	70	NPWS (2003b)
TOTAL:	**4106**	

* Note: 49 of the 50 survey plots collected by Doherty (1997b) were stored within the NP_SCRA survey.

3.2.3 ADDITIONAL SURVEY

A review of existing vegetation information highlighted the need for additional quadrat-based full-floristic data collection within the study area. Additional survey was undertaken in two components:

(i) targeted data collection in spatial gaps identified through coarse stratification; and

(ii) data collection at targeted 'thematic gaps', i.e. known sites considered to contain examples of perceived plant communities which were previously undersampled or not sampled.

All vegetation field survey information was largely collected in line with the Standard (Sivertsen 2009), including precise quadrat location, basic floristic structure, biometric condition, tree health, physiography, landuse, plot disturbance, full-floristic quadrat data and additional overstorey species. All surveys collected cover data for all taxa in the full-

floristic quadrat; some did not record separate abundance scores. A complete example of the field proforma is found in Appendix 1, with explanatory notes found in Appendix 2.

Spatial Gap Filling

A full review of existing data, including sourcing and incorporating survey quadrat floristic data which was not corporately stored in YETI (Bedward *et al*. 2011) was undertaken to determine if there were particular broad ecotypes within the study area that were not sampled or under-sampled relative to other ecotypes. In line with project budget constraints, a coarse stratification of Mitchell Landscapes (Mitchell 2003) was considered appropriate as it provided a reasonable delineation of the study area and surrounds.

Mitchell Landscapes represent a combined classification of geology, topography and climate, without creating an overly complex stratification which would have made quadrat allocation rules difficult to satisfy within the project budget and timeframe. Whilst a coarse stratification is likely to miss some fine scale ecotypes, in many respects these were covered as part of the thematic gap filling component of the survey.

Each Mitchell Landscape was intersected with existing survey quadrat data which were considered suitable for analysis, and decision rules were developed to determine the relative adequacy of sampling. As survey quadrat data outside of the study area within areas of similar biogeographic character is considered useful, quadrats within 10 kilometres of the study area were incorporated in the gap analysis. The relative percentage of remnant vegetation in each Mitchell Landscape was not considered as whilst it indicates the amount of remnant vegetation, this does not always correlate with landscape complexity. It is also considered that many of the over-cleared landscapes have minimal sampling due to the tendency for such landscapes to be on private land, and the often small extent and disturbed nature of vegetation remnants. Many of these landscapes contain important lowland TECs which are considered poorly sampled, and require further sampling and better definition for regulatory purposes.

The study area contained a total of 54 Mitchell Landscapes. Of these, only 25 were considered adequately sampled *relative to* the remainder of the study area. A total of 270 target plots were allocated in remnant vegetation across 29 undersampled Mitchell Landscapes. Initial allocation was random but constrained to areas of public tenure (including National Parks, State Forests, TSRs and Crown Reserves) as well as across 22 private land properties managed by private stakeholders who granted access for surveys.

A small number of target plot locations were subsequently modified by moving (within the same Mitchell Landscape) to areas of greater accessibility, such as to within a few hundred metres of an access track. Care was taken to ensure that target plot locations were moved to an area of similar landscape position to that of the original randomly allocated target location (e.g. a creek line, a hill top or a mid-slope). This was considered a sensible approach given the additional project component of targeting 'thematic gaps'.

Thematic Gap Sampling

In order to ensure that perceived rare or unusual plant communities were sampled, an expert workshop was held and a subsequent data review undertaken in order to determine whether some perceived plant communities were sampled by previous surveys stored within the corporate dataset (Bedward *et al.* 2011) or other datasets which could be used in the analysis. Internal workshopping revealed that a total of 31 perceived plant communities or landscapes were considered likely to be under-sampled or not sampled, and these 'thematic gaps' were targeted for field sampling at known locations. Many of these perceived plant communities were considered by subsequent quantitative analysis as part of this and other studies to be sub-associations within broader plant community associations; those combinations still considered to be distinct associations not able to proven through analysis were described as qualitative (or 'q') plant communities (refer to Additional Plant Communities in Section 6).

An additional 49 survey quadrats were targeted at collecting data in perceived plant communities which were not apparently sampled in the existing dataset.

3.3 DATA ANALYSIS

An initial set of previous and new field survey data was collated in the corporate database (Bedward *et al.* 2011) and exported in a format suitable for analysis. Through the export process all exotic taxa were excluded, a standardisation of taxonomic names was applied and various original scoring systems were transformed to their closest equivalent on a cover-abundance scale of 1 to 6 (1: present and uncommon; 2: common and up to 5% cover; 3: up to 20% cover; 4: up to 50%; 5: up to 75%; and 6: over 75%). Exported data consisted of

unstandardised cover-abundance values in a matrix of 3806 plots (objects) by 2067 species (attributes).

Exported floristic survey quadat data were initially examined using the homogeneity analysis algorithm developed by Bedward, Keith and Pressey (1992), to assess the number of floristic groups (or classification scale) which might be most efficient for describing the floristic diversity of the study area. This assessment, combined with experience of previous plant community classifications covering parts of the study area, suggested an initial classification level of 200 groups.

Survey quadrat data were then analysed to search for groups of consistently co-occurring plant taxa at the chosen classification scale, using the PATN software developed by Belbin (1995a, 1995b), supplemented by use of Primer v5 software to examine group structure through dendrograms and ordinations of data sub-sets.

Cluster analysis began with the PATN non-hierarchical clustering strategy 'ALOC', as recommended by Belbin (1995a) for datasets containing large numbers of objects. ALOC was run with object-centroid distances calculated using the Bray and Curtis association measure, using the first plot as an initial seed, run for the default 62 iterations of *allocation -> centroid re-definition -> re-location*, and using an allocation radius determined by the algorithm as resulting in approximately 200 groups. The resulting groups of objects (plots) were exported to a spreadsheet format, and the membership and floristic composition of each of these initial 'freeALOC' groups was examined in detail with reference to the following information:

- ALOC tabulation of the associations between every plot and its five closest group centroids;
- The floristic composition of each group summarised by the Fidel software developed by Bedward (1999);
- The structure and floristic composition of each individual plot (plus any notes on location, disturbance etc.) as recorded in the compiled survey database;
- graphical representations of object relationships (group structure) in Primer5 dendrograms and ordinations of subset data;
- the spatial distribution of plots across the study area, viewed in GIS;
- the environmental variables associated with every survey quadrat, based on a GIS intersect of plot locations against data layers including geology/lithology, soil, landscape, annual rainfall, aspect, slope and altitude;
- relationships between freeALOC groups and the groups identified by previous classifications overlapping the study area based on numerical analysis of quantitative field survey data (being Benson and Jacobs, 1994; McDougall and Walsh 2007; Gellie 2005; and Tozer *et al.* 2010);
- Potentially mis-allocated plots flagged using the CheckGDF procedure developed by Bedward (2001).

Based on consideration of this information, individual survey quadrats were either retained in their initial group, reallocated to a 'near-neighbour' group supported by the above information, or excluded from further analysis if they could not be reliably assigned to any floristic group and were not considered to represent a distinct new group. At a broader level, each of the initial groups was either retained (in some cases with minor reallocation into or out of the group), split into two or more separate groups, or lumped together with another group. Groups strongly related to previous plant community classification groups were examined, and where supported by the data, were labelled with the alphanumeric code of that classification to indicate the relationship.

The survey dataset was compiled from a variety of past and recent surveys, some of which would have been desirable to exclude had they not been the only available data for a particular area or habitat of the study area. It was recognised that there were a number of survey-related factors in the dataset with the potential to interfere with the clustering algorithm's recognition of 'real' floristic groups. These included widely different field sample sizes; some surveys with many records of coarse-level taxa identification to genus level (e.g. *Poa* spp.); different species cover and abundance scale scoring systems used by some surveys; and irreconcilable taxonomic changes between old and recent surveys. For these and other reasons, the composition of initial freeALOC groups was closely examined.

Some of the reasons for merging initial groups included:

- Groups dominated by plots from single surveys or recorders where there was some consistent difference about the data of those plots likely to blur true composition differences (e.g. distinctive cover-score systems; high frequency of genus-only (spp.) records; and older surveys based on taxonomy not used by more recent surveys in the same/similar habitats);

- Small groups clearly seeded by single disturbed plots, such as recently burnt or logged plots dominated by dense tree regrowth, or grazed TSR plots dominated by exotic pasture with very low native species richness and cover;
- Groups seeded by or dominated by 'mixed' plots, particularly plots containing both wetland/aquatic taxa and adjacent dry/terrestrial taxa. This was commonly caused by either unusually large survey plots (most plots were 20 x 20m, larger 20 x 50m plots have a higher likelihood of containing more than one plant community or higher species richness); survey quadrats that contained suspiciously large species lists and may have been plotless random meanders rather than bounded surveys; and survey quadrats strongly representing sampling across an ecotone (such as wetland perimeters).

The eastern edge of the study area included a small number of plots representing the margins of moist coastal/escarpment plant community types, which had been classified as such by Tozer *et al.* (2010) in their coast/escarpment/eastern tablelands context. In the absence of their related plots outside the study area, the ALOC process tended to group these plots with moist tableland plots and blur the recognition of tableland groups. This was treated by accepting the Tozer *et al.* (2010) allocations of these moist coastal/escarpment plots, and excluding these groups when considering alternative allocations of tableland plots.

A systematic examination of all initial freeALOC groups and group assignments produced a revised allocation of all plots to groups (or to exclusion). This revised group definition was used to seed a subsequent round of ALOC clustering, involving both a zero-iteration run [to examine the affinity of objects (survey quadrats) to the revised groups] and a 10-iteration/0.8-radius run to test the stability of those groups and search for additional groups recognisable in the absence of outlier plots. The outputs of these runs were again examined through ALOC tabulations of plot/centroid associations, FIDEL species cover and frequency data, comparison with previous study allocations, spatial distribution of plots, dendrograms etc., in order to further refine the definition of groups and the allocation of plots to those groups. This iterative process of refinement, re-run and checking continued until groups were either acceptable to the plant community classification team, based on its knowledge of the vegetation of the study area, or required additional input. At this stage input was sought from an expert workshop to discuss the status of these groups based on the field experience of attendees. Following the workshop, further rounds of refinement, re-run and checking were completed to produce a semi-final allocation of plots to groups.

At this point the remaining set of field survey data became available and was added to the analysis dataset, comprising a further 300 plots from seven separate surveys. The entire dataset of 4106 plots was extracted by the export process described above, excluded plots masked, then clustered using ALOC with the semi-final groups as initial seeds and new plots all set to a single group, run for both a zero-iteration run (to examine the affinity of new plots to the semi-final groups) and a 25-iteration/0.8-radius run to test the stability of those groups and search for new groups recognisable with the additional data. Outputs were examined as described above, and final rounds of refinement, re-run and checking were completed to produce a final allocation of plots to groups.

Grasslands

Analysis of grassland floristic survey data was carried out through a separate classification process described by Rehwinkel (unpub.). After various data cleaning operations, transformation of cover-abundance scores into a common system, and dealing with taxonomic consistency issues, field data from 437 remaining grassland samples were analysed using the PATN software (Belbin 1995a, 1995b). Grassland classification followed the agglomerative hierarchical fusion strategy, using the Kulczynski measure of association and applying the flexible UPGMA formula with the default Beta value of -0.1. After multiple iterations run to explore the data and potential groups, a final analysis defined eight grassland plant communities.

3.4 COMMUNITY DESCRIPTION

Final vegetation communities identified were each labelled with an alpha-numeric code reflecting the dominant origin of that group's definition. Where a community corresponded closely with a group defined by a previous regional classification, it was assigned a code reflecting this relationship:

- groups related to alpine communities identified by McDougall & Walsh (2007) are denoted by an 'a' for alps (note that some are combined, and the code used is from the community considered to dominate the group);
- communities corresponding with map units described by Tozer *et al.* (2010) retained the alpha-numeric code assigned by those authors (letters 'e', 'm' and 'p');

- groups closely matching the vegetation groups identified by Gellie (2005) are identified by ‘g’; and
- the complex tableland lake groups identified by Benson & Jacobs (1994) are denoted by ‘L’.

Where the sense (and plot membership) of a previously-defined community was revised but remained recognisable (for example through extension of previous range), the original alphanumeric code was retained but prefixed by ‘r’ to indicate a revision (e.g. ‘rp9’ represents a revision of map unit p9 of Tozer *et al.* 2010; rL12 is a revision of combined lake communities 1 and 2 of Benson & Jacobs 1994). Where an identified community had no clear relationship with any of the groups of previous regional classifications, its alpha-numeric code was prefaced by ‘u’ for upper Murrumbidgee.

Communities were assigned to the NSW Structural Formations and Vegetation Classes of Keith (2004) based on their floristic and structural characteristics and the distribution of assigned plots.

Final groups of classified plots were used to characterise the properties of each community. Average native species richness figures were calculated from field samples allocated to each community, and the vegetation structure of each community was described based on summaries of the structural variable estimates (height and cover by stratum) recorded for field samples. Frequently occurring weeds were also identified from classified field samples.

Field data were also used to generate lists of diagnostic plant species for each community, to assist with its identification in the field. The ‘Fidel’ software developed by Bedward (1999) was used to calculate the frequency of each plant taxon within each group and in all other samples in the dataset. This frequency data was used to identify ‘positive’ and ‘constant’ diagnostic taxa for each community following the process developed by Tozer (2003) and described by Tozer *et al.* (2010). Positive diagnostic taxa were identified as those which occurred more frequently within a community than in other communities (hypergeometric probability <0.001). Those taxa occurring with frequency <0.2 within the community and coefficient of variation >0.05 were excluded to minimise the inclusion of unreliable taxa. Constant diagnostic taxa were identified as those which occur frequently in the community (>0.4) but also occur frequently in other groups.

The habitat or broad environmental domain of each community was described based on GIS intersects of plot locations against spatial environmental data including surface geology (DMR date unknown), soil landscapes (OEH unpub.), modelled climate layers (Hutchinson 1989), and topographic variables (altitude, slope, aspect) derived from a 25 metre grid digital elevation model obtained from the OEH corporate spatial data server.

4. RESULTS

4.1 SAMPLING

On account of the favourable survey season and sampling across a range of ecotypes, a total of 886 taxa were recorded in 319 additional full-floristic and habitat assessment survey quadrats and added to the corporate dataset. The collection of such data from 270 survey quadrats through external consultancies was achieved through expenditure of approximately $124,000 (including an additional $18,000 from ACT, and data entry costs), or $459 per quadrat. This information enabled greater refinement of floristic definitions for 44 of the 73 quantitative plant communities described within the study area. Many of these plant communities were of limited extant distribution such as low-land woodland and riparian shrubland communities, and the additional survey data increased the distribution range of many plant communities within the study area.

The addition of 319 survey quadrats collected as part of this project, as well as faciliting the entry of an additional 193 additional plots which were not previously in the corporate server database (*Bedward et al.* 2011) has gone some way towards filling spatial and perceived thematic gaps of the floristic dataset in the study area. The distribution of survey quadrats used in the analysis is shown in Figure 3. However, strong biases towards areas of public tenure remain and obvious coarse spatial sampling gaps remain on the Monaro plains, the lowands of the ACT and areas west of Goulburn / Yass. Additionally, there are particular ecotypes which remain undersampled, including riparian areas.

Seven threatened taxa were recorded as part of the field survey conducted for this project, being *Ammobium craspedioides* (Yass daisy; TSC Act 1995 - Vulnerable, EPBC Act 1999 - Vulnerable; two records), *Calotis glandulosa* (Mauve Burr Daisy; TSC Act 1995 – Vulnerable, EPBC Act 1999 - Vulnerable; one record), *Eucalyptus aggregata* (Black Gum; TSC Act 1995 - Vulnerable; four records), *Grevillea iaspicula* (Wee Jasper Grevillea; TSC Act 1995 - Critically Endangered, EPBC Act 1999 - Endangered; three records), *Grevillea wilkinsonii* (Tumut Grevillea; TSC Act 1995 – Endangered, EPBC Act 1999 - Endangered; one record), *Swainsona recta* (Small Purple-pea; TSC Act 1995 – Endangered, EPBC Act 1999 – Endangered, NC Act 1980 - Endangered; two records) and *Swainsona sericea* (Silky Swainson-pea; TSC Act 1995 – Vulnerable; five records).

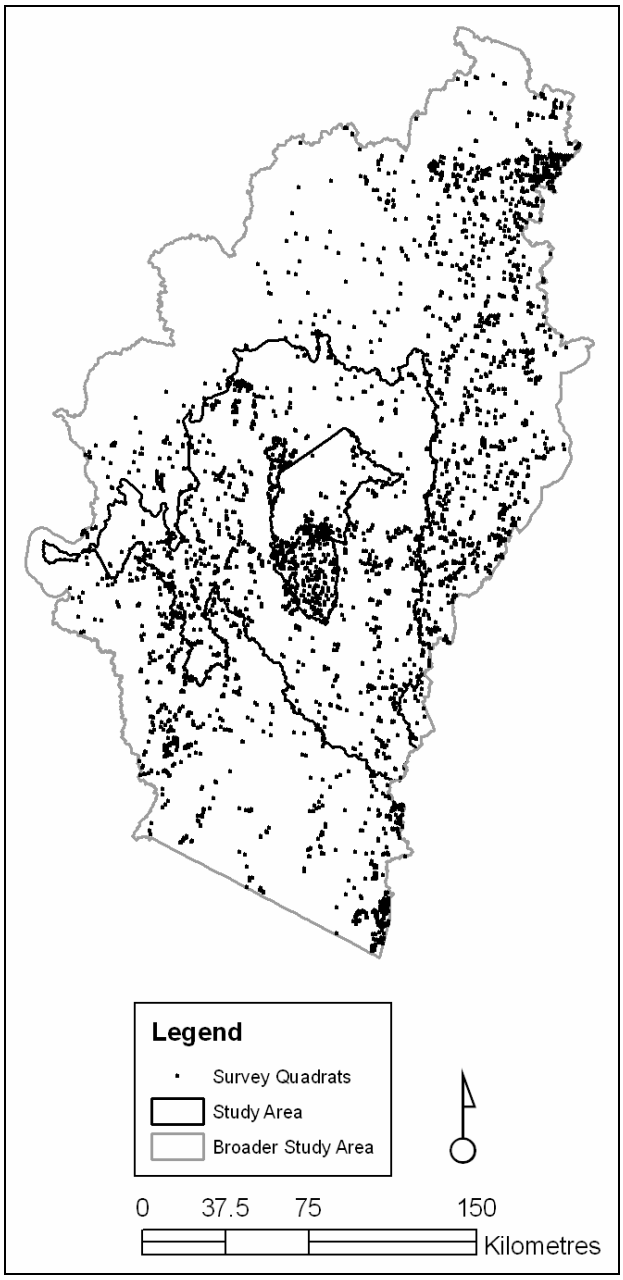


Figure 3: Distribution of survey quadrats across the broader study area.

A complete list of all plant taxa recorded from the study area (including from additional surveys to that of this study) is found in Appendix 3.

4.2 DATA ANALYSIS

Floristic data collected from 4,106 field survey samples met the criteria for inclusion in the classification analysis. Of these, 738 samples (18%) were not assigned to a final group for various reasons; these were generally identified by high allocation radii (association value) from nearest

group centroids, and on detailed inspection were found to include highly disturbed sites; 'mixed' plots including both riparian or wetland taxa and elements of adjacent drier habitats; samples which claimed to be plots but appeared to be random meander lists from a range of habitats with very high species richness; and survey quadrats from surveys using species-importance schemas that did not transform well to the common Braun-Blaunquet cover-abundance scale used for this project.

The remaining 3,368 field samples were assigned to 145 vegetation groups or communities. Of these, 66 plant communities were recorded within the upper Murrumbidgee catchment or considered likely to occur there. An additional eight grassland communities were identified through the process described by Rehwinkel (unpub.). Relationships between the communities identified through the numerical classification processes of this project are shown in the dendrogram presented in Figure 4. The dendrogram produced in PATN is based on taxon frequency data for plant communities, Bray-Curtis association measure and 'furthest neighbour' fusion method.

The 74 plant communities identified by numerical analysis from the upper Murrumbidgee catchment include examples of 17 of the NSW Vegetation Classes within eight of the Structural Formations described by Keith (2004). These are shown in Table 4.

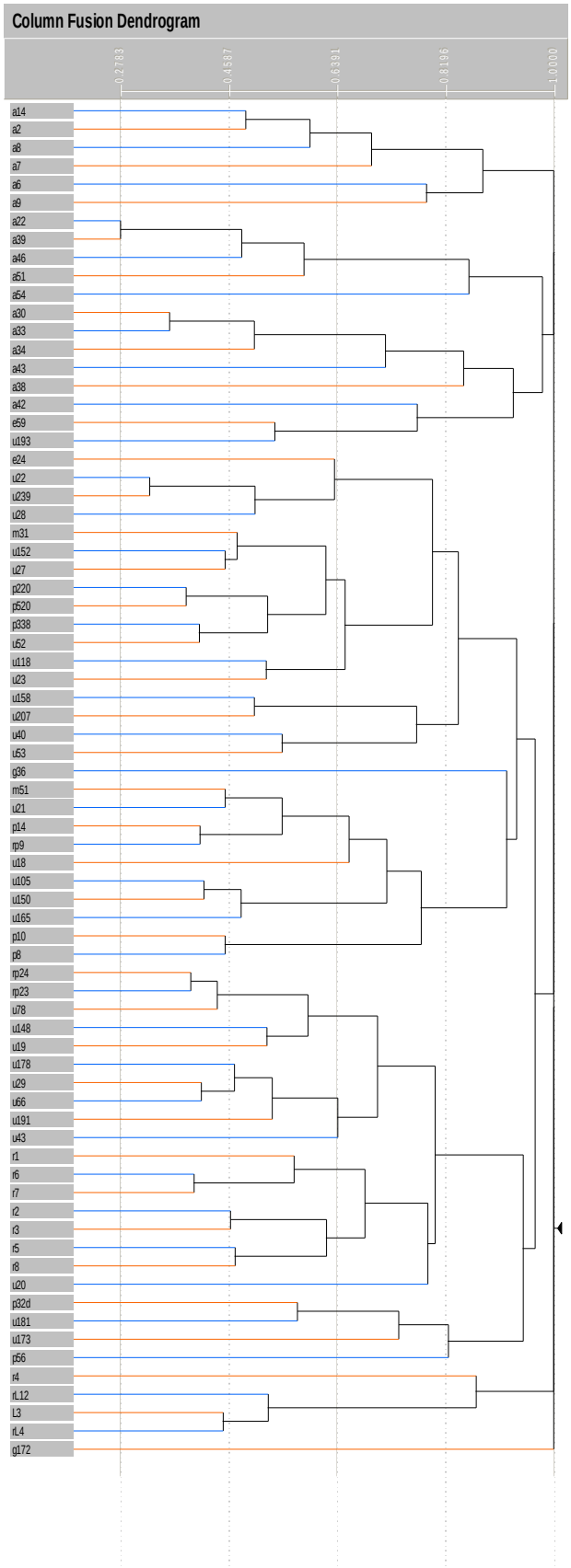


Figure 4: Dendrogram showing hierarchical relationships between 74 vegetation communities of the upper Murrumbidgee catchment identified from analysis of quantitative survey quadrat data.

Table 4: Plant communities occurring in the study area, and their relationship with the Classes and Formations of Keith (2004).

ALPINE COMPLEX	**Class: Alpine Herbfields**
	a6: Dwarf Buttercup - Mud Pratia - Tufted Sedge herbfield of shallow depressions in the Australian Alps Bioregion **a14:** Prickly Snow-grass - Tufted Sedge subalpine valley grassland of the Australian Alps Bioregion **a22:** Snow-grass - Herbfield Celmisia - Woolly Billy-button grassland of the Australian Alps Bioregion **a30:** Fine-leaved Snow-grass - Dwarf Snow-grass - Silver Carraway - Granite Buttercup grassland of the Australian Alps Bioregion **a38:** Kangaroo Grass - Rodd's Bedstraw - Alpine Sunray grassland of steep limestone slopes in the Australian Alps Bioregion
	Class: Alpine Heaths
	a33: Leafy Bossiaea - Mountain Cassinia - Yellow Kunzea - Alpine Hovea heathland of the Australian Alps Bioregion **a39:** Feldmark Heath - Carpet Heath - Snow Grass heathland of the Australian Alps Bioregion **a42:** Epacris - Fine-leaved Snow-grass - Bog Parrot-pea grassy heathland of the Australian Alps Bioregion **a43:** Dwarf Bossiaea - Kangaroo Grass low open heathland of the Australian Alps Bioregion **a46:** Alpine Mint-bush - Alpine Orites - Kosciuszko Nematolepis heathland of the Australian Alps Bioregion **a51:** Mountain Plum Pine - Crag Wallaby-grass - Snow-daisy low open heathland of rock outcrops of the Australian Alps Bioregion **a54:** Mountain Plum Pine – Tall Rice-flower heathland of screes and boulder-fields of the Australian Alps Bioregion **g36:** Button Tea-tree - Yellow Kunzea - Burgan dry heathland on skeletal ridges primarily of the Namadgi Region
	Class: Alpine Bogs and Fens
	a2: Alpine Baeckea - Swamp Heath - Candle Heath - Sphagnum wet heathland of the Australian Alps Bioregion (Bog) **a7:** Bog Buttercup – Creeping Raspwort herbfield of wetland margins in the Australian Alps Bioregion **a8:** Tufted Sedge - Mud Water-milfoil - Tufted Hair-grass sedgeland of the Australian Alps Bioregion (Fen)
RAINF-OREST	**Class: Cool Temperate Rainforests**
	g172: Black Sassafras temperate rainforest of wet sheltered slopes in the Australian Alps Bioregion
WET SCLEROPHYLL FORESTS	**Class: Montane Wet Sclerophyll Forests**
	u40: Alpine Ash very tall wet sclerophyll open forest primarily of the Australian Alps Bioregion **u53:** Mountain Gum - Blackwood tall wet sclerophyll open forest primarily on granitoids of the Australian Alps and western South Eastern Highlands Bioregions **u239:** Alpine Ash - Mountain Gum ± Snow Gum wet sclerophyll open forest of the Australian Alps and South Eastern Highlands Bioregions
	Class: Southern Tableland Wet Sclerophyll Forests
	u52: Ribbon Gum - Robertson's Peppermint very tall wet sclerophyll open forest primarily of the Bondo Subregion of the South Eastern Highlands and the northern Australian Alps Bioregions
	Class: Southern Escarpment Wet Sclerophyll Forests
	p338: Brown Barrel wet sclerophyll very tall grass-herb open forest primarily of the Gourock and Tallaganda Ranges in the South Eastern Highlands Bioregion

DRY SCLEROPHYLL FORESTS	**Class: Southern Tableland Dry Sclerophyll Forests**
	e24: Mountain Gum - Snow Gum very tall dry shrubby open forest primarily in the Kybeyan - Gourock subregion of the South Eastern Highlands Bioregion
	m31: Ribbon Gum - Snow Gum - Shiny Cassinia tall shrub-grass open forest of gullies in quartz-rich ranges in the Monaro and Kybeyan-Gourock subregions of the South Eastern Highlands Bioregion
	m51: Brittle Gum - Scribbly Gum shrub-grass tall dry sclerophyll open forest on exposed quartz-rich slopes and ridges at primarily in the Monaro and Kybeyan-Gourock subregions of the South Eastern Highlands Bioregion
	p8: Silvertop Ash - Narrow-leaved Peppermint shrubby tall dry open forest primarily on sedimentary ridges of the eastern South Eastern Highlands Bioregion
	p10: Black She-oak - Silvertop Ash tall shrubby dry sclerophyll open forest primarily in the Bungonia subregion of the South Eastern Highlands Bioregion
	p14: Red Stringybark - Scribbly Gum - Red-anthered Wallaby Grass tall grass-shrub dry sclerophyll open forest on loamy ridges of the central South Eastern Highlands Bioregion
	rp9: Brittle Gum - Scribbly Gum shrubby tall dry open forest on infertile low ridges and hills primarily of the Bungonia subregion of the South Eastern Highlands Bioregion
	rp23: Red Stringybark - Broad-leaved Peppermint tall dry sclerophyll grassy open forest on loamy rises primarily in the Bungonia subregion of the South Eastern Highlands Bioregion
	u18: Norton's Box - Broad-leaved Peppermint shrubby mid-high open forest on granite substrates primarily in the Namadgi Region
	u21: Broad-leaved Peppermint - Candlebark tall dry sclerophyll open forest of quartz-rich ranges of the upper South East Highlands and lower Australian Alps Bioregions
	u29: Apple Box - Broad-leaved Peppermint tall shrub-grass open forest primarily on granitoids of the South Eastern Highlands Bioregion
	u105: Broad-leaved Peppermint - Brittle Gum - Red Stringybark tall shrub-grass dry sclerophyll open forest of lower ranges of the western South Eastern Highlands and upper South Western Slopes Bioregions
	u148: Red Stringybark - Red Box grass-forb tall open forest of the upper South Western Slopes and western South Eastern Highlands Bioregions
	u150: Broad-leaved Peppermint - Mountain Gum shrubby tall open forest of the South Eastern Highlands and Australian Alps Bioregions
	u152: Robertson's Peppermint - Red Stringybark very tall grass-forb sheltered open forest of the southwest South Eastern Highlands and upper South Western Slopes Bioregions
	u165: Robertson's Peppermint very tall shrubby open forest primarily of the Bondo subregion of the South Eastern Highlands Bioregion
	u191: Black Cypress Pine - Brittle Gum tall dry open forest on hills primarily in the Cooma Region
	Class: Upper Riverina Dry Sclerophyll Forests
	u43: Norton's Box - Hickory Wattle - Drooping She-oak - Western Wedding Bush tall grassy open woodland on serpentinite in the Coolac-Goobarragandra area of the upper South Western Slopes Bioregion
	u66: Norton's Box - Red Stringybark grass-forb mid-high open forest of the South Eastern Highlands and Upper Slopes Subregion of the South Western Slopes Bioregion

FORESTED WETLANDS	**Class: Eastern Riverine Forests**
	p32d: River She-oak riparian forest on sand/gravel alluvial soils along major watercourses of the South Eastern Highlands and upper South Western Slopes Bioregions **p56:** Mountain Tea-tree - Small-fruited Hakea - River Lomatia riparian very tall shrubland of the eastern South Eastern Highlands Bioregion **u181:** River Bottlebrush - Burgan rocky riparian tall shrubland in the South Eastern Highlands and upper South Western Slopes Bioregions
	Class: Inland Riverine Forests
	u173: River Red Gum ± Apple Box very tall grass-forb riparian woodland on alluvial flats in the South Eastern Highlands and upper South Western Slopes Bioregions
FRESHWATER WETLANDS	**Class: Montane Bogs and Fens**
	a9: Tufted Sedge - Small River-buttercup - Common Reed aquatic herbfield of waterways in the Australian Alps and South Eastern Highlands Bioregions **e59:** Small-fruited Hakea - Mountain Baeckea - Myrtle Tea-tree subalpine wet heathland on escarpment and eastern tableland ranges of the South Eastern Highlands Bioregion **u193:** Small-fruited Hakea - Drumstick Heath - Swamp Heath subalpine wet heathland of the Australian Alps and western South Eastern Highlands Bioregions
	Class: Montane Lakes
	rL12: Freshwater sedge-herb marsh of shallow, commonly inundated wetlands of the eastern South Eastern Highlands Bioregion **L3:** Freshwater sedge-herb marsh of shallow ephemeral lakes of the eastern South Eastern Highlands Bioregion **rL4:** Freshwater sedge-herb marsh of deep semi-permanent and/or slightly saline wetlands of the eastern South Eastern Highlands Bioregion
GRASSY WOODLANDS	**Class: Subalpine Woodlands**
	a34: Weeping Snow Gum shrub-grass open woodland of the Australian Alps Bioregion **u22:** Mountain Gum - Snow Gum ± Robertson's Peppermint grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions **u23:** Snow Gum - Drumstick Heath - Myrtle Tea-tree tall woodland to open forest of drainage depressions primarily of the South Eastern Highlands Bioregion **u27:** Snow Gum - Candlebark tall grassy woodland in frost hollows and gullies primarily of the Namadgi Region **u28:** Snow Gum - Mountain Gum - Daviesia mimosoides tall dry grass-shrub subalpine open forest of the Australian Alps and South Eastern Highlands Bioregions **u118:** Black Sallee grass-herb woodland in drainage depressions and moist valley flats in the South Eastern Highlands and Australian Alps Bioregions **u158:** Alpine Sallee shrub-grass subalpine mid-high woodland of the Australian Alps Bioregion **u207:** Jounama Snow Gum - Snow Gum shrubby mid-high woodland on granitoids primarily of the Namadgi Region
	Class: Southern Tableland Grassy Woodlands
	rp24: Yellow Box - Blakely's Red Gum tall grassy woodland on undulating sedimentary and acid-volcanic substrates in the Goulburn area of the South Eastern Highlands Bioregion **u19:** Blakely's Red Gum - Yellow Box ± White Box tall grassy woodland of the Upper South Western Slopes and western South Eastern Highlands Bioregions **u20:** Kurrajong – Blackthorn - Kangaroo Grass shrub-grass mid-high open woodland on limestone karsts in the Wee Jasper area **u178:** Yellow Box ± Apple Box tall grassy woodland of the South Eastern Highlands Bioregion

GRASSY WOODLANDS	**Class: Tableland Clay Grassy Woodlands**
	p220: Ribbon Gum - Snow Gum tableland flats tall grassy woodland primarily on granitoids in the Kybean-Gourock and Monaro subregions of the South Eastern Highlands Bioregion **p520:** Ribbon Gum very tall woodland on sandy alluvial soils along drainage lines of the eastern South Eastern Highlands Bioregion **u78:** Snow Gum grassy mid-high woodland of the South Eastern Highlands Bioregion
GRASSLANDS	**Class: Temperate Montane Grasslands**
	r1: Sub-montane Moist Tussock Grassland of the South Eastern Highlands Bioregion **r2:** River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes, Drainage Lines and Flats of the South Eastern Highlands Bioregion **r3:** Wallaby-grass – Kangaroo Grass – Rush tussock grassland of seasonally wet sites of the South Eastern Highlands Bioregion **r4:** Lacustrine Grass-forbland of the South Eastern Highlands Bioregion **r5:** Wallaby-grass - Tall Speargrass – Common Everlastings Tussock Grassland of the South Eastern Highlands Bioregion **r6:** Dry Tussock Grassland of the Monaro in the South Eastern Highlands Bioregion **r7:** Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion **r8:** Kangaroo Grass - Purple Wire-grass – Wattle Mat-rush dry tussock grassland in the Southern Tablelands region of the South Eastern Highlands Bioregion

5. DISCUSSION

Whilst legislation such as the *Native Vegetation Act 2003* and *ACT Planning and Development Act 2007* has reduced the threat of broad scale clearing in NSW and thw ACT, many of the plant communities described in this study are subject to ongoing threats related to landscape fragmentation including weed invasion, species loss, structural decline, dieback, senescence of key woody species and numerous other threats. This is particularly evident in communities occurring across the tablelands such as the grassy woodlands and natural temperate grasslands, which are highly fragmented and generally persist as small isolated remnants in a fragmented agricultural or urban landscape. Generally, many of the Alpine Complex plant communities, as well as some Dry Sclerophyll Forests and Wet Sclerophyll Forests are reasonably well protected in the formal reserve system, or sustainably managed on Forests NSW estate. Spatial representation in order to quantify their distribution, as well as assessment to determine the magnitude of active threats within each plant community in different areas of the landscape are required to quantify the relative conservation status of each plant community.

This study has developed a plant community classification that will be useful for NRM decision-making to address such threats. However, as with any plant community classification, there are a number of limitations and qualifiers set out below that need to be understood by users of this classification to facilitate its appropriate application.

As numerical plant community classifications are driven by quadrat survey data, they can be limited by a lack of adequate sampling of the ecological variation within a study area or ecotype. Additionally, there are likely to be plant communities which extend far beyond the study area which would be better defined through use of data across their entire geographic range. Such communities are best left undescribed, or described in the context of a broader geographic dataset. This study incorporated survey quadrat data from outside the study area, including all of the Australian Alps bioregion in NSW and the South Eastern Highlands bioregion from the Victorian border north to the Oberon shire. Given the similarities in plant communities in the upper slopes of the South Western Slopes and the western areas of the South Eastern Highlands bioregions, floritistic plot data within 10 km west of the study area as well as the Boorowa shire was also considered.

Within the study area, it is considered that some finer scale and/or highly variable landscape features such as wetlands and narrow riparian zones are poorly sampled and as such it is likely that additional quadrat survey data collection and analysis may reveal enhanced plant community definitions or facilitate description of additional plant communities. For example, as many as ten plant communities (some of which may be sub-communities as defined through human cognitive processes) are described as occurring in the ACT (Johnston *et al*. 2008). All of these plant communities were either poorly sampled or not sampled at all, meaning that they were not able to be defined as quantitative plant communities. Assuming these plant communities were adequately sampled, a numerical classification may be able to improve their definition, and it is plausible that there be some differences in the definition based on statistical correlation rather than observation.

Survey quadrats with outlier or transitional characteristics may be left unclassified or be allocated to a plant community of relatively poor fit in comparison to typically characteristic data. Where appropriate, inclusion of transitional (or ecotone) quadrat survey data does, however, does allow for a plant community description to provide detail on variable floristic character within a plant community (otherwise each plant community may be defined by the ultimate centroid survey quadrat). It is important to recognise that such quadrats may, at times, be equally comfortable in other 'near neighbour' plant communities. Additionally, some outlier survey quadrats may represent viable undersampled communities, but were excluded based on investigation of specific survey quadrat data and consideration that the data is, in some way, faulty. Unless the survey quadrat is known to those doing the analysis, this consideration is based on local knowledge, and it is possible that some rare or unusual plant communities may not have been recognised.

Additional limitations of numerical plant classifications include survey bias, such as observational bias, seasonal/temporal bias and disturbance bias. Through numerous iterations of the numerical analysis, great care was taken to reduce such limitations in this study and ensure that plant communities were not defined based on such data biases. However, after careful consideration of the analysis team there are some plant communities (such as u66: *Norton's Box - Red Stringybark grass-herb mid-high open forest of the South Eastern Highlands and Upper Slopes Subregion of the South Western Slopes Bioregion*) that are defined primarily on the basis of one survey due to a lack of quadrat survey data in a particular landscape.

Where possible, correlations were made between existing plant communities defined from previous studies (refer to Benson *et al.* 2010, Benson and Jacobs 1994, Gellie 2005, McDougall and Walsh

2007 and Tozer *et al.* 2010). At times, there were strong (one to one) correlations, but for the most part plant communities were found to differ based on the addition of further plot data and the decision to combine plant communities that were not considered statistically or ecologically different enough to confidently separate in the field or through vegetation mapping exercises.

6. PLANT COMMUNITY DESCRIPTIONS

Each quantitiatve plant community contains summary information as follows:

- *Number of samples*: Number of separate quadrat samples that were assigned to a particular community and used to characterise its species composition and habitat.
- *Richness (mean (±SD))*: Average richness of native species per quadrat sample within a particular plant community (±1 standard deviation).
- *Slope (degrees)*: Approximate ground surface slope of plots assigned to a particular plant community, as: [(minimum) 25th percentile - 75th percentile (maximum)] (from GIS; samples intersected with slope surface generated from 25m Digital Elevation Model).
- *Altitude (m asl)*: Approximate elevation of samples assigned to a particular plant community, as [(minimum) 25th percentile -75th percentile (maximum)] (from GIS; intersect with elevation surface generated from 25m DEM).
- *Ave. Annual Rainfall (mm)*: Modelled average annual rainfall of samples assigned to a particular plant community, as [(minimum) 25th percentile -75th percentile (maximum)] (from GIS; intersect with climate surface generated using BioClim software).
- Temp. Annual Range (°C): Modelled annual temperature range (maximum of warmest month minus minimum of coldest month) of samples assigned to a particular plant community, as [(minimum) 25th percentile -75th percentile (maximum)] (from GIS; intersect with climate surface generated using BioClim software).

FORMATION: ALPINE COMPLEX

CLASS: ALPINE HERBFIELDS

a6: Dwarf Buttercup - Mud Pratia - Tufted Sedge herbfield of shallow depressions of the Australian Alps Bioregion

Scientific Name: *Ranunculus millanii - Lobelia surrepens - Carex gaudichaudiana - Dichondra repens - Hydrocotyle sibthorpioides - Gonocarpus micranthus*

Number of samples:	5
Richness [mean (±SD)]:	11 (4)
Slope (degrees):	(1) 2-3 (6)
Altitude (m asl):	(1156) 1268-1302 (1527)
Ave. Annual Rainfall (mm):	(1037) 1123-1564 (1590)
Temp. Annual Range (°C):	(22.2) 23.3-24.2 (24.3)

Plate a6:

Vegetation Description: Community a6 is a wet low sedgeland/herbfield occuring on the Bimberi Range (ACT), northern Kosciuszko NP and surrounds (e.g. Kiandra, Seventeen Flat, Broadway Plain, McPhersons Plain, and Cooleman Plain) and a number of sites of suitable topography in Victoria where it is locally common. It is confined to, and highly characteristic of, seasonally inundated depressions of alpine and high subalpine areas. There appears to be no convincing explanation for the genesis of these formations. The depressions may be more or less linear and oriented across slopes or they may be nearly circular on almost flat ground. They are underlain by water-retentive soils, often derived from igneous parent material, and filled with water following snow-melt. By early summer they are usually empty of surface water but soils remain

moist through the season (sometimes filling again during heavy rains). Characteristic species include the prostrate *Lobelia surrepens*, *Ranunculus millanii*, *Gonocarpus micranthus*, *Isolepis montivaga*, *Myriophyllum pedunculatum*, *Stackhousia pulvinaris* and *Lachnagrostis meionectes*. The sedge *Carex gaudichaudiana* is usually present, particularly in deeper sections of the depressions where water tends to persist for longer periods.

Individual examples of *Dwarf Buttercup - Mud Pratia - Tufted Sedge herbfield of shallow depressions* are often only a few square metres in area but there will generally be many within a grassland stand. The main grassland community in which this is expected is a30 [*Dwarf Snow-grass - Fine-leaved Snow-grass - Silver Carraway - Granite Buttercup grassland of the Australian Alps Bioregion*]. Less commonly, it is found amongst heathland such as a42 [*Epacris - Fine-leaved Snow-grass - Bog Parrot-pea grassy heathland of the Australian Alps Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Carex chlorantha	3	40	1	<1	P
Carex gaudichaudiana	3	100	2	4	P
Dichondra repens	1	80	2	21	P
Gonocarpus micranthus	3	60	1	2	P
Hydrocotyle sibthorpioides	2	80	2	4	P
Hypericum japonicum	2	40	1	4	P
Isolepis fluitans	1	20	2	<1	P
Isolepis montivaga	1	20	1	<1	P
Isolepis spp.	1	40	1	<1	P
Juncus brevibracteus	1	40	1	<1	P
Luzula alpestris	1	20	1	<1	P
Myriophyllum pedunculatum	1	20	1	<1	P
Plantago alpestris	1	20	1	<1	P
Plantago antarctica	1	20	1	<1	P
Lobelia surrepens	3	80	2	<1	P
Pultenaea fasciculata	1	20	1	<1	P
Ranunculus millanii	2	80	1	<1	P
Spiranthes australis	1	20	1	<1	P
Asperula gunnii	1	40	1	5	C
Viola betonicifolia	1	60	1	27	C

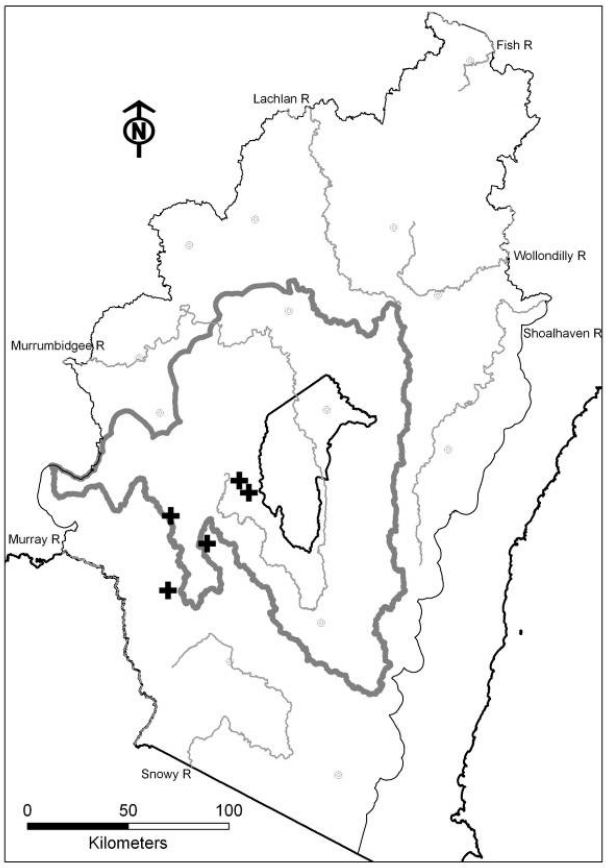


Figure a6: Distribution of field samples assigned to plant community a6.

Threatened Communities: Nil.

Equivalent vegetation types: Unit 8A [*Pratia depression*] and Unit 8B [*Fen (Bog pool)*] (McDougall 1982); Damp alpine heathland subcommunity 10.1 (Walsh *et al.* 1984); Vegetation Type 9 (Helman and Gilmour 1985); 6 [*Lobelia surrepens – Ranunculus millanii herbfield*] (McDougall and Walsh 2007).

Frequently-occurring weeds: None; *Acetosella vulgaris*, *Poa pratensis*, *Rorippa palustris*, *Rumex conglomeratus*, *Taraxacum officinale*, *Trifolium repens* all occurred in 20% of plots.

Threats: Trampling by livestock or feral horses may damage plants or soils but the threat is currently low.

Reservation Status: Mostly in Kosciuszko NP as well as Namadgi NP, but some examples are on freehold or leasehold land west of Kosciuszko NP.

Extent of clearing: Nil.

a14: Prickly Snow-grass - Tufted Sedge subalpine valley grassland of the Australian Alps Bioregion

Scientific Name: *Poa costiniana - Carex gaudichaudiana - Stellaria angustifolia - Asperula gunnii - Luzula modesta*

Number of samples:	23
Richness [mean (±SD)]:	18 (6)
Slope (degrees):	(0) 1-6 (14)
Altitude (m asl):	(1008) 1237-1434 (1618)
Ave. Annual Rainfall (mm):	(807) 1082-1468 (1912)
Temp. Annual Range (°C):	(21.7) 22.8-24.5 (26.1)

Plate a14:

Vegetation Description: Community a14 is a grassland or occasionally open heathland confined to broad valley floors and seepage areas on gentle slopes. Dominant species vary between localities, but common components include herbaceous species such as *Poa costiniana* (which is usually dominant), *Austrofestuca hookeriana*, *Baloskion australe*, *Carex gaudichaudiana*, *Empodisma minus* and *Stylidium montanum* as well as shrubs including *Epacris breviflora*, *E. gunnii* and *Hakea microcarpa*. In the northern part of its range, including the ACT, *Poa labillardieri* is often dominant. Soils are typically sodden humified peats

This community is common from Bimberi, Brindabella and Scabby Ranges (ACT), through lower altitude plains within Kosciuszko NP (Kiandra and Tantangara areas, Mt. Selwyn, Tooma/Tumut Divide, Coolamin Plain, Happy Jacks Plain, Currango Plain). It also occurs in the more easterly ranges of Victoria (e.g. Mt. Wombargo-Cobberas area, Nunniong Plateau, Davies Plain, Dinner Plain). It commonly grades into a2 [*Alpine Baeckea - Swamp Heath - Candle Heath - Sphagnum wet heathland of the Australian Alps Bioregion*] in areas with impeded drainage and a30 [*Dwarf Snow-grass - Fine-leaved Snow-grass - Silver Carraway - Granite Buttercup grassland of the Australian Alps Bioregion*] on drier sites.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Asperula gunnii	1	74	1	4	P
Baloskion australe	1	30	1	2	P
Brachyscome decipiens	1	26	1	2	P
Brachyscome obovata	1	30	1	<1	P
Cardamine astoniae	1	39	1	<1	P
Carex gaudichaudiana	2	91	2	3	P
Carex jackiana	1	26	1	<1	P
Cassinia monticola	1	22	1	1	P
Craspedia crocata	1	22	2	<1	P
Empodisma minus	2	52	2	3	P
Epacris gunnii	1	35	1	2	P
Epilobium billardierianum	1	39	1	2	P
Epilobium gunnianum	1	43	1	1	P
Hookerochloa hookeriana	2	26	1	<1	P
Hydrocotyle algida	1	22	1	<1	P
Hypericum japonicum	1	39	1	3	P
Luzula modesta	1	61	1	2	P
Neopaxia australasica	1	35	1	1	P
Oreomyrrhis ciliata	1	43	1	2	P
Poa costiniana	4	100	2	4	P
Ranunculus graniticola	1	48	1	4	P
Ranunculus millanii	1	30	2	<1	P
Ranunculus pimpinellifolius	1	35	1	1	P
Senecio gunnii	1	39	1	9	P
Stellaria angustifolia	1	61	1	1	P

Threatened Communities: Nil

Equivalent vegetation types: part of *Poa caespitosa – Danthonia nudiflora* alliance (Costin 1954); damp alpine heathland, subcommunity 10.3 (Walsh *et al.* 1984); Community 7 (Benson 1994); group 10 (Helman *et al.* 1988); community 14 [*Subalpine valley grassland*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Acetosella vulgaris* (0.31), *Taraxacum officinale* (0.58), *Trifolium repens* (0.35).

Threats: Some sites in NSW (Kiandra area) and Victoria (near Mt. Wombargo) are subject to excavation by feral pigs, causing these sites to dry. Its greater fertility than surrounding vegetation and permanent wetness makes the community especially vulnerable to weed invasion. *Holcus lanatus*, *Anthoxanthum odoratum* and *Leucanthemum vulgare* have formed extensive colonies at some sites and pose a great threat to this vegetation.

Reservation Status: Well reserves, with almost all examples ocurring within Kosciuszko NP.

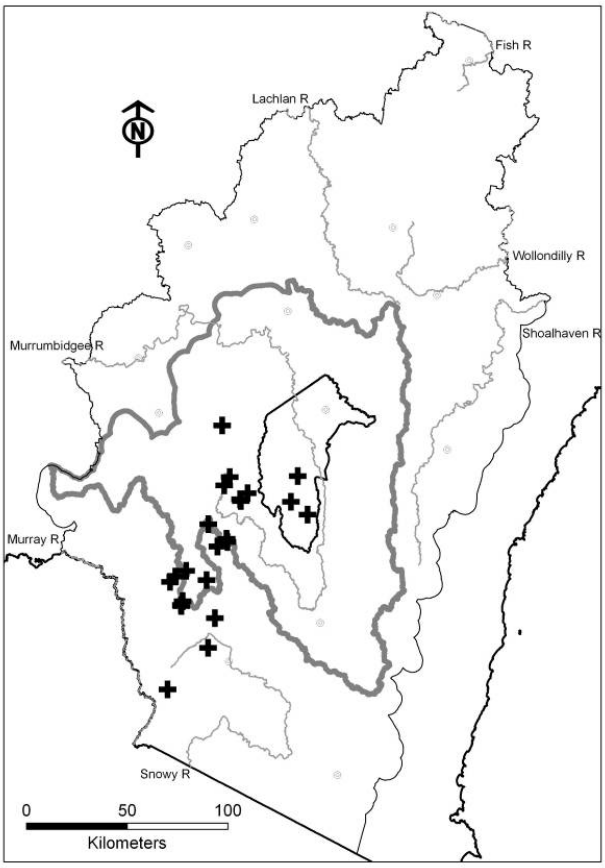


Figure a14: Distribution of field samples assigned to this community.

Extent of clearing: Nil, but this community was probably degraded through decades of grazing in the 19th and 20th centuries.

a22: Snow-grass - Herbfield Celmisia - Woolly Billy-button grassland of the Australian Alps Bioregion

Scientific Name: *Poa fawcettiae - Celmisia costiniana - Craspedia maxgrayi - Euphrasia collina* subsp. *diversicolor - Pentachondra pumila*

Number of samples:	25
Richness [mean (±SD)]:	20 (4)
Slope (degrees):	(1) 4-18 (22)
Altitude (m asl):	(1727) 1937-2083 (2182)
Ave. Annual Rainfall (mm):	(2070) 2290-2560 (2667)
Temp. Annual Range (°C):	(19.6) 20-20.6 (21.6)

Vegetation Description: Community a22 is a grassland occuring on sites of low relief with deep soils (e.g. saddles and stream heads) between the Main Range and Mt. Jagungal in Kosciuszko NP. It is

Plate a22:

generally dominated by Snow-grass (*Poa fawcettiae*), although *P. hiemata* and *Pentachondra pumila* may be locally dominant. Main forbs include *Celmisia costiniana* and Wooly Billy-button *Craspedia maxgrayi*. Species diversity is usually high (compared with other communities at similar elevation). Tall shrubs are rare. A species-poor variant of the community (community 18 of McDougall and Walsh 2007) is found on Mt. Jagungal and Mt. Twynam and is incorporated into the current plant community concept. On Mt. Twynam at least, it may be a result of assisted regeneration following severe erosion caused by cattle grazing. That area was the subject of major soil conservation works in the 1960's after grazing was removed.

This community possibly does not occur in the upper Murrumbidgee catchment, being present on the southern and eastern fall of Mt. Jagungal, which marks the boundary of the catchment. Throughout its range, it grades into a46 [*Alpine Mint-bush - Alpine Orites - Kosciuszko Nematolepis heathland in the Australian Alps Bioregion*]. The ecotone between these communities is large and it will often be difficult to map a boundary between them where the dominants of the shrubland are scattered through the grassland.

Characteristic Species:

Species	C/A	Freq	C/AO	FreqO	Fid
Aciphylla glacialis	1	32	1	<1	P
Acrothamnus montanus	1	48	1	<1	P
Argyrotegium fordianum	1	32	1	<1	P
Australopyrum velutinum	1	20	1	<1	P
Brachyscome scapigera	1	20	1	2	P
Carex breviculmis	1	92	1	12	P
Carex hebes	1	36	1	1	P
Celmisia costiniana	2	76	1	<1	P
Celmisia pugioniformis	1	24	1	2	P

Chionogentias muelleriana subsp. *alpestris*	1	40	1	<1	P
Craspedia aurantia	1	44	1	1	P
Craspedia costiniana	1	28	1	<1	P
Craspedia maxgrayi	1	72	1	<1	P
Deyeuxia crassiuscula	1	20	1	<1	P
Empodisma minus	1	20	2	3	P
Euphrasia collina subsp. *diversicolor*	1	52	1	<1	P
Grevillea australis	1	20	2	2	P
Luzula alpestris	1	28	1	<1	P
Luzula modesta	1	20	1	2	P
Lycopodium fastigiatum	1	28	1	<1	P
Microseris lanceolata	1	76	1	6	P
Oreomyrrhis eriopoda	1	76	1	13	P
Pentachondra pumila	1	44	1	<1	P
Pimelea alpina	1	60	1	1	P
Plantago euryphylla	1	24	1	<1	P
Poa costiniana	3	48	2	4	P
Poa fawcettiae	3	60	2	2	P
Poa saxicola	1	40	1	<1	P
Prasophyllum spp.	1	36	1	<1	P
Ranunculus graniticola	2	20	1	4	P
Rytidosperma nudiflorum	1	88	1	2	P
Scleranthus singuliflorus	1	20	1	<1	P
Senecio pinnatifolius var. *alpinus*	1	52	1	3	P
Trisetum spicatum	1	72	1	2	P

Threatened Communities: Nil.

Equivalent vegetation types: part of *Celmisia longifolia – Poa caespitosa* alliance (Costin 1954); part of the *Tall Alpine Herbfield* of Costin *et al.* (2000); combination of communities 18 [*Poa fawcettiae - Uncinia sulcata grassland*] and 22 [*Poa fawcettiae – Euphrasia collina grassland*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Acetosella vulgaris* (0.46).

Threats: Chronological API indicates that the area of this community has declined in the past 60 years because of encroachment by shrubs. It is uncertain if this is the result of climate change or disturbance by sheep and cattle. Both factors may favour shrub establishment.

Reservation Status: Entirely within Kosciuszko NP.

Extent of clearing: Nil but much of the community was severely degraded by sheep and cattle grazing.

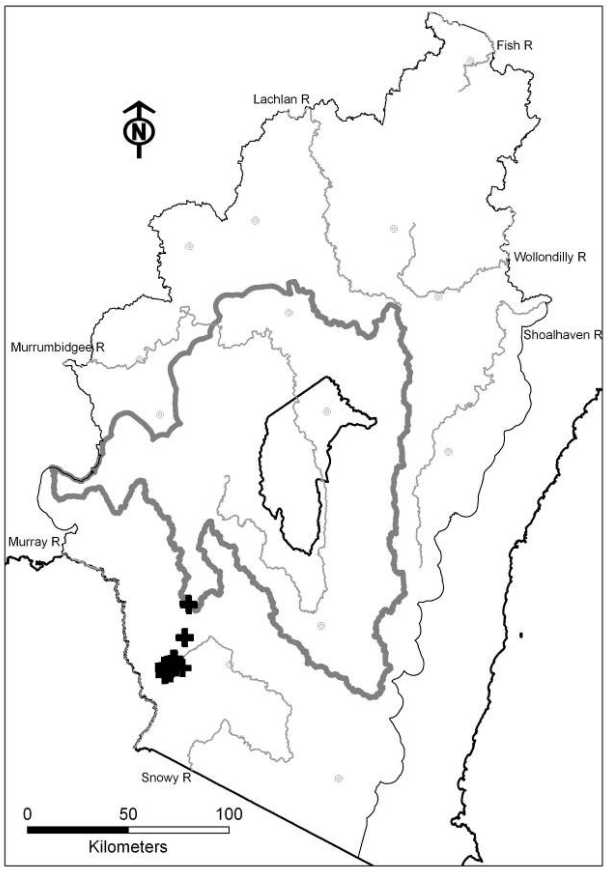


Figure a22: Distribution of field samples assigned to this community.

a30: Fine-leaved Snow-grass - Dwarf Snow-grass - Silver Carraway - Granite Buttercup grassland of the Australian Alps Bioregion

Scientific Name: *Poa hookeri - Poa clivicola - Oreomyrrhis argentea - Ranunculus graniticola - Geranium antrorsum*

Number of samples:	54
Richness [mean (±SD)]:	28 (6)
Slope (degrees):	(0) 2-8 (22)
Altitude (m asl):	(1194) 1285-1397 (1619)
Ave. Annual Rainfall (mm):	(969) 1186-1459 (1814)
Temp. Annual Range (°C):	(21.7) 23.2-24.1 (25)

Vegetation Description: Community a30 is a grassland characterised by a dense cover of one, or often several species of *Poa* (mainly *P. clivicola*, *P. costiniana*, *P. hiemata* or *P. hookeri* but occasionally *P. petrophila* or *P. phillipsiana*) with numerous intertussock spaces containing a large range of herbaceous species. The component of this community dominated by *P. hookeri* was regarded as a distinct community by McDougall and Walsh (2007)

Plate a30:

and may well be so. In the places where it occurs (Kosciuszko NP north from the Happy Jacks area), it forms a mosaic with grassland dominated by other species, making it hard to collect homogeneous samples and increasing the likelihood of combination in the classification. In any case, the grasslands would be inseparable as a mapping unit. The *Poa hookeri*-dominated variant is characterised by the dwarf tussocks of *P. hookeri* and the closed cover of mat-forming herbs, shrubs and low shrubs (e.g. *Calotis pubescens*, *Coprosma nivalis*, *Dillwynia prostrata*, *Pimelea biflora*, *Pultenaea fasciculata*, *Pultenaea polifolia*, *Rutidosis leiolepis*).

Tall shrubs such as *Hakea microcarpa* and *Cassinia monticola* may be present in this community and at times are abundant enough for the vegetation to be structurally an open heathland. Despite the greater shrub cover, such examples are floristically inseparable from surrounding grasslands. There is evidence that these shrubs are recent invaders of the grassland community. Their invasion has probably been facilitated by past grazing disturbance although climate change will also favour expansion of shrubs into frost hollows.

This community is the most common grassland of the treeless plains in Kosciuszko NP, occurring from the upper Thredbo Valley in the south to Emu Plain in the west, Cooleman Plain in the north and Snowy Plain in the east. It is the dominant community of large plains such as Kiandra, Happy Jacks and Long Plains and also occurs in the ACT at Cheyenne Flat and Bimberi (and probably elsewhere at high altitude). Its distribution is controlled by temperature and soil depth: low temperatures associated with cold air drainage in the growing season do not favour tall shrub and tree establishment; it is best expressed where soils are deep and on shallow soils it is replaced by heathlands and woodlands.

The lower edge of *Dwarf Snow-grass – Fine-leaved Snow-grass – Silver Carraway – Granite Buttercup grassland* commonly adjoins a14 [*Prickly Snow-grass – Tufted Sedge subalpine valley grassland of the Australian Alps Bioregion*] and its upper edge is usually u158 [*Alpine Sallee shrub-grass subalpine mid-high woodland of the Australian Alps Bioregion*]. Patches of a33 [*Leafy Bossiaea – Mountain Cassinia – Yellow Kunzea – Alpine Hovea heathland of the Australian Alps Bioregion*] and a34 [*Weeping Snow Gum – Small-fruited Hakea – Blue Snow-grass grassy open woodland of the Australian Alps Bioregion*] may be found in a mosaic within the grassland.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acaena echinata	1	33	1	9	P
Aciphylla simplicifolia	1	33	1	2	P
Acrothamnus hookeri	1	65	1	7	P
Ajuga australis	1	26	1	8	P
Asperula gunnii	1	63	1	4	P
Asterolasia trymalioides	1	15	2	<1	P
Australopyrum velutinum	1	28	1	<1	P
Austrodanthonia spp.	1	33	1	7	P
Brachyscome aculeata	1	33	1	2	P
Brachyscome decipiens	1	37	1	1	P
Brachyscome scapigera	1	24	1	2	P
Cardamine lilacina	1	22	1	1	P
Carex breviculmis	1	94	1	12	P
Carex hebes	1	28	1	1	P
Celmisia pugioniformis	1	30	1	2	P
Craspedia coolaminica	1	78	1	<1	P
Craspedia jamesii	1	54	1	3	P
Diuris monticola	1	26	1	<1	P
Epilobium billardierianum	1	43	1	1	P
Erigeron bellidioides	1	28	1	<1	P
Euphrasia collina subsp. *paludosa*	1	39	1	2	P
Festuca asperula	1	15	1	1	P
Geranium antrorsum	1	91	1	2	P
Grevillea australis	2	15	1	2	P
Hakea microcarpa	2	19	1	3	P
Hovea montana	1	17	1	1	P
Hovea sp. aff. *heterophylla* (Kiandra)	1	20	1	<1	P
Leptorhynchos elongatus	1	17	1	<1	P
Leptorhynchos squamatus	1	72	1	2	P
Linum marginale	1	13	1	1	P
Luzula flaccida	1	59	1	12	P
Melicytus sp. 'Snowfields'	1	19	1	3	P
Microseris lanceolata	1	56	1	6	P

Oreomyrrhis argentea	1	56	1	<1	P
Pimelea biflora	1	24	1	<1	P
Pimelea linifolia subsp. *caesia*	1	57	1	8	P
Plantago antarctica	1	19	1	<1	P
Plantago euryphylla	1	30	1	<1	P
Poa clivicola	3	50	2	1	P
Poa hiemata	3	24	2	1	P
Poa hookeri	3	43	3	<1	P
Poa costiniana	3	22	2	4	P
Poa fawcettiae	1	17	3	2	P
Poa petrophila	2	17	2	<1	P
Poa phillipsiana	2	41	3	2	P
Podolepis jaceoides	1	46	1	<1	P
Poranthera oreophila	1	54	1	27	P
Prasophyllum spp.	1	15	1	<1	P
Pultenaea fasciculata	2	19	1	<1	P
Pultenaea polifolia	1	20	1	<1	P
Ranunculus graniticola	1	89	1	3	P
Rhodanthe anthemoides	1	37	1	<1	P
Rhytidosporum alpinum	1	19	1	<1	P
Rutidosis leiolepis	2	15	2	<1	P
Scleranthus biflorus	1	81	1	9	P
Scleranthus fasciculatus	1	26	1	<1	P
Senecio pinnatifolius var. *alpinus*	1	50	1	2	P
Swainsona monticola	1	13	1	<1	P
Trisetum spicatum	1	46	1	2	P
Xerochrysum subundulatum	1	26	1	<1	P

Threatened Communities: Nil.

Equivalent vegetation types: Vegetation Type 2 (Helman and Gilmour 1985); Group 16 (Helman *et al.* 1988); Community 6 (Benson 1994); combination of 30 [*Poa hiemata – Poa clivicola grassland*] and 31 [*Poa hookeri grassland*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Acetosella vulgaris* (0.59), *Hypochaeris radicata* (0.59).

Threats: Despite its great spatial extent in conservation reserves, *Dwarf Snow-grass - Fine-leaved Snow-grass - Silver Carraway - Granite Buttercup grassland* is one of the most threatened communities in the Alps and upper Murrumbidgee catchment. Patches of up to 100 m^2 may be overturned by pigs causing the exposure of bare soil, a large reduction in the cover of *Poa* species, and an increase in disturbance tolerant species such as *Geranium antrorsum*, *Drabastrum alpestre* and *Stellaria multiflora* (McDougall and Walsh 2002). Horses are commonly seen in this grassland and presumably selectively graze some of its species. Grassland forbs were found to be selectively grazed by cattle on the Bogong High Plains in Victoria (Van Rees and Holmes 1986) so it is possible that horses are having a significant effect on species abundance and turnover. Investigation of horse diet is urgently required, given the high incidence of rare and threatened plant species in this community (McDougall and Walsh 2007). Invasion by Ox-eye Daisy (*Leucanthemum vulgare*) also appears to be a significant threat. This weed has spread rapidly in recent years. Based on its invasion ecology and impact elsewhere (Clements *et al.* 2004), its containment will be essential for the future survival of this community.

Reservation Status: Mostly within Kosciuszko NP; some examples on freehold land at Snowy Plain (in the Southern Rivers CMA).

Extent of clearing: Nil but probably highly degraded in places by domestic grazing and, at Kiandra, mining.

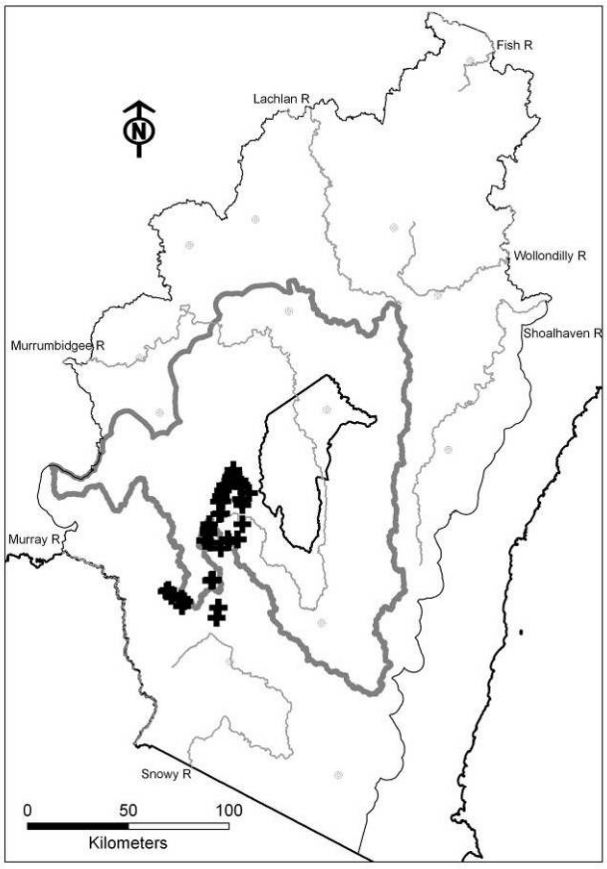


Figure a30: Distribution of field samples assigned to this community.

a38: Kangaroo Grass - Rodd's Bedstraw - Alpine Sunray grassland of steep limestone slopes in the Australian Alps Bioregion

Scientific Name: *Themeda australis - Galium roddii - Leucochrysum albicans* subsp*. alpinum - Cassinia ochracea - Xerochrysum viscosum*

Number of samples:	6
Richness [mean (±SD)]:	15 (4)
Slope (degrees):	(2) 14-27 (39)
Altitude (m asl):	(1185) 1207-1220 (1240)
Ave. Annual Rainfall (mm):	(1080) 1081-1082 (1084)
Temp. Annual Range (°C):	(24.7) 24.7-24.8 (24.8)

Plate a38:

Vegetation Description: Community a38 is a grassland which is common on steep slopes in the Blue Waterholes area of Kosciuszko NP (Cave Creek), where it occurs on loose limestone scree and around rocky outcrops. Kangaroo Grass (*Themeda australis*) is dominant in most areas, although plant cover is sometimes sparse. There are occasional emergent shrubs of *Cassinia ochracea*, *Grevillea lanigera and Hakea microcarpa* but shrub cover is generally low. Slopes in similar habitat at Yarrangobilly Caves about 25 km south of Blue Waterholes support small pockets of this community within a forested landscape.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Brachyscome rigidula	1	33	1	2	P
Carex breviculmis	1	100	1	13	P
Cassinia ochracea	1	67	1	<1	P
Clematis leptophylla	1	33	1	2	P
Convolvulus angustissimus	1	67	1	3	P
Craspedia coolaminica	1	50	1	2	P
Galium roddii	1	50	1	<1	P
Grevillea lanigera	1	33	1	3	P
Hakea microcarpa	1	83	1	3	P
Leucochrysum albicans subsp. *alpinum*	1	100	1	<1	P
Linum marginale	1	67	1	1	P
Muehlenbeckia axillaris	2	33	1	<1	P
Picris angustifolia	1	67	1	2	P
Pimelea linifolia subsp. *caesia*	1	83	1	8	P
Poa fawcettiae	3	100	3	2	P
Rhodanthe anthemoides	1	33	1	1	P
Themeda australis	3	100	2	21	P
Vittadinia cuneata	1	67	1	2	P
Xerochrysum viscosum	1	83	1	1	P

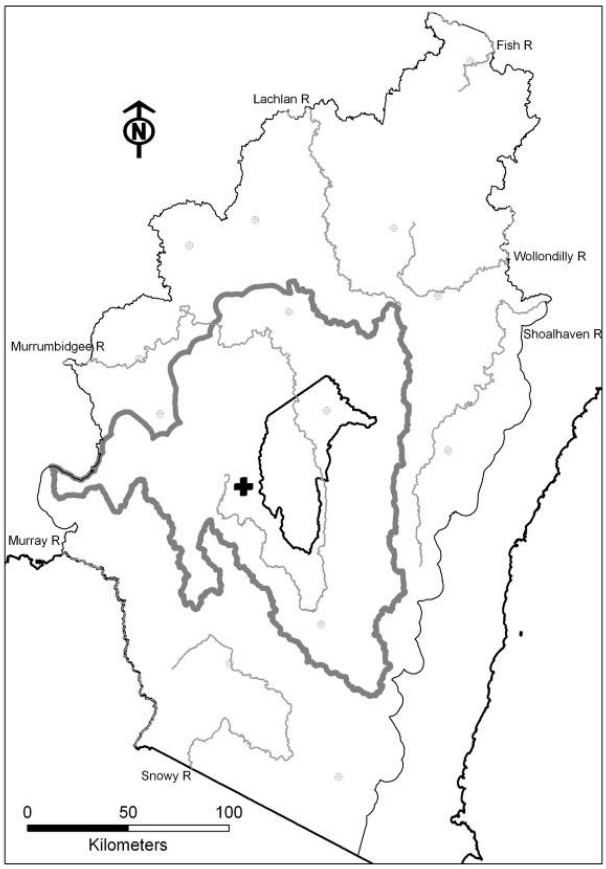


Figure a38: Distribution of field samples assigned to thiscommunity.

Threatened Communities: Nil.

Equivalent vegetation types: 38 [*Themeda triandra – Leucochrysum albicans grassland*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Cerastium vulgare* (0.33), *Crepis capillaris* (0.50), *Echium vulgare* (0.33), *Hypochaeris radicata* (0.67), *Rosa rubiginosa* (0.67), *Sedum acre* (0.67), *Tragopogon dubius* (0.67), *Trifolium dubium* (0.83).

Threats: The Cave Creek area has a high diversity of weeds, some of which are locally abundant. *Sedum acre* occupies a niche on rocky sites also occupied by the very restricted *Galium roddii*, which appears to be threatened as a result. Many of the weeds present in Cave Creek are locally dominant in similar habitat at Yarrangobilly Caves (e.g. *Potentilla recta*, *Rosa rubiginosa*, *Tragopogon dubius*, *Verbascum thapsus*). Control of these and other weed species may be required in the future. Control will be difficult however because the steep slopes of Cave Creek are unstable and frequent pedestrian traffic could have a significant impact on plants growing there.

Reservation Status: Entirely within Kosciuszko NP.

Extent of clearing: Nil.

CLASS: ALPINE HEATHS

a33: Leafy Bossiaea - Mountain Cassinia - Yellow Kunzea - Alpine Hovea heathland of the Australian Alps Bioregion

Scientific Name: *Bossiaea foliosa - Cassinia monticola - Epacris petrophila - Hovea montana - Kunzea muelleri - Pimelea biflora / Poa hiemata*

Number of samples:	36
Richness [mean (±SD)]:	26 (5)
Slope (degrees):	(0) 3-10 (21)
Altitude (m asl):	(1241) 1330-1582 (1790)
Ave. Annual Rainfall (mm):	(1144) 1506-1777 (2050)
Temp. Annual Range (°C):	(21.1) 21.8-23.3 (24.1)

Plate a33:

Vegetation Description: Community a33 is either a closed or open heathland dominated by shrubs 1 – 1.5 m tall. In the Murray catchment (e.g. upper Tooma River catchment), the heathland is commonly dominated by *Bossiaea foliosa* and despite the closed nature of this variant, the diversity of forbs and grasses is high. *Dichelachne crinita*, an uncommon species in the higher Alps, is a common component there. Elsewhere the community may be dominated by *Bossiaea foliosa*, *Epacris petrophila*, *Hovea montana*, *Cassinia monticola*, *Grevillea australis*, *Kunzea muelleri* or *Podolobium alpestre*. Gaps between shrubs are commonly dominated by *Poa clivicola*, *P. fawcettiae* or *P. phillipsiana*, and occasionally *Austrostipa nivicola*, with many forbs characteristic of the adjoining grassland community a30 [*Dwarf Snow-grass - Fine-leaved Snow-grass - Silver Carraway - Granite Buttercup grassland of the Australian Alps Bioregion*].

Within the upper Murrumbidgee catchment, this community is abundant in Kosciuszko NP (e.g. Long Plain, Bullocks Hill, Currango Plain) and Namadgi NP (e.g. Mt. Bimberi, Mt. Murray, Mt. Gingera). It may be found in a mosaic with community a30 but usually occupies the upper slopes of subalpine frost hollows.

Leafy Bossiaea - Mountain Cassinia - Yellow Kunzea - Alpine Hovea heathland is a combination of three heathland communities of McDougall and Walsh (2007): 33, 35 and 36. These communities may be separable floristically, each being influenced by the herbaceous composition of surrounding grassland communities. However, at their extremities the differences between them are minor and, for mapping purposes, they are likely to be indistinguishable.

Characteristic Species:

Species	C/A	Freq	C/AO	FreqO	Fid
Aciphylla simplicifolia	1	72	1	2	P
Acrothamnus hookeri	1	33	1	8	P
Asperula gunnii	1	58	1	4	P
Bossiaea foliosa	2	31	2	4	P
Brachyscome decipiens	1	25	1	1	P
Brachyscome scapigera	1	25	1	2	P
Brachyscome spathulata	1	33	1	11	P
Cardamine lilacina	1	39	1	<1	P
Carex breviculmis	1	92	1	12	P
Carex hebes	1	22	1	1	P
Cassinia monticola	1	56	1	<1	P
Celmisia pugioniformis	1	42	1	2	P
Craspedia coolaminica	1	28	1	2	P
Craspedia jamesii	1	75	1	3	P
Empodisma minus	1	25	2	3	P
Epacris gunnii	1	33	1	2	P
Erigeron bellidioides	1	39	1	<1	P
Euphrasia collina subsp. *paludosa*	1	31	1	2	P
Geranium antrorsum	1	33	1	3	P
Grevillea australis	1	50	2	1	P
Hakea microcarpa	1	33	1	3	P
Hovea montana	2	50	1	<1	P
Kunzea muelleri	2	47	2	<1	P
Leptorhynchos squamatus	1	61	1	2	P
Luzula modesta	1	31	1	2	P
Microseris lanceolata	1	69	1	6	P
Oreomyrrhis argentea	1	33	1	<1	P
Pimelea biflora	1	36	1	<1	P
Pimelea linifolia subsp. *ceasia*	1	33	1	8	P
Poa clivicola	3	28	3	2	P
Poa costiniana	2	53	2	4	P
Poa hiemata	1	53	3	1	P
Poranthera oreophila	1	50	1	27	P
Ranunculus graniticola	1	83	1	3	P

Scleranthus biflorus	1	64	1	9	P
Senecio pinnatifolius var. *alpinus*	1	44	1	3	P
Trisetum spicatum	1	31	1	2	P
Xerochrysum subundulatum	1	47	1	<1	P

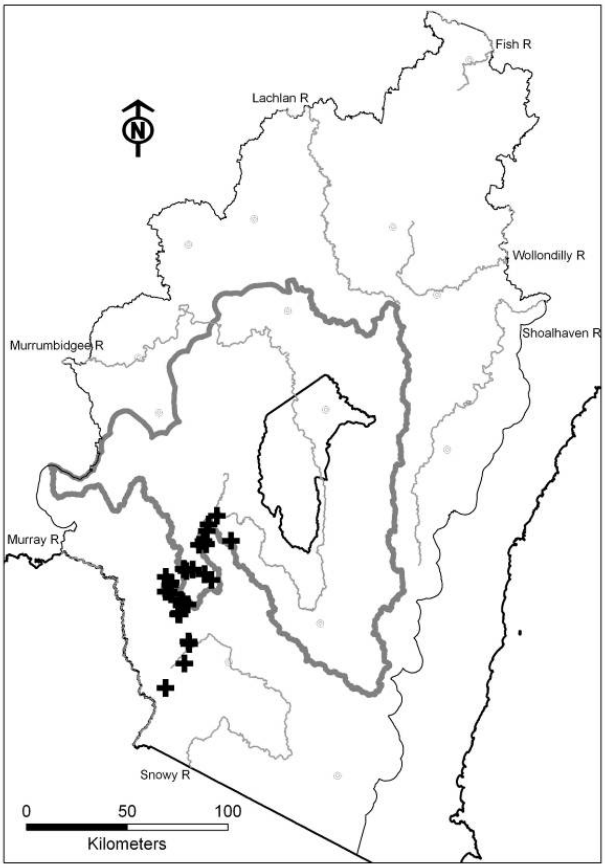


Figure a33: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: 33 [*Northern Alps Hovea montana open heathland*] and 35 [*Bossiaea foliosa – Epacris petrophila heathland*] and 36 [*Broadway Bossiaea foliosa closed heathland*] (McDougall and Walsh 2007); not clearly identified in other previous vegetation descriptions.

Frequently-occurring weeds: *Acetosella vulgaris* (0.58), *Hypochaeris radicata* (0.36).

Threats: This community is frequently visited by feral horses. Although trampling and selective grazing undoubtedly occur, the overall effect is likely to be minimal because most shrubs in this community are unpalatable and facultative resprouters; in addition, most palatable species will be found in grassland. The greatest threat appears to be invasion by Ox-eye Daisy (*Leucanthemum vulgare*). In an example of several hectares near Tantangara Dam, this weed has a cover of about 80%.

Reservation Status: Mostly in conservation reserves (Kosciuszko NP, Bimberi NR, Namadgi NP) with small amounts on freehold land at Snowy Plain in the Southern Rivers CMA.

Extent of clearing: Probably negligible and this community appears to be expanding into grassland either because of past land use disturbance or climate change (or both).

a39: Feldmark Heath - Carpet Heath - Snow Grass heathland of the Australian Alps Bioregion

Scientific Name: *Epacris* sp. *- Pentachondra pumila - Poa fawcettiae - Senecio pectinatus - Craspedia maxgrayi*

Number of samples:	10
Richness [mean (±SD)]:	19 (4)
Slope (degrees):	(2) 6-10 (17)
Altitude (m asl):	(1729) 1936-2117 (2147)
Ave. Annual Rainfall (mm):	(2095) 2327-2581 (2634)
Temp. Annual Range (°C):	(19.7) 19.9-20.6 (21.6)

Plate a39:

Vegetation Description: Community a39 is a low heathland dominated by an undescribed *Epacris* species, *Kunzea muelleri* or occasionally *E. petrophila*, occurring on the upper granite or phyllite slopes and summits of the Kosciuszko Main Range, with an outlier on the summit of Mt. Jagungal. Sites containing this community are generally rocky with shallow soil. This heathland has some floristic elements of Community 40 of McDougall and Walsh (2007; *Epacris gunnii – Chionohebe pulvinatus* feldmark; e.g. *Leucochrysum albicans* and *Luzula australasica*) but the cushion species of Community 40 are absent. An unusual feature of some stands is the presence of *Baeckea gunniana*, a species usually associated with moist sites. It can sometimes be found layering over large granite boulders. The

diversity and abundance of herb species is usually low. Rock and bare ground are common.

On less exposed sites with deeper soil profiles, *Feldmark Heath - Carpet Heath - Snow Grass heath* often grades into a46 [*Alpine Mint-bush - Alpine Orites - Kosciuszko Nematolepis shrubland of the Australian Alps Bioregion*]. This community is found in Murray and Southern Rivers catchments but may extend into the upper Murrumbidgee catchment area.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Aciphylla glacialis	1	30	1	<1	P
Acrothamnus montanus	2	50	1	1	P
Brachyscome tenuiscapa	1	20	1	<1	P
Carex breviculmis	1	100	1	13	P
Carex hebes	1	30	1	1	P
Celmisia costiniana	1	80	1	1	P
Chionogentias muelleriana subsp. *alpestris*	1	30	1	<1	P
Craspedia aurantia	1	60	1	1	P
Craspedia costiniana	1	40	1	<1	P
Craspedia maxgrayi	1	70	1	<1	P
Deyeuxia carinata	1	20	1	<1	P
Deyeuxia crassiuscula	1	30	1	<1	P
Empodisma minus	1	30	2	3	P
Epacris sp. (*sensu* Costin *et al.* 2000)	3	90	1	2	P
Erigeron bellidioides	1	30	1	1	P
Erigeron nitidus	1	30	1	<1	P
Euphrasia collina subsp. *diversicolor*	1	40	1	1	P
Grevillea australis	2	40	1	2	P
Kunzea muelleri	5	30	2	1	P
Luzula alpestris	1	40	1	<1	P
Microseris lanceolata	1	60	1	7	P
Oreomyrrhis eriopoda	1	80	1	13	P
Pentachondra pumila	1	70	1	<1	P
Pimelea alpina	1	50	1	1	P
Poa costiniana	2	40	2	5	P
Poa fawcettiae	2	50	3	2	P
Poa hiemata	3	20	2	2	P
Poa saxicola	1	20	1	<1	P
Prasophyllum spp.	1	20	1	<1	P
Rytidosperma nudiflorum	1	60	1	2	P
Senecio pectinatus var. *major*	1	40	1	<1	P
Senecio pinnatifolius var. *alpinus*	1	30	1	3	P
Stackhousia pulvinaris	1	20	1	<1	P
Trisetum spicatum	1	40	1	3	P

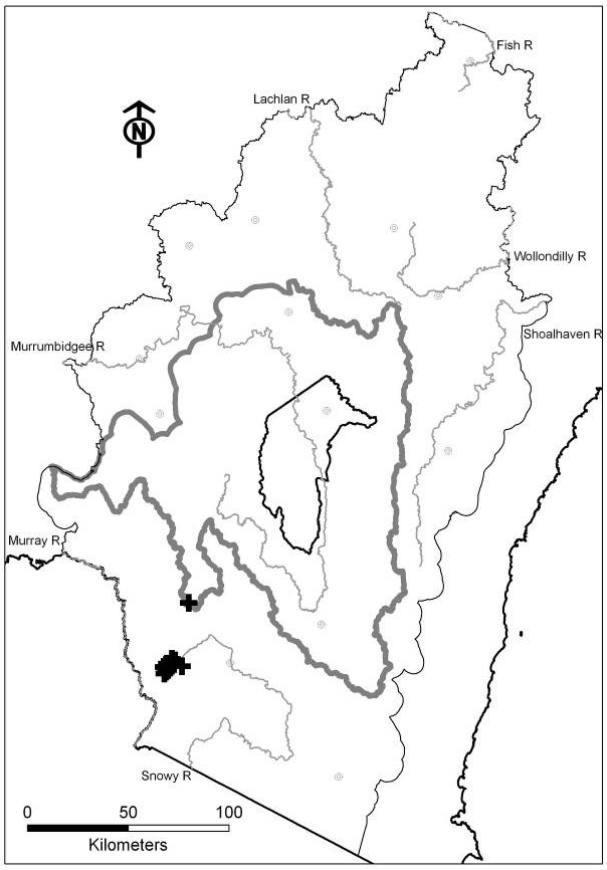


Figure a39: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: *Epacris serpyllifolia – Kunzea muelleri* alliance (Costin 1954); a combination of the *Epacris microphylla* and *Kunzea muelleri* associations (McVean 1969); 39 [*Kosciuszko alpine Epacris - Kunzea open heathland*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Acetosella vulgaris* (0.30).

Threats: Some examples (e.g. summit of Mt. Kosciuszko) are subject to trampling pressure by tourists. The top stations of some lifts in NSW ski resorts are positioned within this community. The impact of these pressures on the overall community is currently low.

Reservation Status: Entirely within Kosciuszko NP.

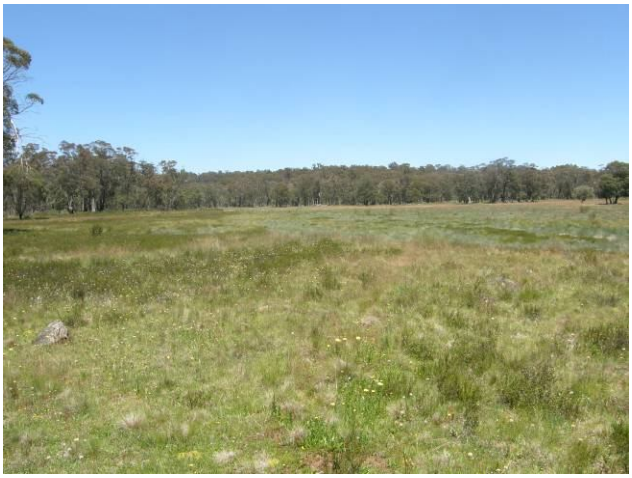
Extent of clearing: Nil, but severely degraded by grazing prior to the 1950s.

a42: Epacris - Fine-leaved Snow-grass - Bog Parrot-pea grassy heathland of the Australian Alps Bioregion

Scientific Name: *Epacris celata - Epacris gunnii / Poa clivicola - Deyeuxia gunniana - Cotula alpina - Lomandra* sp.

Number of samples:	3
Richness [mean (±SD)]:	26 (4)
Slope (degrees):	(0) 0-2 (3)
Altitude (m asl):	(1153) 1153-1155 (1156)
Ave. Annual Rainfall (mm):	(1367) 1369-1372 (1373)
Temp. Annual Range (°C):	(24.1) 24.2-24.2 (24.2)

Plate a42: Community a42, McPhersons Plain.



Vegetation Description: Community a42 is a grassy heathland comprised of very short plants of *Epacris celata* and *E. gunnii*. In stature and abundance, the shrubs are less prominent than the grasses (*Poa clivicola*, *P. sieberiana* and *Themeda australis*), which makes the community look more like a grassland than an open heathland. This community is not closely related to any of the other communities in the upper Murrumbidgee catchment. It is rare and isolated from other treeless vegetation in the Australian Alps.

This community is currently recorded only from McPhersons Plain, part of a high plateau on the western side of the Tumut Valley to the west of Kosciuszko NP. Considering other treeless plains on the plateau nearby (Sparks Plain and Tomneys Plain) have not been surveyed it is likely that it is not restricted to McPhersons Plain.

Adjoining communities include u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*] on upper slopes, a2 [*Alpine Baeckea - Swamp Heath - Candle Heath - Sphagnum wet heathland of the Australian Alps Bioregion (Bog)*] in areas of impeded drainage, and a14 [*Prickly Snow-grass - Tufted Sedge subalpine valley grassland of the Australian Alps Bioregion*], as well as a9 [*Tufted Sedge - Small River-buttercup - Common Reed aquatic herbfield of waterways in the Australian Alps and South Eastern Highlands Bioregions*] along waterways. Examples of a6 [*Dwarf Buttercup - Mud Pratia - Tufted Sedge herbfield of shallow depressions in the Australian Alps Bioregion*] are scattered within the community.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Asperula gunnii	1	67	1	5	P
Baloskion australe	1	33	1	2	P
Brachyscome decipiens	1	67	1	2	P
Brachyscome scapigera	1	100	1	2	P
Bulbine bulbosa	1	67	1	4	P
Caesia alpina	1	33	1	<1	P
Carex hebes	1	33	1	2	P
Cotula alpina	1	100	1	1	P
Deyeuxia crassiuscula	1	33	1	<1	P
Deyeuxia gunniana	1	100	1	<1	P
Dillwynia palustris	2	33	1	<1	P
Diuris monticola	1	33	1	<1	P
Diuris spp.	1	33	1	<1	P
Empodisma minus	1	67	2	4	P
Epacris celata	3	100	2	<1	P
Epacris gunnii	3	100	1	2	P
Erigeron bellidioides	1	33	1	1	P
Euphrasia collina subsp. *paludosa*	2	100	1	2	P
Gonocarpus micranthus	1	67	1	2	P
Hakea microcarpa	1	67	1	3	P
Hydrocotyle sibthorpioides	1	67	2	5	P
Hypericum japonicum	1	67	1	4	P
Lomandra sp. aff. *micrantha*	1	67	2	<1	P
Oreobolus distichus	1	33	1	<1	P
Pimelea biflora	1	33	1	<1	P
Plantago euryphylla	1	33	1	1	P
Poa clivicola	5	67	3	2	P
Prasophyllum spp.	1	67	1	<1	P
Pultenaea polifolia	1	33	1	<1	P
Ranunculus graniticola	1	100	1	4	P
Stylidium graminifolium sens. lat.	2	100	1	25	P
Carex breviculmis	1	67	1	13	C
Luzula flaccida	1	67	1	13	C
Poa sieberiana	3	67	2	48	C
Poranthera oreophila	2	67	1	27	C
Themeda australis	1	67	2	21	C

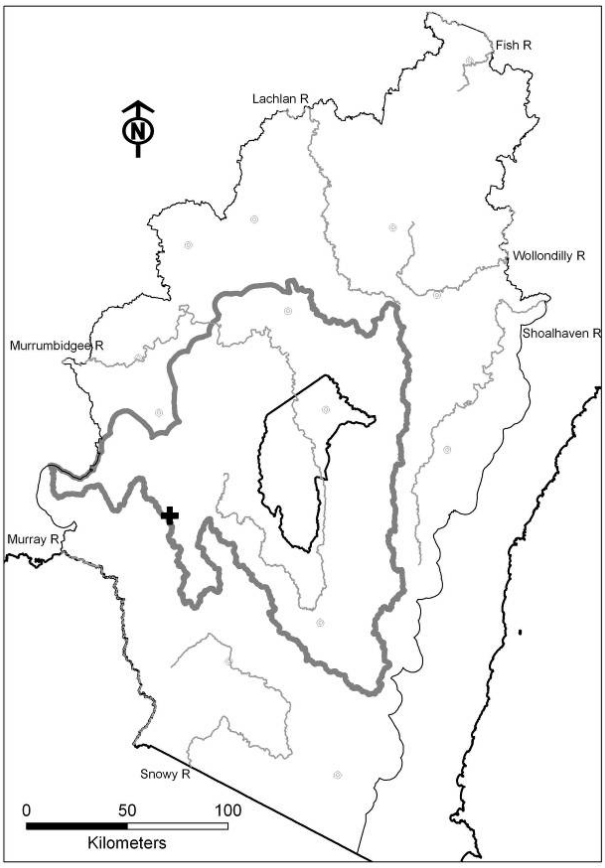


Figure a42: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: Community 42 [*Epacris celata – Poa clivicola open heathland*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Cerastium vulgare* (0.33), *Holcus lanatus* (0.33), *Hypochaeris radicata* (0.67), *Poa pratensis* (0.33), *Trifolium repens* (0.67).

Threats: Some of the community is the subject of a conservation agreement that fosters management of the vegetation for its significant biodiversity features. Despite this, the community is threatened overall by feral animals, stray domestic stock from neighbouring properties, and future changes in land use.

Reservation Status: Not present in a conservation reserve. McPhersons Plain is partly in a State Forest lease and partly freehold. Treeless plains nearby are freehold.

Extent of clearing: Nil but probably locally degraded by historic grazing practices.

a43: Dwarf Bossiaea - Kangaroo Grass low open heathland of the Australian Alps Bioregion

Scientific Name: *Bossiaea riparia - Cryptandra amara - Hakea microcarpa - Dillwynia prostrata / Themeda australis*

Number of samples:	3
Richness [mean (±SD)]:	23 (5)
Slope (degrees):	(3) 6-12 (15)
Altitude (m asl):	(1198) 1209-1254 (1289)
Ave. Annual Rainfall (mm):	(968) 971-980 (986)
Temp. Annual Range (°C):	(24.5) 24.7-24.9 (25)

Plate a43: Plant community a43 (left hand side), adjoining a30.

Vegetation Description: Community a43 is an open heathland characterised by an extensive cover of a prostrate form of the shrub *Bossiaea riparia* and much exposed rock. The associated flora is variable and may depend on the amount of soil present and the composition of the surrounding vegetation. Despite its variability, the community has few affinities with other communities. Of communities present in treeless subalpine plains, five species were restricted to community a43 or very rare elsewhere (*Bossiaea riparia*, *Cryptandra amara*, *Daviesia mimosoides* subsp. *acris*, *Mirbelia oxylobioides*, *Patersonia longifolia*). *P. longifolia* is otherwise unknown in the Alps.

This community is endemic to the upper Murrumbidgee catchment, being restricted to the rocky slopes above the upper Murrumbidgee River, and a few of its tributaries (in the vicinity of Currango Plain and Tantangara Dam). It possibly occurs at lower elevations adjacent to the Cotter River, Paddy's River and Murrumbidgee River in the ACT. It is typically found amongst a30 [*Dwarf Snow-grass - Fine-leaved Snow-grass - Silver Carraway - Granite Buttercup grassland of the Australian Alps Bioregion*] and sometimes in association with a34 [*Weeping Snow Gum - Small-fruited Hakea - Blue Snow-grass*

grassy open woodland of the Australian Alps Bioregion].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Agrostis venusta	1	33	1	<1	P
Australopyrum velutinum	1	33	1	<1	P
Austrodanthonia eriantha	1	33	2	1	P
Austrostipa nivicola	1	33	1	<1	P
Bossiaea riparia	2	100	1	<1	P
Calotis glandulosa	2	33	1	<1	P
Carex hebes	1	33	1	2	P
Cassinia monticola	1	33	1	1	P
Craspedia aurantia	1	33	1	2	P
Cryptandra amara	1	67	1	1	P
Dillwynia prostrata	4	67	2	<1	P
Diuris monticola	1	67	1	<1	P
Epilobium billardierianum	1	67	1	2	P
Festuca muelleri	1	33	1	<1	P
Hakea microcarpa	1	100	1	3	P
Luzula novae-cambriae	1	33	1	<1	P
Patersonia longifolia	2	33	2	1	P
Pimelea linifolia subsp. *caesia*	1	100	1	8	P
Pimelea pauciflora	1	33	1	<1	P
Poa clivicola	2	67	3	2	P
Poa hookeri	3	33	3	<1	P
Poa saxicola	1	33	1	<1	P
Podolepis jaceoides	1	67	1	1	P
Pultenaea subspicata	2	33	2	2	P
Rhodanthe anthemoides	1	33	1	1	P
Rutidosis leiolepis	2	33	2	<1	P
Senecio pinnatifolius var. *alpinus*	1	67	1	3	P
Themeda australis	1	100	2	21	P
Trisetum spicatum	1	67	1	3	P
Xerochrysum subundulatum	1	33	1	1	P
Carex breviculmis	1	67	1	13	C
Euchiton gymnocephalus	1	67	1	15	C
Luzula flaccida	1	67	1	13	C
Microlaena stipoides	1	67	2	34	C

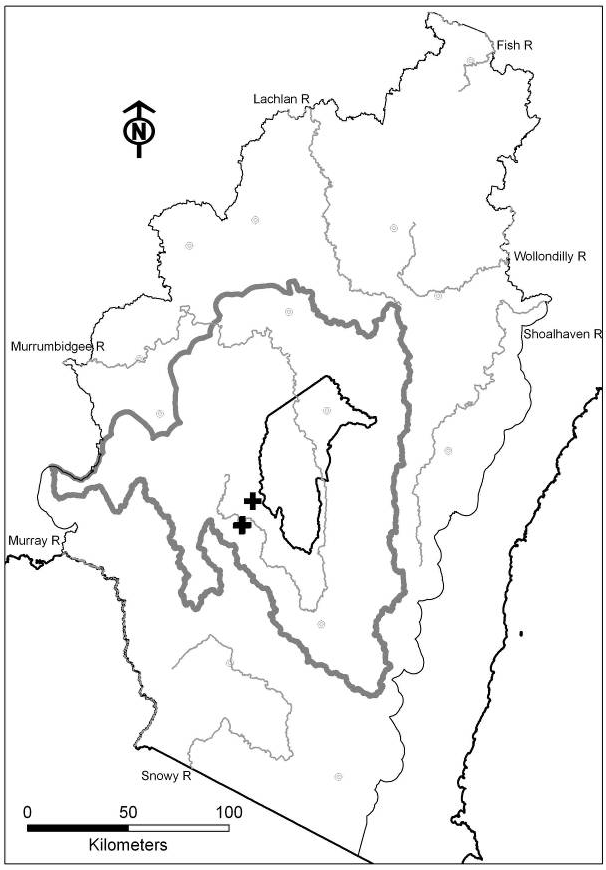


Figure a43: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: 43 [*Bossiaea riparia dwarf heathland*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Acetosella vulgaris* (0.33), *Agrostis capillaris* (0.33), *Aira caryophyllea* (0.33), *Anthoxanthum odoratum* (0.33), *Hypericum perforatum* (0.33), *Hypochaeris radicata* (1.00), *Vulpia bromoides* (0.33).

Threats: None obvious.

Reservation Status: All known examples occur within Kosciuszko NP.

Extent of clearing: Unknown but probably nil. Many examples on the steep slopes of the Murrumbidgee River at Gulf Bend are sparsely vegetated and may be recovering from past disturbance associated with domestic grazing.

a46: Alpine Mint-bush - Alpine Orites - Kosciuszko Nematolepis heathland of the Australian Alps Bioregion

Scientific Name: *Nematolepis ovatifolia - Orites lancifolius - Prostanthera cuneata - Olearia brevipedunculata - Grevillea australis*

Number of samples:	17
Richness [mean (±SD)]:	22 (7)
Slope (degrees):	(1) 5-12 (18)
Altitude (m asl):	(1635) 1749-1945 (2009)
Ave. Annual Rainfall (mm):	(1851) 2075-2296 (2438)
Temp. Annual Range (°C):	(20.2) 20.6-21.5 (21.7)

Plate a46:

Vegetation Description: Community a46 is a shrubland which is scattered and common on the dry slopes of the Kosciuszko Main Range between Dead Horse Gap (near Thredbo) and Mt. Jagungal. Dominant species include *Nematolepis ovatifolia*, *Orites lancifolia* and/or *Prostanthera cuneata* but other shrubs such as *Grevillea australis*, *Hovea montana*, *Kunzea muelleri* and *Oxylobium ellipticum* may be locally abundant. Shrub cover is sparse at its upper altitudinal limits and closed at its lower.

Alpine Mint-bush - Alpine Orites - Kosciuszko Nematolepis shrubland is a combination of two shrub-dominated communities described by McDougall and Walsh (2007), which represent a continuum from near the treeline, where shrubs are tall and closed with a sparse herb cover, to the alpine zone, where shrubs are shorter and gaps between shrubs are filled with species characteristic of a22 [*Snow-grass - Herbfield Celmisia - Woolly Billy-button grassland of the Australian Alps Bioregion*]. In fact, at their boundaries, these communities are probably inseparable. At its lower extent, *Alpine Mint-bush - Alpine Orites - Kosciuszko Nematolepis shrubland* grades into u158 [*Alpine Sallee shrub-grass subalpine mid-high woodland of the Australian Alps Bioregion*].

There are outliers in the upper Murrumbidgee catchment in the upper Tumut valley and at Kiandra. The Kiandra example contains the northern-most population of *Phebalium squamulosum* subsp. *alpinum*.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Aciphylla simplicifolia	1	24	1	2	P
Acrothamnus montanus	1	29	1	1	P
Argyrotegium fordianum	1	24	1	<1	P
Asperula gunnii	1	41	1	5	P
Carex breviculmis	1	82	1	13	P
Celmisia costiniana	2	24	1	1	P
Celmisia pugioniformis	1	47	1	2	P
Craspedia aurantia	1	65	1	1	P
Deyeuxia crassiuscula	1	24	1	<1	P
Empodisma minus	1	24	2	3	P
Erigeron bellidioides	1	35	1	1	P
Erigeron nitidus	1	59	1	<1	P
Euphrasia collina subsp. *diversicolor*	1	29	1	1	P
Gonocarpus montanus	1	24	1	1	P
Grevillea australis	2	82	1	1	P
Leptorhynchos squamatus	2	24	1	3	P
Luzula alpestris	1	24	1	<1	P
Luzula modesta	1	29	1	2	P
Lycopodium fastigiatum	1	29	1	<1	P
Melicytus sp. 'Snowfields'	1	53	1	3	P
Microseris lanceolata	1	47	1	7	P
Nematolepis ovatifolia	3	82	2	<1	P
Olearia algida	1	29	1	<1	P
Olearia brevipedunculata	1	29	1	<1	P
Olearia phlogopappa sens. lat.	1	24	1	3	P
Oreomyrrhis eriopoda	1	65	1	13	P
Orites lancifolius	3	24	2	<1	P
Oxylobium ellipticum	2	29	1	4	P
Pimelea alpina	1	71	1	1	P
Plantago euryphylla	1	41	1	<1	P
Poa costiniana	2	29	2	5	P
Poa fawcettiae	4	35	3	2	P
Poa hiemata	3	65	2	1	P
Prostanthera cuneata	2	53	2	<1	P
Ranunculus graniticola	1	41	1	4	P
Rytidosperma nudiflorum	1	41	1	2	P
Scleranthus biflorus	1	41	1	10	P
Senecio pinnatifolius var. *alpinus*	1	35	1	3	P

Trisetum spicatum	1	41	1	2	P
Viola betonicifolia	1	53	1	27	C

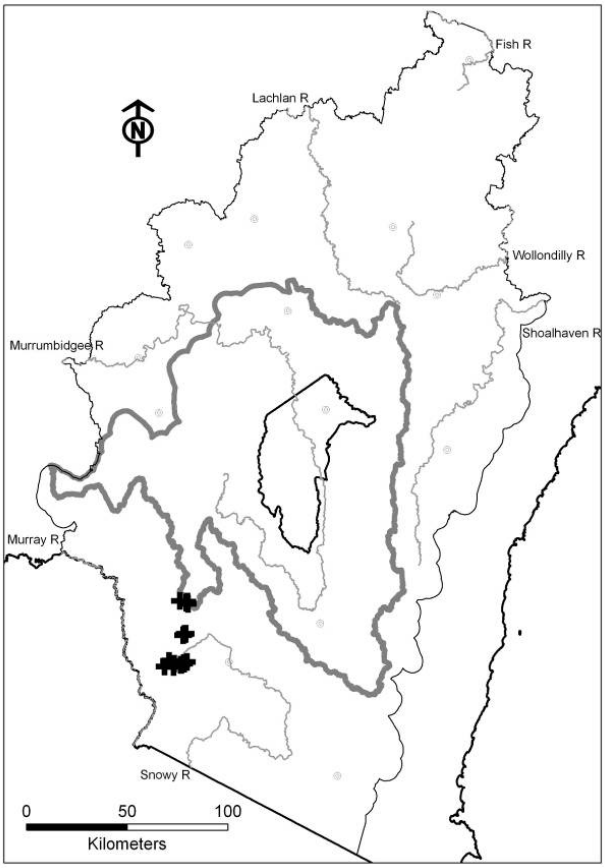


Figure a46: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: part of *Oxylobium ellipticum – Podocarpus alpinus* alliance (Costin 1954); *Phebalium ovatifolium* association (McVean 1969); part of Heath Formation (Costin *et al.* 2000); combination of 23 [*Grevillea australis – Nematolepis ovatifolia open heathland*] and 46 [*Nematolepis ovatifolia – Prostanthera cuneata closed heathland*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Acetosella vulgaris* (0.65).

Threats: None obvious. This community is apparently expanding either under the influence of climate change or because of past disturbance from grazing. Much of this community was burnt in 2003 but regeneration of most species seems to have occurred (Walsh and McDougall 2005).

Reservation Status: All within Kosciuszko National Park.

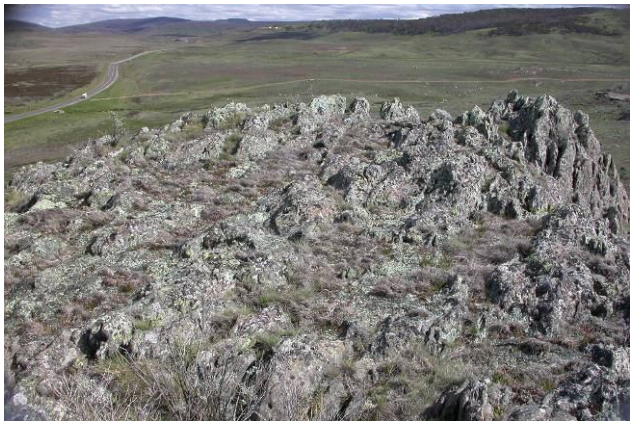
Extent of clearing: Nil.

a51: Mountain Plum Pine - Crag Wallaby-grass - Snow-daisy low open heathland of rock outcrops of the Australian Alps Bioregion

Scientific Name: *Podocarpus lawrencei - Grevillea australis / Austrodanthonia alpicola - Brachyscome nivalis - Polystichum proliferum*

Number of samples:	5
Richness [mean (±SD)]:	22 (7)
Slope (degrees):	(9) 15-22 (30)
Altitude (m asl):	(1911) 2029-2076 (2153)
Ave. Annual Rainfall (mm):	(2316) 2322-2576 (2653)
Temp. Annual Range (°C):	(19.7) 20-20.2 (20.7)

Plate a51:



Vegetation Description: Community a51 is a low sparse shrubland occuring on cliffs and other rocky outcrops from Mt. Buller in Victoria to Kiandra in NSW. It is especially common on the higher peaks of the Kosciuszko Main Range and Mt. Jagungal area. Although described in the past as a grassland community dominated by *Austrodanthonia alpicola*, this community often has a significant component of shrubs (mostly *Grevillea australis*, *Leucopogon montanus* or *Podocarpus lawrencei*). Plant cover in general is minimal. Herbs and grasses such as *Austrodanthonia alpicola*, *Brachyscome nivalis*, *Brachyscome rigidula*, *Crassula sieberiana* and *Luzula novae-cambriae* occur in most examples and are rarely found in other communities in the Alps.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acaena novae-zelandiae	1	40	1	28	C
Aciphylla glacialis	1	20	1	<1	P
Acrothamnus montanus	1	80	1	1	P
Argyrotegium fordianum	1	20	1	<1	P

Argyrotegium mackayi	1	20	1	<1	P
Asperula pusilla	1	20	1	<1	P
Austrodanthonia alpicola	1	100	1	<1	P
Brachyscome nivalis	1	40	1	<1	P
Cardamine robusta	1	20	1	<1	P
Carex breviculmis	1	60	1	13	C
Celmisia pugioniformis	2	40	1	2	P
Chionogentias muelleriana subsp. *alpestris*	1	20	1	<1	P
Craspedia adenophora	1	20	1	<1	P
Craspedia aurantia	1	40	1	2	P
Craspedia maxgrayi	1	20	1	<1	P
Crassula sieberiana	1	40	1	6	C
Deyeuxia crassiuscula	1	60	1	<1	P
Epilobium billardierianum	1	60	1	2	P
Erigeron nitidus	1	20	1	<1	P
Ewartia nubigena	1	60	1	<1	P
Luzula novae-cambriae	1	20	1	<1	P
Lycopodium fastigiatum	1	40	1	<1	P
Melicytus sp. 'Snowfields'	1	60	1	3	P
Microseris lanceolata	1	60	1	7	P
Nematolepis ovatifolia	2	40	3	<1	P
Olearia brevipedunculata	1	20	1	<1	P
Oreomyrrhis brevipes	1	20	0	0	P
Oreomyrrhis eriopoda	1	80	1	13	P
Ozothamnus secundiflorus	1	20	1	<1	P
Poa costiniana	1	60	2	5	P
Poa fawcettiae	3	60	3	2	P
Poa saxicola	1	20	1	<1	P
Podocarpus lawrencei	2	80	2	<1	P
Polystichum proliferum	1	80	1	7	P
Prostanthera cuneata	2	40	2	<1	P
Rytidosperma nudiflorum	1	40	1	2	P
Scleranthus singuliflorus	1	60	1	<1	P
Senecio pectinatus var. *major*	1	20	1	<1	P
Senecio pinnatifolius var. *alpinus*	1	60	1	3	P
Trisetum spicatum	1	60	1	3	P
Viola betonicifolia	1	80	1	27	C

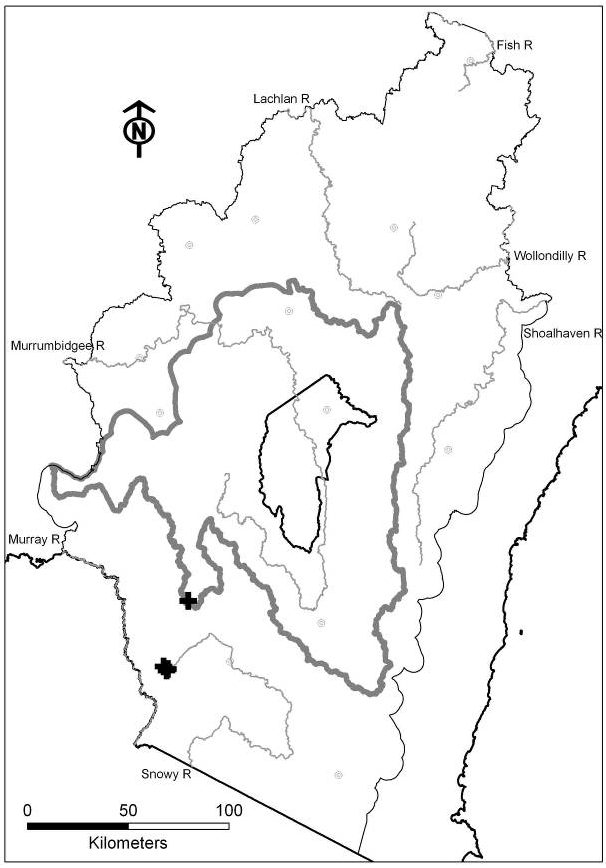


Figure a51: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: *Brachycome nivalis – Danthonia alpicola* alliance (Costin 1954); *Poa hothamensis* (rocky) grassland, Unit 13 (McDougall 1982); *Brachyscome - Austrodanthonia* tall alpine herbfield (Costin *et al.* 2000); 51: *Austrodanthonia alpicola – Grevillea australis* open heathland (McDougall and Walsh 2007).

Frequently-occurring weeds: *Acetosella vulgaris* (0.80), *Hypochaeris radicata* (0.40).

Threats: Examples of this community on cliffs above Blue Lake in Kosciuszko NP are possibly threatened by rock climbing. Examples elsewhere may be damaged by tourists climbing rocky outcrops for better views but the overall threat to the community from these activities is currently low.

Reservation Status: Likely to be entirely within Kosciuszko NP.

Extent of clearing: Nil.

a54: Mountain Plum Pine – Tall Rice-flower heathland of screes and boulder-fields of the Australian Alps Bioregion

Scientific Name: *Podocarpus lawrencei – Pimelea ligustrina* subsp. *ciliata / Polystichum proliferum*

Number of samples:	2
Richness [mean (±SD)]:	15 (6)
Slope (degrees):	(6) 7-8 (8)
Altitude (m asl):	(1766) 1798-1861 (1892)
Ave. Annual Rainfall (mm):	(2062) 2096-2164 (2198)
Temp. Annual Range (°C):	(20.7) 20.9-21.3 (21.5)

Plate a54:

Vegetation Description: Community a54 is a closed shrubland dominated by Mountain Plum Pine (*Podocarpus lawrencei*). It occurs in areas of minimal soil development and abundant large rocks in the alpine and subalpine areas of Victoria (Bogong High Plains, Mt. Hotham area, Mt. Howitt, Mt. Buffalo, Cobberas and Crosscut Saw) and NSW (between Mt. Kosciuszko and Mt. Jagungal, and the steep slopes of the Tumut valley in the vicinity of Cabramurra). Scree slopes containing *Podocarpus lawrencei* in the ACT may also be referable to this community but further sampling is required to confirm this. Examples have been recorded on metamorphic rock, where *Podocarpus lawrencei* layers over large rock slabs on granite boulder streams and outcrops and on basalt scree. The species composition of plots depends on the location of drainage features, which often pass under the boulders. Species characteristic of wetlands (e.g. *Richea continentis*) may therefore be found in damp parts of the habitat. Species richness is commonly low and in sites with large rocks and no exposed soil there were often only a few species per plot.

This community is highly restricted and the primary habitat for the Mountain Pygmy Possum (*Burramys parvus*), an endangered mammal. It is usually found in screes and bounder fields amongst u158 [*Alpine Sallee shrub-grass subalpine mid-high woodland of the Australian Alps Bioregion*] or a46 [*Alpine Mint-bush - Alpine Orites - Kosciuszko Nematolepis heathland of the Australian Alps Bioregion*]. After the 2003 fires, the diversity of many *Podocarpus lawrencei* heathlands increased. *Pelargonium helmsii*, a species rarely recorded prior to 2003, was found to be common in many burnt *Podocarpus lawrencei*-dominated heathlands in Kosciuszko NP. A population of *Senecio velleioides*, normally a wet sclerophyll forest species, was located in this community two years after the fire at 1880 m above sea level on Blue Cow Mountain. This is the first record for this species in treeless vegetation in the Australian Alps.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Argyrotegium fordianum	1	50	1	<1	P
Baeckea gunniana	2	50	2	1	P
Carex breviculmis	1	50	1	13	C
Deyeuxia monticola	1	50	1	6	C
Epilobium billardierianum	1	50	1	2	P
Erigeron nitidus	1	100	1	<1	P
Grevillea australis	2	50	2	2	P
Lagenophora stipitata	1	50	1	17	C
Lycopodium fastigiatum	1	50	1	<1	P
Nematolepis ovatifolia	2	100	3	<1	P
Olearia brevipedunculata	1	50	1	<1	P
Olearia phlogopappa	1	50	1	3	P
Oreomyrrhis eriopoda	1	50	1	13	C
Orites lancifolius	2	100	3	<1	P
Pimelea axiflora subsp. *alpina*	1	50	1	<1	P
Pimelea ligustrina subsp. *ciliata*	1	100	1	<1	P
Poa hiemata	1	50	2	2	P
Podocarpus lawrencei	4	100	2	<1	P
Polystichum proliferum	1	100	1	7	P
Prostanthera cuneata	3	100	2	<1	P
Richea continentis	1	50	2	<1	P
Senecio gunnii	1	50	1	9	C

Threatened Communities: Nil (but possibly eligible for listing).

Equivalent vegetation types: part of *Oxylobium ellipticum – Podocarpus alpinus* alliance (Costin 1954); *Podocarpus lawrencei* association (McVean 1969); *Podocarpus* heathland, Unit 1 (McDougall 1982); *Podocarpus* heathland, subcommunity 1.1 (Walsh *et al.* 1984); 54 [*Podocarpus lawrencei closed heathland*] (McDougall and Walsh 2007).

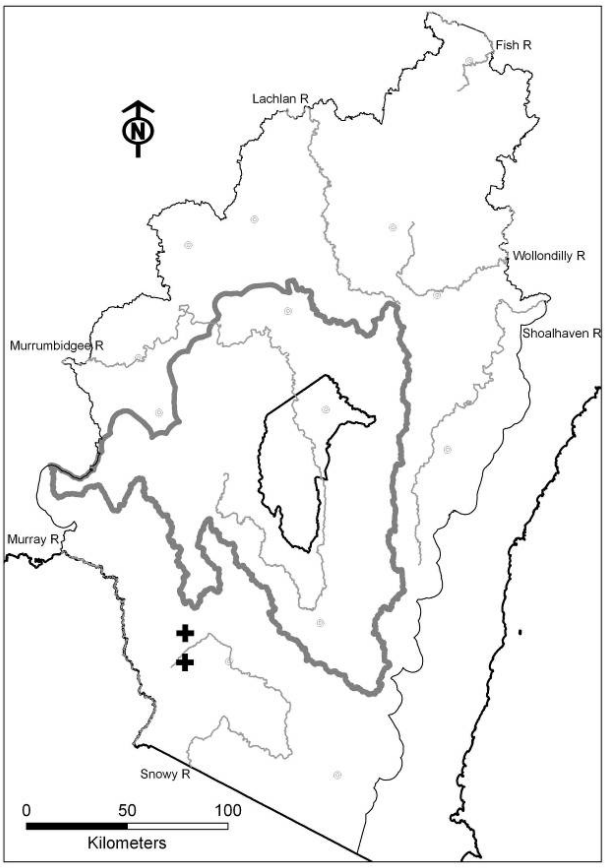


Figure a54: Distribution of field samples assigned to this community.

Frequently-occurring weeds: *Acetosella vulgaris* (0.5).

Threats: Surveys of regeneration following the 2003 fires suggest that recovery of many stands will be slow and patchy, and some may not recover at all in the short term. Basal regeneration of *Podocarpus lawrencei* has been observed in some populations in the ACT and Cobberas (Carey *et al.* 2003, Tolsma *et al.* 2004) but none appears to have occurred in Kosciuszko NP (McDougall and Broome unpublished data). Resprouting of partially burnt stems did occur throughout its range but it tended to be rare and much of the regeneration subsequently died. Seedlings were observed in the summer following the fire but these have been rare or patchy at some sites. At Mt. Blue Cow, for instance, very few seedlings could be found in the summit area. Further downslope, seed germination did occur in the three snow-free seasons following the fire and seedlings were locally abundant. Supplementary planting of *Podocarpus lawrencei* may be necessary in the summit area of Mt. Blue Cow if the community is to persist there with its structural dominant. This task will be very difficult because there is little soil in which to plant.

Dendrochronological research on *Podocarpus lawrencei* indicates that plants are up to 400 years old. Since the plants are obligate seeders (in NSW at least), catastrophic fires must be rare in this community. Too frequent fire is therefore a grave threat to this community and its iconic resident, the Mountain Pygmy Possum.

Reservation Status: All within Kosciuszko NP.

Extent of clearing: Nil.

g36: Button Tea-tree - Yellow Kunzea - Burgan dry heathland on skeletal ridges primarily of the Namadgi Region

Scientific Name: *Leptospermum micromyrtus - Kunzea muelleri - Kunzea ericoides / Carex breviculmis - Gonocarpus tetragynus*

Number of samples:	8
Richness [mean (±SD)]:	15 (4)
Slope (degrees):	(3) 11-23 (30)
Altitude (m asl):	(1123) 1370-1461 (1634)
Ave. Annual Rainfall (mm):	(928) 1043-1137 (1357)
Temp. Annual Range (°C):	(22.1) 23.4-23.9 (25.2)

Vegetation Description: Community g36 is a dense shrubland interspersed with large expanses of unvegetated rock outcrop. Dominant species include *Leptospermum micromyrtus*, *Kunzea ericoides*, *Calytrix tetragona*, *Kunzea muelleri* and *Leionema lamprophyllum*. *Epacris robusta* and *Oxylobium ellipticum* may also be locally common and *Eucalyptus cinerea* subsp. *triplex* is an emergent (up to 10 m tall) at one site. *Carex breviculmis*, *Derwentia perfoliata*, *Gonocarpus tetragynus* and *Poa* spp. are common ground cover elements. Species such as *Pelargonium australe*, *Trachymene composita* and the endangered *Dampiera fusca* are likely to be ephemeral components that increase in abundance after fire.

This community has been recorded on granite outcrops at Booroomba Rocks in the ACT, the NSW side of Mt. Coree on the NSW / ACT border (Brindabella NP) and in Yaouk NR in NSW. It was identified as *Montane / Sub-Alpine Dry Rocky Shrubland* by Gellie (2005). Modelling by Gellie (2005), which suggested that the community extends from the ACT to the higher parts of Kosciuszko NP to the south-west (in the vicinity of the Main Range), is not supported by subsequent plot sampling. While the exact distribution of this community is uncertain because of undersampling (a probable consequence of the remoteness of the areas in which it occurs), the distribution of one of its character species gives a clue to the likely distribution. The variant of *Asterolasia trymalioides* that occurs in this community is likely to be recognized at subspecific rank (Keith McDougall pers. comm.). It is found at Booroomba

Rocks in Namadgi NP and granite outcrops along the ACT / NSW border (e.g. Mt. Kelly, Mt. Scabby) to Yaouk NR. This variant also occurs in Tinderry NR (Twin Peaks) in similar habitat and with many of the characteristic species listed below, however its relationship to this plant community has not been investigated through plot sampling.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Asterolasia aff. *trymalioides*	2	25	2	<1	P
Austrodanthonia fulva	2	25	2	1	P
Baeckea utilis	1	25	2	2	P
Bulbine glauca	1	25	1	<1	P
Callistemon pallidus	1	25	1	<1	P
Calytrix tetragona	3	25	2	1	P
Carex breviculmis	2	63	1	13	P
Derwentia perfoliata	1	38	1	4	P
Deyeuxia monticola	1	38	1	5	P
Epacris robusta	2	25	0	0	P
Kunzea ericoides	3	75	2	4	P
Kunzea muelleri	3	75	2	<1	P
Leptospermum micromyrtus	2	88	1	<1	P
Leptospermum namadgiensis	2	25	0	0	P
Leucopogon attenuatus	2	38	1	1	P
Oxylobium ellipticum	2	38	1	4	P
Pelargonium australe	1	38	1	<1	P
Poa induta	2	38	3	6	P
Prostanthera decussata	2	25	2	<1	P
Thelymitra spp.	1	25	1	3	P
Trachymene composita	3	25	1	<1	P
Gonocarpus tetragynus	2	50	2	48	C

Threatened Communities: Nil.

Equivalent vegetation types: Equivalent to VG36 [*Montane / Sub-Alpine Dry Rocky Shrubland*] (Gellie 2005).

Frequently-occurring weeds: Highest frequency weeds were *Hypochaeris glabra*, *Hypochaeris radicata*, *Vulpia bromoides*, *Vulpia myuros* f. *megalura* (all 0.20).

Threats: None known.

Reservation Status: Likely to be entirely within conservation reserves; recorded from Namadgi NP (ACT), Brindabella NP and Yaouk NR.

Extent of clearing: Nil.

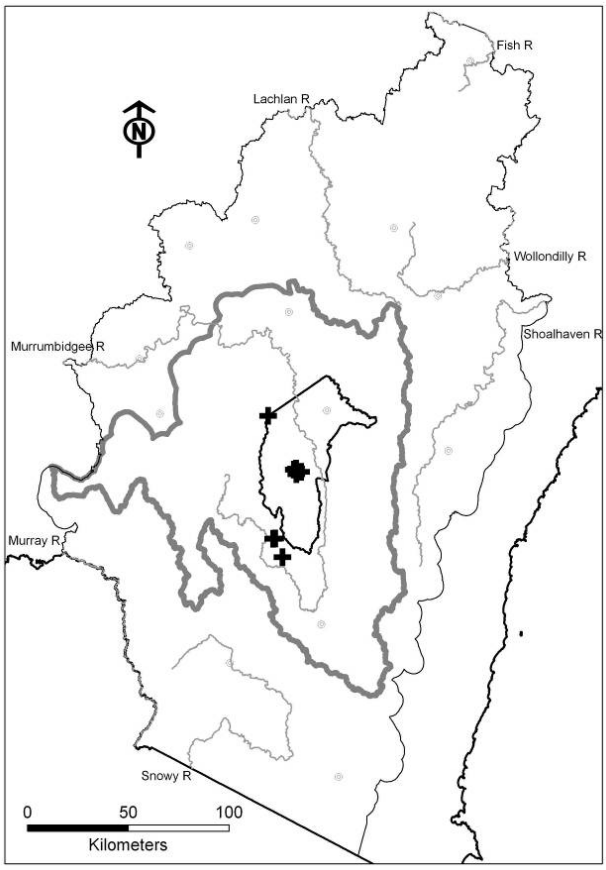


Figure g36: Distribution of field samples assigned to this community.

CLASS: ALPINE BOGS AND FENS

a2: Alpine Baeckea - Swamp Heath - Candle Heath - Sphagnum wet heathland of the Australian Alps Bioregion (Bog)

Scientific Name: *Baeckea gunniana - Epacris paludosa - Richea continentis / Carex gaudichaudiana - Sphagnum cristatum*

Number of samples:	38
Richness [mean (±SD)]:	20 (6)
Slope (degrees):	(0) 2-9 (20)
Altitude (m asl):	(1149) 1377-1741 (2004)
Ave. Annual Rainfall (mm):	(999) 1383-2051 (2488)
Temp. Annual Range (°C):	(20.3) 21.5-23.6 (24.8)

Plate a2:

Vegetation Description: Community a2 generally occurs as a low closed wet heathland dominated by *Baeckea gunniana*, *Epacris paludosa* (and at higher altitudes, *E. glacialis*) and *Richea continentis* with intervening areas dominated by *Sphagnum cristatum* (*S. novo-zelandicum* in pools) and associated herbs (e.g. *Astelia alpina*, *A. psychrocharis*, *Baloskion australe*, *Carex gaudichaudiana*, *Carpha nivicola*, *Celmisia* spp. (*C. pugioniformis*, *C. 'pulchella'* ms., *C. tomentosa*), *Diplaspis nivis*, *Empodisma minus*, *Erigeron paludicola*, *Oreobolus distichus*, *Oschatzia cuneifolia* and *Poa costiniana*. At lower elevations it may be a closed heath dominated by shrubs such as *Baeckea gunniana*, *Epacris paludosa*, *Richea continentis*, *Callistemon pityoides* and *Epacris breviflora*. It is found mainly in broad valleys, but also in seepage zones on slopes of low relief and along margins of smaller watercourses. Free water, either as pools or as slow-flowing streams, may or may not be present.

This community is widespread through the northern Alps and higher sub-alps, occurring in patches from the Brindabella Ranges in the ACT through to Kosciuszko NP in NSW (possibly extenting into the South Eastern Highlands at lower altitudes). In Victoria it is known from The Cobberas and across the Bogong High Plains, with outlying examples on the Mt. Buffalo plateau. In the upper Murrumbidgee catchment, examples of this community are generally small, occurring in linear strips along creeks or as patches of less than 100 m^2. Most are found in conservation reserves (Kosciuszko NP, Bimberi NR, Namadgi NP) but there are limited occurrences on State Forest and private land east of Tumbarumba.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Aciphylla simplicifolia	1	29	1	2	P
Asperula gunnii	1	45	1	4	P
Astelia psychrocharis	1	32	1	<1	P
Baeckea gunniana	1	79	2	<1	P
Baloskion australe	1	55	1	1	P
Brachyscome obovata	1	39	1	<1	P
Carex gaudichaudiana	1	95	2	3	P
Carpha nivicola	1	29	1	<1	P
Celmisia pugioniformis	1	32	1	2	P
Empodisma minus	3	97	2	2	P
Epacris glacialis	2	26	1	<1	P
Epacris gunnii	1	24	1	2	P
Epacris paludosa	2	71	2	<1	P
Epilobium gunnianum	1	39	1	1	P
Erigeron paludicola	1	37	1	<1	P
Gonocarpus micranthus	1	29	1	2	P
Hakea microcarpa	1	21	1	3	P
Luzula modesta	1	53	1	2	P
Oreobolus distichus	1	50	1	<1	P
Oreomyrrhis ciliata	1	50	1	2	P
Oschatzia cuneifolia	1	24	1	<1	P
Poa costiniana	2	95	2	4	P
Ranunculus pimpinellifolius	1	24	1	1	P
Richea continentis	3	61	1	<1	P
Rytidosperma nivicola	1	24	1	<1	P
Sphagnum cristatum	4	89	2	<1	P

Threatened Communities: TSC Act 1995 - *Montane Peatlands and Swamps of the New England Tableland*, *NSW North Coast*, *Sydney Basin*, *South East Corner*, *South Eastern Highlands and Australian Alps bioregions*; EPBC Act 1999 - *Alpine Sphagnum Bogs and Associated Fens*.

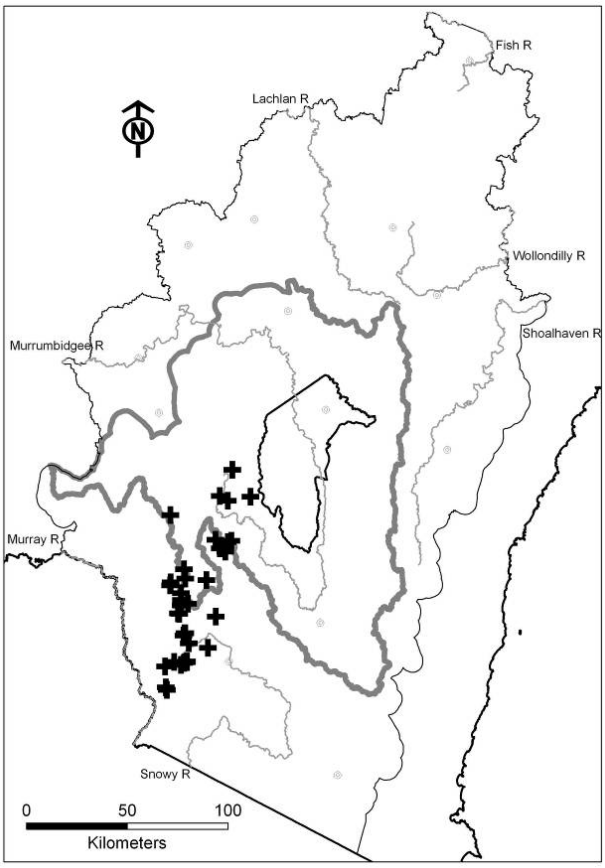


Figure a2: Distribution of field samples assigned to this community.

Equivalent vegetation types: *Epacris paludosa – Sphagnum cymbifolium* alliance and *Carex gaudichaudiana – Sphagnum cymbifolium* alliance and *Epacris breviflora – Blindia robusta* alliance (Costin 1954); *Sphagnum – Richea – Astelia* association (McVean 1969); types 4a and 4b (Helman and Gilmour 1985); groups 11 and 12 (Helman *et al.* 1988), combination of Community 2 [*Richea continentis – Carpha nivicola – Sphagnum cristatum wet heathland*] and Community 3 [*Baeckea gunniana – Callistemon pityoides - Sphagnum cristatum wet heathland*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Trifolium repens* is the most frequently-occurring weed in the community (7% of plots).

Threats: Historically this community was heavily degraded by cattle and sheep grazing, and by fire used for grazing management. Many examples were drained for water management during the Snowy Hydro Scheme and some were destroyed in early ski resort development. Damage still occurs as a result of trampling by feral horses, deer and pigs. Some freehold examples are still affected by domestic grazing practices.

Reservation Status: Most examples of this community are in Kisciuskko NP and Namadgi NP. A few are in State Forest and freehold land adjoining Kosciuszko NP.

Extent of clearing: Not assessed. Very little has been cleared but all has been degraded.

a7: Bog Buttercup – Creeping Raspwort herbfield of wetland margins in the Australian Alps Bioregion

Scientific Name: *Gonocarpus micranthus - Ranunculus pimpinellifolius – Carex gaudichaudiana – Cotula alpina – Hydrocotyle algida – Neopaxia australasica*

Number of samples:	2
Richness [mean (±SD)]:	20 (8)
Slope (degrees):	(2) 4-7 (9)
Altitude (m asl):	(1577) 1582-1591 (1595)
Ave. Annual Rainfall (mm):	(1775) 1817-1902 (1944)
Temp. Annual Range (°C):	(21.8) 21.9-22 (22)

Plate a7:

Vegetation Description: Community a7 is a herbfield occuring in broad valleys or around seepage zones on flat ground anywhere in the subalpine zone where soils are relatively deep and permanently sodden (but not inundated); often found on sites with basaltic parent material. Forbs such as *Hypericum japonicum*, *Ranunculus pimpinellifolius*, *Gonocarpus micranthus*, *Nertera granadensis* and *Epilobium curtisiae* are the usual dominants and form a dense mat of overlapping leaves.

Examples of this community are often small (a few m^2) and adjoin a2 [*Alpine Baeckea - Swamp Heath - Candle Heath - Sphagnum wet heathland of the Australian Alps Bioregion*]. It has been recorded from Boggy Plain near Tantangara, Long Plain and Bogong Plain near Mt. Jagungal (all in the upper Murrumbidgee catchment) but undoubtedly commonly occurs elsewhere within the subalpine

area and possibly into the ACT. It is also found in the Victorian high country.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Agrostis venusta	1	50	1	<1	P
Baeckea gunniana	1	50	2	1	P
Brachyscome tadgellii	1	50	1	<1	P
Carex cephalotes	1	50	1	<1	P
Carex echinata	1	50	1	<1	P
Carex gaudichaudiana	3	100	2	4	P
Cotula alpina	2	100	1	1	P
Epilobium curtisiae	1	50	1	<1	P
Epilobium gunnianum	1	100	1	1	P
Gonocarpus micranthus	2	100	1	2	P
Hydrocotyle algida	2	100	1	1	P
Isolepis subtilissima	2	50	1	<1	P
Juncus falcatus	2	50	1	<1	P
Luzula modesta	1	50	1	2	P
Myriophyllum alpinum	2	50	1	<1	P
Myriophyllum pedunculatum	1	50	1	<1	P
Neopaxia australasica	2	100	1	1	P
Nertera granadensis	1	50	1	<1	P
Olearia algida	1	50	1	<1	P
Oreobolus pumilio	1	50	2	<1	P
Oreomyrrhis ciliata	2	100	1	2	P
Poa costiniana	1	100	2	5	P
Ranunculus millanii	1	100	1	<1	P
Ranunculus pimpinellifolius	3	100	1	1	P
Richea continentis	1	50	2	<1	P
Rytidosperma nivicola	1	50	1	<1	P
Veronica serpyllifolia	1	50	1	<1	P
Acaena echinata	1	50	1	9	C
Hypericum japonicum	1	50	1	4	C

Threatened Communities: TSC Act 1995 - *Montane Peatlands and Swamps of the New England Tableland*, *NSW North Coast*, *Sydney Basin*, *South East Corner*, *South Eastern Highlands and Australian Alps bioregions.*

Equivalent vegetation types: 7 [*Hypericum japonicum – Ranunculus pimpinellifolius herbfield*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Taraxacum officinale* (0.5), *Trifolium repens* (0.5).

Threats: A relatively high weed percentage in plots (particularly *Acetosella vulgaris*, *Cerastium glomeratum*, *Holcus lanatus* and *Trifolium repens*) is indicative of disturbance and relatively benign growing conditions. Sites in NSW may be affected by pigs and are especially vulnerable to trampling by feral horses.

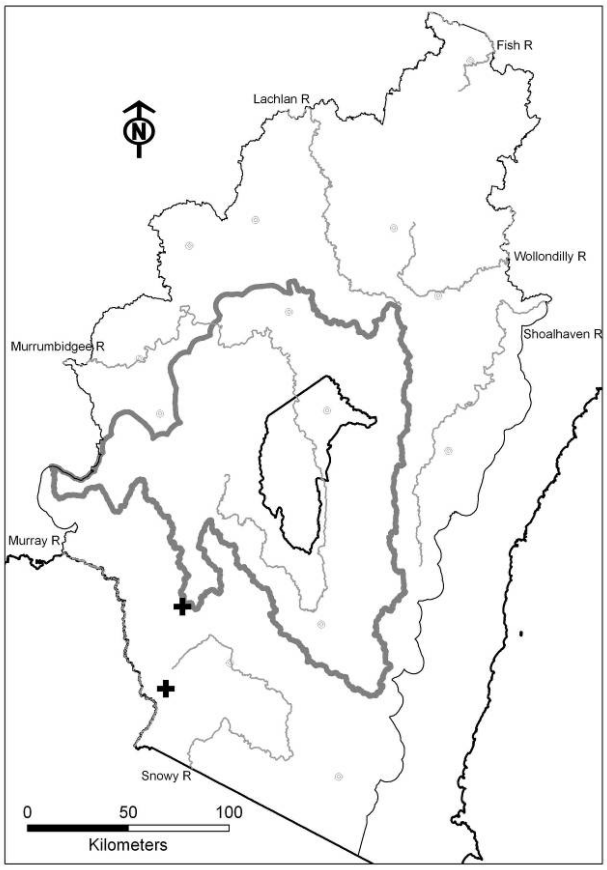


Figure a7: Distribution of field samples assigned to this community.

Reservation Status: Possibly all within Kosciuszko NP.

Extent of clearing: Nil, but probably severely damaged by trampling when grazed by domestic stock.

a8: Tufted Sedge - Mud Water-milfoil - Tufted Hair-grass sedgeland of the Australian Alps Bioregion (Fen)

Scientific Name: *Carex gaudichaudiana - Myriophyllum pedunculatum - Deschampsia caespitosa - Isolepis montivaga*

Number of samples:	7
Richness [mean (±SD)]:	12 (6)
Slope (degrees):	(1) 2-4 (13)
Altitude (m asl):	(1281) 1559-1760 (1920)
Ave. Annual Rainfall (mm):	(1525) 1758-2040 (2405)
Temp. Annual Range (°C):	(20.7) 21.4-21.9 (23.5)

Plate a8:

Vegetation Description: Community a8 is a wet sedgeland (fen) dominated by the sedge *Carex gaudichaudiana*, making it one of the most immediately recognisable of alpine/subalpine communities. Typically, sites are inundated through most (if not all) summer with water depths up to approximately 15 cm. Examples tend to be species-poor but in some areas *Brachyscome obovata*, *Carex echinata*, *Deschampsia caespitosa*, *Epilobium gunnianum*, *Isolepis montivaga*, and *Myriophyllum pedunculatum* may be reasonably common. *Sphagnum cristatum* often occupies any ground raised slightly above the bed of the fen. *Poa costiniana* is a frequent component of this community but is typically present only at the margins of the zone of permanent inundation.This community is highly variable and poorly sampled.

This community is widespread in valleys and low saddles in Kosciuszko NP (extending into the alpine zone) and subalpine valleys of the ACT. It is known from Victoria where it is far less common. Examples in the upper Murrumbidgee catchment are often small and form part of a mosaic with a2 [*Alpine Baeckea - Swamp Heath - Candle Heath - Sphagnum wet heathland of the Australian Alps Bioregion*] in areas of impeded drainage, and a14 [*Prickly Snow-grass - Tufted Sedge subalpine valley grassland of the Australian Alps Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Asperula gunnii	1	43	1	5	P
Baloskion australe	1	43	1	2	P
Brachyscome obovata	1	43	1	1	P
Cardamine astoniae	2	29	1	<1	P
Carex echinata	2	29	1	<1	P
Carex gaudichaudiana	4	100	2	4	P
Carpha nivicola	1	29	1	<1	P
Deschampsia cespitosa	1	57	1	<1	P
Epilobium gunnianum	1	43	1	1	P
Isolepis montivaga	1	29	1	<1	P
Juncus falcatus	1	29	2	<1	P
Luzula modesta	1	29	1	2	P
Myriophyllum pedunculatum	1	57	1	<1	P
Neopaxia australasica	1	29	1	1	P
Oreomyrrhis ciliata	2	29	1	2	P
Poa costiniana	1	71	2	5	P
Ranunculus pimpinellifolius	2	29	1	1	P
Richea continentis	1	29	2	<1	P
Sphagnum cristatum	2	57	3	1	P

Threatened Communities: TSC Act 1995 - *Montane Peatlands and Swamps of the New England Tableland*, *NSW North Coast*, *Sydney Basin*, *South East Corner*, *South Eastern Highlands and Australian Alps bioregions*; EPBC Act 1999 - *Alpine Sphagnum Bogs and Associated Fens*.

Equivalent vegetation types: *Carex gaudichaudiana* alliance (Costin 1954); *Carex – Drepanocladus* association (McVean 1969); Vegetation Type 6a (Helman and Gilmour 1985); Fen (Costin *et al.* 2000); 8 [*Fen*] (McDougall and Walsh 2007).

Frequently-occurring weeds: No weeds have been recorded in plots in this community.

Threats: The weed *Myosotis caespitosa*, although not recorded in plots, is abundant at a few sites in Kosciuszko NP (e.g. Boggy Plain, Ogilvies Plain) and may threaten the integrity of this community.

Reservation Status: Possibly all within Kosciuszko and Namadgi NPs.

Extent of clearing: Nil, but this community was probably highly degraded by domestic grazing. The dominant species, *Carex gaudichaudiana*, is noted for its high palatability (Van Rees and Holmes 1986).

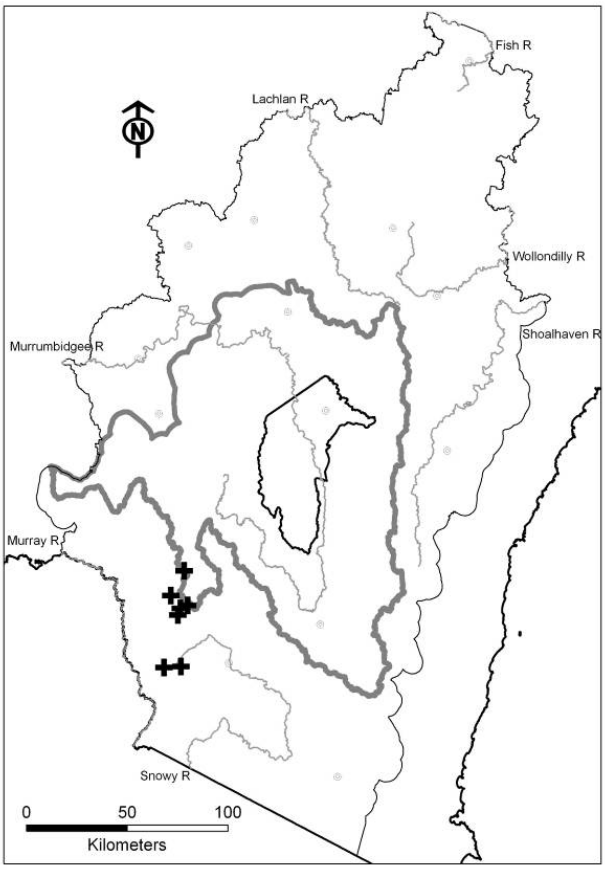


Figure a8: Distribution of field samples assigned to this community.

FORMATION: RAINFORESTS

CLASS: COOL TEMPERATE RAINFORESTS

g172: Black Sassafras temperate rainforest of wet sheltered slopes in the Australian Alps Bioregion

Scientific Name: *Atherosperma moschatum - Dicksonia antarctica / Polystichum proliferum - Blechnum fluviatile - Australina pusilla - Asplenium flabellifolium*

Number of samples:	2
Richness [mean (±SD)]:	14 (3)
Slope (degrees):	(8) 10-13 (14)
Altitude (m asl):	(1037) 1053-1084 (1099)
Ave. Annual Rainfall (mm):	(1104) 1126-1170 (1192)
Temp. Annual Range (°C):	(25) 25.1-25.2 (25.2)

Plate g172:

Vegetation Description: Community g172 is a rare rainforest community to about 20 m high, occurring in deep east facing valleys and gorges. The dominant tree species is Black Sassafras (*Atherosperma moschatum*). The shrub layer is dominated by *Dicksonia antarctica*, with a sparse groundlayer dominated by *Polystichum proliferum*, *Blechnum fluviatile*, *Australina pusilla*, *Asplenium flabellifolium*, *Urtica incisa* and *Viola hederacea*.

This community mainly occurs as a narrow band along drainage lines, usually only a few metres wide and often overtopped by the canopy of adjacent u40 [*Alpine Ash tall wet sclerophyll open forest primarily of the Australian Alps Bioregion*]. However, the structure and floristics of these communities are distinct and they do not intergrade.

Black Sassafras temperate rainforest is found as isolated patches along creeks near Bogong Peaks (such as Stinking Creek and the upper Goobaragandra River), the Geehi Valley, and the Jacobs and Pinch River Gorges. Stands in the Pilot River Gorge contain *Elaeocarpus holopetalus.* Fire is believed to have limited the extent of this community as it is only found in locations that are protected from wildfires, which in the Australian Alps are usually driven by strong north westerly winds. The remaining stands are often not burned even in extreme events such as the 2003 wildfires that affected 70% of Kosciuszko NP.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Asplenium bulbiferum subsp. *gracillimum*	1	50	2	<1	P
Asplenium flabellifolium	2	100	1	9	P
Atherosperma moschatum	6	100	3	<1	P
Australina pusilla	2	100	2	1	P
Blechnum fluviatile	2	100	0	0	P
Dicksonia antarctica	4	100	3	2	P
Diplazium australe	2	50	2	<1	P
Histiopteris incisa	1	50	1	<1	P
Leptospermum grandifolium	1	50	3	2	P
Polystichum proliferum	2	100	1	7	P
Sambucus australasica	2	50	2	<1	P
Sambucus gaudichaudiana	2	50	1	<1	P
Tasmannia xerophila	1	50	1	2	P
Urtica incisa	1	100	1	2	P
Veronica subtilis	1	50	1	<1	P
Viola hederacea	1	100	2	19	P
Eucalyptus delegatensis	1	50	3	5	C
Poa helmsii	1	50	2	4	C
Rubus parvifolius	1	50	1	11	C
Tasmannia lanceolata	1	50	1	4	C

Threatened Communities: Nil.

Frequently occurring weeds: No weeds have been recorded in the sites sampled to date.

Equivalent vegetation types: This community was identified by Gellie (2005) as VG172 [*Kosciuszko Western Escarpment Cool Temperate Rainforest*].

Threats: Climate change and any increased incidence of hot fires could potentially reduce the extent of the community.

Reservation Status: Within the Upper Murrumbidgee Catchment all sites known are in Kosciuszko NP.

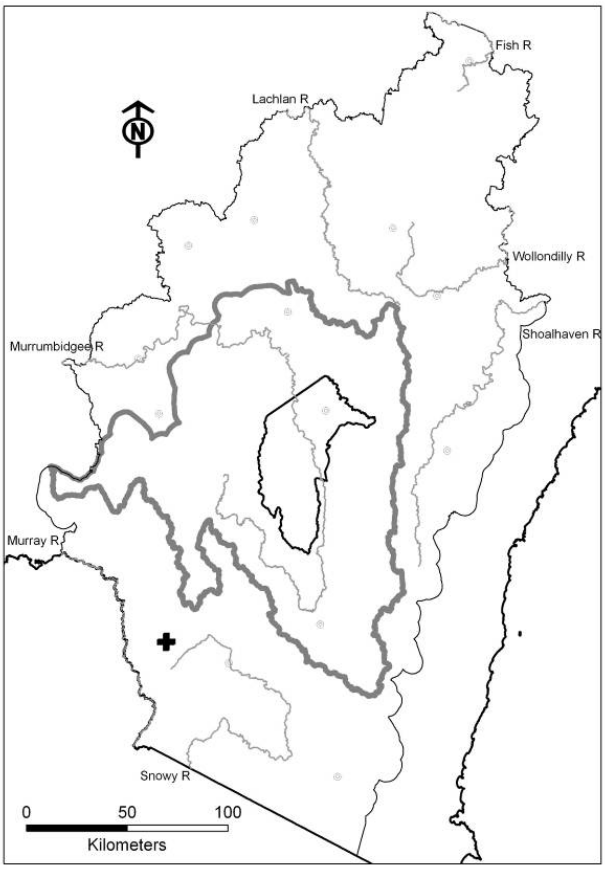


Figure g172: Distribution of field samples assigned to this community.

Extent of clearing: This community has not been affected by clearing.

FORMATION: WET SCLEROPHYLL FORESTS

CLASS: MONTANE WET SCLEROPHYLL FORESTS

u40: Alpine Ash very tall wet sclerophyll open forest primarily of the Australian Alps Bioregion

Scientific Name: *Eucalyptus delegatensis* ± *Eucalyptus dalrympleana / Polyscias sambucifolia* subsp. *leptophylla - Coprosma hirtella - Derwentia derwentiana / Poa helmsii - Stellaria pungens - Polystichum proliferum*

Number of samples:	35
Richness [mean (±SD)]:	27 (7)
Slope (degrees):	(1) 16-26 (35)
Altitude (m asl):	(1021) 1163-1337 (1504)
Ave. Annual Rainfall (mm):	(1042) 1261-1533 (1802)
Temp. Annual Range (°C):	(22.1) 23.2-24.6 (25.2)

Plate u40:

Vegetation Description: Community u40 is a very tall open forest dominated by Alpine Ash (*Eucalyptus delegatensis*), often with Mountain Gum (*E. dalrympleana*) occurring at low abundance. At maturity, this community ranges from 25m to 45m in height. The understorey is predominantly shrubby and of variable density depending on site condition and time since fire. It is typically dominated by *Polyscias sambucifolia* subsp*. leptophylla*, *Tasmannia xerophila* and *Coprosma hirtella*. *Daviesia latifolia* and *Acacia obliquinervia* occur in many sites in abundance after fire. *Polystichum proliferum*, *Derwentia derwentiana*, *Dianella tasmanica* and *Poa helmsi* frequently form the groundlayer, along with herbs such as *Stellaria pungens* and *Viola betonicifolia.*

This community is found mainly from Cabramurra to the Pilot on the western side of the Main Range, mostly on steep slopes. In the ACT, it is found in Namadgi NP at Bulls Head and above Smokers Gap. At higher altitudes the community grades into u158 [*Alpine Sallee shrub-grass subalpine mid-high woodland of the Australian Alps Bioregion*], and at lower elevations it grades into u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*].

Eucalyptus delegatensis is killed by crown fires. Recruitment after hot fires is often prolific, with very high stand densities. Following a crown fire the vegetation is often dominated by shrubs of *Daviesia* and *Acacia* for several years until trees grow sufficiently to exert site dominance. The vegetation is often extremely dense, with many thousands of stems per hectare. If fires occur at intervals of 20 years or less the Alpine Ash are unlikely to have flowered and developed seed. In these circumstances the vegetation may become a shrubland with scattered trees of Mountain Gum or Snowgum, which usually resprout after fire (Geoff Robertson pers. comm.).

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia obliquinervia	2	37	1	3	P
Acaena novae-zelandiae	1	51	1	27	P
Asperula euryphylla	2	29	1	<1	P
Bossiaea foliosa	2	29	2	4	P
Cassinia aculeata	2	46	1	14	P
Coprosma hirtella	2	86	1	11	P
Daviesia latifolia	4	57	2	7	P
Derwentia derwentiana	2	80	1	6	P
Dianella tasmanica	2	71	1	16	P
Eucalyptus dalrympleana	1	46	3	20	P
Eucalyptus delegatensis	3	91	3	4	P
Galium migrans	2	23	1	2	P
Leucopogon gelidus	1	26	1	2	P
Olearia megalophylla	2	31	1	4	P
Olearia phlogopappa	1	54	1	2	P
Ozothamnus secundiflorus	1	37	1	<1	P
Picris angustifolia	1	20	1	2	P
Poa ensiformis	3	23	2	2	P
Poa helmsii	3	80	1	3	P
Polyscias sambucifolia subsp. *leptophylla*	2	89	1	4	P
Polystichum proliferum	2	80	1	7	P
Prostanthera lasianthos	1	31	1	1	P

Rubus parvifolius	2	71	1	11	P
Senecio pinnatifolius var. *lanceolatus*	2	37	2	<1	P
Stellaria pungens	2	83	2	31	P
Tasmannia xerophila	2	57	1	1	P
Viola betonicifolia	2	71	1	27	P
Viola hederacea	1	40	2	18	P
Clematis aristata	1	43	1	24	C

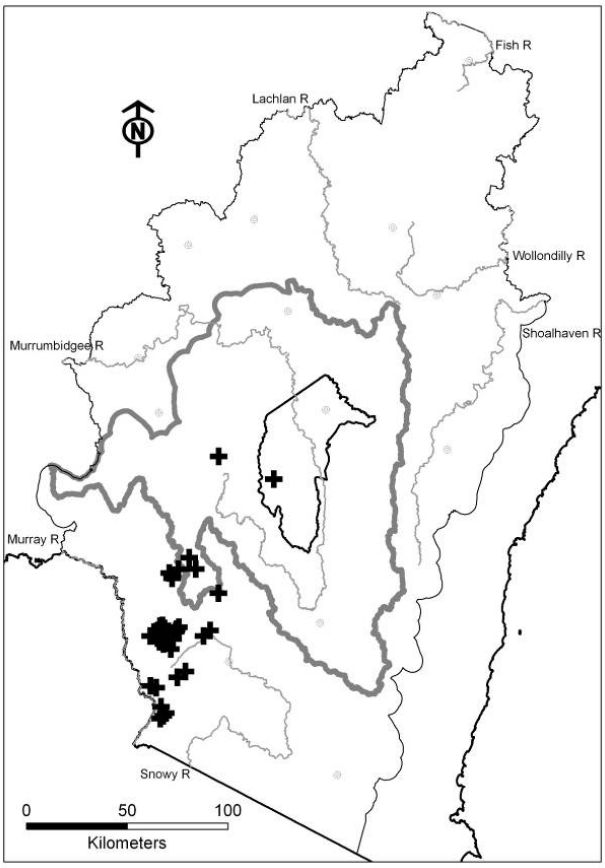


Figure u40: Distribution of field samples assigned to this community.

Threatened Communities: Nil

Frequently occurring weeds: *Cirsium vulgare* (0.17).

Equivalent vegetation types: This community is defined by a large group of field survey plots, some of which (10) were also classified by Gellie (2005). Most of these were assigned to VG87 [*Western Escarpment Moist Shrub/Herb/Grass Forest*], with a smaller number classified as VG86 [*Western Sub-alpine Moist Shrub Forest*].

Threats: Hot fires at intervals of less than 20 years are likely to eliminate *Eucalyptus delegatensis*.

Reservation Status: There are around 100,000 ha of *Eucalyptus delegatensis* (all community types) in NSW, with about 80,000 ha reserved in Kosciuszko NP and Brindabella NP (Geoff Robertson pers. comm.).Most of the area not reserved occurs in Bago, Maragle and Ingebyra SFs. *E. dalrympleana* forests are also reserved within Namadgi NP (ACT).

Extent of clearing: This community has not been affected by clearing, although it is the subject of regenerative logging in State Forest tenure.

u53: Mountain Gum - Blackwood tall wet sclerophyll open forest primarily on granitoids of the Australian Alps and western South Eastern Highlands Bioregions

Scientific Name: *Eucalyptus dalrympleana* ± *Eucalyptus delegatensis - Eucalyptus viminalis - Eucalyptus pauciflora / Acacia melanoxylon / Leptospermum grandifolium - Epacris breviflora - Tasmannia lanceolata / Polystichum proliferum - Acaena novae-zelandiae - Blechnum nudum*

Number of samples:	18
Richness [mean (±SD)]:	34 (12)
Slope (degrees):	(1) 8-18 (26)
Altitude (m asl):	(924) 1101-1261 (1368)
Ave. Annual Rainfall (mm):	(895) 1020-1385 (1506)
Temp. Annual Range (°C):	(23.3) 23.9-25.3 (25.7)

Vegetation Description: Community u53 is a tall to very tall open forest dominated by Mountain Gum (*Eucalyptus dalrympleana*). The well developed mid-storey is characterised by the tall shrub *Acacia melanoxylon* along with smaller shrubs such as *Leptospermum grandifolium*, *Coprosma hirtella*, *Tasmannia lanceolata*, *Coprosma quadrifida*, *Baeckea utilis* and *Lomatia myricoides*. The moist groundlayer is a diverse mix of ferns, forbs and grasses including *Acaena novae-zelandiae*, *Polystichum proliferum*, *Blechnum nudum*, *Carex appressa*, *Poa helmsii*, *Blechnum penna-marina* subsp. *alpina*, *Clematis aristata*, *Mentha laxiflora*, *Lagenophora stipitata*, *Stellaria pungens*, *Pteridium esculentum*, *Viola hederacea* and *Asperula scoparia*.

This community is most common within northern parts of the Australian Alps bioregion, and adjacent high altitude regions of the western South Eastern Highlands bioregion. It is found through Namadgi NP, northern Kosciuszko NP and Bago SF. It occurs on a variety of aspects, but favours sheltered locations – most often adjacent to drainage features. It is most common on granite, granodiorite or metasedimentary geologies. Co-occurring communities include u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*] and u239 [*Alpine Ash - Mountain Gum ± Snow Gum wet sclerophyll open forest of the Australian Alps and*

South Eastern Highlands Bioregions], which generally occupies more exposed locations. Narrow creeklines within u53 may be dominated by dense patches of *Leptospermum grandifolium*, a shrub of up to 4 m in height. Patches where this shrub is dominant may represent VG84 [*Montane Wet Heath/Herb Woodland*] of Gellie (2005), however more intensive sampling is required to clarify this. It is possible that this shrubland, which is often only a few tens of m^2 in extent, has been inadvertently incorporated into u53 because plots were larger than shrubland stands. A *Leptospermum grandifolium* shrubland occurs in similar vegetation and landscape positions in the Victorian high country.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia melanoxylon	2	67	1	14	P
Acaena novae-zelandiae	2	72	1	27	P
Baeckea utilis	2	44	2	1	P
Blechnum minus	2	39	1	<1	P
Blechnum nudum	3	67	2	3	P
Blechnum penna-marina subsp. *alpina*	2	61	1	<1	P
Blechnum wattsii	2	28	2	<1	P
Carex appressa	2	67	1	7	P
Clematis aristata	1	61	1	24	P
Coprosma hirtella	1	72	1	11	P
Coprosma quadrifida	1	50	1	8	P
Derwentia derwentiana	1	39	1	7	P
Deyeuxia brachyathera	1	28	1	<1	P
Epacris breviflora	2	83	1	2	P
Epilobium billardierianum subsp. *hydrophilum*	2	44	1	<1	P
Eucalyptus dalrympleana	2	61	3	20	P
Eucalyptus delegatensis	3	39	3	5	P
Eucalyptus viminalis	3	39	3	13	P
Gonocarpus micranthus	1	22	1	2	P
Gratiola peruviana	2	22	1	1	P
Isolepis subtilissima	1	33	1	<1	P
Lagenophora stipitata	2	56	1	17	P
Leptinella filicula	1	28	1	3	P
Leptospermum grandifolium	3	100	2	1	P
Lomatia myricoides	2	44	1	11	P
Mentha laxiflora	2	61	2	<1	P
Olearia phlogopappa	2	33	1	3	P
Poa helmsii	2	67	2	3	P
Polyscias sambucifolia subsp. *leptophylla*	1	28	2	4	P
Polystichum proliferum	2	72	1	7	P
Prostanthera lasianthos	3	22	1	1	P
Ranunculus lappaceus	1	39	1	11	P
Rubus parvifolius	2	56	1	11	P
Senecio biserratus	1	22	1	<1	P
Senecio hispidulus	2	22	1	2	P
Tasmannia lanceolata	2	72	1	3	P
Pteridium esculentum	1	44	2	27	C
Stellaria pungens	1	50	2	31	C
Viola hederacea	1	44	2	18	C

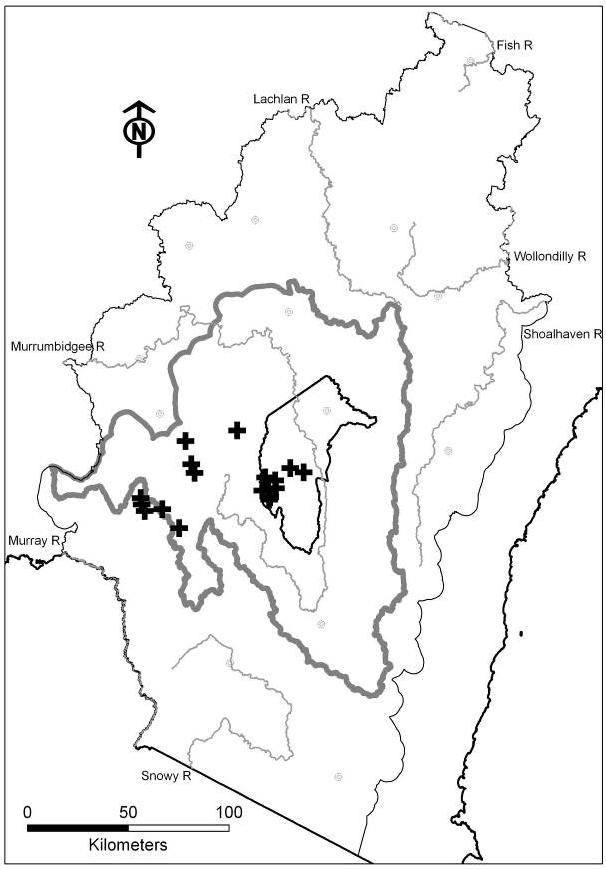


Figure u53: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Frequently occurring weeds: *Cirsium vulgare* (0.22), *Hypochaeris radicata* (0.28) and *Prunella vulgaris* (0.33).

Equivalent vegetation types: This community is most closely related to VG86 [*Western Sub-alpine Moist Shrub Forest*] previously described by Gellie (2005).

Threats: Logging; Grazing by feral herbivores; Frequent and intense fire.

Reservation Status: Recorded from survey plots within Kosciuszko NP (NSW) and Namadgi NP (ACT); likely to be well reserved.

Extent of clearing: Considered minimal.

u239: Alpine Ash - Mountain Gum ± Snow Gum wet sclerophyll open forest of the Australian Alps and South Eastern Highlands Bioregions

Scientific Name: *Eucalyptus delegatensis - Eucalyptus dalrympleana ± Eucalyptus pauciflora / Coprosma hirtella - Lomatia myricoides - Olearia megalophylla / Asperula scoparia - Clematis aristata - Stellaria pungens - Viola betonicifolia*

Number of samples:	100
Richness [mean (±SD)]:	29 (7)
Slope (degrees):	(1) 8-18 (36)
Altitude (m asl):	(1006) 1179-1357 (1526)
Ave. Annual Rainfall (mm):	(846) 1101-1365 (1653)
Temp. Annual Range (°C):	(22.2) 23.5-24.5 (25.3)

Plate u239:

Vegetation Description: Community u239 is a tall to very tall open forest dominanted by Alpine Ash (*Eucalyptus delegatensis*) and Mountain Gum (*E. dalrympleana*). Snow Gum (*E. pauciflora*) is often present. The higher abundance of *E. dalrympleana* and the presence of *E. pauciflora* and other species of drier sites indicate that this community occurs in drier habitats than u40 [*Alpine Ash tall wet sclerophyll open forest primarily of the Australian Alps Bioregion*]. At maturity, this community ranges from 25m to 45m in height. Below the canopy it is often variable, and may be grassy or shrubby depending on site condition and fire history. The shrub layer is often a sparse cover of *Coprosma hirtella*, *Acacia dealbata*, *Daviesia mimosoides*, and *Lomatia myricoides*. The groundlayer is a mixture of *Poa sieberiana*, *Poa phillipsiana*, and forbs such as *Asperula scoparia*, *Stellaria pungens*, *Clematis aristata*, *Coronidium scorpiodes* and *Viola betonicifolia.*

This community is found mainly from the Brindabella Range south to the Victorian border, but is more common north of the Cabramurra-Khancoban Road, mostly on steep slopes between 1000 and 1400 metres. In the Australian Alps, it often grades into u158 [*Alpine Sallee shrub-grass subalpine mid-high woodland of the Australian Alps Bioregion*], and at lower elevations the community grades into u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*]. In moister sheltered slopes at the southern edge of its range this community may grade into u40 [*Alpine Ash tall wet sclerophyll open forest primarily of the Australian Alps Bioregion*].

For information on the fire ecology of *E. delegatensis* dominated communites, refer to the description of u40.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia dealbata	2	51	2	25	P
Acacia kettlewelliae	2	5	1	<1	P
Acacia obliquinervia	2	23	1	2	P
Acaena novae-zelandiae	1	45	1	27	P
Arthropodium milleflorum	1	34	1	7	P
Asperula scoparia	2	85	2	20	P
Billardiera macrantha	1	6	1	<1	P
Brachyscome spathulata	2	38	1	10	P
Caladenia alpina	1	5	1	<1	P
Cassinia aculeata	1	39	1	13	P
Chiloglottis pluricallata	1	7	1	<1	P
Chiloglottis valida	1	14	1	2	P
Clematis aristata	2	78	1	22	P
Coprosma hirtella	2	85	1	9	P
Coronidium scorpioides	2	49	1	19	P
Craspedia jamesii	1	20	1	3	P
Craspedia spp.	2	19	1	3	P
Daviesia latifolia	3	26	2	6	P
Daviesia mimosoides subsp. *mimosoides*	3	36	2	9	P
Daviesia ulicifolia	2	32	1	9	P
Derwentia derwentiana	1	46	1	6	P
Deyeuxia monticola	1	22	1	5	P
Deyeuxia rodwayi	1	5	1	1	P
Dianella tasmanica	1	48	1	15	P
Eucalyptus dalrympleana	2	77	3	18	P
Eucalyptus delegatensis	4	96	3	2	P
Eucalyptus pauciflora	2	50	3	20	P
Geranium potentilloides	1	43	1	12	P
Gonocarpus montanus	1	8	1	1	P
Lagenophora stipitata	1	40	1	17	P
Leptinella filicula	1	17	1	3	P
Leucopogon gelidus	1	15	1	2	P

Lobelia pedunculata	1	18	1	5	P
Lobelia puberula	1	11	1	<1	P
Lomandra longifolia	2	51	2	42	C
Lomatia myricoides	2	46	1	11	P
Olearia erubescens	1	45	1	11	P
Olearia megalophylla	1	45	1	4	P
Olearia phlogopappa	1	16	1	3	P
Oxylobium ellipticum	2	11	1	4	P
Ozothamnus stirlingii	2	9	1	<1	P
Ozothamnus thyrsoideus	1	8	1	2	P
Persoonia chamaepeuce	1	22	1	11	P
Persoonia subvelutina	2	20	1	<1	P
Picris angustifolia	1	10	1	2	P
Picris angustifolia subsp. *angustifolia*	2	7	1	2	P
Platylobium formosum	2	29	2	10	P
Poa helmsii	1	13	2	3	P
Poa induta	2	14	3	6	P
Poa phillipsiana	4	26	2	2	P
Poa sieberiana	3	51	2	48	C
Podolobium alpestre	1	9	2	2	P
Polyscias sambucifolia subsp. *leptophylla*	2	36	2	3	P
Polystichum proliferum	1	19	1	7	P
Poranthera microphylla	1	60	1	26	P
Pterostylis monticola	1	7	1	<1	P
Ranunculus plebeius	1	14	1	3	P
Ranunculus scapiger	1	11	1	1	P
Ranunculus spp.	1	8	1	2	P
Senecio diaschides	1	15	1	5	P
Senecio gunnii	1	44	1	8	P
Senecio linearifolius	1	13	1	5	P
Stackhousia monogyna	1	23	1	12	P
Stellaria pungens	2	78	2	30	P
Tasmannia lanceolata	1	27	1	3	P
Viola betonicifolia	1	74	1	26	P
Viola hederacea	1	31	2	18	P
Wahlenbergia gloriosa	1	23	1	2	P

Threatened Communities: Nil

Frequently occurring weeds: This community is generally low in weeds. *Hypochaeris radicata* and occasional *Crepis capillaris* are found in low numbers.

Equivalent vegetation types: This community is defined by a very large group of field survey plots, some of which (22) were also classified by Gellie (2005). These were assigned to a wide variety of Forest Ecosystems and there is no direct equivalent – related types include VG102 [*Brindabella Montane Dry Fern/Grass Forest*] and VG86 [*Western Sub-alpine Moist Shrub Forest*].

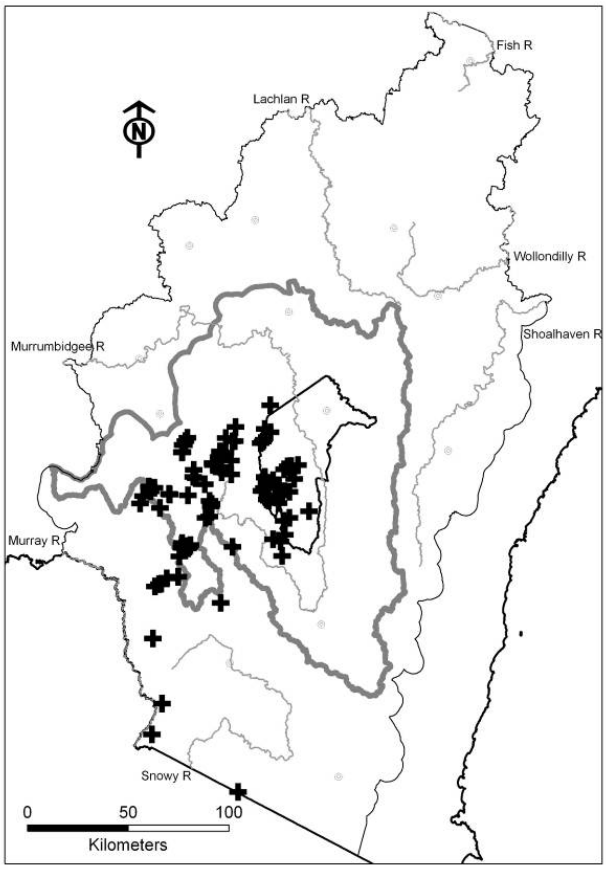


Figure u239: Distribution of field samples assigned to this community.

Threats: Hot fires at intervals of less than 20 years are likely to eliminate *E. delegatensis* (Geoff Robertson pers. comm.).

Reservation Status: There are around 100,000 ha of *E. delegatensis* (all community types) in NSW, with about 80,000 ha being reserved in Kosciuszko NP and Brindabella NP. Most of the area not reserved occurs in Bago, Maragle and Ingebyra SFs (Geoff Robertson pers. comm.).

Extent of clearing: This community has not been affected by clearing to any appreciable degree.

CLASS: SOUTHERN TABLELAND WET SCLEROPHYLL FORESTS

u52: Ribbon Gum - Robertson's Peppermint very tall wet sclerophyll open forest primarily of the Bondo Subregion of the South Eastern Highlands and the northern Australian Alps Bioregions

Scientific Name: *Eucalyptus viminalis - Eucalyptus robertsonii / Acacia melanoxylon / Rubus parvifolius - Cassinia aculeata / Pteridium esculentum - Clematis aristata - Stellaria pungens*

Number of samples:	85
Richness [mean (±SD)]:	36 (9)
Slope (degrees):	(2) 12-21 (36)
Altitude (m asl):	(426) 804-1088 (1249)
Ave. Annual Rainfall (mm):	(739) 1001-1189 (1396)
Temp. Annual Range (°C):	(24) 24.7-25.7 (28.2)

Vegetation Description: Community u52 is a very tall eucalypt forest dominated by Ribbon Gum (*Eucalyptus viminalis*) and Robertson's Peppermint (*E. robertsonii*). Brown Barrel (*E. fastigata*) may be dominant in patches, which in the ACT can be found up to 1320m above sea level. The understorey of this community is open and variable in height, typically including *Acacia melanoxylon*, *Acacia dealbata*, *Cassinia aculeata*, *Lomatia myricoides* and *Coprosma quadrifida*. The moist groundlayer is a mix of forbs, ferns, climbers and grasses including *Pteridium esculentum*, *Clematis aristata*, *Stellaria pungens*, *Acaena novae-zelandiae*, *Lagenophora stipitata*, *Viola hederacea*, *Rubus parvifolius*, *Glycine clandestina*, *Asperula scoparia*, *Microlaena stipoides*, *Poa sieberiana*, *Geranium potentilloides* and *Hydrocotyle laxiflora*.

Ribbon Gum - Robertson's Peppermint moist open forest is prevalent in Namadgi NP and Brindabella NP, but extends east to Tinderry NR, and west through Kosciuszko NP to Bondo SF near Tumut. It occupies a variety of aspects, but is most common in sheltered environments. It occurs on a variety of geologies, including rhyolite, granite, granodiorite and meta-sediments. Associated communities are moist forests and subalpine woodlands of the Australian Alps and western South Eastern Highlands bioregions. These include u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*] which occurs at higher altitude, u150 [*Broad-leaved Peppermint - Mountain Gum tall grass-forb open forest of the South Eastern Highlands and Australian Alps Bioregions*] on drier and more exposed sites, and u152 [*Robertson's Peppermint - Red Stringybark very tall grass-forb sheltered open forest of the southwest South Eastern Highlands and upper South Western Slopes bioregions*] which occurs in drier environments.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia dealbata	2	65	2	25	P
Acacia melanoxylon	2	68	1	12	P
Acaena novae-zelandiae	1	81	1	26	P
Adiantum aethiopicum	1	21	2	3	P
Asperula scoparia	1	65	2	21	P
Asplenium flabellifolium	1	25	1	8	P
Australina pusilla	1	12	2	1	P
Bedfordia arborescens	1	13	3	2	P
Blechnum minus	1	21	1	<1	P
Blechnum nudum	2	19	2	3	P
Bursaria spinosa	2	21	1	10	P
Carex appressa	2	29	1	6	P
Cassinia aculeata	1	69	1	12	P
Clematis aristata	1	87	1	22	P
Coprosma hirtella	1	46	1	11	P
Coprosma quadrifida	1	47	1	7	P
Cynoglossum australe	1	12	1	4	P
Deyeuxia rodwayi	2	9	1	<1	P
Dianella tasmanica	1	45	1	16	P
Dichondra repens	1	54	2	20	P
Drymophila cyanocarpa	1	7	1	<1	P
Echinopogon ovatus	1	46	1	9	P
Epilobium billardierianum subsp. *cinereum*	1	16	1	5	P
Eucalyptus fastigata	4	21	3	6	P
Eucalyptus robertsonii	3	56	3	8	P
Eucalyptus viminalis	3	73	3	11	P
Euchiton gymnocephalus	1	36	1	14	P
Galium gaudichaudii	1	22	1	9	P
Galium migrans	1	11	1	2	P
Geranium potentilloides	1	61	1	12	P
Glycine clandestina	1	69	1	29	P
Gratiola peruviana	1	18	1	1	P
Gynatrix pulchella	1	16	2	<1	P
Hydrocotyle laxiflora	1	59	2	29	P
Lagenophora stipitata	1	79	1	16	P
Leptinella filicula	1	15	1	3	P
Leptospermum juniperinum	1	7	2	<1	P
Lomatia myricoides	1	60	1	10	P
Luzula flaccida	1	26	1	13	P
Mentha diemenica	1	18	1	2	P

Microlaena stipoides	1	65	2	33	P
Olearia argophylla	1	8	2	2	P
Olearia erubescens	1	25	1	12	P
Olearia megalophylla	1	20	1	4	P
Olearia stellulata	1	13	1	2	P
Platylobium formosum	1	29	2	10	P
Poa helmsii	1	25	2	3	P
Poa tenera	3	11	2	2	P
Polystichum proliferum	1	55	1	6	P
Pomaderris aspera	2	27	2	2	P
Lobelia pedunculata	1	14	1	5	P
Prostanthera lasianthos	1	7	1	1	P
Pteridium esculentum	3	89	2	25	P
Pterostylis coccina	1	12	1	<1	P
Pterostylis decurva	1	7	1	<1	P
Ranunculus lappaceus	1	46	1	10	P
Ranunculus plebeius	1	13	1	3	P
Rubus parvifolius	1	71	1	10	P
Senecio diaschides	1	28	1	5	P
Senecio linearifolius	1	29	1	4	P
Stellaria pungens	1	85	2	30	P
Urtica incisa	1	15	1	2	P
Veronica calycina	1	29	1	16	P
Veronica derwentiana	1	11	1	<1	P
Viola hederacea	1	73	2	17	P
Lomandra longifolia	1	48	2	42	C
Poa sieberiana	2	64	2	48	C

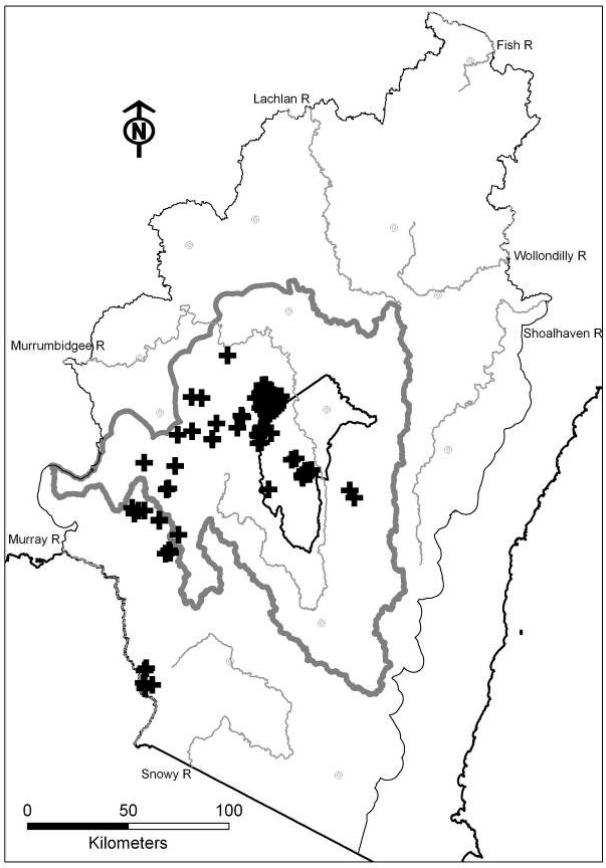


Figure u52: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Frequently occurring weeds: *Cirsium vulgare* (0.41), *Rosa rubiginosa* (0.24).

Equivalent vegetation types: Most similar to VCA ID 300 [*Ribbon Gum - Narrow-leaved (Robertson's) Peppermint montane fern - grass tall open forest on deep clay loam soils in the upper NSW SWS Bioregion and western Kosciuszko escarpment*] (Benson *et al.* 2008) and represents a combination of VG82 [*Western Montane Acacia Fern/Herb Forest*], VG83 [*Montane Riparian Moist Shrub/Grass/Herb Forest*] and VG102 [*Brindabella Montane Dry Fern/Grass Forest*] (Gellie 2005).

Threats: Frequent and intense fire; Grazing by feral herbivores.

Reservation Status: Likely to be well reserved. Recorded from survey plots in Bimberi NR, Black Andrew NR, Brindabella NP and SCA, Kosciuszko NP, Namadgi NP (ACT) and Tinderry NR.

Extent of clearing: Considered likely to be minor.

CLASS: SOUTHERN ESCARPMENT WET SCLEROPHYLL FORESTS

p338: Brown Barrel wet sclerophyll very tall grass-herb open forest primarily of the Gourock and Tallaganda Ranges in the South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus fastigata* ± *Eucalyptus radiata - Eucalyptus viminalis / Acacia dealbata - Leucopogon lanceolatus / Pteridium esculentum / Poa meionectes - Dianella tasmanica - Viola hederacea - Stellaria pungens - Clematis aristata*

Number of samples:	112
Richness [mean (±SD)]:	33 (8)
Slope (degrees):	(0) 5-15 (33)
Altitude (m asl):	(562) 907-1117 (1353)
Ave. Annual Rainfall (mm):	(759) 911-1005 (1144)
Temp. Annual Range (°C):	(22.7) 23.7-24.7 (25.8)

Plate p338:

Vegetation Description: Community p338 is a very tall eucalypt forest dominated by Brown Barrel (*Eucalyptus fastigata*), Narrow-leaved Peppermint (*E. radiata*) and Ribbon Gum (*E. viminalis*). The understorey is variable in height depending on local dominance, but typically includes *Acacia dealbata*, *Leucopogon lanceolatus*, *Acacia melanoxylon*, *Coprosma quadrifida* and *Lomatia myricoides*. The moist groundlayer is a mix of forbs and grasses including *Pteridium esculentum*, *Poa meionectes*, *Dianella tasmanica*, *Viola hederacea*, *Stellaria pungens*, *Lagenophora stipitata*, *Clematis aristata*, *Poranthera microphylla*, *Gonocarpus tetragynus*, *Dichondra repens*, *Microlaena stipoides*, *Veronica calycina* and *Asperula scoparia*.

Brown Barrel wet sclerophyll very tall grass-herb open forest is generally confined to the eastern part of the study area, within the South Eastern Highlands bioregion. It is common in sheltered environments typically on granite or meta-sedimentary geologies, but is also recorded from granodiorite and basalt substrates. Associated communities are dry forests of the Great Dividing Range including p8 [*Silvertop Ash - Narrow-leaved Peppermint shrubby tall dry open forest primarily on sedimentary ridges of the eastern South Eastern Highlands Bioregion*] and e24 [*Mountain Gum - Snow Gum subalpine very tall dry shrubby open forest primarily in the Kybeyan - Gourock subregion of the South Eastern Highlands Bioregion*], which both occur in more exposed locations. In the ACT and west into the Brindabellas, *E. fastigata* stands are likely to be part of u52 [*Ribbon Gum - Robertson's Peppermint very tall wet sclerophyll open forest primarily of the Bondo Subregion of the South Eastern Highlands and northern Australian Alps Bioregions*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia dealbata	2	61	2	25	P
Acacia melanoxylon	1	36	1	13	P
Acaena novae-zelandiae	2	54	1	27	P
Acrothamnus hookeri	2	20	1	7	P
Acrotriche divaricata	2	9	1	<1	P
Ajuga australis	1	17	1	7	P
Asperula scoparia	2	56	2	21	P
Blechnum cartilagineum	1	5	2	1	P
Brachyscome formosa	2	4	2	<1	P
Chiloglottis pluricallata	1	13	1	<1	P
Chiloglottis spp.	1	10	2	1	P
Choretrum candollei	1	4	1	<1	P
Clematis aristata	1	72	1	22	P
Clematis spp.	2	6	2	<1	P
Comesperma volubile	1	7	1	1	P
Coprosma quadrifida	1	37	1	7	P
Coronidium scorpioides	2	54	1	19	P
Cyathea australis	1	10	2	2	P
Desmodium gunnii	2	7	2	1	P
Dianella tasmanica	2	82	1	14	P
Dichondra repens	2	57	2	19	P
Drymophila cyanocarpa	2	5	1	<1	P
Echinopogon ovatus	1	23	1	10	P
Eucalyptus cypellocarpa	2	13	3	5	P
Eucalyptus fastigata	3	70	3	4	P
Eucalyptus nitens	3	8	3	<1	P
Eucalyptus obliqua	3	17	3	3	P
Eucalyptus radiata	2	48	3	10	P
Eucalyptus viminalis	3	43	3	12	P
Galium propinquum	1	15	1	4	P
Geranium potentilloides	2	32	1	12	P
Glycine clandestina	2	61	1	29	P

Gonocarpus tetragynus	1	57	2	47	C
Goodia lotifolia	1	8	1	1	P
Hakea eriantha	1	20	1	1	P
Helichrysum leucopsideum	1	6	1	<1	P
Hydrocotyle acutiloba	2	7	1	2	P
Lagenophora stipitata	2	71	1	15	P
Leptinella filicula	2	17	1	3	P
Leucopogon lanceolatus	2	56	2	11	P
Lobelia puberula	1	9	1	<1	P
Lomandra longifolia	2	68	2	41	P
Lomatia fraseri	2	12	1	1	P
Lomatia myricoides	2	27	1	11	P
Luzula flaccida	1	24	1	13	P
Microlaena stipoides	1	57	2	33	P
Olearia megalophylla	1	12	1	5	P
Persoonia silvatica	1	23	1	2	P
Plantago debilis	2	12	2	4	P
Poa ensiformis	2	7	2	2	P
Poa meionectes	3	87	2	14	P
Polyscias sambucifolia subsp. *sambucifolia*	2	11	1	1	P
Polystichum proliferum	1	17	1	7	P
Poranthera microphylla	1	66	1	26	P
Pteridium esculentum	3	89	2	25	P
Ranunculus pimpinellifolius	2	5	1	1	P
Rubus parvifolius	1	28	1	11	P
Schelhammera undulata	2	4	2	<1	P
Senecio prenanthoides	1	55	1	18	P
Smilax australis	2	21	2	2	P
Stellaria pungens	2	73	2	30	P
Tasmannia lanceolata	1	17	1	3	P
Veronica calycina	1	57	1	15	P
Viola hederacea	2	81	2	16	P
Xerochrysum bracteatum	1	17	1	1	P

Threatened Communities: Nil.

Frequently occurring weeds: *Hypochaeris radicata* (0.74).

Equivalent vegetation types: WSFp338 [*Southern Range Wet Forest*] (Tozer *et al.* 2010) and a combination of VG55 [*Eastern Tableland Fern/Herb/Grass Moist Forest*], VG56 [*Tableland and Escarpment Moist Herb/Gern/Grass Forest*] and VG95 [*Tableland Acacia Moist Herb Forest*] (Gellie 2005).

Threats: Logging; frequent and intense fire.

Reservation Status: Likely to be well reserved. Recorded from survey plots in Badja Swamps NR, Bondi Gulf NR, Coolumbooka NR, Deua NP, Gourock NP, Monga NP and SCA, Southeast Forest NP, Tallaganda NP and SCA and Wadbilliga NP.

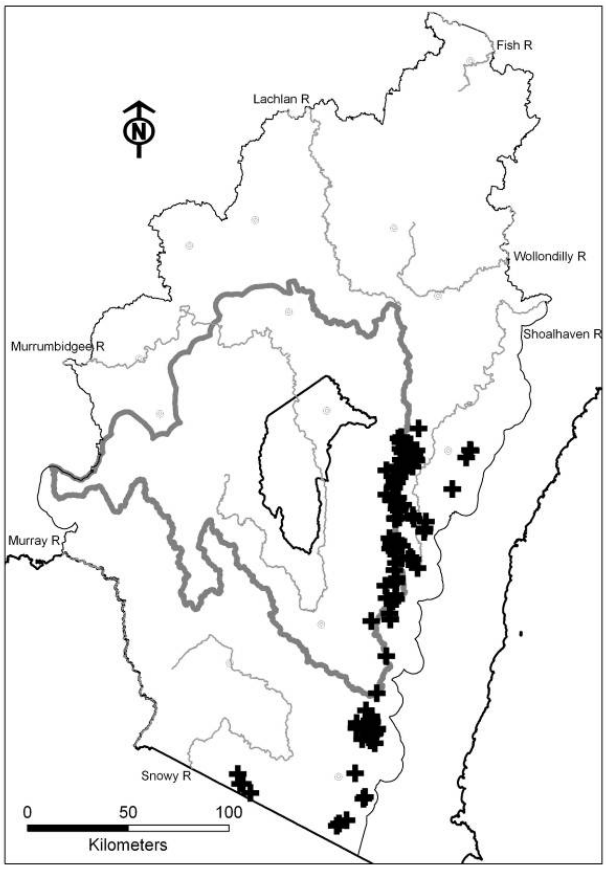


Figure p338: Distribution of field samples assigned to this community.

Extent of clearing: Not assessed, but likely to be minor due to its generally steep mountainous habitat.

FORMATION: DRY SCLEROPHYLL FORESTS

CLASS: SOUTHERN TABLELAND DRY SCLEROPHYLL FORESTS

e24: Mountain Gum - Snow Gum very tall dry shrubby open forest primarily in the Kybeyan - Gourock subregion of the South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus dalrympleana - Eucalyptus pauciflora - Eucalyptus radiata / Persoonia silvatica - Monotoca scoparia / Lomandra longifolia - Poa meionectes - Stylidium graminifolium sens. lat. - Dianella tasmanica*

Number of samples:	30
Richness [mean (±SD)]:	25 (8)
Slope (degrees):	(0) 2-8 (21)
Altitude (m asl):	(758) 922-1147 (1351)
Ave. Annual Rainfall (mm):	(809) 879-1036 (1120)
Temp. Annual Range (°C):	(22.7) 23.5-24.2 (25.6)

Plate e24:

Vegetation Description: Community e24 is a very tall dry shrubby open forest dominated by Mountain Gum (*Eucalyptus dalrympleana*), often with Snow Gum (*E. pauciflora*) or Narrow-leaved Peppermint (*E. radiata*). The shrub layer is generally patchy, with species such as *Persoonia silvatica*, *Bossiaea foliosa*, *Monotoca scoparia*, *Daviesia ulicifolia* and the tall shrubs *Acacia dealbata* and *Exocarpus strictus*. The ground layer is usually sparse and dominated by leaf litter and woody debris, with patches of low shrubs and forbs including *Lomanda longifolia*, *Stylidium graminifolium sens. lat.*, *Dianella tasmanica* and *Gonocarpus tetragynus*, and grasses including *Poa meionectes* and *P. sieberiana*.

Mountain Gum - Snow Gum very tall dry shrubby open forest is distributed along the western fall of the Great Dividing Range from Tallaganda NP in the north extending south to the Bombala area. It is generally found on loamy forest soils of low fertility. This community generally occurs in a mosaic with p338 [*Brown Barrel wet sclerophyll very tall grass-herb open forest primarily of the Gourock and Tallaganda Ranges in the South Eastern Highlands Bioregion*] occurring on more sheltered aspects on better soils. It is often increasingly dominated by *Eucalyptus pauciflora* at higher altitude within its range.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Banksia marginata	2	30	1	3	P
Bossiaea foliosa	2	63	2	4	P
Choretrum pauciflorum	1	20	1	3	P
Daviesia ulicifolia	2	57	2	10	P
Dianella tasmanica	2	67	1	16	P
Eucalyptus dalrympleana	3	80	3	19	P
Eucalyptus pauciflora	3	60	3	21	P
Eucalyptus radiata	3	50	3	10	P
Exocarpos strictus	2	40	1	12	P
Gompholobium huegelii	1	27	1	5	P
Hovea linearis	1	47	1	13	P
Lomandra longifolia	2	80	2	42	P
Monotoca scoparia	2	60	1	14	P
Patersonia sericea	2	27	2	3	P
Persoonia chamaepeuce	2	33	1	11	P
Persoonia silvatica	1	67	1	3	P
Poa meionectes	2	67	2	16	P
Polyscias sambucifolia subsp. *sambucifolia*	2	20	1	1	P
Stylidium graminifolium sens. lat.	2	70	1	25	P
Acacia dealbata	1	43	2	26	C
Coronidium scorpioides	2	40	1	20	C
Gonocarpus tetragynus	2	67	2	48	C
Hibbertia obtusifolia	1	40	1	35	C
Lomandra multiflora subsp. *multiflora*	1	40	1	18	C
Microlaena stipoides	1	57	2	34	C

Threatened Communities: Components of this community may contain TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions*.

Frequently occurring weeds: *Hypochaeris radicata* (0.37).

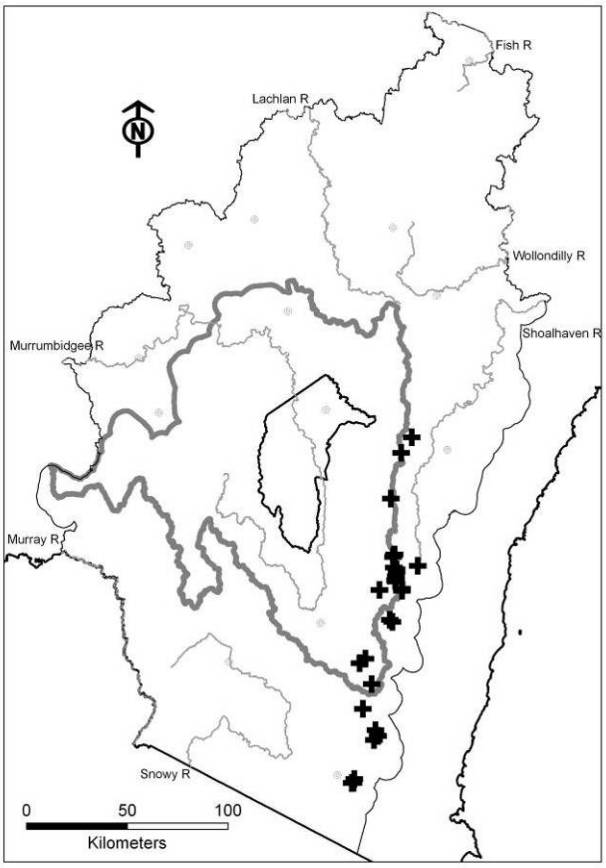


Figure e24: Distribution of field samples assigned to this community.

Equivalent vegetation types: Vegetation type DSFe24 [*Subalpine Dry Shrub Forest*] (Tozer *et al.* 2010) with some similarities to VG64 [*South East Tableland Edge Shrub/Grass Dry Forest*] (Gellie 2005).

Threats: Minimal. Logging and inappropriate fire regimes may alter the floristics and structure over time.

Reservation Status: Unknown, although examples of this community are found in Badja Swamps NR, Coolumbooka NR, Dangelong NR, Deua NP, Good Good NR, Gourock NP, South East Forest NP, Tallaganda NP, Tallaganda SCA and Wadbilliga NP.

Extent of clearing: considered minimal.

m31: Ribbon Gum - Snow Gum - Shiny Cassinia tall shrub-grass open forest of gullies in quartz-rich ranges in the Monaro and Kybeyan-Gourock subregions of the NSW South Eastern Highlands

Scientific Name: *Eucalyptus viminalis - Eucalyptus pauciflora / Cassinia longifolia - Acacia dealbata / Poa sieberiana - Elymus scaber - Gonocarpus tetragynus - Microlaena stipoides*

Number of samples:	42
Richness [mean (±SD)]:	35 (10)
Slope (degrees):	(4) 7-15 (25)
Altitude (m asl):	(721) 815-947 (1112)
Ave. Annual Rainfall (mm):	(527) 586-694 (846)
Temp. Annual Range (°C):	(23.8) 25.6-26.2 (27.7)

Plate m31: Plant community m31, Murrumbidgee River, Cooma.

Vegetation Description: Community m31 is a tall open forest to woodland dominated by Ribbon Gum (*Eucalyptus viminalis*) and Snow Gum (*E. pauciflora*), frequently with Candlebark (*E. rubida*) as a co-dominant. A patchy to sparse shrub layer is commonly present, containing *Cassinia longifolia* and *Acacia dealbata*, and groundcover consists of a moderately diverse range of grasses, forbs and hard-leaved low shrubs. Commonly occurring species include *Poa sieberiana*, *Elymus scaber*, *Chrysocephalum semipapposum*, *Gonocarpus tetragynus*, *Euchiton gymnocephalus*, *Hypericum gramineum*, *Acaena echinata*, *Microlaena stipoides*, *Hibbertia obtusifolia* and *Scleranthus biflorus*.

Field samples assigned to this community were recorded from gullies and footslopes of minor watercourses on moderately-low fertility siliceous substrates along eastern tableland ranges from Tinderry NR south to Cooma and Nimmitabel, with a disjunct occurrence further south in the Merriangaah

area. Many records are from the Coornartha/Numeralla/Countegany area. Within this range, this community is found primarily on Adaminaby Group sandstones but also from metamorphics (quartzite, schist) and Glenbog Granodiorite. This community is likely to be restricted to narrow areas of moist deeper soil along drainage lines, grading into u21 [*Broad-leaved Peppermint - Candlebark tall dry sclerophyll open forest of quartz-rich ranges of the upper South East Highlands and lower Australian Alps Bioregions*] on sheltered footslopes and m51 [*Brittle Gum - Scribbly Gum shrub-grass tall dry sclerophyll open forest on exposed quartz-rich slopes and ridges at primarily in the Monaro and Kybeyan-Gourock subregions of the South Eastern Highlands*] on exposed stony slopes and ridges. As annual rainfall increases to the east and at higher altitudes, this community is replaced in similar moist sandy alluvium habitats by p520 [*Ribbon Gum very tall woodland on sandy alluvial soils along drainage lines of the eastern South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia dealbata	2	81	2	25	P
Acacia rubida	2	29	1	6	P
Acaena echinata	1	50	1	9	P
Acaena novae-zelandiae	2	52	1	27	P
Ajuga australis	1	29	1	8	P
Austrodanthonia racemosa var. *racemosa*	1	40	2	10	P
Bossiaea buxifolia	1	33	1	7	P
Cassinia longifolia	2	88	1	15	P
Chrysocephalum semipapposum	2	55	1	4	P
Daucus glochidiatus	1	24	1	8	P
Derwentia perfoliata	1	21	1	4	P
Desmodium varians	1	36	1	12	P
Dichondra repens	2	45	2	20	P
Echinopogon ovatus	1	43	1	10	P
Elymus scaber	1	69	1	20	P
Epilobium billardierianum subsp. *cinereum*	1	24	1	5	P
Eucalyptus pauciflora	3	64	3	20	P
Eucalyptus rubida	3	43	3	8	P
Eucalyptus viminalis	3	71	3	12	P
Euchiton gymnocephalus	1	55	1	15	P
Exocarpos strictus	1	31	1	12	P
Geranium neglectum	1	21	2	2	P
Hypericum gramineum	1	55	1	25	P
Leucopogon fletcheri subsp. *brevisepalus*	1	21	1	3	P
Melichrus urceolatus	1	43	1	13	P
Mirbelia oxylobioides	3	19	1	3	P
Oxalis spp.	1	21	1	3	P
Plantago varia	1	33	1	11	P
Poa sieberiana	2	74	2	48	P
Pultenaea procumbens	1	21	1	4	P
Rumex brownii	1	38	1	9	P
Scleranthus biflorus	1	40	1	10	P
Veronica plebeia	1	19	1	6	P
Viola betonicifolia	1	52	1	27	P
Glycine clandestina	1	45	1	29	C
Gonocarpus tetragynus	2	62	2	48	C
Hibbertia obtusifolia	1	45	1	35	C
Hydrocotyle laxiflora	1	40	2	30	C
Microlaena stipoides	2	55	2	34	C
Themeda australis	1	40	2	21	C

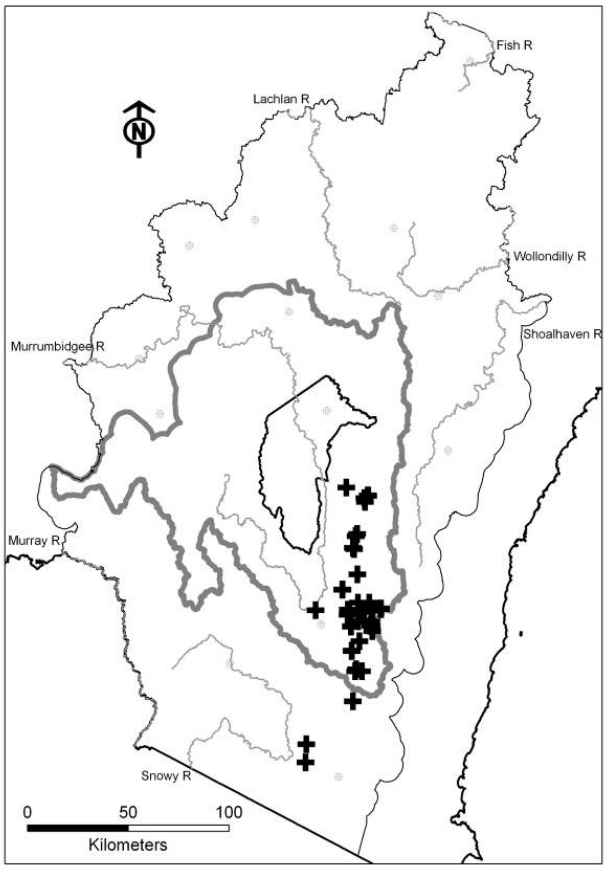


Figure m31: Distribution of field samples assigned to this community.

Threatened Communities: Some examples of this community may match the Final Determination description of the TSC Act 1995 Endangered Ecological Community - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions*.

Equivalent vegetation types: This community has no direct equivalent in the Forest Ecosystem classification of Gellie (2005), however it includes many of the plots that were assigned by those studies to VG73 [*Eastern Tableland Dry Shrub/Grass Forest*] and VG74 [*South Eastern Tablelands Dry Shrub/Grass/Herb Forest*].

Frequently-occurring weeds: *Acetosella vulgaris* (0.21), *Centaurium erythraea* (0.28), *Cirsium vulgare* (0.18), *Hypochaeris radicata* (0.62), *Trifolium arvense* (0.21).

Threats: Although m31 occupies relatively moist and productive sites, these are generally narrow zones within dry siliceous hills and ranges in dissected terrain. As a result this community is unlikely to have been extensively cleared, although larger examples of the type may have been historically thinned or cleared of trees to encourage pasture growth for grazing stock. Examples of this type on private land are likely to be subject to occasional ongoing light grazing. Its moister landscape position means this type is likely to be prone to ongoing weed invasion, particularly exotic pasture species spread by grazing animals.

Reservation Status: Most of the plots assigned to this type were sampled in conservation reserves, including Coornartha NR, Dangelong NR, Macanally SCA, Merriangaah NR, Mount Clifford NR, Numeralla NR, Quidong NR, Strike-A-Light NR, Tinderry NR, Undoo NR and Wadjan NR.

Extent of clearing: Likely to be minor.

m51: Brittle Gum - Scribbly Gum shrub-grass tall dry sclerophyll open forest on exposed quartz-rich slopes and ridges at primarily in the Monaro and Kybeyan-Gourock subregions of the South Eastern Highlands

Scientific Name: *Eucalyptus mannifera - Eucalyptus rossii - Eucalyptus macrorhyncha - Eucalyptus dives / Hibbertia obtusifolia - Melichrus urceolatus / Joycea pallida - Pultenaea procumbens - Dianella revoluta*

Number of samples:	50
Richness [mean (±SD)]:	21 (7)
Slope (degrees):	(1) 6-17 (26)
Altitude (m asl):	(771) 851-971 (1196)
Ave. Annual Rainfall (mm):	(539) 591-683 (801)
Temp. Annual Range (°C):	(24.5) 25.6-26.5 (27)

Vegetation Description: Community m51 is a tall eucalypt open forest to woodland with a 10-15m tall canopy dominated by Brittle Gum (*Eucalyptus mannifera*) and Scribbly Gum (*E. rossii*), commonly with Broad-leaved Peppermint (*E. dives*) and/or Red Stringybark (*E. macrorhyncha*). Shrubs are absent to patchy and a sparse to moderate groundcover is dominated by a relatively depauperate mix of tough low shrubs, forbs and grasses, including *Hibbertia obtusifolia*, *Joycea pallida*, *Dianella revoluta*, *Pultenaea procumbens*, *Melichrus urceolatus* and *Brachyloma daphnoides..*

Plate m51: Plant community m51, adjacent to Dangelong NR, Nimmitabel.

This community is defined by plots distributed from the Captains Flat/Burra area in the north, south along the Tinderry Mountains and Black Range to Numeralla and Sunny Corner, with disjunct records in the far south from Merriangaah and Quidong on Sherwins Range and Gibraltar Ridge. Within this range, m51 occurs on siliceous, moderately-low fertility substrates, with records primarily from Adaminaby Group sediments (sandstones, siliceous siltstones and mudstones) but also from Jerangle and Cooma Metamorphics and Glenbog Granodiorite. Records are predominantly from mid-elevations (800-1000m asl) in areas of relatively low mean annual rainfall (predominantly 600-700mm/annum).

Within this range, this community may grade into u21 [*Broad-leaved Peppermint - Candlebark tall dry sclerophyll open forest of quartz-rich ranges of the upper South East Highlands and lower Australian Alps Bioregions*] on deeper soils on footslopes and flats, and in sheltered gullies may be replaced by m31 [*Ribbon Gum - Snow Gum - Shiny Cassinia tall shrub-grass open forest of gullies in quartz-rich ranges in the Monaro and Kybeyan-Gourock subregions of the NSW South Eastern Highlands*]. On similar exposed landscape positions with siliceous substrates north of Queanbeyan, this community is replaced by the related p14 [*Red Stringybark - Scribbly Gum - Red-anthered Wallaby Grass tall grass-shrub dry sclerophyll open forest on loamy ridges of the central South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia buxifolia	1	14	1	1	P
Acacia falciformis	2	26	2	7	P
Acacia gunnii	1	26	1	6	P
Acacia rubida	1	46	1	5	P
Bossiaea buxifolia	1	32	1	7	P
Brachyloma daphnoides	1	62	1	16	P
Brachyscome rigidula	1	14	1	2	P
Callitris endlicheri	3	16	2	1	P
Cassinia longifolia	1	34	1	16	P
Choretrum pauciflorum	2	14	1	3	P
Daviesia leptophylla	1	22	1	5	P
Daviesia mimosoides subsp. *mimosoides*	1	24	2	9	P
Derwentia perfoliata	1	22	1	4	P
Dianella revoluta	1	66	1	22	P
Dillwynia sericea	1	24	1	4	P
Eucalyptus dives	3	50	3	18	P
Eucalyptus macrorhyncha	3	46	3	15	P
Eucalyptus mannifera	3	80	2	10	P
Eucalyptus rossii	3	58	3	7	P
Hibbertia obtusifolia	1	84	1	34	P
Joycea pallida	3	80	2	17	P
Leucopogon ericoides	3	18	1	<1	P
Leucopogon microphyllus	3	22	2	1	P
Melichrus urceolatus	1	62	1	12	P
Persoonia rigida	1	50	1	2	P
Platysace lanceolata	2	18	2	5	P
Pultenaea procumbens	2	66	1	4	P
Gonocarpus tetragynus	1	54	2	48	C
Lomandra longifolia	1	58	2	42	C

Threatened Communities: Nil.

Equivalent vegetation types: Community m51 has no direct equivalent in the Forest Ecosystem classification of Gellie (2005), however it includes a number of plots that were assigned to VG115 [*South East Tablelands Dry Shrub/Tussock Grass Forest*].

Frequently-occurring weeds: *Hypochaeris radicata* (0.07).

Threats: This community occupies relatively infertile and dry rocky slopes and is likely to have suffered only minor clearing across its range. Examples on private land may be subject to stock grazing but are unlikely to support high animal densities. Weed invasion is not a significant problem for this community.

Reservation Status: Due to the infertile, steep, dry rocky habitat of this community, it is well represented in conservation reserves. This community has been sampled from many conservation reserves across its range, including Burra Creek NR, Yanununbeyan SCA, Tinderry NR, Mount Dowling NR, Macanally NR, Coornatha NR, Kybeyan NR and Merriangaah NR.

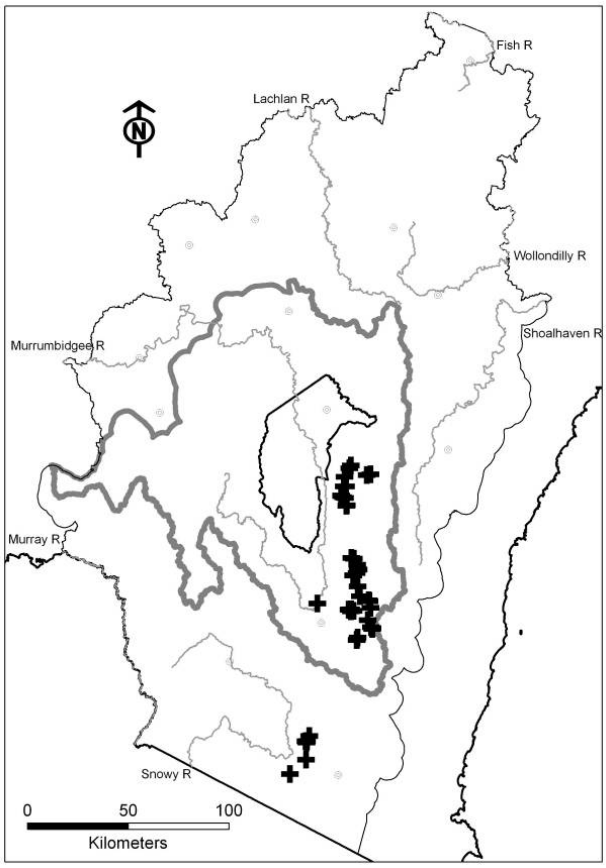


Figure m51: Distribution of field samples assigned to this community.

Extent of clearing: Only minor clearing likely.

p8: Silvertop Ash - Narrow-leaved Peppermint shrubby tall dry open forest primarily on sedimentary ridges of the eastern South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus sieberi - Eucalyptus radiata / Leucopogon lanceolatus - Persoonia linearis - Hibbertia obtusifolia - Pteridium esculentum / Gonocarpus tetragynus - Lomandra longifolia - Poa sieberiana*

Number of samples:	83
Richness [mean (±SD)]:	26 (8)
Slope (degrees):	(1) 6-17 (31)
Altitude (m asl):	(648) 806-994 (1190)
Ave. Annual Rainfall (mm):	(694) 856-956 (1069)
Temp. Annual Range (°C):	(22.6) 24.2-25.2 (26.2)

Plate p8: Community p8, Palerang Fire Trail, Tallaganda SCA.

Vegetation Description: Community p8 is a dry open forest with a tall tree canopy characteristically dominated by Silvertop Ash (*Eucalyptus sieberi*), with or without other eucalypts of dry sites including Narrow-leaved Peppermint (*E. radiata*) or Broad-leaved Peppermint (*E. dives*) and north of the study area, Blaxland's Stringybark (*E. blaxlandii*). This forest typically has an open understorey with a sparse complement of hard-leaved tall shrubs commonly including *Acacia terminalis*, *Persoonia linearis* and *Podolobium ilicifolium*, and shorter shrubs such as *Leucopogon lanceolatus* and *Monotoca scoparia.* Groundcover is often dominated by leaf litter and rock, with sparse and scattered plant cover dominated by tough wiry taxa including *Gonocarpus tetragynus*, *Pteridium esculentum*, *Lomandra longifolia*, *Poa sieberiana*, *Dianella revoluta*, *Billardiera scandens* and *Hibbertia obtusifolia.*

This community occurs primarily on dry exposed ridges and slopes with shallow to skeletal soils of moderately low to low soil fertility derived from a range of quartz-rich sedimentary, acid-volcanic and igneous substrates. This community occurs extensively on the eastern tablelands from Jenolan south along the Kanangra Range to Mount Werong, Wiarborough, Wombeyan Caves, the Cookbundoon Range, Currawang, the Gourock, Butmaroo and Bendoura Ranges to the Kybeyan Range (Countegany), and east of Braidwood from Charleys Forest to Northangera and Monga. It extends further to the east beyond the current study area (see Tozer *et al.* 2010).

Silvertop Ash - Narrow-leaved Peppermint shrubby tall dry open forest is often associated with WSFp73 (Tozer *et al*. 2010) north of the study area, and p338 [*Brown Barrel wet sclerophyll very tall grass-herb open forest primarily of the Gourock and Tallaganda Ranges in the South Eastern Highlands Bioregion*] in the south of its range, with p8 typically occupying drier stony ridgetops and exposed slopes, grading into WSFp73 or p338 on deeper, moister soils of lower slopes and sheltered aspects.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia falciformis	1	28	2	7	P
Acacia gunnii	1	18	1	6	P
Acacia obliquinervia	1	12	2	3	P
Acacia obtusifolia	2	10	2	1	P
Acacia terminalis	2	34	1	3	P
Acacia ulicifolia	1	10	1	2	P
Amperea xiphoclada	2	19	1	1	P
Austrodanthonia fulva	3	8	2	1	P
Austrostipa rudis	2	12	1	3	P
Banksia spinulosa var. *spinulosa*	2	34	2	1	P
Billardiera scandens	1	49	1	8	P
Bossiaea obcordata	2	7	2	<1	P
Comesperma volubile	1	7	1	1	P
Dampiera purpurea	1	8	2	<1	P
Daviesia ulicifolia	2	22	2	10	P
Dianella caerulea	1	27	1	5	P
Dianella revoluta	2	52	1	22	P
Eucalyptus blaxlandii	2	14	2	<1	P
Eucalyptus radiata	3	58	3	10	P
Eucalyptus sieberi	3	89	3	6	P
Eucalyptus smithii	3	10	1	<1	P
Gonocarpus tetragynus	2	73	2	47	P
Goodenia bellidifolia subsp. *bellidifolia*	1	6	2	1	P
Goodenia hederacea	2	40	2	16	P
Goodenia spp.	1	6	1	<1	P
Hakea dactyloides	2	17	2	2	P
Hakea eriantha	2	10	1	2	P
Hardenbergia violacea	1	34	1	14	P

Hibbertia diffusa	2	6	2	<1	P
Hibbertia obtusifolia	2	77	1	34	P
Hibbertia serpyllifolia	2	6	2	<1	P
Lepidosperma urophorum	2	19	2	1	P
Leucopogon lanceolatus	2	73	2	11	P
Lomandra filiformis subsp. *coriacea*	2	36	2	18	P
Lomandra glauca	2	23	2	4	P
Lomandra longifolia	2	67	2	42	P
Lomandra multiflora subsp. *multiflora*	2	36	1	18	P
Lomandra obliqua	2	24	2	3	P
Lomatia ilicifolia	1	22	1	3	P
Lomatia silaifolia	2	22	2	<1	P
Monotoca scoparia	2	54	1	14	P
Patersonia glabrata	2	18	2	1	P
Patersonia sericea	1	19	2	3	P
Persoonia laurina	1	8	1	<1	P
Persoonia linearis	1	75	1	9	P
Phyllanthus hirtellus	2	8	1	1	P
Platysace ericoides	2	14	2	<1	P
Podolobium ilicifolium	2	46	2	2	P
Polyscias sambucifolia subsp. *decomposita*	1	12	2	<1	P
Polyscias sambucifolia subsp. *sambucifolia*	2	8	1	1	P
Pomax umbellata	2	28	2	5	P
Pteridium esculentum	2	70	2	26	P
Rhytidosporum procumbens	2	14	1	3	P
Tetratheca thymifolia	1	11	1	<1	P
Xanthorrhoea concava	2	7	2	1	P
Poa sieberiana	2	53	2	48	C

Equivalent vegetation types: This community is equivalent to DSFp8 [*Tableland Ridge Forest*] identified by Tozer *et al.* (2010), with the addition of a small number of new plots from the Monga area and some minor reallocations of plots between this group and the closely related DSFp73. The current classification included 74 of the 84 plots originally allocated to DSFp8 by Tozer *et al.* (2010) – the other 10 plots were outside the broader study area, to the east.

Community p8 includes many plots that were not available at the time of the Gellie (2005) classification, and there is no directly equivalent forest ecosystem. However, p8 includes a number of plots allocated by Gellie (2005) to VG59 [*Eastern Tableland and Escarpment Shrub/Fern Dry Forest*] and VG112 [*Eastern Tablelands Dry Shrub Forest*].

Frequently-occurring weeds: *Hypochaeris radicata* (0.1), *Oxalis corniculata* (0.03), *Taraxacum officinale* (0.03).

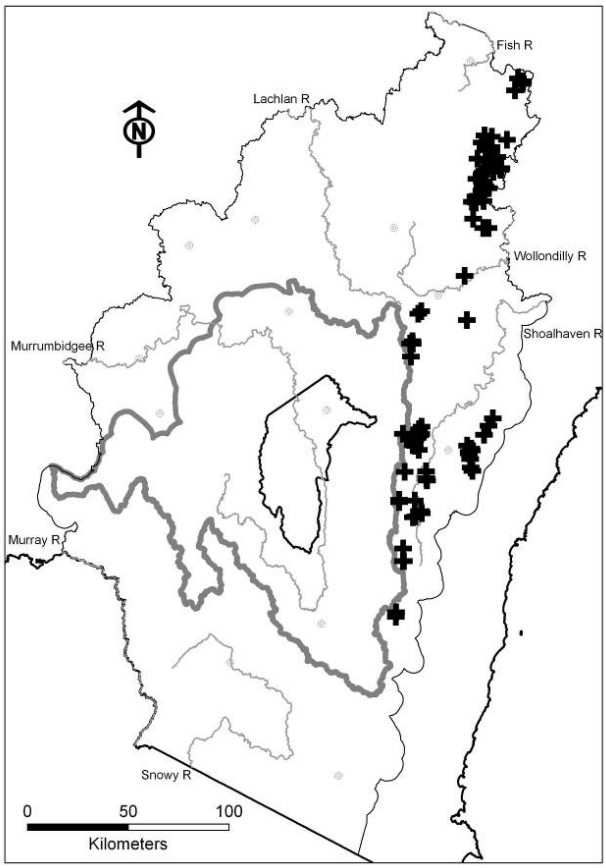


Figure p8: Distribution of field samples assigned to this community.

Threats: The steep, dissected, infertile habitat of this type is likely to have largely protected it from broadscale clearing. Parts of its range are within State Forest and private lands subject to logging and grazing. Weed invasion is not a significant threat.

Reservation Status: Recorded from within Kanangra-Boyd NP, Blue Mountains NP, Mares Forest NP, Tallaganda NP and SCA, Monga NP and SCA, Budawang NP and Deua NP. Many other reserves have records immediately adjacent and are likely to contain areas of this type; these reserves include Tarlo River NP, Cookbundoon NR, Gourock NP and Wadbilliga NP.

Extent of clearing: Likely to be minor and scattered, largely restricted to slightly flatter or marginally more fertile examples and edges where this type adjoins habitats more suitable for agricultural development.

p10: Black She-oak - Silvertop Ash tall shrubby dry sclerophyll open forest primarily in the Bungonia subregion of the South Eastern Highlands Bioregion

Scientific Name: *Allocasuarina littoralis - Eucalyptus sieberi - Eucalyptus agglomerata / Persoonia linearis - Hibbertia obtusifolia / Goodenia hederacea - Lomandra obliqua - Microlaena stipoides - Pomax umbellata*

Number of samples:	53
Richness [mean (±SD)]:	30 (9)
Slope (degrees):	(0) 3-10 (27)
Altitude (m asl):	(589) 663-789 (919)
Ave. Annual Rainfall (mm):	(695) 730-769 (866)
Temp. Annual Range (°C):	(23.5) 25.3-25.7 (26.3)

Plate p10: Community p8, Tiyces Lane, Towrang.

Vegetation Description: Community p10 is a dry tall open eucalypt forest with a canopy dominated by Silvertop Ash (*Eucalyptus sieberi*) and Blue-leaved Stringybark (*E. agglomerata*), usually with a sparse to dense small tree layer of *Allocasuarina littoralis* and scattered shrubs including *Acacia terminalis* and *Persoonia linearis.* Groundcover tends to be dominated by leaf litter, with a sparse scatter of wiry grasses, sedges, forbs and low shrubs including *Billardiera scandens*, *Entolasia stricta*, *Goodenia hederacea*, *Hibbertia obtusifolia*, *Lepidosperma gunnii*, *Lomandra multiflora*, *Lomandra obliqua*, *Microlaena stipoides* and *Pomax umbellata*.

Plots assigned to this community were sampled from dry ridges and slopes on soils of moderately low fertility derived predominantly from sedimentary and metasedimentary rocks of the Adaminaby, Lambie and Shoalhaven Groups and the Towrang and Gundary Beds - predominantly shales, sandstones, quartzites and conglomerates. Records range from Greenwich Park and Chatsbury in the north, south to Larbert and Durran Durra, west to Collector and east beyond the study area boundary.Whilst not sampled in the ACT, similar vegetation has been observed around Gibraltar Hill, which may be a western outlier of this community.

This community is often associated with other dry ridge forests across its range. It commonly occupies lower ridges and slopes of tableland hills, and may grade into p8 [*Silvertop Ash - Narrow-leaved Peppermint shrubby tall dry open forest*] on high stony tableland peaks, while on lower slopes it is often replaced by rp9 [*Brittle Gum - Scribbly Gum shrubby tall dry open forest*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia obtusifolia	2	15	2	1	P
Acacia terminalis	1	53	2	3	P
Allocasuarina littoralis	3	83	2	3	P
Banksia spinulosa var. *spinulosa*	2	17	2	2	P
Billardiera scandens	1	53	1	9	P
Brachyloma daphnoides	1	34	1	16	P
Caustis flexuosa	1	13	2	<1	P
Daviesia leptophylla	2	26	1	5	P
Dianella revoluta	1	43	1	22	P
Entolasia stricta	2	53	1	3	P
Eucalyptus agglomerata	3	64	3	2	P
Eucalyptus globoidea	3	25	3	2	P
Eucalyptus rossii	3	21	3	7	P
Eucalyptus sieberi	3	83	3	7	P
Goodenia hederacea subsp. *hederacea*	2	98	2	16	P
Hakea dactyloides	2	23	2	3	P
Helichrysum leucopsideum	2	19	1	<1	P
Hibbertia empetrifolia	2	17	2	<1	P
Hibbertia obtusifolia	1	77	1	34	P
Joycea pallida	2	40	2	17	P
Lepidosperma gunnii	1	55	1	4	P
Lepidosperma urophorum	2	15	2	1	P
Lomandra glauca	1	23	2	4	P
Lomandra multiflora subsp. *multiflora*	1	51	1	18	P
Lomandra obliqua	2	70	2	2	P
Lomatia ilicifolia	2	30	1	3	P
Melichrus urceolatus	1	43	1	13	P
Microlaena stipoides	2	57	2	34	P
Monotoca scoparia	1	32	1	15	P
Opercularia aspera	1	19	1	3	P
Opercularia diphylla	2	21	2	3	P
Patersonia glabrata	2	28	2	1	P
Patersonia longifolia	2	23	2	<1	P

Patersonia sericea	1	38	2	3	P
Persoonia linearis	1	92	1	9	P
Persoonia mollis subsp. *livens*	1	13	1	1	P
Platysace ericoides	2	30	2	<1	P
Platysace lanceolata	2	25	2	5	P
Podolobium ilicifolium	1	26	2	3	P
Pomax umbellata	1	66	2	4	P
Rhytidosporum procumbens	1	49	1	2	P
Stypandra glauca	2	49	2	5	P
Xanthorrhoea concava	2	30	2	<1	P
Gonocarpus tetragynus	2	45	2	48	C

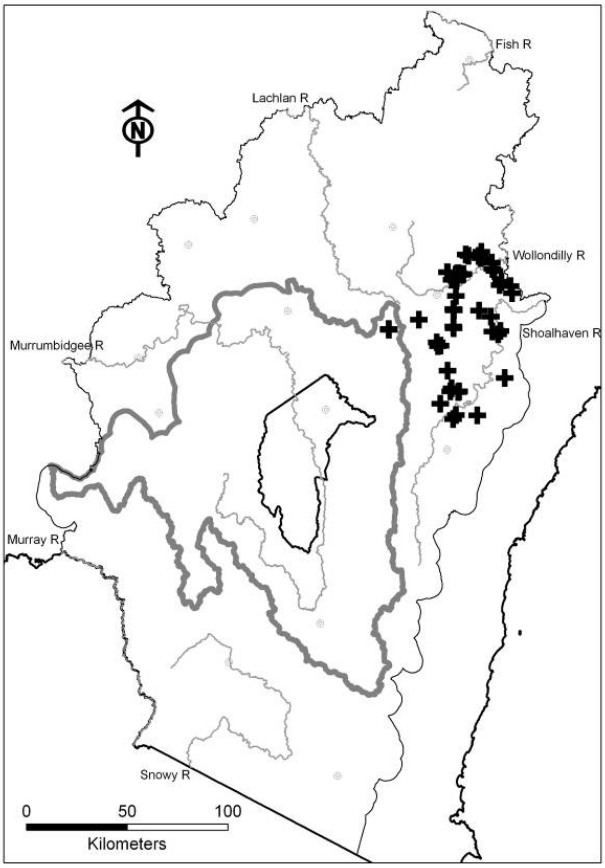


Figure p10: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: Community p10 represents a slight westward extension of DSFp10 [*Eastern Tablelands Dry Forest*] identified by Tozer *et al.* (2010), with the addition of new plots from Collector and new reserves around Goulburn, and some minor reallocations in and out of the group. This community extends beyond the current study area's eastern boundary; this study included only 45 of the 65 plots assigned to DSFp10 by Tozer *et al.* (2010) and the description here is based on those 45 plots. Some similarities with VG15 [*North East Tableland Dry Shrub Forest*] (Gellie 2005).

Frequently-occurring weeds: *Hypochaeris glabra* (0.09).

Threats: p10 is commonly found as remnant patches of woody vegetation on poor soils on hills and ridges in rural landscapes. Some of its original extent is likely to have been cleared, and most remnants on private land are likely to be subject to ongoing light grazing.

Reservation Status: This community is known to occur in Tarlo River NP, Cookbundoon NR, Pomaderris NR, Bungonia SCA, Morton NP (western edge), Nadgigomar NR. It also occurs in Belanglo SF.

Extent of clearing: p10 is only likely to have undergone minor clearing across its range, predominantly at the edges of patches where it adjoins areas of slightly deeper and/or more fertile soils.

p14: Red Stringybark - Scribbly Gum - Red-anthered Wallaby Grass tall grass-shrub dry sclerophyll open forest on loamy ridges of the central South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus macrorhyncha - Eucalyptus rossii ± Eucalyptus mannifera / Hibbertia obtusifolia - Brachyloma daphnoides - Daviesia leptophylla / Joycea pallida - Gonocarpus tetragynus - Poa sieberiana*

Number of samples:	165
Richness [mean (±SD)]:	27 (8)
Slope (degrees):	(0) 5-16 (51)
Altitude (m asl):	(504) 703-856 (1157)
Ave. Annual Rainfall (mm):	(603) 712-790 (918)
Temp. Annual Range (°C):	(24.1) 25.8-26.6 (28.1)

Plate p14: Community p14, plot RIC002LQ.

Vegetation Description: Community p14 is a tall open eucalypt forest dominated by Red Stringybark

(*Eucalyptus macrorhyncha*) and Scribbly Gum (*E. rossii*), often with Brittle Gum (*E. mannifera*), Long-leaved Box (*E. goniocalyx*), Broad-leaved Peppermint (*E. dives*) or Red Box (*E. polyanthemos*). The shrub layer is patchy and generally includes *Hibbertia obtusifolia*, *Brachyloma daphnoides*, *Daviesia leptophylla*, *Acacia gunni* and *Hovea linearis* and occasionally *Melichrus urceolatus*, *Monotoca scoparia*, *Persoonia rigida* and *Gompholobium huegellii*. The climbing or prostrate sub-shrub *Hardenbergia violacea* is often present. The ground cover is also generally patchy and dominated by grasses such as *Joycea pallida* and *Poa sieberiana* and a variety of forbs including *Lomandra filiformis* subsp*. coriacea*, *Dianella revoluta*, *Lomandra multiflora*, *Gonocarpus tetragynus* and *Goodenia hederacea.*

This community is widely distributed, occurring within the Murrumbidgee catchment mostly in areas north of the Wee Jasper and Captains Flat areas to Oberon in the Central West catchment. It grades into communities such as m51 [*Brittle Gum - Scribbly Gum shrub-grass tall dry sclerophyll open forest on exposed quartz-rich slopes and ridges at primarily in the Monaro and Kybeyan-Gourock subregions of the South Eastern Highlands*] south of Queanbeyan, as well as rp23 [*Red Stringybark - Broad-leaved Peppermint tall dry sclerophyll grassy open forest on loamy rises primarily in the Bungonia subregion of the South Eastern Highlands Bioregion*], and rp24 [*Yellow Box - Blakely's Red Gum tall grassy woodland on undulating sedimentary and acid-volcanic substrates in the Goulburn area of the South Eastern Highlands Bioregion*] on more gently undulating loamy soils.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia buxifolia	1	8	1	1	P
Acacia decurrens	1	6	2	1	P
Acacia falciformis	1	15	2	7	P
Acacia genistifolia	2	11	1	1	P
Acacia gunnii	1	44	1	4	P
Acacia lanigera	1	4	0	0	P
Astrotricha ledifolia	1	4	1	<1	P
Austrodanthonia fulva	3	8	2	1	P
Brachyloma daphnoides	2	62	1	14	P
Caladenia carnea	1	4	1	1	P
Cassinia arcuata	1	8	2	1	P
Cheiranthera linearis	1	13	1	<1	P
Comesperma ericinum	2	3	1	<1	P
Daviesia leptophylla	2	51	1	3	P
Dianella revoluta	1	63	1	20	P
Dillwynia phylicoides	2	16	2	1	P
Dillwynia sericea	1	26	1	3	P
Dillwynia sieberi	1	4	1	<1	P
Dillwynia spp.	2	4	1	<1	P
Diuris sulphurea	1	5	1	1	P
Drosera auriculata	1	8	1	2	P
Eucalyptus dives	3	30	3	18	P
Eucalyptus goniocalyx	2	34	3	2	P
Eucalyptus macrorhyncha	3	86	3	12	P
Eucalyptus mannifera	3	51	2	9	P
Eucalyptus polyanthemos	3	22	3	2	P
Eucalyptus praecox	3	2	0	0	P
Eucalyptus rossii	3	66	3	4	P
Genoplesium spp.	1	4	1	<1	P
Glossodia major	1	3	1	<1	P
Gompholobium huegelii	1	20	1	4	P
Gompholobium minus	1	5	1	1	P
Gonocarpus tetragynus	2	84	2	46	P
Goodenia bellidifolia	2	8	2	1	P
Goodenia hederacea	2	67	2	15	P
Hakea decurrens subsp. *decurrens*	2	2	1	<1	P
Hardenbergia violacea	1	34	1	13	P
Hibbertia calycina	1	6	2	<1	P
Hibbertia obtusifolia	1	89	1	32	P
Hibbertia riparia	1	11	1	<1	P
Hibbertia spp.	1	4	1	<1	P
Hovea heterophylla	2	13	1	4	P
Hovea linearis	1	40	1	12	P
Joycea pallida	3	74	2	15	P
Leptospermum multicaule	2	5	2	<1	P
Leucopogon virgatus	1	15	1	3	P
Lomandra filiformis subsp. *coriacea*	2	61	2	17	P
Lomandra multiflora subsp. *multiflora*	1	45	1	17	P
Melichrus urceolatus	1	37	1	12	P
Monotoca scoparia	1	31	1	14	P
Olearia microphylla	1	4	2	<1	P
Patersonia sericea	1	9	2	3	P
Persoonia rigida	1	21	1	2	P
Phyllanthus hirtellus	1	8	1	1	P
Poa sieberiana	2	73	2	47	P
Pomax umbellata	1	12	2	5	P
Pterostylis spp.	1	19	1	5	P
Pultenaea microphylla	2	11	1	<1	P
Pultenaea procumbens	1	11	1	4	P
Pultenaea subspicata	1	7	2	2	P
Rhytidosporum procumbens	1	14	1	3	P
Senecio tenuiflorus	2	7	1	2	P
Stypandra glauca	1	17	2	5	P
Styphelia triflora	1	8	1	<1	P
Tetratheca spp.	1	2	1	<1	P
Thelymitra spp.	1	11	1	2	P

Thysanotus patersonii	1	5	1	<1	P
Unidentified	1	2	2	<1	P
Wahlenbergia gracilis	2	12	1	6	P

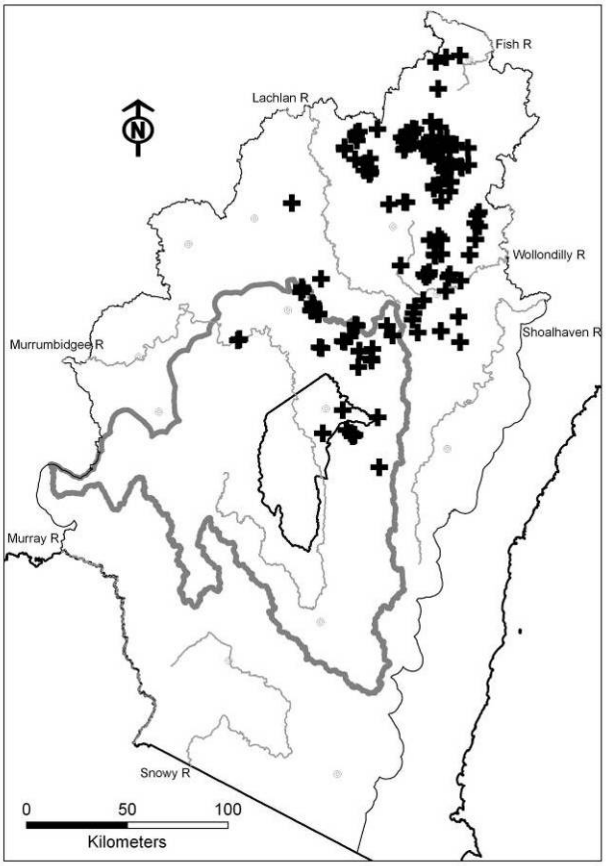


Figure p14: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Frequently occurring weeds: *Hypochaeris glabra* (0.14), *Hypochaeris radicata* (0.29).

Equivalent vegetation types: This community represents DSF p14 [*Western Tablelands Dry Forest*] as described by Tozer *et al.* (2010) with a western range extension into the upper Murrumbidgee catchment. The relationship between p14 and communities identified by Benson *et al.* (2010) with similar structural dominants outside the upper Murrumbidgee catchment (such as VCA ID 290, VCA ID 349 and VCA ID 351) requires resolution through further sampling and analysis.

Threats: Large areas have been cleared or used for poor-country grazing.

Reservation Status: Considered to be moderately reserved. Examples of this community are found in Abercrombie River NP, Back Arm NR, Bango NR, Belmount SCA, Gillindich NR, Keverstone NP, McLeods Creek NR, Morton NP, Mundoonen NR, Razorback NR, Tarlo River NP, Wee Jasper NR and Yanununbeyan NP.

Extent of clearing: As this community generally occurs on lithosols on low ridgetops, clearing is considered minimal.

rp9: Brittle Gum - Scribbly Gum shrubby tall dry open forest on infertile low ridges and hills primarily of the Bungonia subregion of the South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus mannifera - Eucalyptus rossii / Allocasuarina littoralis / Melichrus urceolatus - Brachyloma daphnoides - Hibbertia obtusifolia / Goodenia hederacea - Gonocarpus tetragynus - Lomandra filiformis* subsp. *coriacea - Microlaena stipoides - Joycea pallida*

Number of samples:	51
Richness [mean (±SD)]:	30 (8)
Slope (degrees):	(0) 3-8 (20)
Altitude (m asl):	(560) 649-762 (918)
Ave. Annual Rainfall (mm):	(669) 701-754 (893)
Temp. Annual Range (°C):	(24.7) 25.7-26.2 (26.6)

Plate rp9: Community rp9, plot TOW005HQ.

Vegetation Description: Community rp9 represents a tall dry eucalypt woodland to open forest with a tree canopy commonly dominated by Brittle Gum (*Eucalyptus mannifera*) and/or Scribbly Gum (*E. rossii*), often associated with Broad-leaved Peppermint (*Eucalyptus dives*) and Red Stringybark (*Eucalyptus macrorhyncha*). A sparse to patchy small tree stratum of *Allocasuarina littoralis* is commonly present, above a sparse understorey of tough wiry shrubs including *Persoonia linearis*, *Acacia gunnii*, *Daviesia leptophylla* and *Kunzea ericoides*. Groundcover plants are generally sparse but reasonably diverse, including scattered tough low shrubs (*Brachyloma daphnoides*, *Dillwynia sericea*, *Hibbertia obtusifolia*, *Leucopogon virgatus*, *Lissanthe strigosa* and *Melichrus urceolatus)*, grasses (*Aristida*

ramosa, *Joycea pallida*, *Microlaena stipoides*, *Poa sieberiana)* and forbs *(Dianella revoluta*, *Gonocarpus tetragynus*, *Goodenia hederacea*, *Lepidosperma gunnii*, *Lomandra filiformis* subsp. *coriacea*, *Lomandra multiflora*, *Opercularia diphylla*, *Hypericum gramineum*, *Lomandra longifolia).*

This community is recorded from soils classed as moderately low to low fertility (Charman 1978), derived most commonly from sandstones, quartzites, conglomerates and shales of the Adaminaby, Mount Fairy and Lambie Groups, with additional records in the Boro/Manar and Bungonia/Marulan areas from acid volcanic and granitic substrates. Records range from Big Hill west to Kingsdale, Yarra, Collector and Bellmount, south to Tarago, Butmaroo, Mulloon and Warri, east to Braidwood, Nadgigomar, Windellama, Bungonia, Marulan and Brayton. Within this range, on sheltered slopes and slightly deeper soils of hills and ridges this community may grade into p10 [*Black She-oak - Silvertop Ash tall shrubby dry sclerophyll open forest primarily in the Bungonia subregion of the South Eastern Highlands Bioregion*], while on footslopes it may grade into rp23 [*Red Stringybark - Broad-leaved Peppermint tall dry sclerophyll grassy open forest on loamy rises primarily in the Bungonia subregion of the South Eastern Highlands Bioregion*]. To the west and north of its range it is replaced in similar habitats by the related p14 [*Red Stringybark - Scribbly Gum - Red-anthered Wallaby Grass tall grass-shrub dry sclerophyll open forest on loamy ridges of the central South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia gunnii	1	25	1	6	P
Allocasuarina littoralis	2	52	2	3	P
Aristida ramosa	2	38	2	5	P
Astroloma humifusum	2	25	1	5	P
Austrodanthonia spp.	2	25	1	7	P
Austrostipa mollis	2	17	2	<1	P
Brachyloma daphnoides	2	67	1	16	P
Cheilanthes sieberi	1	23	1	9	P
Daviesia leptophylla	2	23	1	5	P
Dianella revoluta	2	69	1	22	P
Dillwynia sericea	1	29	1	4	P
Entolasia stricta	2	27	2	4	P
Eucalyptus dives	3	52	3	18	P
Eucalyptus macrorhyncha	3	38	3	16	P
Eucalyptus mannifera	3	65	3	10	P
Eucalyptus rossii	3	60	3	7	P
Gonocarpus tetragynus	2	85	2	47	P
Goodenia hederacea subsp. *hederacea*	2	94	2	15	P
Hibbertia obtusifolia	2	63	1	34	P
Hovea heterophylla	2	31	1	4	P
Joycea pallida	3	54	2	17	P
Kunzea ericoides	2	25	2	4	P
Laxmannia gracilis	1	21	1	<1	P
Lepidosperma gunnii	2	50	1	4	P
Leucopogon virgatus	2	17	1	3	P
Lissanthe strigosa	2	29	1	7	P
Lomandra filiformis subsp. *coriacea*	2	67	2	18	P
Lomandra multiflora subsp. *multiflora*	2	58	1	18	P
Lomandra obliqua	1	21	2	3	P
Melichrus urceolatus	1	71	1	12	P
Microlaena stipoides	2	77	2	34	P
Opercularia diphylla	2	38	2	3	P
Patersonia sericea	2	25	1	3	P
Persoonia linearis	1	52	1	10	P
Rhytidosporum procumbens	2	23	1	3	P
Tricoryne elatior	2	21	1	4	P
Hypericum gramineum	1	42	1	25	C
Lomandra longifolia	2	42	2	42	C
Poa sieberiana	2	46	2	48	C

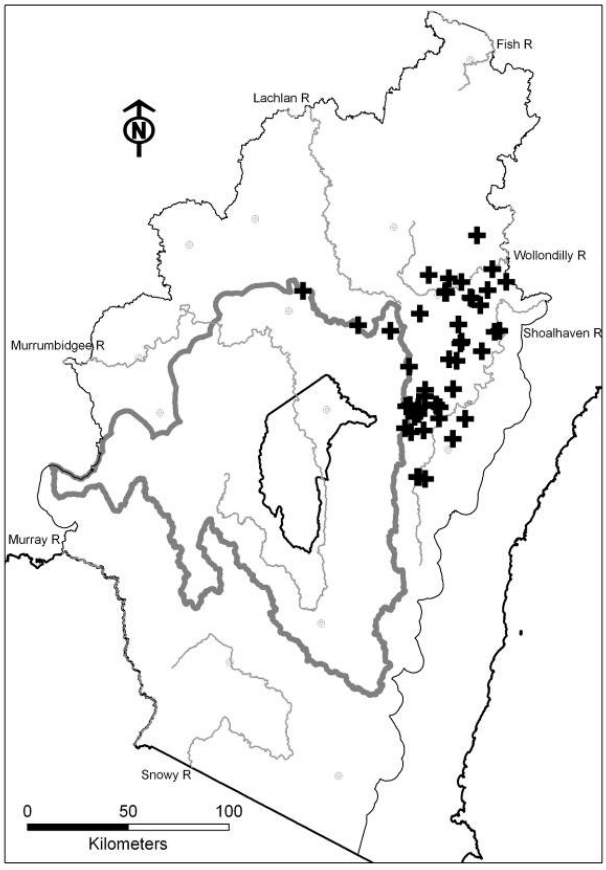


Figure rp9: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: Type rp9 represents a revision of the community DSFp9 [*Tableland Low Woodland*] identified by Tozer *et al.* (2010), based on an overlapping but different study area with additional and new field samples.

There is no equivalent Forest Ecosystem in the classifications of Gellie (2005); most of the plots in this group are recent samples from private land, which were not available at the time of those earlier crown-land focussed classifications.

Frequently-occurring weeds: *Hypochaeris radicata* (0.29).

Threats: Frequent and high-intensity grazing, for example in areas of closer rural subdivision, represent a threat to remnants of this community, with the potential to disrupt survival processes such as seed production and seedling establishment, leading to structure and composition changes including local extinctions of sensitive plant species.

Reservation Status: Recorded from Tarlo River NP, Belmount SCA, Nadgigomar NR and Scott NR.

Extent of clearing: This type has probably experienced widespread but relatively low clearing levels, with clearing likely to have affected smaller hills and lower edges of patches. Future clearing pressure on remaining examples is most likely in areas of rural-residential subdivision around larger towns.

rp23: Red Stringybark - Broad-leaved Peppermint tall dry sclerophyll grassy open forest on loamy rises primarily in the Bungonia subregion of the South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus macrorhyncha - Eucalyptus dives / Melichrus urceolatus - Hibbertia obtusifolia - Hardenbergia violacea / Microlaena stipoides - Lomandra filiformis* subsp. *coriacea - Hydrocotyle laxiflora - Gonocarpus tetragynus - Themeda australis - Poa sieberiana*

Number of samples:	86
Richness [mean (±SD)]:	36 (9)
Slope (degrees):	(0) 3-11 (37)
Altitude (m asl):	(531) 661-856 (1118)
Ave. Annual Rainfall (mm):	(664) 700-790 (940)
Temp. Annual Range (°C):	(24) 25.5-26.3 (28.3)

Vegetation Description: Community rp23 is a tall eucalypt open forest or woodland most commonly dominated by Red Stringybark (*Eucalyptus macrorhyncha*) and Broad-leaved Peppermint (*E. dives*), often with a mix of other eucalypts including

Plate rp23: Community rp23, Plot CAN039LQ.

Apple Box (*E. bridgesiana*), Brittle Gum (*E. mannifera*) and Yellow Box (*E. melliodora*). Taller shrubs are frequently absent, but some plots have a sparse small tree layer of tall acacias and a sparse to patchy shrub stratum. Groundcover of plants is commonly moderate to dense, with the most frequent taxa being *Lomandra filiformis* subsp. *coriacea* and a mix of grasses (eg. *Microlaena stipoides*, *Themeda australis*, *Poa sieberiana)*, low shrubs *(Hibbertia obtusifolia*, *Melichrus urceolatus)*, and forbs *(Gonocarpus tetragynus*, *Goodenia hederacea*, *Hydrocotyle laxiflora*, *Hypericum gramineum* and *Oxalis perennans*).

This community occupies gently undulating to hilly country in the north-eastern Southern Tablelands, and is recorded from an area bounded by Tuena, Arkstone and Paling Yards in the north, Crooked Corner, Lost River, Bannister, Parkesbourne, Collector and Tarago in the southwest, and Larbert, Braidwood and Tomboye in the southeast. It extends to the east beyond the current study area boundary on similar undulating tableland country. Plots assigned to this type are commonly on sandy soils of intermediate depth and moderately low to low fertility derived from substrates including Adaminaby and Lambie Group sedimentary rocks and various granitic and acid volcanic rocks.

The floristic composition of this community is intermediate between vegetation of drier hills with shallow soil, and vegetation of gentle slopes and flats with deeper soils and better groundwater availability. On gentler slopes and flats this type may grade into rp24 [*Yellow Box - Blakely's Red Gum tall grassy woodland on undulating sedimentary and acid-volcanic substrates in the Goulburn area of the South Eastern Highlands Bioregion*], while on steeper slopes with shallower soils it is generally replaced by dry sclerophyll forest types such as rp9 [*Brittle Gum - Scribbly Gum shrubby tall dry open forest on infertile low ridges and hills primarily of the Bungonia subregion of the South Eastern Highlands Bioregion*] or p14 [*Red Stringybark - Scribbly Gum - Red-anthered Wallaby Grass tall grass-shrub dry*

sclerophyll open forest on loamy ridges of the central South Eastern Highlands Bioregion]. The majority of plots allocated to this community are from private land subject to regular stock grazing, fencepost cutting and other disturbances, which may help to explain the highly variable shrub and canopy composition of this type.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia decurrens	2	14	1	1	P
Acacia genistifolia	1	12	1	1	P
Acaena echinata	2	22	1	9	P
Aristida jerichoensis var. *jerichoensis*	2	13	2	<1	P
Aristida ramosa	2	29	2	5	P
Astroloma humifusum	1	22	1	5	P
Austrodanthonia laevis	2	23	2	3	P
Austrodanthonia monticola	2	6	2	1	P
Austrodanthonia racemosa	2	44	2	10	P
Austrodanthonia tenuior	2	10	2	<1	P
Austrostipa densiflora	2	8	1	<1	P
Austrostipa mollis	3	7	2	<1	P
Austrostipa rudis subsp. *nervosa*	2	8	2	1	P
Austrostipa scabra	2	12	1	4	P
Bossiaea buxifolia	2	31	1	6	P
Bossiaea prostrata	2	20	1	2	P
Cassinia arcuata	1	8	1	1	P
Cassinia laevis	1	7	2	1	P
Cheilanthes sieberi	2	37	1	8	P
Chrysocephalum apiculatum	2	19	1	6	P
Cymbonotus lawsonianus	1	30	1	4	P
Daviesia latifolia	2	21	2	7	P
Dianella longifolia var. *longifolia*	1	9	1	3	P
Dichelachne micrantha	2	33	1	9	P
Dillwynia sericea	1	13	1	4	P
Echinopogon caespitosus	1	10	1	<1	P
Einadia nutans	1	17	1	4	P
Elymus scaber	2	35	1	21	P
Eucalyptus blakelyi	3	14	3	2	P
Eucalyptus bridgesiana	2	29	3	7	P
Eucalyptus cinerea	3	13	2	<1	P
Eucalyptus dives	3	56	3	17	P
Eucalyptus macrorhyncha	3	56	3	15	P
Eucalyptus mannifera	2	29	3	11	P
Eucalyptus melliodora	3	21	3	5	P
Galium gaudichaudii	2	22	1	9	P
Geranium solanderi	2	35	1	19	P
Glycine microphylla	2	7	2	1	P
Gonocarpus tetragynus	2	90	2	47	P
Goodenia hederacea	2	69	2	15	P
Hardenbergia violacea	2	42	1	14	P
Hibbertia obtusifolia	2	64	1	34	P
Hovea heterophylla	2	24	1	4	P
Hydrocotyle laxiflora	2	84	2	28	P
Hypericum gramineum	2	76	1	24	P
Indigofera australis	1	16	1	7	P
Juncus filicaulis	1	10	1	2	P
Juncus subsecundus	1	8	1	2	P
Lagenophora gracilis	2	9	1	1	P
Laxmannia gracilis	2	6	1	1	P
Lissanthe strigosa	2	38	1	6	P
Lomandra filiformis subsp. *coriacea*	2	90	2	17	P
Lomandra multiflora subsp. *multiflora*	2	37	1	18	P
Luzula densiflora	1	22	1	5	P
Melichrus urceolatus	2	60	1	12	P
Microlaena stipoides	2	93	2	33	P
Opercularia aspera	2	16	1	3	P
Opercularia diphylla	2	23	2	3	P
Opercularia hispida	2	12	1	2	P
Oxalis perennans	2	70	1	12	P
Ozothamnus diosmifolius	1	7	1	<1	P
Panicum effusum	1	10	1	3	P
Pimelea curviflora	2	29	1	6	P
Plantago gaudichaudii	2	12	1	1	P
Pterostylis spp.	1	19	1	6	P
Pultenaea microphylla	2	9	1	1	P
Solenogyne dominii	1	13	1	3	P
Solenogyne gunnii	2	13	1	5	P
Thelymitra spp.	1	10	1	2	P
Themeda australis	2	62	2	20	P
Thysanotus patersonii	2	10	1	<1	P
Tricoryne elatior	2	29	1	3	P
Veronica plebeia	2	34	1	5	P
Wahlenbergia gracilis	1	19	1	6	P
Poa sieberiana	2	57	2	48	C

Threatened Communities: Nil.

Equivalent vegetation types: Community rp23 represents a revision of the community GWp23 [*Tableland Hills Grassy Woodland*] identified by Tozer *et al.* (2010), based on an overlapping but different study area with additional and new field samples with a greater tablelands and slopes focus than that earlier study.

Frequently-occurring weeds: *Acetosella vulgaris* (0.35), *Hypochaeris radicata* (0.61).

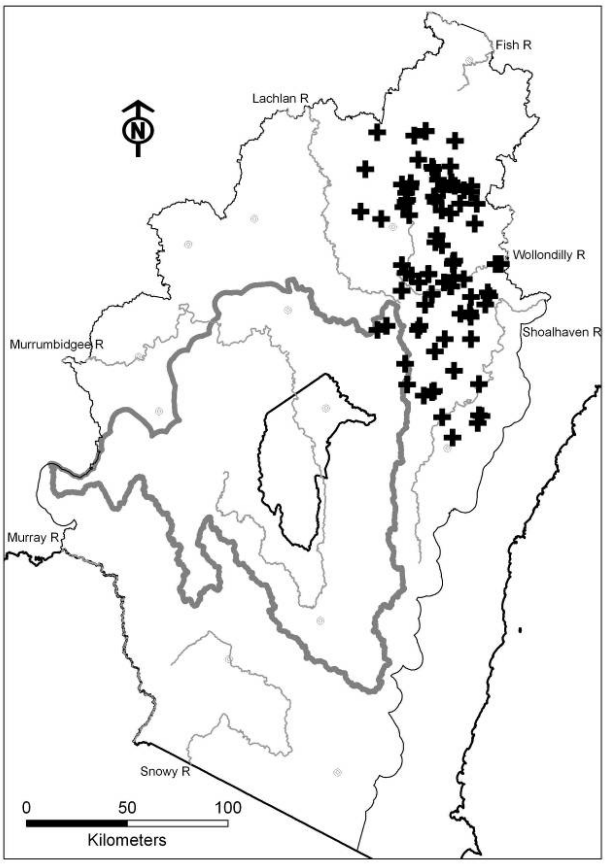


Figure rp23: Distribution of field samples assigned to this community.

Threats: Frequent and high-intensity grazing, for example in areas of closer rural subdivision, represent a threat to remnants of this type, with the potential to disrupt survival processes such as seed production and seedling establishment, leading to structure and composition changes including local extinctions of sensitive plant species.

Reservation Status: The undulating tableland range of this community is dominated by private lands and contains few conservation reserves. It has been recorded from the newer reserves of Gillindich NR, Mares Forest NP and Oakdale NR and immediately adjacent to Abercrombie River NP and Bungonia NP.

Extent of clearing: This type has probably experienced widespread but moderate levels of clearing, occupying habitats intermediate in attractiveness for agricultural development. Clearing is likely to have affected examples at the 'better' end of the productivity scale, and edges of poorer patches. Future clearing pressure on remaining examples is most likely in areas of rural-residential subdivision around larger towns.

u18: Norton's Box - Broad-leaved Peppermint shrubby mid-high open forest on granite substrates primarily in the Namadgi Region

Scientific Name: *Eucalyptus nortonii - Eucalyptus dives / Cassinia longifolia - Hibbertia obtusifolia - Olearia tenuifolia / Gonocarpus tetragynus - Dichelachne micrantha - Wahlenbergia stricta - Hydrocotyle laxiflora*

Number of samples:	17
Richness [mean (±SD)]:	26 (7)
Slope (degrees):	(8) 15-23 (35)
Altitude (m asl):	(730) 818-978 (1318)
Ave. Annual Rainfall (mm):	(735) 789-958 (1072)
Temp. Annual Range (°C):	(24.1) 25.5-26 (26.3)

Vegetation Description: Community u18 is a mid-high eucalypt open forest dominated by Norton's Box (*Eucalyptus nortonii*) and Broad-leaved Peppermint (*E. dives*) with occasional occurrences of dense stands of Black Cypress Pine (*Callitris endlicheri*). *C. endlicheri* may occur in either the canopy or midstorey layer. The shrub layer is generally dense and may be dominated by *Cassinia longifolia*, *Olearia tenuifolia*, *Brachyloma daphnoides*, *Kunzea ericoides*, *Calytrix tetragona* and *Acacia falciformis.* The ground layer is generally sparse and frequently includes the forbs *Gonocarpus tetragynus*, *Wahlenbergia stricta* and *Hydrocotyle laxiflora* and the low shrub *Hibbertia obtusifolia. Dichelachne micrantha* is the most common grass, with occasional occurrences of *Joycea pallida* and *Austrodanthonia pilosa*.

Norton's Box - Broad-leaved Peppermint mid-high shrubby open forest is defined by survey plots from within the ACT, primarily in Namadgi NP in the Mount Tennant area and slopes around Blue Gum Creek, however it may potentially occur in other parts of the Brindabella Ranges on earthy sands derived from granite substrates. In Namadgi NP it grades into communities such as u150 [*Broad-leaved Peppermint - Mountain Gum tall grass-forb open forest of the South Eastern Highlands and Australian Alps Bioregions*], u29 [*Apple Box - Broad-leaved Peppermint tall shrub-grass woodland primarily on granitoids of the South Eastern Highlands Bioregion*], u66 [*Norton's Box - Red Stringybark grass-herb mid-high open forest of the South Eastern Highlands and Upper Slopes Subregion of the South Western Slopes Bioregion*] and u27 [*Snow Gum - Candlebark tall grassy woodland in frost hollows and gullies primarily of Namadgi Region*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia falciformis	3	41	2	7	P
Brachyloma daphnoides	1	59	1	16	P
Bursaria spinosa	2	35	1	10	P
Callitris endlicheri	4	35	2	1	P
Calytrix tetragona	3	47	2	<1	P
Cassinia longifolia	3	100	1	16	P
Cheilanthes austrotenuifolia	3	24	1	3	P
Dichelachne micrantha	3	53	1	10	P
Dillwynia sericea	2	24	1	4	P
Dodonaea viscosa	3	24	1	2	P
Eucalyptus dives	3	65	3	18	P
Eucalyptus nortonii	3	100	3	3	P
Hibbertia obtusifolia	2	76	1	34	P
Kunzea ericoides	2	53	2	4	P
Leucopogon attenuatus	2	29	1	1	P
Olearia tenuifolia	2	65	1	<1	P
Oxalis exilis	2	35	1	5	P
Pomax umbellata	3	35	2	5	P
Pultenaea procumbens	1	35	1	4	P
Senecio quadridentatus	1	29	1	6	P
Stypandra glauca	2	29	2	5	P
Thysanotus tuberosus	1	41	1	3	P
Wahlenbergia stricta	2	65	1	18	P
Dianella revoluta var. *revoluta*	2	41	1	22	C
Glycine clandestina	1	59	1	29	C
Gonocarpus tetragynus	2	71	2	48	C
Hydrocotyle laxiflora	2	53	2	30	C
Hypericum gramineum	1	53	1	25	C
Lomandra longifolia	1	53	2	42	C

Threatened Communities: Nil.

Frequently occurring weeds: *Hypochaeris glabra* (0.41), *Hypochaeris radicata* (0.76).

Equivalent vegetation types: There are some affinities with VG79 [*Montane Dry Shrub/Tussock Grass Forest*] (Gellie (2005).

Threats: This community appears to be well reserved within the ACT, and would not have been significantly cleared in the past. Minor threats include herbaceous weed invasion and grazing by feral goats.

Reservation Status: All known examples of this community occur in Namadgi NP, however there may be other examples on unsampled private land in surrounding areas.

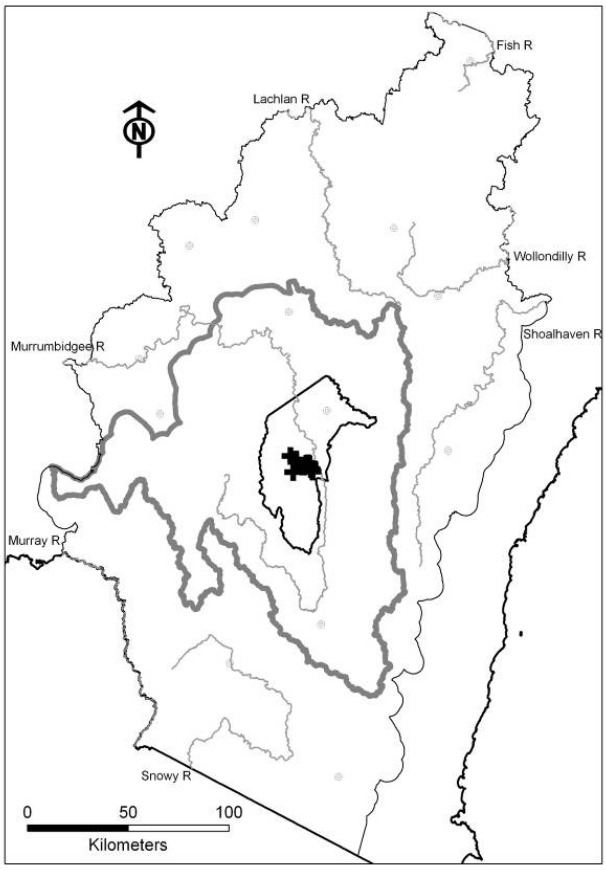


Figure u18: Distribution of field samples assigned to this community.

Extent of clearing: Given the landscape position and the known reservation status, clearing rates in this plant community are likely to be low.

u21: Broad-leaved Peppermint - Candlebark tall dry sclerophyll open forest of quartz-rich ranges of the upper South East Highlands and lower Australian Alps Bioregions

Scientific Name: *Eucalyptus dives - Eucalyptus rubida / Acacia dealbata / Hibbertia obtusifolia - Brachyloma daphnoides - Bossiaea buxifolia / Joycea pallida - Gonocarpus tetragynus - Poa sieberiana*

Number of samples:	45
Richness [mean (±SD)]:	33 (9)
Slope (degrees):	(2) 8-14 (29)
Altitude (m asl):	(745) 909-1074 (1189)
Ave. Annual Rainfall (mm):	(574) 667-764 (900)
Temp. Annual Range (°C):	(24.5) 25.5-26.2 (26.6)

Vegetation Description: Community u21 is a tall eucalypt woodland to open forest to woodland, with a canopy dominated by Broad-leaved peppermint (*Eucalyptus dives*) and/or Candlebark (*E. rubida*), often with Apple Box (*E. bridgesiana*) co-occuring. E rubida tends to be the most prevalent tree species in this community in the ACT. There may be a scattered to patchy stratum of tall shrubs, commonly including *Acacia dealbata*, *Cassinia longifolia* and/or *Acacia rubida*. A sparse groundcover is dominated by a mix of tough low shrubs, forbs and tussock grasses, including *Hibbertia obtusifolia*, *Brachyloma daphnoides*, *Bossiaea buxifolia*, *Pultenaea procumbens* and *Melichrus urceolatus; Gonocarpus tetragynus*, *Dianella revoluta*, *Hypericum gramineum*, *Lomandra longifolia*, *Joycea pallida* and *Poa sieberiana.*

This community is defined by plots distributed over a broad area corresponding to higher parts of the South East Corner bioregion and lower slopes of the Australian Alps bioregion. In the east, plots range from Captains Flat south through Tinderry, Strike-a-Light and Mount Dowling NRs to Numeralla and Sunny Corner, with a gap for the southern Monaro basalts then further records on ranges in the far south from Merriangaah and Tombong, west to Byadbo and the Suggan Buggan Range. In the north-west, plots run from northeast Namadgi NP (lower slopes of Booroomba Ck) south along Boboyan Road to the lower slopes of Yaouk Bill Range and Murrumbucca.

Within this range, u21 generally occurs on broad ridge crests and broad gentle slopes with moderately-low fertility soils of intermediate depth (not skeletal, not deep), with records primarily from Adaminaby Group and Yalmy Group sediments (sandstones, mudstones, shales) and from granites and granodiorites (including Shannons Flat Suite, Clear Range Suite and Glenbog Suite). In the east of its range, this community may grade into m51 [*Brittle Gum - Scribbly Gum shrub-grass tall dry sclerophyll open forest on exposed quartz-rich slopes and ridges at primarily in the Monaro and Kybeyan-Gourock subregions of the South Eastern Highlands*] on shallower soils on dry, exposed north and west-facing slopes and ridges, while in sheltered gullies and on sheltered south-facing slopes it may be replaced by m31 [*Ribbon Gum - Snow Gum - Shiny Cassinia tall shrub-grass open forest of gullies in quartz-rich ranges in the Monaro and Kybeyan-Gourock subregions of the NSW South Eastern Highlands*]. In the western part of its range, in the lower ACT Alps, it tends to grade into u29 [*Apple Box - Broad-leaved Peppermint tall shrub-grass woodland primarily on granitoids of the South Eastern Highlands Bioregion*] on steep exposed slopes with shallower soil or u52 [*Ribbon Gum - Robertson's Peppermint very tall wet sclerophyll open forest primarily of the Bondo Subregion of the South Eastern Highlands and northern Australian Alps Bioregions*] on moist sheltered slopes and gullies. In frost hollows at higher elevations may be replaced by u27 [*Snow Gum - Candlebark tall grassy woodland in frost hollows and gullies primarily of the Namadgi Region*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia dealbata	1	60	2	25	P
Acacia gunnii	1	22	1	6	P
Acacia rubida	2	36	1	6	P
Astroloma humifusum	1	24	1	5	P
Austrodanthonia spp.	1	22	1	7	P
Bossiaea buxifolia	1	64	1	6	P
Brachyloma daphnoides	1	73	1	16	P
Cassinia longifolia	1	62	1	16	P
Dichelachne rara	1	27	1	8	P
Dillwynia sericea	1	24	1	4	P
Eucalyptus bridgesiana	3	38	3	7	P
Eucalyptus dives	3	89	3	17	P
Eucalyptus rubida	3	82	3	8	P
Galium gaudichaudii	1	31	1	9	P
Gonocarpus tetragynus	2	80	2	47	P
Hibbertia obtusifolia	2	96	1	34	P
Hovea heterophylla	1	20	1	4	P
Hovea linearis	1	53	1	13	P
Hypericum gramineum	1	56	1	25	P
Indigofera australis	1	22	1	7	P
Joycea pallida	2	84	2	17	P
Leucopogon fletcheri subsp. *brevisepalus*	1	40	1	3	P
Lomandra multiflora subsp. *multiflora*	1	49	1	18	P
Melichrus urceolatus	1	58	1	12	P
Mirbelia oxylobioides	3	18	1	3	P
Pimelea curviflora	1	38	1	6	P

Pultenaea procumbens	2	53	1	4	P
Stackhousia monogyna	1	36	1	12	P
Wahlenbergia communis	1	22	1	5	P
Wahlenbergia spp.	1	18	1	5	P
Wahlenbergia stricta	1	42	1	18	P
Lomandra longifolia	1	44	2	42	C
Poa sieberiana	1	60	2	48	C

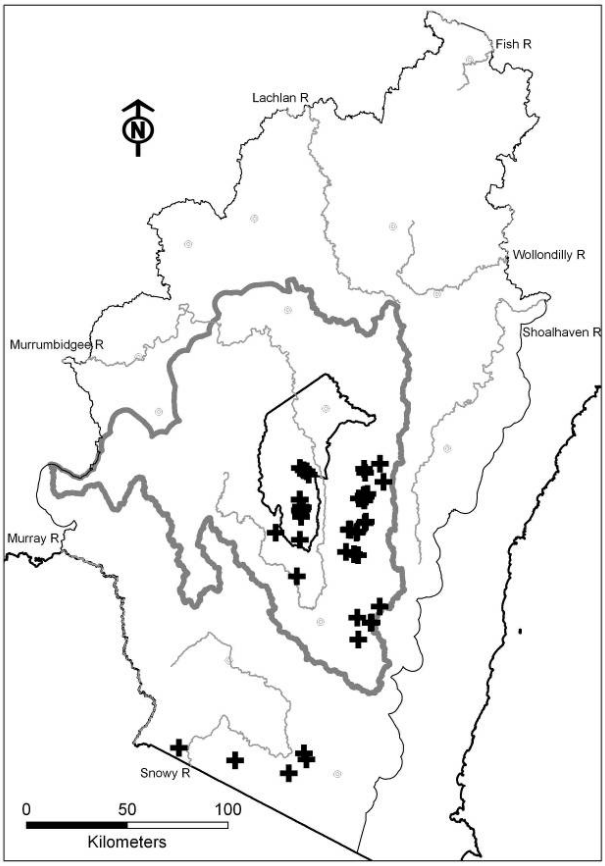


Figure u21: Distribution of field samples assigned to this community.

Threatened Communities: Examples may be part of the TSC Act - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions*.

Equivalent vegetation types: Community u21 has no directly equivalent community in the classification of Gellie (2005). Most of the plots defining this community were not classified by Gellie (2005), and the small number of common plots were assigned by those authors to either VG74 [*South Eastern Tablelands Dry Shrub/Grass/Herb Forest*] or VG75 [*Tablelands Shrub/Tussock Grass Forest*]. Other plots which defined those VG74 and VG75 were assigned by the present study to related groups m31 and m51.

Frequently-occurring weeds: *Centaurium erythraea* (0.43), *Hypochaeris radicata* (0.43).

Threats: The habitat of this community is generally of low suitability for agriculture, and it is unlikely to have been widely cleared.

Reservation Status: Many of the plots assigned to type u21 are recorded from conservation reserves, including examples across its broad range. NSW reserves known to contain this type include Yanununbeyan SCA, Tinderry NR, Burnt School NR, Strike-a-Light NR, Yaouk NR, Numeralla NR, Kybeyan NR, Merriangah NR, Meringo NR, Quidong NR, and south-eastern Kosciuszko NP. Within the ACT, samples of this community are distributed through eastern Namadgi NP.

Extent of clearing: In more fertile examples, moderate levels of clearing have occurred across its range primarily for pastoral development.

u29: Apple Box - Broad-leaved Peppermint tall shrub-grass open forest primarily on granitoids of the South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus bridgesiana - Eucalyptus dives* ± *Eucalyptus nortonii - Eucalyptus melliodora / Bursaria spinosa - Cassinia longifolia / Elymus scaber - Poa sieberiana - Gonocarpus tetragynus*

Number of samples:	52
Richness [mean (±SD)]:	40 (9)
Slope (degrees):	(0) 12-23 (37)
Altitude (m asl):	(634) 765-961 (1257)
Ave. Annual Rainfall (mm):	(554) 663-778 (945)
Temp. Annual Range (°C):	(24.7) 25.8-26.7 (27.2)

Plate u29:

Vegetation Description: Community u29 is a tall eucalypt woodland to open forest characterised by

the presence of Apple Box (*Eucalyptus bridgesiana*), Broad-leaved Peppermint (*E. dives*), Norton's Box (*E. nortonii*) and/or Yellow Box (*E. melliodora*) on granite hills with a shrubby/grassy/herbaceous understorey. Shrub species include *Cassinia longofolia*, *Bursaria spinosa* and the tall shrub *Acacia dealbata*. The ground layer is grassy/herbaceous with the main grass species being *Poa sieberiana*, *Elymus scaber* and *Themeda australis* and the forbs including *Hydrocotyle laxiflora*, *Gonocarpus tetragynus*, *Glycine clandestina*, *Hypericum gramineum*, *Desmodium varians*, *Geranium solanderi*, *Galium gaudichaudii* and *Plantago varia*. The dominant tree species may vary from site to site.

Apple Box - Broad-leaved Peppermint tall shrub-grass woodland occurs primarily on granitoids in eastern parts of the Namadgi Region (e.g. Booth Range), extending southward to the Snowy Mountains in Kosciuzsko NP, around Puapong and Merriangaah NRs and east to Captains Flat. In the ACT and adjacent ranges it grades into u27 [*Snow Gum - Candlebark tall grassy woodland in frost hollows and gullies primarily of the Namadgi Region*] downslope and u21 [*Broad-leaved Peppermint - Candlebark tall dry sclerophyll open forest of quartz-rich ranges of the upper South East Highlands and lower Australian Alps Bioregions*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia dealbata	1	56	2	25	P
Acaena ovina	1	54	1	7	P
Acrotriche serrulata	1	37	1	11	P
Ajuga australis	1	21	1	8	P
Asperula conferta	1	42	1	10	P
Asplenium flabellifolium	1	29	1	8	P
Austrodanthonia penicillata	1	23	1	3	P
Austrodanthonia spp.	2	23	1	7	P
Austrostipa scabra	2	13	1	4	P
Bossiaea buxifolia	1	21	1	7	P
Bothriochloa macra	1	27	1	3	P
Brachyscome rigidula	1	17	1	2	P
Bursaria spinosa	2	85	1	9	P
Carex inversa	1	46	1	8	P
Cassinia longifolia	3	81	1	15	P
Cheilanthes sieberi	2	40	1	8	P
Chrysocephalum semipapposum	1	17	1	4	P
Clematis leptophylla	2	17	1	1	P
Crassula sieberiana	1	33	1	5	P
Cullen microcephalum	1	19	1	2	P
Cymbonotus lawsonianus	1	15	1	5	P
Cymbonotus spp.	2	54	1	3	P
Cynoglossum australe	1	21	1	4	P
Cynoglossum suaveolens	1	13	1	3	P
Daucus glochidiatus	1	54	1	7	P
Desmodium varians	1	69	1	11	P
Dichelachne micrantha	1	37	1	9	P
Dichelachne spp.	1	19	1	2	P
Dodonaea viscosa	1	38	1	2	P
Echinopogon cheelii	1	13	1	<1	P
Echinopogon spp.	1	17	1	<1	P
Elymus scaber	3	87	1	20	P
Epilobium billardierianum ssp. *billardierianum*	1	13	1	2	P
Eucalyptus bridgesiana	3	62	3	6	P
Eucalyptus dives	3	42	3	18	P
Eucalyptus melliodora	3	31	3	5	P
Eucalyptus nortonii	3	38	3	3	P
Euchiton sphaericus	1	58	1	6	P
Galium gaudichaudii	1	63	1	9	P
Geranium solanderi	2	56	1	19	P
Glycine clandestina	2	81	1	29	P
Gonocarpus tetragynus	2	77	2	47	P
Hydrocotyle laxiflora	3	94	2	29	P
Hypericum gramineum	1	73	1	25	P
Indigofera australis	1	25	1	7	P
Kunzea ericoides	3	19	2	4	P
Lepidosperma laterale	1	37	1	9	P
Lomandra filiformis subsp. *filiformis*	1	56	1	15	P
Luzula spp.	1	37	1	6	P
Panicum effusum	1	23	1	3	P
Pimelea curviflora	1	19	1	6	P
Plantago varia	1	56	1	10	P
Pleurosorus rutifolius	1	15	1	<1	P
Poa sieberiana	3	90	2	47	P
Rumex brownii	1	37	1	9	P
Schoenus apogon	2	48	1	5	P
Senecio quadridentatus	1	23	1	5	P
Solenogyne dominii	1	17	1	3	P
Solenogyne gunnii	1	15	1	5	P
Sorghum leiocladum	1	19	1	<1	P
Themeda australis	1	54	2	20	P
Vittadinia cuneata	1	23	1	2	P
Vittadinia muelleri	2	15	1	2	P
Wahlenbergia communis	1	52	1	4	P
Wahlenbergia spp.	1	17	1	5	P
Wahlenbergia stricta	2	48	1	18	P
Hibbertia obtusifolia	1	44	1	35	C
Lomandra longifolia	1	56	2	42	C

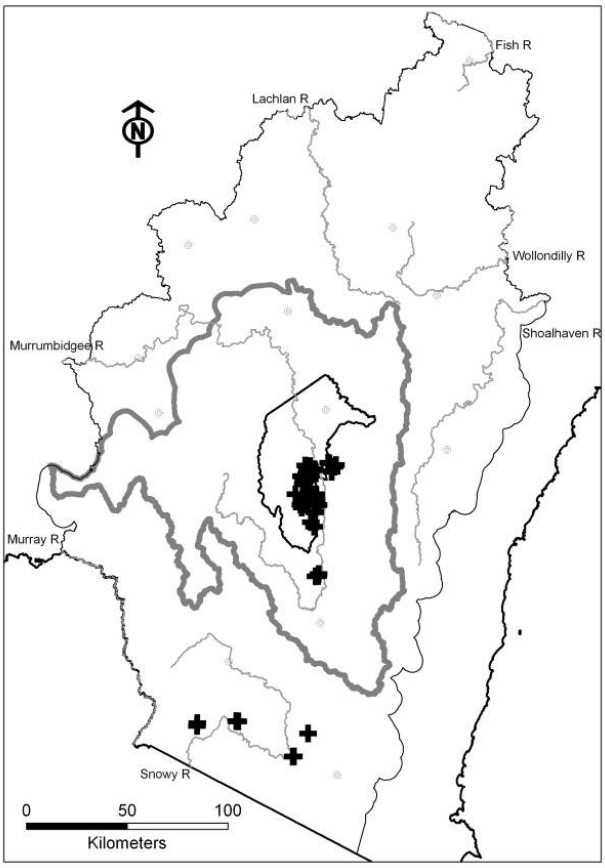


Figure u29: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Frequently occurring weeds: *Anagallis arvensis* (0.35), *Centaurium erythraea* (0.62), *Cirsium vulgare* (0.37), *Hypochaeris glabra* (0.25), *Hypochaeris radicata* (0.58), *Oxalis corniculata* (0.5), *Petrorhagia nanteuilii* (0.33), *Rosa rubiginosa* (0.42), *Trifolium arvense* (0.63), *Trifolium campestre* (0.46), *Verbascum thapsus* subsp. *thapsus* (0.23).

Equivalent vegetation types: Nil. Defined by plots not used in previous classifications.

Threats: Due to the landscape position and infertile soils, the main threat to this community is likely to be grazing.

Reservation Status: Unknown, although examples of this community are found in Kosciuszko NP, Merriangaah NR, Namadgi NP (ACT) and Stony Creek NR.

Extent of clearing: Likely to be minor as it occurs on poor soils on hills.

u105: Broad-leaved Peppermint - Brittle Gum - Red Stringybark tall shrub-grass dry sclerophyll open forest of lower ranges of the western South Eastern Highlands and upper South Western Slopes Bioregions

Scientific Name: *Eucalyptus dives - Eucalyptus macrorhyncha - Eucalyptus mannifera / Acacia rubida / Hibbertia obtusifolia - Platylobium formosum - Hardenbergia violacea / Poa sieberiana - Gonocarpus tetragynus - Lomandra longifolia*

Number of samples:	74
Richness [mean (±SD)]:	30 (10)
Slope (degrees):	(0) 11-24 (30)
Altitude (m asl):	(396) 647-861 (1078)
Ave. Annual Rainfall (mm):	(848) 996-1188 (1249)
Temp. Annual Range (°C):	(24.7) 25.2-27.1 (28.3)

Vegetation Description: Community u105 is a tall dry sclerophyll open forest dominated by Broad-leaved Peppermint (*Eucalyptus dives*), Brittle Gum (*E. mannifera*) and Red Stringybark (*E. macrorhyncha*) with a sparse to patchy layer of medium shrubs including *Acacia rubida* and *Cassinia longifolia*. A diverse complement of low shrubs commonly including *Hibbertia obtusifolia*, *Monotoca scoparia*, *Platylobium formosum* and/or *Persoonia chamaepeuce*, and a groundcover of tussock grasses, forbs and sprawling twiners, most frequently including *Joycea pallida*, *Poa sieberiana*, *Dianella revoluta*, *Gonocarpus tetragynus*, *Hardenbergia violacea*, *Hovea linearis*, *Lomandra longifolia* and *Stylidium graminifolium sens. lat.*.

This community is commonly recorded from dry rocky ridges and exposed west-facing upper slopes with shallow soils of moderate to moderately low fertility derived from a wide variety of substrates including rhyolite, tuff, sandstone, shale, granite, granodiorite, psammite and conglomerate. Plots assigned to this type are closely tied to the Bondo IBRA subregion and are distributed around the northern and western rims of the Kosciuszko Main Range, associated with lower foothill ranges, ridges of major valleys and outlying western ridgelines. Plots were recorded from Burrinjuck, Wee Jasper, the margins of the Brindabella Range, the Snubba Range from Wereboldera to Talbingo, east of Talbingo Reservoir on lower slopes above the Tumut River, on the southwestern lower slopes of the Kosciuszko massif from Jagumba Range to Khancoban, Geehi and Tom Groggin, and on outlying lower western ridgelines at Downfall, Carabost, Mundaroo and Tumbarumba. It may also occur in the Cotter River area of the ACT.

Broad-leaved Peppermint - Brittle Gum - Red Stringybark tall shrub-grass dry open forest grades

into various communities across its range. In sheltered areas of deeper moister soil such as gullies and footslopes it may be replaced by u152 [*Robertson's Peppermint - Red Stringybark very tall grass-forb sheltered open forest of the southwest South Eastern Highlands and upper South Western Slopes Bioregions*]. In the north of its range, at higher altitudes it may grade into u150 [*Broad-leaved Peppermint - Mountain Gum tall grass-forb open forest of the South Eastern Highlands and Australian Alps Bioregions*], particularly in the Brindabella ranges, while at lower altitudes and decreasing rainfall from Burrinjuck east it may grade into p14 [*Red Stringybark - Scribbly Gum - Red-anthered Wallaby Grass tall grass-shrub dry sclerophyll open forest on loamy ridges of the central South Eastern Highlands Bioregion*]. To the west as rainfall declines and altitude falls, it is gradually replaced on lower ridgelines by u148 [*Red Stringybark - Red Box grass-forb tall open forest of the upper South Western Slopes and western South Eastern Highlands Bioregions*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia buxifolia	1	14	1	1	P
Acacia gunnii	1	22	1	6	P
Acacia rubida	1	50	1	5	P
Acacia ulicifolia	1	9	1	2	P
Acrotriche serrulata	1	32	1	11	P
Astrotricha ledifolia	1	14	1	<1	P
Austrostipa rudis	1	22	2	3	P
Billardiera scandens	1	30	1	9	P
Boronia nana	1	6	1	<1	P
Cassinia longifolia	1	42	1	16	P
Cassytha pubescens	1	19	1	2	P
Cheiranthera linearis	1	10	1	1	P
Choretrum pauciflorum	1	11	1	3	P
Daviesia leptophylla	1	20	1	5	P
Dianella revoluta var. *revoluta*	1	65	1	21	P
Dichelachne sieberiana	2	16	2	5	P
Dillwynia phylicoides	2	22	2	2	P
Eriochilus cucullatus	1	9	1	<1	P
Eucalyptus bicostata	1	8	3	<1	P
Eucalyptus dives	3	86	3	16	P
Eucalyptus goniocalyx	3	17	3	4	P
Eucalyptus macrorhyncha	3	76	3	14	P
Eucalyptus mannifera	3	72	3	10	P
Eucalyptus nortonii	2	15	3	3	P
Eucalyptus robertsonii	1	22	3	9	P
Gompholobium huegelii	1	23	1	4	P
Gonocarpus tetragynus	1	89	2	47	P
Grevillea lanigera	1	16	1	3	P
Grevillea ramosissima	2	7	1	<1	P
Hardenbergia violacea	1	72	1	13	P
Hibbertia obtusifolia	1	93	1	33	P
Hovea linearis	1	57	1	12	P
Indigofera australis	1	31	1	6	P
Joycea pallida	2	53	2	17	P
Lepidosperma laterale	1	22	1	9	P
Leptospermum brevipes	1	7	2	<1	P
Leucopogon attenuatus	1	9	1	1	P
Leucopogon fletcheri subsp. *brevisepalus*	1	13	1	3	P
Leucopogon virgatus	1	17	1	3	P
Lomandra filiformis subsp. *coriacea*	1	41	2	18	P
Lomandra filiformis subsp. *filiformis*	1	38	1	16	P
Lomandra longifolia	1	65	2	42	P
Melichrus urceolatus	1	25	1	13	P
Monotoca scoparia	1	58	1	14	P
Omphacomeria acerba	1	8	1	<1	P
Persoonia chamaepeuce	1	50	1	10	P
Pimelea glauca	1	6	1	<1	P
Platylobium formosum	2	65	2	9	P
Poa sieberiana	2	92	2	47	P
Poa tenera	3	10	2	2	P
Pultenaea spinosa	3	23	2	<1	P
Stackhousia monogyna	1	24	1	12	P
Stylidium graminifolium sens. lat.	1	65	1	24	P
Tetratheca bauerifolia	1	39	1	6	P
Thelymitra pauciflora	1	6	1	<1	P
Xanthorrhoea australis	2	7	2	<1	P
Xanthorrhoea glauca subsp. *angustifolia*	2	6	2	<1	P

Threatened Communities: Nil.

Equivalent vegetation types: This community is defined by a large number of field survey plots, including many plots from forested public lands which were classified by Gellie (2005). Strongly related Forest Ecosystems from those classifications include VG110 [*Tablelands Dry Shrub/Grass Forest*] (23 plots in common), VG108 [*Western Tablelands Dry Herb/Grass Forest*] (15 plots in common), and VG109 [*Widespread Tablelands Dry Shrub/Tussock Grass Forest*] (5 plots in common). The relationship between u105 and communities identified by Benson *et al.* (2010) with similar structural dominants (such as VCA ID 351) requires resolution through further sampling and analysis.

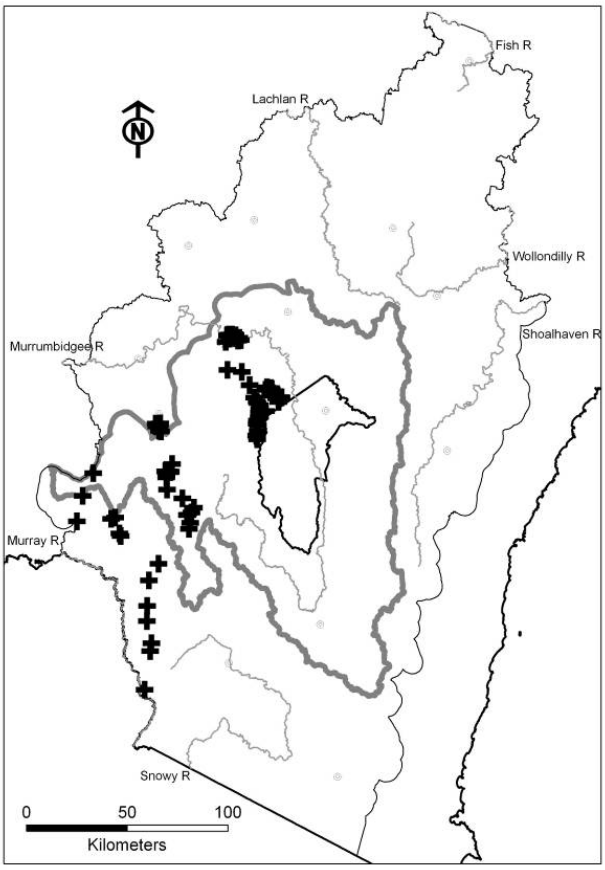


Figure u105: Distribution of field samples assigned to this community.

Frequently-occurring weeds: *Centaurium erythraea* (0.26), *Hypochaeris radicata* (0.24).

Threats: This community is generally found on ridges and steep country with relatively low suitability for agriculture, and is unlikely to have been widely cleared. Examples on private land may be subject to occasional light rough-country grazing. Surveyed examples of this vegetation have not been subject to widespread weed invasion, but it is within the altitude and rainfall band prefered by *Hypericum perforatum* St John's wort (>500m altitude and >600mm rainfall; Naughton and Bourke 2007) and may be prone to invasion by this weed.

Reservation Status: Recorded from plots in Burrinjuck NR, Wereboldera SCA, Brindabella NP and SCA, Bimberi NR, Downfall NR, Bogandyera NR and at numerous locations down the western edge of Kosciuszko NP.

Extent of clearing: Unlikely to have been widely cleared.

u148: Red Stringybark - Red Box grass-forb tall open forest of the upper South Western Slopes and western South Eastern Highlands Bioregions

Scientific Name: *Eucalyptus macrorhyncha - Eucalyptus polyanthemos / Hibbertia obtusifolia / Poa sieberiana - Gonocarpus tetragynus - Lomandra filiformis* subsp*. coriacea - Hydrocotyle laxiflora - Austrodanthonia pilosa - Elymus scaber*

Number of samples:	64
Richness [mean (±SD)]:	32 (9)
Slope (degrees):	(1) 7-19 (30)
Altitude (m asl):	(293) 441-552 (837)
Ave. Annual Rainfall (mm):	(713) 846-961 (1201)
Temp. Annual Range (°C):	(25.5) 26.3-28.2 (28.8)

Plate u148:

Vegetation Description: Community u148 is a tall eucalypt forest dominated by Red Stringybark (*Eucalyptus macrorhyncha*) and Red Box (*E. polyanthemos*), occasionally with Long-leaved Box (*E. goniocalyx*), Norton's Box (*E. nortonii*) or Blakely's Red Gum (*E. blakelyi*). The shrub layer is sparse to absent, with occasional occurrences of *Brachyloma daphnoides*, *Xanthorrhoea glauca* subsp. *angustifolia*, and the low shrub *Melichrus urceolatus*. The ground cover is open to dense and dominated by grasses such as *Poa sieberiana*, *Austrodanthonia pilosa*, *Elymus scaber* and *Microlaena stipoides*, and forbs including *Gonocarpus tetragynus*, *Hydrocotyle laxiflora*, *Lomandra filiformis* subsp. *coriacea*, *Lomandra filiformis* subsp. *filiformis*, *Daucus glochidiatus* and *Wahlenbergia stricta.*

Red Stringybark - Red Box grass-forb tall open forest is widely distributed across the western half of the South Eastern Highlands and into the upper Slopes of the NSW South Western Slopes within the Murrumbidgee catchment. It occurs as far east as Yass, and westwards in a band through Tumut and southwards towards the Murray River. It grades into communities such as u19 [*Blakely's Red Gum - Yellow Box ± White Box tall grassy woodland of the*

Upper South Western Slopes and western South Eastern Highlands Bioregions] in more fertile areas, p14 [*Red Stringybark - Scribbly Gum - Red-anthered Wallaby Grass tall grass-shrub dry sclerophyll open forest on loamy ridges of the central South Eastern Highlands Bioregion*] on poorer soils in the north-eastern extent of its range, and u105 [*Broad-leaved Peppermint - Brittle Gum - Red Stringybark tall shrub-grass dry sclerophyll open forest of lower ranges of the western South Eastern Highlands and upper South Western Slopes Bioregions*] on poorer soils in the western extent of its range.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia buxifolia	1	9	1	1	P
Acacia implexa	1	16	1	2	P
Acacia ulicifolia	2	19	1	1	P
Austrodanthonia pilosa	2	56	2	8	P
Bothriochloa macra	2	11	1	3	P
Brachychiton populneus	1	17	1	2	P
Brachyloma daphnoides	2	36	1	16	P
Brunonia australis	2	20	1	<1	P
Cassinia longifolia	1	34	1	16	P
Cheilanthes austrotenuifolia	1	17	1	3	P
Cheilanthes sieberi	1	44	1	8	P
Cheiranthera linearis	1	22	1	<1	P
Cynoglossum suaveolens	1	11	1	3	P
Daucus glochidiatus	1	56	1	7	P
Dichelachne crinita	2	13	1	3	P
Dichelachne hirtella	2	16	1	1	P
Dichelachne sieberiana	2	30	2	5	P
Dodonaea viscosa	1	11	1	2	P
Drosera auriculata	1	22	1	2	P
Elymus scaber	2	53	1	20	P
Eucalyptus albens	3	9	3	<1	P
Eucalyptus blakelyi	2	25	3	2	P
Eucalyptus goniocalyx	3	41	3	3	P
Eucalyptus macrorhyncha	3	92	3	14	P
Eucalyptus nortonii	3	30	3	3	P
Eucalyptus polyanthemos	3	67	3	2	P
Eucalyptus sideroxylon	3	11	2	<1	P
Geranium solanderi	1	41	1	19	P
Glycine clandestina	1	52	1	29	P
Gonocarpus tetragynus	2	77	2	47	P
Hibbertia obtusifolia	1	67	1	34	P
Hydrocotyle laxiflora	2	64	2	29	P
Hypericum gramineum	1	45	1	25	P
Lomandra filiformis subsp. *coriacea*	2	63	2	18	P
Lomandra filiformis subsp. *filiformis*	2	66	1	15	P
Lomandra spp.	2	11	1	<1	P
Luzula densiflora	1	31	1	5	P
Melichrus urceolatus	1	27	1	13	P
Microtis unifolia	1	25	1	4	P
Oxalis perennans	1	41	1	13	P
Poa sieberiana	2	72	2	48	P
Pultenaea spinosa	2	17	2	<1	P
Scutellaria humilis	1	17	1	1	P
Senecio bathurstianus	1	27	1	<1	P
Senecio prenanthoides	1	38	1	19	P
Senecio quadridentatus	1	17	1	5	P
Senecio tenuiflorus	1	20	1	2	P
Stypandra glauca	2	42	2	5	P
Thelymitra spp.	1	11	1	3	P
Tricoryne elatior	1	25	1	3	P
Wahlenbergia stricta subsp. *stricta*	1	61	1	18	P
Wurmbea dioica	1	23	1	2	P
Xanthorrhoea glauca subsp. *angustifolia*	2	27	2	<1	P
Microlaena stipoides	2	47	2	34	C

Threatened Communities: Nil.

Equivalent vegetation types: No clear equivalent, but similar to VG119 [*Western Tablelands Dry Shrub/Grass Forest*] in Gellie (2005). It also displays characteristics of NSW VCA 290 [*Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South-western Slopes Bioregion*] (Benson 2008) and probably represents the more fertile end of this community.

Frequently occurring weeds: *Aira elegantissima* (0.31), *Anagallis arvensis* (0.33), *Briza maxima* (0.86), *Briza minor* (0.45), *Cirsium vulgare* (0.31), *Hypericum perforatum* (0.37), *Hypochaeris glabra* (0.37), *Hypochaeris radicata* (0.55), *Orobanche minor* (0.35), *Petrorhagia nanteuilii* (0.51), *Trifolium angustifolium* (0.45), *Trifolium arvense* (0.45), *Trifolium campestre* (0.41).

Threats: Patch clearing on private land, weed infestation and grazing.

Reservation Status: Examples of this community are found in Bango NR, Bogandyera NR, Burrinjuck NR, Downfall NR, Ellerslie NR, Kosciuszko NP, Minjary NP, Mudjarn NR, Mulligans Flat NR (ACT), Mundoonen NR, Oak Creek NR, Tumblong SCA and Wereboldera SCA.

Extent of clearing: Likely to be moderate.

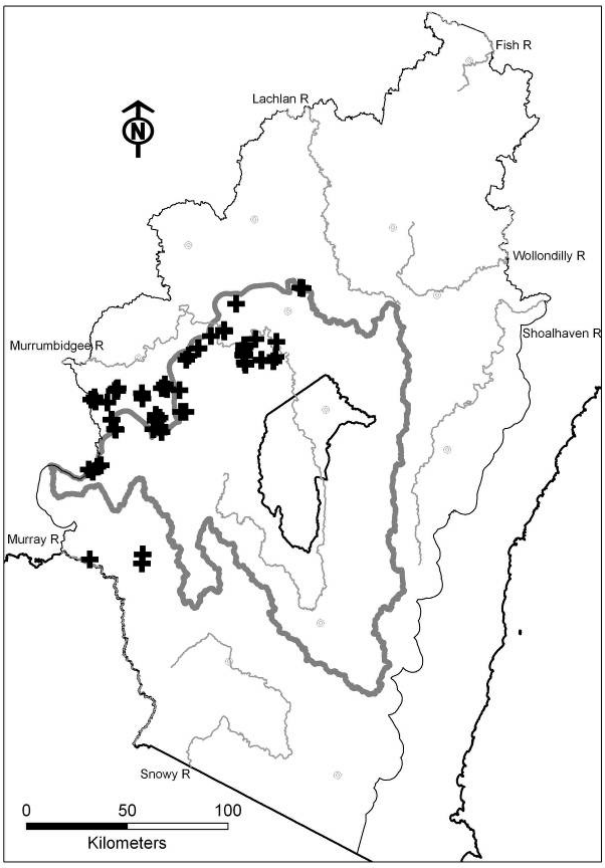


Figure u148: Distribution of field samples assigned to this community.

u150: Broad-leaved Peppermint - Mountain Gum shrubby tall open forest of the South Eastern Highlands and Australian Alps Bioregions

Scientific Name: *Eucalyptus dives - Eucalyptus dalrympleana / Acacia dealbata / Daviesia mimosoides* subsp. *mimosoides - Hibbertia obtusifolia - Monotoca scoparia - Persoonia chamaepeuce - Tetratheca bauerifolia / Lomandra longifolia - Gonocarpus tetragynus - Poa sieberiana*

Number of samples:	73
Richness [mean (±SD)]:	24 (6)
Slope (degrees):	(1) 6-17 (37)
Altitude (m asl):	(826) 1072-1230 (1490)
Ave. Annual Rainfall (mm):	(690) 870-1054 (1181)
Temp. Annual Range (°C):	(23.1) 24.3-25.2 (25.6)

Vegetation Description: Community u150 is a shrubby tall dry open forest dominated by Broad-leaved Peppermint (*Eucalyptus dives*) and Mountain Gum (*E. dalrympleana*). The well defined mid-storey typically includes *Monotoca scoparia*, *Daviesia mimosoides* subsp. *mimosoides* and *Acacia dealbata.*

Plate u150:

Shorter shrubs often include *Hibbertia obtusifolia*, *Persoonia chamaepeuce*, *Tetratheca bauerifolia* and *Brachyloma daphnoides*. The sparse groundlayer generally includes *Lomandra longifolia*, *Gonocarpus tetragynus*, *Stylidium graminifolium sens. lat.*, *Poa sieberiana*, *Dianella revoluta*, *Goodenia hederacea*, *Hovea linearis*, *Joycea pallida*, *Poranthera microphylla* and *Stellaria pungens*.

This is a widespread community, occurring from Tallaganda NP and Kybean SCA in the eastern part of the study area, through Tinderry NR, Namadgi NP to Brindabella NP in the west. It is most common on metasedimentary and granite geologies, usually on lower slopes. This community often forms a mosaic with other dry montane forests and subalpine woodlands including u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*], u52 [*Ribbon Gum - Robertson's Peppermint very tall wet sclerophyll open forest primarily of the Bondo Subregion of the South Eastern Highlands and northern Australian Alps Bioregions*] and, in the south of the study area, m31 [*Brittle Gum - Scribbly Gum shrub-grass tall dry sclerophyll open forest on exposed quartz-rich slopes and ridges primarily in the Monaro and Kybeyan-Gourock subregions of the South Eastern Highlands*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia gunnii	1	19	1	6	P
Acrotriche serrulata	1	25	1	11	P
Brachyloma daphnoides	1	49	1	16	P
Cassytha pubescens	1	8	1	2	P
Choretrum pauciflorum	1	25	1	2	P
Daviesia mimosoides subsp. *mimosoides*	3	68	2	8	P
Daviesia ulicifolia	2	29	2	10	P
Derwentia perfoliata	1	22	1	4	P

Deyeuxia quadriseta	1	19	1	4	P
Dianella revoluta var. *revoluta*	1	51	1	22	P
Eucalyptus dalrympleana	3	67	3	19	P
Eucalyptus dives	3	85	3	17	P
Eucalyptus robertsonii	3	21	3	9	P
Eucalyptus rubida	3	25	3	8	P
Exocarpos strictus	1	30	1	12	P
Gonocarpus tetragynus	2	77	2	47	P
Grevillea lanigera	1	15	1	3	P
Hibbertia obtusifolia	2	93	1	33	P
Hovea linearis	1	48	1	12	P
Lomandra longifolia	2	92	2	41	P
Monotoca scoparia	2	79	1	13	P
Oxylobium ellipticum	1	16	1	4	P
Persoonia chamaepeuce	1	63	1	10	P
Persoonia silvatica	1	11	1	3	P
Pimelea linifolia	1	19	1	8	P
Poa sieberiana	2	70	2	48	P
Stylidium graminifolium sens. lat.	1	71	1	24	P
Tetratheca bauerifolia	2	55	1	6	P
Acacia dealbata	2	41	2	26	C

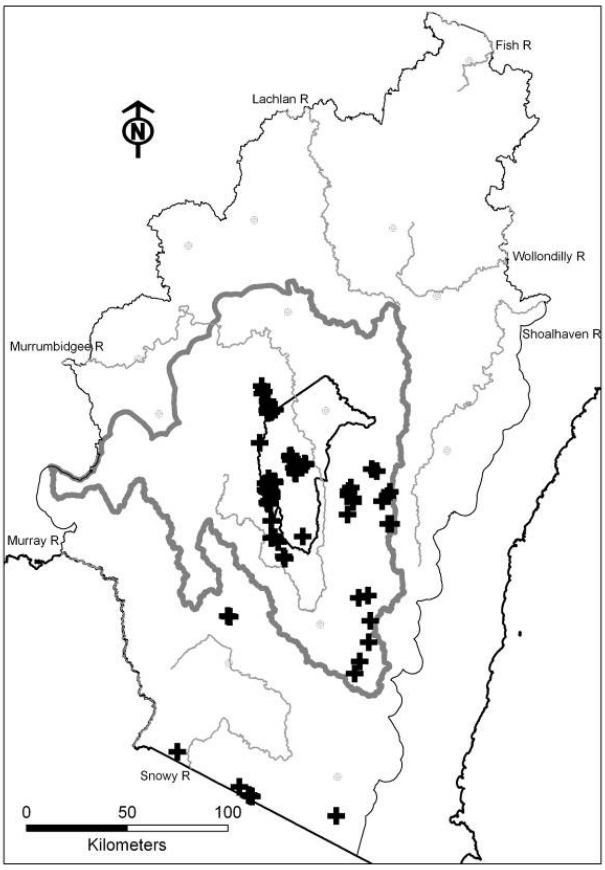


Figure u150: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: Amalgamates VG103 [*Western Montane Dry Fern/Grass Forest*], VG105 [*ACT Montane Dry Shrub Forest*] and VG107: [*Central Tableland/ACT Montane Dry Shrub Forest*], all previously described by Gellie (2005).

Frequently occurring weeds: *Centaurium erythraea* (0.08), *Hypochaeris radicata* (0.17).

Threats: Frequent and intense fire.

Reservation Status: Likely to be reasonably well reserved; most of the plots assigned to this community were surveyed in conservation reserves, including Namadgi NP (ACT), Bimberi NR, Bondi Gulf NR, Brindabella NP and SCA, Dangelong NR, Nimmo NR, Scabby Range NR, Tallaganda NP, Tinderry NR, Yanununbeyan NP and Yaouk NR.

Extent of clearing: Not assessed, but likely to be minimal.

u152: Robertson's Peppermint - Red Stringybark very tall grass-forb sheltered open forest of the southwest South Eastern Highlands and upper South Western Slopes Bioregions

Scientific Name*: Eucalyptus robertsonii - Eucalyptus macrorhyncha / Acacia dealbata / Pteridium esculentum - Hibbertia obtusifolia / Poa sieberiana - Microlaena stipoides - Hydrocotyle laxiflora - Gonocarpus tetragynus - Geranium solanderi - Acaena novae-zelandiae*

Number of samples:	101
Richness [mean (±SD)]:	44 (12)
Slope (degrees):	(1) 5-17 (38)
Altitude (m asl):	(309) 619-817 (1085)
Ave. Annual Rainfall (mm):	(825) 963-1177 (1312)
Temp. Annual Range (°C):	(24.5) 25.8-27.5 (28.6)

Vegetation Description: Community u152 is a very tall open eucalypt forest with canopy commonly dominated by Robertson's Peppermint (*Eucalyptus robertsonii*) and Red Stringybark (*E. macrorhyncha*), less frequently with Apple Box (*E. bridgesiana*), Broad-leaved Peppermint (*E. dives*) or Ribbon Gum (*E. viminalis*). Patches within this community may be dominated by Eurabbie (*E. bicostata*). Plots assigned to this group commonly contain a sparse layer of scattered shrubs and small trees including *Acacia dealbata* and *A. melanoxylon*, with a patchy to continuous groundcover of grasses and fern (e.g. *Pteridium esculentum*, *Poa sieberiana*, *Microlaena stipoides*, *Elymus scaber* and *Themeda australis*), low shrubs (e.g. *Hibbertia obtusifolia* and *Platylobium*

formosum), and a diverse mix of forbs (e.g. *Acaena novae-zelandiae*, *Dichondra repens*, *Euchiton gymnocephalus*, *Geranium solanderi*, *Glycine clandestina*, *Gonocarpus tetragynus*, *Hydrocotyle laxiflora*, *Hypericum gramineum*, *Lomandra filiformis* subsp*. filiformis*, *Plantago varia*, *Senecio prenanthoides*, *Viola betonicifolia* and *Wahlenbergia stricta*).

This community is found on moist sheltered slopes and gullies along lower western margins of the Kosciuszko main range and further west on lower outlying ranges. It is commonly recorded from soils of intermediate fertility derived from a wide variety of substrates including granodiorite, granite, rhyolite, sandstone, tuff, psammite and shale. Plots are distributed around the northern and western rims of the main range, associated with lower foothills of the ranges and major valleys and outlying lower western ranges. Records occur from Burrinjuck and lower slopes of the Brindabellas in the north, west and south to Bungongo, Wee Jasper, Billapaloola and Argalong; south along Snubba Range and lower slopes of the upper Goobarragandra and Tumut Rivers; western footslopes of the Bago Range at Courabyra, Tumbarumba and Maragle; to the far south along lower slopes of the upper Murray gorge to Khancoban and Tom Groggin; and on lower ranges to the west including Ellerslie, Downfall and Munderoo.

Robertson's Peppermint - Red Stringybark very tall grass-forb sheltered open forest generally occurs on more sheltered slopes and footslopes with somewhat deeper, moister soils than the related community u105 [*Broad-leaved Peppermint - Brittle Gum - Red Stringybark tall shrub-grass dry sclerophyll open forest of lower ranges of the western South Eastern Highlands and upper South Western Slopes Bioregions*]. At higher altitudes with cooler winters and increasing rainfall it may be replaced by u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*] or u52 [*Ribbon Gum - Robertson's Peppermint very tall wet sclerophyll open forest primarily of the Bondo Subregion of the South Eastern Highlands and northern Australian Alps Bioregions*], while at lower elevations on the margins of undulating slopes country it may grade into u148 [*Red Stringybark - Red Box grass-forb tall open forest of the upper South Western Slopes and western South Eastern Highlands Bioregions*] or u29 [*Apple Box - Broad-leaved Peppermint tall shrub-grass woodland primarily on granitoids of the South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia dealbata	2	66	2	25	P
Acacia melanoxylon	1	42	1	13	P
Acaena agnipila	1	5	1	<1	P
Acaena echinata	1	49	1	8	P
Acaena novae-zelandiae	2	73	1	26	P
Acrotriche serrulata	1	50	1	10	P
Ajuga australis	1	23	1	7	P
Ammobium craspedioides	2	5	1	<1	P
Amyema pendulum	1	13	1	2	P
Asperula conferta	1	29	1	10	P
Asperula scoparia	2	35	2	22	P
Austrodanthonia penicillata	2	11	1	3	P
Austrodanthonia pilosa	2	34	2	8	P
Austrodanthonia racemosa	2	28	2	10	P
Boronia nana	1	9	1	<1	P
Brunonia australis	2	4	2	<1	P
Bulbine bulbosa	1	30	1	3	P
Burchardia umbellata	1	7	1	<1	P
Caladenia carnea	1	19	1	<1	P
Carex breviculmis	2	30	1	12	P
Carex incomitata	1	11	1	<1	P
Cassinia aculeata	1	29	1	13	P
Cassinia longifolia	1	38	1	16	P
Cheilanthes austrotenuifolia	1	11	1	3	P
Chiloglottis trapeziformis	1	6	1	<1	P
Corybas spp.	1	5	1	<1	P
Cymbonotus preissianus	2	47	1	5	P
Cynoglossum suaveolens	1	10	1	3	P
Daucus glochidiatus	1	26	1	8	P
Desmodium varians	1	32	1	12	P
Dichelachne crinita	1	10	1	3	P
Dichelachne sieberiana	2	19	2	5	P
Dichondra repens	2	54	2	20	P
Dipodium roseum	1	13	1	<1	P
Diuris sulphurea	1	7	1	1	P
Drosera auriculata	2	25	1	2	P
Drosera spp.	1	4	1	<1	P
Echinopogon intermedius	1	10	1	<1	P
Echinopogon ovatus	2	41	1	9	P
Elymus scaber	2	56	1	20	P
Epilobium billardierianum subsp*. cinereum*	1	28	1	4	P
Eucalyptus bicostata	3	13	1	<1	P

Eucalyptus bridgesiana	3	37	3	6	P
Eucalyptus dives	2	34	3	18	P
Eucalyptus macrorhyncha	3	60	3	14	P
Eucalyptus robertsonii	3	68	3	7	P
Eucalyptus viminalis	3	24	3	12	P
Euchiton gymnocephalus	1	54	1	14	P
Exocarpos cupressiformis	1	20	1	3	P
Galium ciliare	1	5	2	<1	P
Galium gaudichaudii	1	26	1	9	P
Galium propinquum	1	12	1	4	P
Geranium solanderi	2	69	1	18	P
Glossodia major	2	4	1	<1	P
Glycine clandestina	1	82	1	28	P
Gompholobium huegelii	2	13	1	4	P
Gonocarpus tetragynus	2	81	2	47	P
Grevillea rosmarinifolia	1	5	1	<1	P
Hardenbergia violacea	1	26	1	14	P
Hibbertia obtusifolia	1	66	1	34	P
Hovea linearis	1	24	1	13	P
Hydrocotyle laxiflora	2	81	2	28	P
Hypericum gramineum	1	68	1	24	P
Leptospermum continentale	1	10	1	1	P
Lomandra filiformis subsp. *coriacea*	2	38	2	18	P
Lomandra filiformis subsp. *filiformis*	1	59	1	15	P
Luzula densiflora	1	17	1	5	P
Luzula flaccida	1	47	1	12	P
Mentha diemenica	1	17	1	2	P
Microlaena stipoides	2	82	2	33	P
Microtis unifolia	1	33	1	3	P
Ophioglossum lusitanicum	2	4	1	<1	P
Oxalis exilis	1	23	1	4	P
Oxalis perennans	1	25	1	13	P
Oxalis radicosa	1	4	1	<1	P
Pimelea curviflora	1	19	1	6	P
Plantago varia	2	55	1	10	P
Platylobium formosum	2	53	2	9	P
Poa helmsii	1	11	2	3	P
Poa sieberiana	3	86	2	47	P
Polygala japonica	1	4	1	<1	P
Pteridium esculentum	2	68	2	26	P
Pterostylis longifolia	1	6	1	<1	P
Pterostylis nutans	1	14	1	<1	P
Pterostylis pedunculata	1	8	1	<1	P
Pultenaea juniperina	2	5	2	<1	P
Pultenaea polifolia	1	5	1	<1	P
Ranunculus lappaceus	1	34	1	10	P
Ranunculus pachycarpus	2	4	0	0	P
Ranunculus scapiger	2	10	1	1	P
Ranunculus sessiliflorus	2	5	1	<1	P
Scutellaria humilis	1	15	1	1	P
Senecio bathurstianus	1	7	1	1	P
Senecio diaschides	2	23	1	5	P
Senecio prenanthoides	1	54	1	18	P
Senecio tenuiflorus	2	10	1	2	P
Stackhousia monogyna	1	35	1	12	P
Thelymitra pauciflora	1	5	1	<1	P
Themeda australis	2	52	2	20	P
Thysanotus tuberosus	1	14	1	3	P
Veronica calycina	1	45	1	15	P
Viola betonicifolia	2	65	1	26	P
Wahlenbergia stricta	1	52	1	18	P
Wurmbea dioica	1	25	1	2	P
Stellaria pungens	1	41	2	31	C

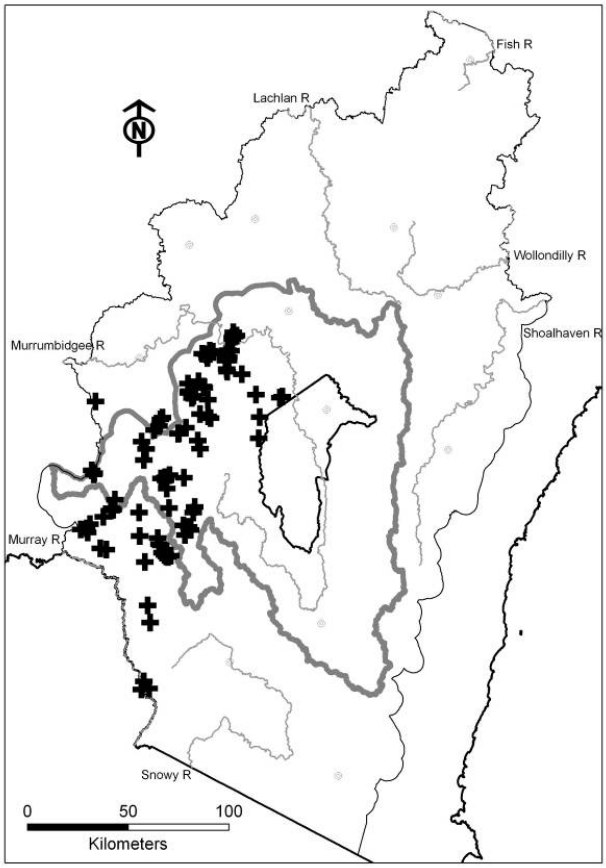


Figure u152: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: The most strongly related Forest Ecosystems of Gellie (2005) are VG93 [*Western Tablelands Herb/Grass Dry Forest*] (29 shared plots) and VG94 [*South West Slopes Acacia Dry Herb/Grass Forest*] (8 plots). Community u152 has affinities with VCA ID 295 [*Robertson's Peppermint - Broad-leaved Peppermint - Norton's Box - stringybark shrub-fern open forest of the NSW*

South Western Slopes and SEH Bioregions] (Benson *et al.* 2010).

Frequently-occurring weeds: *Centaurium erythraea* (0.42), *Cirsium vulgare* (0.32), *Hypericum perforatum* (0.31), *Hypochaeris radicata* (0.78), *Rosa rubiginosa* (0.31).

Threats: Most surveyed occurrences of this community are on slopes and foothills of steep country with relatively low suitability for agriculture, and these situations are unlikely to have been widely cleared. Areas in State Forests may be subject to logging and to fire regimes intended for silvicultural management, which may modify vegetation structure and floristic composition over time. Some clearing may have occurred on the margins of private land examples where gentler footslopes were judged suitable for pasture development and grazing. Surveyed examples have not been subject to widespread weed invasion, but areas subject to disturbance by grazing animals or vehicles, including logged forests, may be more prone to invasion by weeds. This community is found within the altitude and rainfall band prefered by St John's wort (*Hypericum perforatum* - >500m altitude and >600mm rainfall; Naughton and Bourke 2007) and may be prone to invasion by this weed.

Reservation Status: Recorded from plots within Burrinjuck NR, Brindabella NP and SCA, Bimberi NR, Wereboldera SCA, Ellerslie NR, Downfall NR, Courabyra NR, Bogandyera NR, Clarkes Hill NR and at numerous locations down the western edge of Kosciuszko NP.

Extent of clearing: Unlikely to have been widely cleared in eastern parts of its distribution on the foothills of the Kosciuszko main range, but examples on private lands on the margins of lower ranges further west may have been subject to moderate levels of clearing where they extended onto rolling foothills attractive for pasture development.

u165: Robertson's Peppermint very tall shrubby open forest primarily of the Bondo subregion of the South Eastern Highlands

Scientific Name: *Eucalyptus robertsonii / Platylobium formosum - Hibbertia obtusifolia - Olearia erubescens - Persoonia chamaepeuce - Pteridium esculentum / Lomandra longifolia - Gonocarpus tetragynus - Poa sieberiana*

Number of samples:	23
Richness [mean (±SD)]:	28 (9)
Slope (degrees):	(3) 6-20 (30)
Altitude (m asl):	(497) 751-1032 (1174)
Ave. Annual Rainfall (mm):	(836) 989-1249 (1383)
Temp. Annual Range (°C):	(24.3) 25-26.8 (28.2)

Vegetation Description: Community u165 is a very tall eucalypt open forest dominated by Robertson's Peppermint (*Eucalyptus robertsonii*), occasionally with other eucalypts including Broad-leaved peppermint (*E. dives*), Mountain Gum (*E. dalrympleana*) or Ribbon Gum (*E. viminalis*). The shrub layer ranges from dense to sparse, with shrubs including *Platylobium formosum*, *Olearia erubescens. Persoonia chamaepeuce*, *Monotoca scoparia*, *Exocaprus strictus* and *Hibbertia obtusifolia*. *Daviesia latifolia* is abundant in recently burnt patches of forest. The ground cover is open to dense and dominated by forbs such as *Lomandra longifolia*, *Gonocarpus tetragynus* and *Clematis aristida*, with *Poa sieberiana* being the dominant grass species.

This community is distributed primarily in western sections of Kosciuszko NP, extending northwards to the Brindabella ranges and south to the Geehi valley in the Murray catchment. It grades into communities such as u105 [*Broad-leaved Peppermint - Brittle Gum - Red Stringybark tall shrub-grass dry sclerophyll open forest of lower ranges of the western South Eastern Highlands and upper South Western Slopes Bioregions*], u239 [*Alpine Ash - Mountain Gum ± Snow Gum wet sclerophyll open forest of the Australian Alps and South Eastern Highlands Bioregions*], u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*] and in the Brindabellas, u52 [*Ribbon Gum - Robertson's Peppermint very tall wet sclerophyll open forest primarily of the Bondo Subregion of the South Eastern Highlands and northern Australian Alps Bioregions*]. This community may extend further west into the NSW South Western Slopes bioregion.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia rubida	1	39	1	6	P
Asperula scoparia	1	57	2	22	P
Brachyscome spathulata	1	35	1	11	P
Caladenia gracilis	1	22	1	1	P
Cassinia uncata	2	22	2	1	P
Clematis aristata	1	70	1	23	P
Coprosma hirtella	1	39	1	12	P
Coprosma quadrifida	1	30	1	8	P
Corybas spp.	1	22	1	<1	P
Craspedia jamesii	1	22	1	4	P
Daviesia latifolia	2	39	2	7	P
Eucalyptus robertsonii	3	91	3	8	P
Exocarpos strictus	1	35	1	12	P
Gonocarpus tetragynus	1	83	2	47	P
Hibbertia obtusifolia	1	70	1	34	P
Lomandra longifolia	1	87	2	42	P
Monotoca scoparia	1	48	1	15	P
Olearia erubescens	1	57	1	12	P
Persoonia chamaepeuce	2	52	1	11	P
Pimelea linifolia	1	30	1	8	P
Platylobium formosum	2	96	2	10	P
Pteridium esculentum	2	65	2	27	P
Tetratheca bauerifolia	1	39	1	7	P
Poa sieberiana	2	65	2	48	C
Viola betonicifolia	1	43	1	27	C

Threatened Communities: Nil.

Equivalent vegetation types: This community is most similar to NSW VCA 295 [*Robertson's Peppermint - Broad-leaved Peppermint - Norton's Box - stringybark shrub-fern open forest of the NSW South Western Slopes and South Eastern Highlands Bioregions*] (Benson 2008). It incorporates VG106 [*Montane Dry Shrub/Tussock Forest*] and plots assigned to other communities described by Gellie (2005)

Frequently occurring weeds: *Hypochaeris radicata* (0.3).

Threats: Some areas have been cleared for pastoral land or pine plantations, and some areas may be burnt too frequently.

Reservation Status: Examples of this community are recorded from Brindabella NP and Kosciuszko NP.

Extent of clearing: Considered minor.

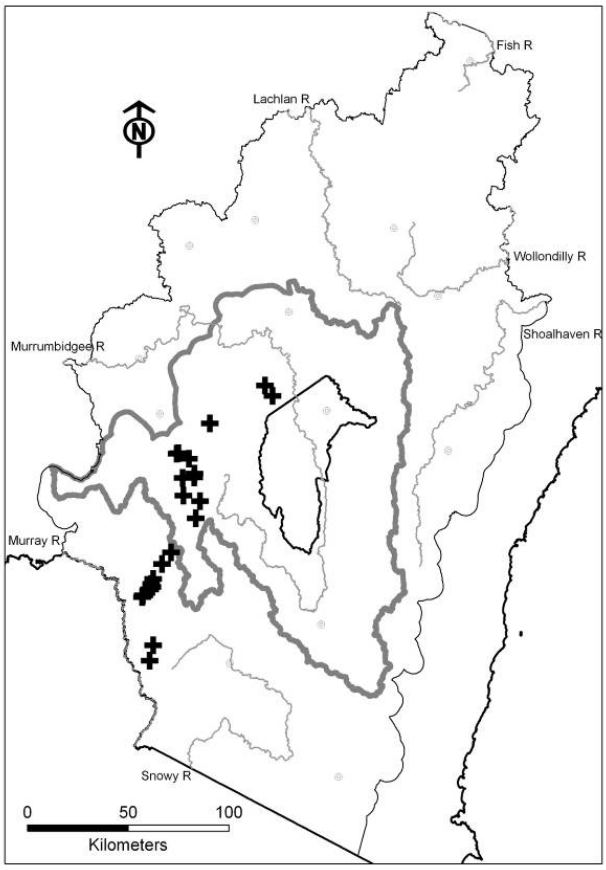


Figure u165: Distribution of field samples assigned to this community.

u191: Black Cypress Pine - Brittle Gum tall dry open forest on hills primarily in the Cooma Region

Scientific Name: *Callitris endlicheri - Eucalyptus mannifera / Bossiaea buxifolia - Cassinia longifolia - Brachyloma daphnoides / Crassula sieberiana - Oxalis perennans - Austrostipa scabra - Chrysocephalum semipapposum*

Number of samples:	14
Richness [mean (±SD)]:	33 (10)
Slope (degrees):	(0) 6-12 (26)
Altitude (m asl):	(652) 805-910 (996)
Ave. Annual Rainfall (mm):	(507) 518-540 (614)
Temp. Annual Range (°C):	(26.3) 26.9-27.5 (27.6)

Vegetation Description: Community u191 is a tall dry open forest to woodland, with a canopy dominated by Black Cypress Pine (*Callitris endlicheri*) and Brittle Gum (*Eucalyptus mannifera* subsp.

Plate u191:

mannifera) and occasional Ribbon Gum (*E. viminalis*). The shrub layer is generally sparse and commonly includes *Brachyloma daphnoides*, *Cassinia longifolia* and *Bossiaea buxifolia*, often with dense patches of young *Callitris endlicheri*. Ground layer vegetation is generally patchy due to high levels of litter or surface rock, with scattered large tussocks of *Joycea pallida*, and frequent forbs of low cover including *Crassula sieberiana*, *Oxalis perennans*, *Chrysocephalum semipapposum*, *Gonocarpus tetragynus*, grasses including *Austrostipa scabra*, *Austrodanthonia* spp. and *Elymus scaber*, the sedge *Carex breviculmis* and the fern *Cheilanthes austrotenuifolia*.

Black Cypress Pine - Brittle Gum tall dry open forest occurs primarily on earthy sands and lithosols derived from metasediments in hills around Cooma including Mount Gladstone and Binjura NR, extending north along Clear Range and steep lower slopes above the Murrumbidgee River. It is also recorded from steep slopes of the Molonglo River gorge near Queanbeyan. Around Cooma and Clear Range this community grades into m51 [*Brittle Gum - Scribbly Gum shrub-grass tall dry sclerophyll open forest on exposed quartz-rich slopes and ridges at primarily in the Monaro and Kybeyan-Gourock subregions of the South Eastern Highlands*] and u178 [*Yellow Box ± Apple Box tall grassy woodland of the South Eastern Highlands*] along drainage lines down slope. Around Queanbeyan it grades into u66 [*Norton's Box - Red Stringybark grass-herb mid-high open forest of the South Eastern Highlands and Upper Slopes Subregion of the South Western Slopes Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia mearnsii	1	36	2	3	P
Aristida ramosa	1	43	2	5	P
Austrodanthonia spp.	1	71	1	7	P
Austrostipa densiflora	1	21	1	1	P
Austrostipa scabra	1	79	2	4	P
Bossiaea buxifolia	1	64	1	7	P
Bothriochloa macra	1	29	1	3	P
Brachyloma daphnoides	1	64	1	16	P
Callitris endlicheri	2	86	3	1	P
Carex breviculmis	1	64	1	13	P
Cassinia longifolia	1	64	1	16	P
Cheilanthes austrotenuifolia	1	64	1	3	P
Chrysocephalum apiculatum	1	43	1	6	P
Chrysocephalum semipapposum	1	79	1	4	P
Crassula sieberiana	1	93	1	5	P
Daucus glochidiatus	1	43	1	8	P
Desmodium varians	1	43	1	12	P
Dichelachne spp.	1	21	1	2	P
Einadia nutans	1	36	1	4	P
Elymus scaber	1	71	1	21	P
Eucalyptus mannifera	3	57	3	11	P
Euchiton involucratus	1	64	1	3	P
Grevillea lanigera	1	29	1	3	P
Lissanthe strigosa	1	50	1	7	P
Lomandra filiformis	1	21	1	2	P
Luzula densiflora	1	36	1	6	P
Mirbelia oxylobioides	1	21	1	3	P
Oxalis perennans	1	86	1	13	P
Poa phillipsiana	1	29	3	3	P
Senecio quadridentatus	1	29	1	6	P
Themeda australis	1	57	2	21	P
Vittadinia cuneata	1	36	1	2	P
Vittadinia muelleri	1	21	1	2	P
Wahlenbergia communis	1	29	1	5	P
Wahlenbergia gracilis	1	36	1	6	P
Wahlenbergia stricta	1	57	1	19	P
Xerochrysum viscosum	1	29	1	1	P
Gonocarpus tetragynus	1	71	2	48	C
Hydrocotyle laxiflora	1	43	2	30	C
Joycea pallida	3	43	2	18	C
Poa sieberiana	1	57	2	48	C

Threatened Communities: Nil.

Frequently occurring weeds: *Acetosella vulgaris* (0.29), *Anagallis arvensis* (0.21), *Echium vulgare* (0.36), *Eragrostis curvula* (0.21), *Erophila verna* (0.64), *Hypericum perforatum* (0.29), *Hypochaeris glabra* (0.29), *Hypochaeris radicata* (0.57), *Linaria arvensis* (0.57), *Pentaschistis airoides* (0.43), *Petrorhagia nanteuilii* (0.64), *Trifolium arvense* (0.64), *Vulpia myuros f. megalura* (0.36).

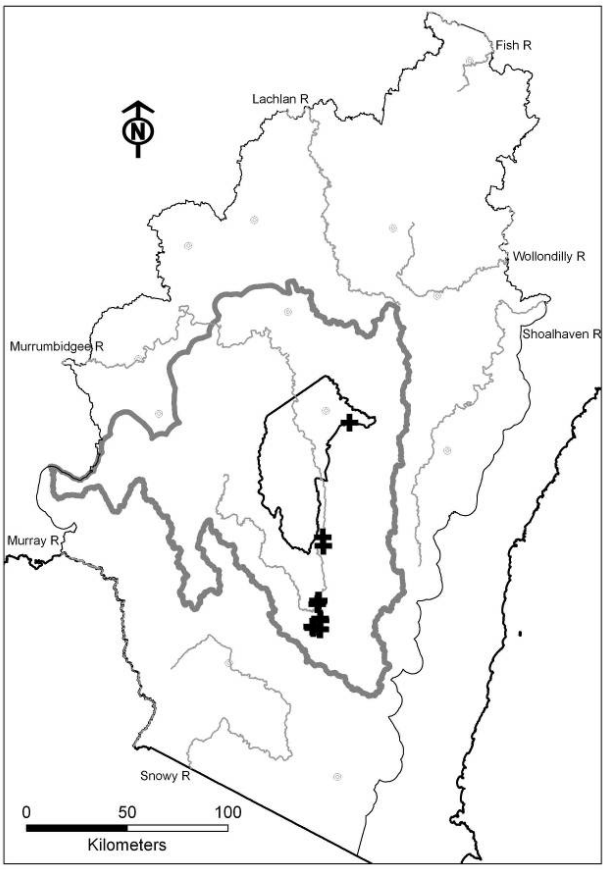


Figure u191: Distribution of field samples assigned to this community.

Equivalent vegetation types: This community was identified largely from field survey plots completed for the current study, and there is no equivalent Forest Ecosystem identified by Gellie (2005) It is possibly related to VG79 [*Montane Dry Shrub/Tussock Grass Forest*].

Threats: Due to the landscape position and infertile soils, the main threat to this community is likely to be grazing.

Reservation Status: This community is sampled from Binjura NR (NSW) and Molonglo Gorge NR (ACT). Whilst unsampled, it is considered to occur in Bullen Range NR and Gigerline NR in the ACT. It is known to occur at Scottsdale Reserve (Bush Heritage Australia).

Extent of clearing: Likely to be minor as it occurs on low nutrient soils on hills.

CLASS: UPPER RIVERINA DRY SCLEROPHYLL FORESTS

u43: Norton's Box - Hickory Wattle - Drooping She-oak - Western Wedding Bush tall grassy open woodland on serpentinite in the Coolac-Goobarragandra area of the upper NSW Southwestern Slopes Bioregion

Scientific Name: *Eucalyptus nortonii / Allocasuarina verticillata - Acacia implexa / Ricinocarpos bowmanii - Xanthorrhoea glauca* subsp. *angustifolia / Austrodanthonia pilosa - Austrostipa scabra - Themeda australis*

Number of samples:	4
Richness [mean (±SD)]:	34 (2)
Slope (degrees):	(9) 14-15 (25)
Altitude (m asl):	(237) 505-644 (694)
Ave. Annual Rainfall (mm):	(687) 972-1083 (1148)
Temp. Annual Range (°C):	(26.7) 26.8-27.3 (28.5)

Plate u43: Community u43, Honeysuckle Range, Plot UMC418.

Vegetation Description: Community u43 is generally characterised by scattered or isolated Norton's Box (*Eucalyptus nortonii*) and Hickory Wattle (*Acacia implexa*) within a sparse to patchy tall shrub layer of Drooping She-oak (*Allocasuarina verticillata*). Distinctive scattered *Xanthorrhoea glauca* subsp. *angustifolia* and low *Ricinocarpos bowmanii* are often present. The groundcover commonly contains a high diversity of grass taxa including *Austrodanthonia pilosa*, *Austrostipa scabra*, *Bothriochloa macra*, *Themeda australis*, *Poa sieberiana*, *Panicum effusum*, *Austrodanthonia racemosa* and *Elymus scaber*. Plots and observations suggest that this vegetation is also characterised by the presence of *Ptilotus exaltatus*, a genus typically found in drier environments west of the study area. Other common groundcover plants include small wiry tufts of *Carex breviculmis* and *Lomandra filiformis*, forbs *Daucus glochidiatus*, *Senecio quadridentatus*, *Scutellaria humilis*, *Tricoryne elatior* and *Dichondra repens*, tough rock ferns including *Cheilanthes sieberi* and *Pleurosorus rutifolius*, and twiners including *Convolvulus angustissimus* and scattered hummocks of the vine *Clematis microphylla*. Given the patchy nature of canopy and shrub species in serpentinite landscapes, this community may occur as a woodland, shrubland or grassland.

This distinctive community is restricted to soils derived from the Coolac Serpentinite formation, a narrow north-south belt of mixed intrusive/metamorphic ultramafic rocks running from east of Coolac/Pettits south along the Mooney Mooney and Honeysuckle Ranges through Gobarralong, Brungle Creek, Wyangle to Goobarragandra. These soils are relatively rich in magnesium and iron-group elements (cobalt, chromium, iron, manganese and nickel) and poor in calcium and potassium (Lyons *et al.* 1974), conditions which inhibit the growth of some plant species. Average annual rainfall along the Honeysuckle Range is moderately high (700-1100mm), but local conditions may be harsh and dry; soils along this steep-sided range are commonly shallow to skeletal with much exposed rock and west-facing slopes are likely to experience high summer evaporation rates.

Observations suggest that ridgecrests and upper slopes may only support widely scattered trees and shrubs over a grassy groundcover, with tree density approaching grassy woodland structure in gullies and on footslopes where deeper soils have developed and greater moisture is presumably available.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia decora	2	25	1	<1	P
Acacia implexa	2	100	1	2	P
Acacia penninervis	2	25	2	<1	P
Allocasuarina verticillata	3	75	1	<1	P
Austrodanthonia monticola	2	25	2	1	P
Austrodanthonia pilosa	2	75	2	9	P
Austrodanthonia setacea	2	25	1	<1	P
Austrostipa densiflora	1	25	1	1	P
Austrostipa rudis	1	25	2	<1	P
Austrostipa scabra	2	75	1	4	P
Bothriochloa macra	3	50	1	3	P
Carex breviculmis	2	75	1	13	P
Cheilanthes sieberi	2	75	1	9	P

Clematis microphylla	2	25	1	<1	P
Convolvulus angustissimus	2	75	1	3	P
Crassula sieberiana	1	50	1	6	P
Daucus glochidiatus	2	75	1	8	P
Dichanthium sericeum	1	25	1	<1	P
Eucalyptus nortonii	2	75	3	3	P
Goodenia spp.	2	25	1	<1	P
Hibbertia calycina	1	25	1	<1	P
Oxalis exilis	2	50	1	5	P
Panicum effusum	2	50	1	3	P
Pleurosorus rutifolius	1	25	1	<1	P
Ptilotus spp.	1	25	0	0	P
Ptilotus semilanatus	2	25	0	0	P
Ricinocarpos bowmanii	2	75	0	0	P
Schoenus apogon	1	50	1	5	P
Scutellaria humilis	2	50	1	2	P
Senecio bathurstianus	1	25	1	1	P
Senecio quadridentatus	2	100	1	6	P
Themeda australis	2	100	2	21	P
Thysanotus patersonii	1	25	1	1	P
Tricoryne elatior	2	50	1	4	P
Wahlenbergia gracilenta	1	50	1	<1	P
Wahlenbergia luteola	2	50	1	1	P
Xanthorrhoea glauca subsp. *angustifolia*	3	75	2	<1	P
Austrodanthonia racemosa	3	50	2	10	C
Dichondra repens	2	50	2	21	C
Elymus scaber	2	50	1	21	C
Gonocarpus tetragynus	1	50	2	48	C
Hovea linearis	1	50	1	13	C
Hydrocotyle laxiflora	1	50	2	30	C
Lomandra filiformis subsp. *coriacea*	1	75	2	19	C
Lomandra filiformis subsp. *filiformis*	2	50	1	16	C
Oxalis perennans	2	50	1	13	C
Poa sieberiana	2	75	2	48	C
Rumex brownii	1	50	1	9	C

Threatened Communities: Nil.

Equivalent vegetation types: Identified by Mulvaney *et al.* (2005) as Serpentine Woodland, and Benson *et al*. (2010) as VCA ID 301 [*Drooping Sheoke - Ricinocarpus bowmannii - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt*].

Frequently-occurring weeds: Grazed areas of this community are widely invaded by common south-western slopes exotic pasture plants. The following exotic plant taxa were recorded in 30% or more of plots assigned to this type: *Acetosella vulgaris* (0.5), *Avena barbata* (0.5), *Briza maxima* (1.00), *Bromus diandrus* (0.75), *Bromus hordeaceus* (0.5), *Carthamus lanatus* (0.5), *Hypericum perforatum* (0.75), *Hypochaeris glabra* (0.5), *Petrorhagia nanteuilii* (1), *Rosa rubiginosa* (0.5), *Rostraria cristata* (0.5), *Sonchus oleraceus* (0.5), *Trifolium angustifolium* (0.75), *Trifolium arvense* (0.5), *Trifolium campestre* (0.5), *Trifolium dubium* (0.5), *Trifolium glomeratum* (0.5).

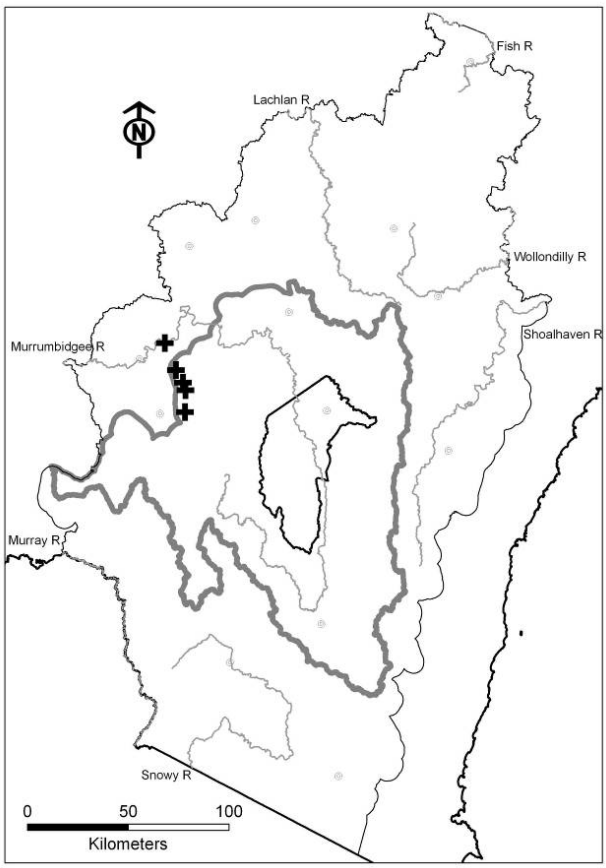


Figure u43: Distribution of field samples assigned to this community.

Threats: Community u43 is grazed by stock across most of its extent, and some areas have been subject to clearing of tree or shrub layers. Mineral prospecting and mining may have local impacts; past mining took place at Tumut Gold Mine and McAlpine Mine, and significant areas of serpentinite are covered by current mineral exploration licences.

Reservation Status: Not represented in any conservation reserves. Small areas exist in two TSRs, at north and south ends of its range; a larger area is within Red Hill SF (which may be subject to grazing lease); the remainder is private freehold.

Extent of clearing: Uncertain. Further investigation is required into the causes of the sparse tree and shrub cover observed across this landscape; whether it is partially due to the influence of serpentinite on plant growth, or is simply an artefact of historic clearing for pasture development. Some areas may have been cleared, but it is also possible that some areas are naturally open.

u66: Norton's Box - Red Stringybark grass-forb mid-high open forest of the South Eastern Highlands and Upper Slopes Subregion of the South Western Slopes Bioregion

Scientific Name: *Eucalyptus nortonii* ± *Eucalyptus macrorhyncha - Eucalyptus polyanthemos / Cassinia longifolia - Hibbertia obtusifolia / Poa sieberiana - Daucus glochidiatus - Cheilanthes austrotenuifolia*

Number of samples:	16
Richness [mean (±SD)]:	41 (10)
Slope (degrees):	(8) 12-19 (28)
Altitude (m asl):	(443) 613-740 (812)
Ave. Annual Rainfall (mm):	(611) 672-724 (1076)
Temp. Annual Range (°C):	(25.8) 26.3-27.1 (27.5)

Vegetation Description: Community u66 is a mid-high open woodland to open forest characterised by Norton's Box (*Eucalyptus nortonii*), often with Red Stringybark (*E. macrorhyncha*) or Red Box (*E. polyanthemos*), and occasionally with Kurrajong (*Brachychiton populneus*) or Black Cypress Pine (*Callitris endlicheri*). *Allocasuarina verticillata* or *Acacia implexa* may be present in low abundance in the mid-storey, along with shrubs including *Cassinia longifolia*, *Bursaria spinosa*, *Pimelea curviflora* and the low shrub *Hibbertia obtusifolia*. The ground layer is generally patchy, with grasses including *Poa sieberiana*, *Austrodathonia* spp. and *Austrostipa scabra*, and forbs including *Hydrocotyle laxiflora*, *Daucus glochidiatus*, *Acaena ovina*, *Geranium solanderi*, *Gonocarpus tetragynus*, *Lomandra filiformis* subsp. *filiformis* and *Wahlenbergia stricta*. The fern *Cheilanthes austrotenuifolia* and sedge *Carex appressa* may be present.

Norton's Box - Red Stringybark mid-high grass-forb open forest is located mainly on low hills of sandstone and acid-volcanic (ignimbrite, rhyolite, tuff) substrates within the northern ACT and surrounds, with further occurrences sampled from steep slopes around Talbingo to the west. It is likely that this community requires greater floristic sampling to refine its description. Around Canberra, this community generally occurs on slightly less fertile soils than u29 [*Apple Box - Broad-leaved Peppermint tall shrub-grass woodland primarily on granitoids of the South Eastern Highlands Bioregion*] and u178 [*Yellow Box ± Apple Box tall grassy woodland of the South Eastern Highlands*]. Around Talbingo it grades into u148 [*Red Stringybark - Red Box grass-forb tall open forest of the upper South Western Slopes and western South Eastern Highlands Bioregions*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia implexa	1	31	1	2	P
Acaena ovina	1	69	1	8	P
Ajuga australis	1	31	1	8	P
Allocasuarina verticillata	1	38	1	<1	P
Austrodanthonia spp.	1	63	1	7	P
Austrostipa scabra	1	56	2	4	P
Bothriochloa macra	1	31	1	3	P
Brachychiton populneus	1	31	1	2	P
Bursaria spinosa	1	63	1	10	P
Callitris endlicheri	1	31	2	1	P
Carex inversa	1	63	1	8	P
Cassinia longifolia	1	75	1	16	P
Cheilanthes austrotenuifolia	1	69	1	3	P
Cheilanthes sieberi	1	50	1	9	P
Clematis leptophylla	1	50	1	1	P
Crassula sieberiana	1	56	1	5	P
Cymbonotus lawsonianus	1	38	1	5	P
Cynoglossum suaveolens	1	44	1	3	P
Daucus glochidiatus	1	75	1	8	P
Desmodium varians	1	56	1	12	P
Dodonaea viscosa	1	25	1	2	P
Eucalyptus nortonii	3	63	3	3	P
Eucalyptus polyanthemos	3	31	3	3	P
Euchiton sphaericus	1	50	1	7	P
Galium gaudichaudii	1	50	1	10	P
Geranium solanderi	1	69	1	19	P
Hibbertia obtusifolia	1	75	1	34	P
Hydrocotyle laxiflora	1	100	2	29	P
Kunzea ericoides	1	38	2	4	P
Lepidosperma laterale	1	63	1	9	P
Lomandra filiformis subsp. *filiformis*	1	69	1	16	P
Luzula densiflora	1	38	1	6	P
Oxalis perennans	1	56	1	13	P
Pimelea curviflora	1	50	1	6	P
Plantago varia	1	44	1	11	P
Poa sieberiana	1	94	2	48	P
Pterostylis nana	1	31	1	<1	P
Pultenaea procumbens	1	31	1	4	P
Rumex brownii	1	38	1	9	P
Scutellaria humilis	1	31	1	1	P
Senecio quadridentatus	1	50	1	5	P
Vittadinia cuneata	1	31	1	2	P
Wahlenbergia spp.	1	25	1	5	P
Wahlenbergia stricta	1	69	1	18	P
Wurmbea dioica	1	38	1	3	P
Glycine clandestina	1	56	1	29	C

Gonocarpus tetragynus	1	69	2	48	C
Hypericum gramineum	1	56	1	25	C
Senecio prenanthoides	1	50	1	19	C

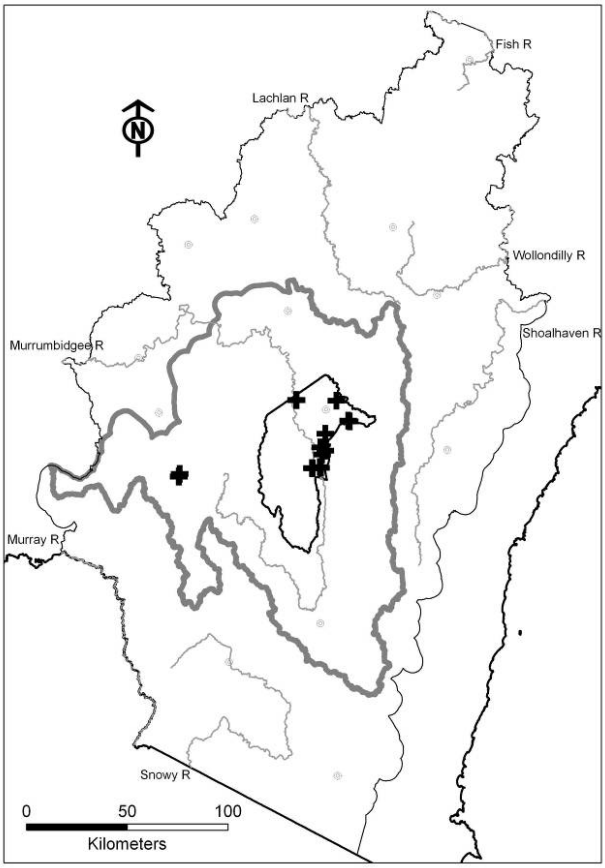


Figure u66: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Frequently occurring weeds: *Aira elegantissima* (0.38), *Anagallis arvensis* (0.31), *Briza minor* (0.31), *Bromus diandrus* (0.38), *Hypericum perforatum* (0.38), *Hypochaeris radicata* (0.75), *Orobanche minor* (0.31), *Petrorhagia nanteuilii* (0.5), *Rosa rubiginosa* (0.44), *Sonchus oleraceus* (0.31), *Trifolium arvense* (0.88), *Trifolium campestre* (0.5), *Trifolium glomeratum* (0.31), *Vulpia myuros* (0.44).

Equivalent vegetation types: No obvious equivalent communities. There are a number of similar VCA plant community types including VCA ID 294, 297, 306, 310, 311 and 316 (Benson *et al*. 2010).

Threats:. Grazing and minor to moderate clearing. This community is prone to weed invasion.

Reservation Status: Examples of this community are found in Isaacs Ridge Reserve (ACT), Kosciuszko NP, Mt. Majura (ACT), Namadgi NP (ACT), Rob Roy Reserve (ACT) and Tuggeranong Hill Reserve (ACT).

Extent of clearing: Likely to be moderately cleared where it occurs on lower slopes.

FORMATION: FORESTED WETLANDS

CLASS: EASTERN RIVERINE FORESTS

p32d: River She-oak riparian forest on sand/gravel alluvial soils along major watercourses of the South Eastern Highlands and upper South Western Slopes Bioregions

Scientific Name: *Casuarina cunninghamiana / Acacia dealbata / Microlaena stipoides - Dichondra repens - Lomandra longifolia - Echinopogon ovatus - Poa labillardierei*

Number of samples:	15
Richness [mean (±SD)]:	28 (8)
Slope (degrees):	(0) 5-26 (36)
Altitude (m asl):	(259) 507-622 (702)
Ave. Annual Rainfall (mm):	(688) 697-728 (909)
Temp. Annual Range (°C):	(25.5) 26.3-27.6 (28.6)

Plate p32d: Community p32d, Nanangroe Road, Murrumbidgee River, Plot UMC404.

Vegetation Description: Community p32d is characterised by a tall tree canopy of River She-oak (*Casuarina cunninghamiana*). The shrub layer is often sparse and may include scattered *Acacia dealbata*, *Bursaria spinosa* or *Kunzea ericoides*, and patches of young *C. cunninghamia* plants. Groundcover is often dominated by bare soil/rock and thick litter of *Casuarina* branchlets, and a dense tree canopy often contributes to a shady moist ground environment. Groundcover plants may be sparse or patchy, and frequent species include *Dichondra repens*, *Echinopogon ovatus*, *Geranium solanderi*, *Microlaena stipoides*, *Poa labillardierei*, *Rumex brownii*, *Hydrocotyle laxiflora*, *Lomandra longifolia* and a variety of small ferns and sedges.

River She-oak riparian forest occurs across the study area on major rivers and streams including the Murrumbidgee, Abercrombie, Tarlo and Wollondilly Rivers. Plots assigned to p32d by the current study were recorded from the Retreat and Abercrombie Rivers in the north of the study area to lower altitudes on rivers in the ACT, on the Murrumbidgee River below Burrinjuck Dam and along the Goodradigbee River. This type occurs on river gravel, cobbles and coarse sandy alluvium along permanent and semi-permanent watercourses in relatively narrow confined channels subject to high-velocity flows. On meandering tableland watercourses with deeper, finer-grained alluvial silts and loams, this type is replaced by u173 [*River Red Gum ± Apple Box very tall grass-forb riparian woodland on alluvial flats in the South Eastern Highlands and upper South Western Slopes Bioregions*]. To the west of the study area where major rivers cut through deep fine-grained silts and loams and sand lenses on broad river flats, this type is replaced on riverbanks by a mixed River Red Gum - River She-oak type (eg. see Mulvaney *et al.* 2005), observed but not sampled on broad sandy flats on the Murrumbidgee at Jugiong and Gobarralong. To the east of the study area in coastal escarpment streams, p32d grades into similar River She-oak-dominated vegetation with increasing elements of moist eucalypt forest and rainforest in the midstorey and groundcover (FoWp32 described by Tozer *et al.* 2010).

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Adiantum aethiopicum	1	38	2	3	P
Asplenium flabellifolium	1	44	1	9	P
Austrodanthonia racemosa	2	38	2	10	P
Bursaria spinosa	1	50	1	10	P
Carex spp.	2	25	1	2	P
Casuarina cunninghamiana	4	100	4	<1	P
Cheilanthes sieberi	1	38	1	9	P
Dichondra repens	2	81	2	20	P
Echinopogon ovatus	1	63	1	10	P
Eucalyptus bridgesiana	1	31	3	7	P
Geranium solanderi	1	56	1	19	P
Kunzea ericoides	3	38	2	4	P
Microlaena stipoides	2	94	2	34	P
Pellaea falcata	1	25	2	2	P
Plantago debilis	2	25	2	4	P
Poa labillardierei var. *labillardierei*	1	50	2	10	P
Rumex brownii	1	63	1	9	P
Senecio quadridentatus	2	38	1	5	P
Urtica incisa	1	38	1	2	P

Acacia dealbata	2	56	2	26	C
Acaena novae-zelandiae	2	50	1	28	C
Hydrocotyle laxiflora	2	56	2	30	C
Lomandra longifolia	2	75	2	42	C
Stellaria pungens	2	50	2	31	C

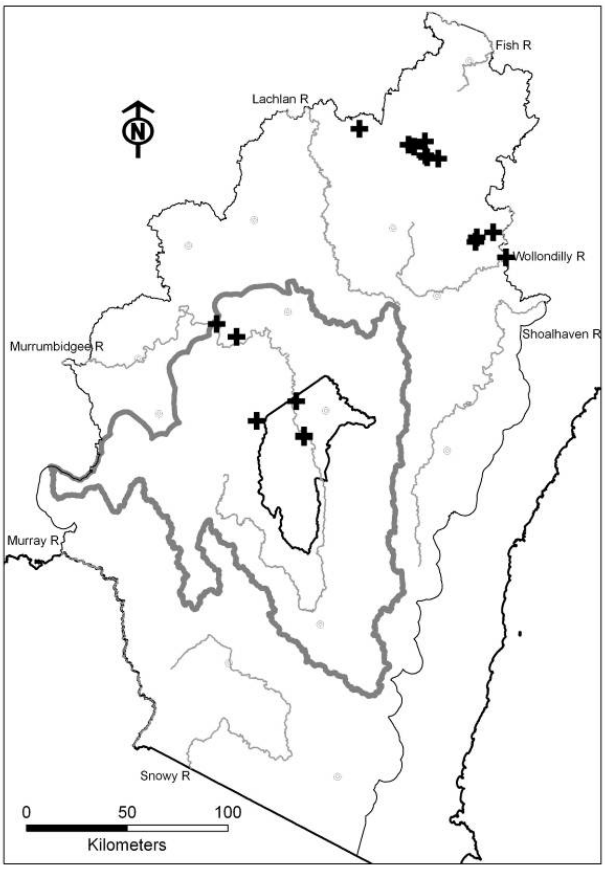


Figure p32d: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: This community is closely related to FoWp32 [*Riverbank Forest*] described by Tozer *et al.* (2010) for the coast and tablelands. The inclusion of additional tableland and slopes field samples in the current study area indicates that a split is warranted between the moist *Casuarina cunninghamiana* forests of the coast and coastal escarpments with their rainforest and wet sclerophyll elements, and the drier *C. cunninghamia* forests of the tablelands and slopes containing elements of adjacent dry forests and woodlands. Community p32d also represents a dry subset of Forest Ecosystem 53 [*Riparian Acacia Shrub/Grass/Herb Forest*] described by Gellie (2005), and is described by Benson *et al.* (2010) as VCA ID 85 [*River Oak forest and woodland wetland of the NSW South-western Slopes and South Eastern Highlands Bioregions*].

Frequently-occurring weeds: This community is susceptible to invasion by a wide variety of exotic plant species. The following taxa were recorded from 30% or more of plots assigned to this community: *Acetosella vulgaris* (0.57), *Anagallis arvensis* (0.43), *Cirsium vulgare* (0.36), *Conyza bonariensis* (0.43), *Euphorbia peplus* (0.36), *Holcus lanatus* (0.36), *Hypochaeris radicata* (0.71), *Modiola caroliniana* (0.43), *Plantago lanceolata* (0.36), *Prunella vulgaris* (0.43), *Rosa rubiginosa* (0.43), *Rubus fruticosus* sp. agg. (0.5), *Sonchus oleraceus* (0.79).

Threats: Generally not cleared, as it tends to be restricted to a narrow band of relatively infertile sand/gravel/cobble alluvium subject to frequent flooding. In some tableland rural environments a narrow strip of this community may be the only extant woody vegetation. However, many examples of this community across all tenures are degraded by weed invasion, and examples on private land are commonly subject to frequent stock grazing.

Reservation Status: Plots recorded from Abercrombie River NP, Brindabella SCA, Burrinjuck NR, Razorback NR and Tarlo River NP in NSW, and Woodstock NR, Stony Creek NR, Bullen Range NR and Kambah Pool Recreation Area in the ACT. Likely to occur in many other conservation reserves along permanent watercourses in dissected country.

Extent of clearing: Generally minor.

p56: Mountain Tea-tree - Small-fruited Hakea - River Lomatia riparian very tall shrubland of the eastern South Eastern Highlands Bioregion

Scientific Name: *Leptospermum grandifolium - Hakea microcarpa - Lomatia myricoides - Leptospermum obovatum / Carex gaudichaudiana - Poa labillardierei - Scirpus polystachyus*

Number of samples:	9
Richness [mean (±SD)]:	24 (5)
Slope (degrees):	(1) 3-6 (21)
Altitude (m asl):	(505) 721-916 (993)
Ave. Annual Rainfall (mm):	(605) 710-916 (1032)
Temp. Annual Range (°C):	(23.2) 24.2-25.9 (26.5)

Vegetation Description: Community p56 is a distinctive riparian shrubland that occurs in a narrow band along beds and lower terraces of rivers and major streams of the eastern southern tablelands where substrates are dominated by exposed bedrock with shallow to skeletal pockets of coarse sand, gravel or cobble alluvium. A tree layer is often absent, or exists as scattered small individuals of creek-bank

Plate p56: Community p56, Shoalhaven River.

species including Ribbon Gum (*Eucalyptus viminalis*) and Snow Gum (*E. pauciflora*). A characteristic dense to patchy layer of low to tall shrubs is commonly dominated by *Hakea microcarpa*, *Leptospermum grandifolium*, *L. obovatum*, *Lomatia myricoides* and other riparian taxa. Groundcover ranges from dense to patchy depending on flood disturbance and levels of bare rock and open water cover; areas of exposed sandy soil are commonly bound by tussocks of *Poa labillardierei*, *Lomandra longifolia* and *Carex appressa* and soft herbs including *Epilobium* spp., *Hydrocotyle peduncularis* and *Acaena novae-zelandiae*, while flowlines and pools and wet banks contain a mix of aquatic and semi-aquatic plants commonly including *Carex gaudichaudiana*, *Juncus*, *Ranunculus* and *Myriophyllum* spp. and tall clumps of *Scirpus polystachyus*.

This community is recorded from eastern tableland streams subject to frequent high-velocity flows, including the upper Shoalhaven and upper Tuross Rivers, Bredbo River, Big Badja River, Maclaughlin River, Bombala River, Dragon Swamp Creek and White Rock River, and is likely to occur on other streams across this range with suitable rocky alluvial habitat. Where deeper sandy alluvial deposits develop this community is replaced by p520 [*Ribbon Gum very tall woodland on sandy alluvial soils along drainage lines of the eastern South Eastern Highlands Bioregion*]. Further to the west on similar shallow sand/gravel/cobble alluvium this type is replaced by community u181 [*River Bottlebrush - Burgan rocky riparian tall shrubland in the South Eastern Highlands and upper South Western Slopes Bioregions*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia siculiformis	2	22	1	<1	P
Blechnum minus	2	22	1	1	P
Callistemon subulatus	2	33	1	<1	P
Carex appressa	2	44	1	7	P
Carex gaudichaudiana	3	89	2	4	P
Elatine gratioloides	1	33	1	<1	P
Epilobium spp.	2	67	1	1	P
Eucalyptus viminalis	1	67	3	13	P
Grevillea lanigera	2	44	1	3	P
Hakea microcarpa	2	78	1	3	P
Hydrocotyle sibthorpioides	2	44	2	4	P
Hypericum japonicum	2	44	1	4	P
Juncus falcatus	2	22	1	<1	P
Juncus gregiflorus	2	22	1	<1	P
Leptospermum grandifolium	3	67	3	2	P
Leptospermum lanigerum	5	22	2	<1	P
Leptospermum obovatum	3	56	1	<1	P
Lomatia myricoides	2	56	1	12	P
Micrantheum hexandrum	1	22	1	<1	P
Myriophyllum spp.	2	33	2	<1	P
Ozothamnus ferrugineus	1	22	2	<1	P
Persicaria prostrata	1	22	2	1	P
Poa labillardierei	2	89	2	10	P
Pultenaea altissima	1	33	1	<1	P
Ranunculus amphitrichus	1	44	2	<1	P
Schoenoplectus validus	2	22	1	<1	P
Scirpus polystachyus	2	67	1	<1	P
Typha orientalis	1	22	0	0	P
Acaena novae - zelandiae	2	44	1	28	C
Elymus scaber	1	44	1	21	C
Lomandra longifolia	2	56	2	42	C

Threatened Communities: Nil.

Equivalent vegetation types: This community is equivalent to FrWp56 [*Shoalhaven Riparian Scrub*] identified by Tozer *et al.* (2010), with the addition of a new plot from the Bredbo River.

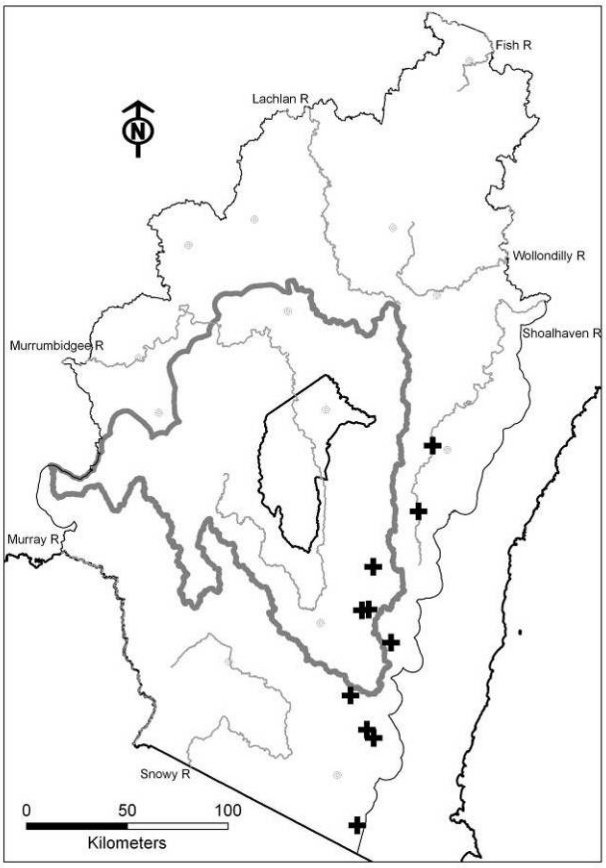


Figure p56: Distribution of field samples assigned to this community.

Frequently-occurring weeds: This riparian community is relatively moist and is subject to frequent disturbance by flooding, so is prone to invasion by a variety of exotic plant species. The following taxa were recorded from 30% or more of plots assigned to this community: *Acetosella vulgaris* (0.33), *Anthoxanthum odoratum* (0.33), *Holcus lanatus* (0.67), *Hypochaeris radicata* (0.44), *Plantago lanceolata* (0.33), *Prunella vulgaris* (0.56).

Threats: Weed invasion is likely to be the main ongoing threat to this community, particularly invasive perennial weeds such as Blackberry (*Rubus fruticosus* spp. agg.) and St John's Wort (*Hypericum perforatum*) with the ability to survive major floods and gradually dominate the riparian zone and displace native plants.

Reservation Status: Recorded from Deua NP and South East Forest NP, also likely to occur in many other conservation reserves along the eastern tableland ranges.

Extent of clearing: Likely to be very minor due to its rocky, flood-prone habitat.

u181: River Bottlebrush - Burgan rocky riparian tall shrubland in the South Eastern Highlands and upper South Western Slopes Bioregions

Scientific Name: *Callistemon sieberi - Kunzea ericoides - Acacia rubida - Bursaria spinosa / Rumex brownii - Lythrum hyssopifolia - Lomandra longifolia*

Number of samples:	10
Richness [mean (±SD)]:	25 (6)
Slope (degrees):	(0) 4-19 (25)
Altitude (m asl):	(360) 462-607 (749)
Ave. Annual Rainfall (mm):	(605) 648-675 (962)
Temp. Annual Range (°C):	(26.7) 27-27.4 (28)

Plate u181: Community u181, Goobra Sandy TSR, Goobragandra River, Plot UMC414.

Vegetation Description: Community u181 is characteristically a tall to low riparian shrubland, with a patchy to dense layer of shrubs commonly dominated by *Callistemon sieberi* and *Kunzea ericoides* with scattered *Acacia rubida* and *Bursaria spinosa*. Ccattered emergent or flood-stunted trees sometimes occur. Ground cover tends to be dominated by exposed rock and bare sand/gravel alluvium, with scattered or patchy low moisture-loving plants including tussocks of *Lomandra longifolia*, *Juncus* spp. and *Carex appressa*, forbs (*Lythrum hyssopifolia*, *Rumex brownii*, *Persicaria* spp., *Epilobium* spp.), and scattered grasses (*Austrodanthonia racemosa*, *Microlaena stipoides* and *Elymus scaber*). River Red Gum (*Eucalyptus camaldulensis*) may be found as part of or adjacent to this community, where it is at the eastern edge of its range.

River Bottlebrush - Burgan rocky riparian shrubland has been recorded from the Murrumbidgee River (around Michelago, Gigerline and Greenway), the Molonglo gorge and a Queanbeyan River tributary, in Yass River gorge and tributaries (Bogolong Creek),

and on the Goobarragandra River east of Tumut. It was also observed on Lerida Creek near Gunning, and may occur elsewhere across western parts of the study area in suitable rocky riparian habitats. This community appears to be restricted to riparian areas of exposed rocky substrate with skeletal or shallow pockets of gravelly soil along western tableland streams, often in confined gorges through hilly country but also on small bedrock reefs exposed in streams through undulating tableland/slopes country.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia dawsonii	1	20	1	<1	P
Acacia rubida	2	70	1	6	P
Alternanthera denticulata	1	20	1	<1	P
Austrodanthonia racemosa	2	50	2	10	P
Bursaria spinosa	1	60	1	10	P
Callistemon sieberi	2	100	2	<1	P
Callitris endlicheri	2	40	3	1	P
Calytrix tetragona	2	30	2	1	P
Carex appressa	1	50	1	7	P
Cassinia spp.	1	20	1	1	P
Cheilanthes sieberi	1	50	1	9	P
Dodonaea viscosa subsp. *angustissima*	1	50	1	<1	P
Epilobium spp.	1	20	1	1	P
Eucalyptus camaldulensis	3	20	4	<1	P
Juncus spp.	1	30	1	2	P
Juncus usitatus	1	20	1	<1	P
Kunzea ericoides	2	90	2	4	P
Leptospermum obovatum	1	20	3	<1	P
Lespedeza juncea subsp. *sericea*	2	30	1	<1	P
Lythrum hyssopifolia	1	60	1	<1	P
Paspalum distichum	2	20	2	<1	P
Persicaria hydropiper	2	20	1	<1	P
Persicaria prostrata	2	20	2	1	P
Pomaderris angustifolia	1	20	1	<1	P
Rumex brownii	1	70	1	9	P
Acacia dealbata	1	40	2	26	C
Elymus scaber	2	50	1	21	C
Geranium solanderi	1	50	1	19	C
Lomandra longifolia	2	60	2	42	C
Microlaena stipoides	2	50	2	34	C
Poa labillardierei	2	40	2	10	C
Themeda australis	1	50	2	21	C

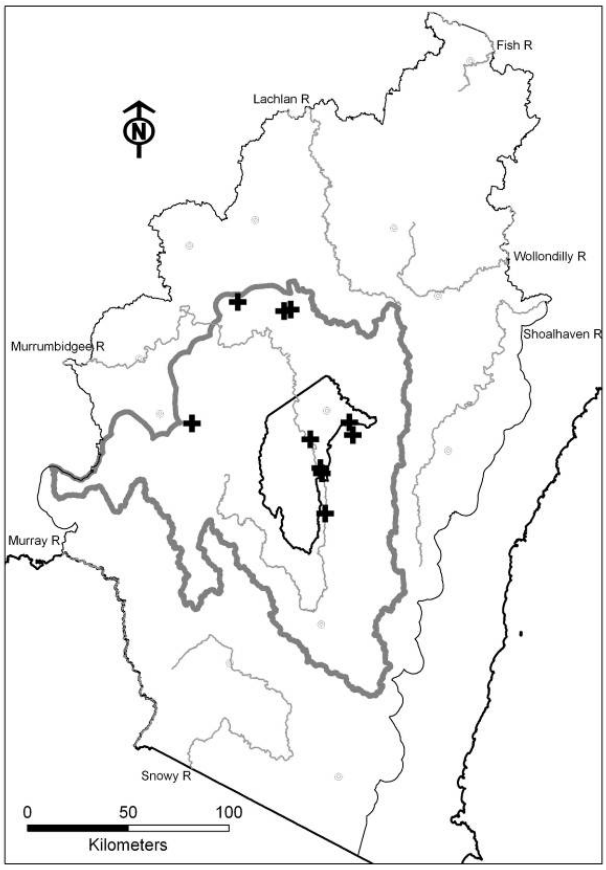


Figure u181: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: This community has no equivalent Forest Ecosystem in the classifications of Gellie (2005), some plots were originally part of VG82 [*Montane Acacia Fern/Herb Forest*]. It appears to have affinities with VCA ID 333 [*Bottlebrush riparian shrubland wetland of the northern NSW South-western Slopes and southern BBS Bioregions*] (Benson *et al*. (2010).

Frequently-occurring weeds: Community u181 occurs along stream channels where moist conditions and frequent flooding and grazing disturbance allow the arrival, survival and reproduction of a wide variety of exotic plants. The following exotic plant species were recorded from 30% or more of the plots assigned to this type: *Acetosella vulgaris* (0.60), *Anagallis arvensis* (0.70), *Avena fatua* (0.30), *Briza maxima* (0.30), *Briza minor* (0.50), *Bromus diandrus* (0.50), *Bromus hordeaceus* (0.30), *Conyza bonariensis* (0.40), *Crataegus monogyna* (0.30), *Cynara cardunculus* (0.40), *Cynosurus echinatus* (0.40), *Cyperus eragrostis* (0.40), *Dactylis glomerata* (0.30), *Hypericum perforatum* (0.80), *Hypochaeris glabra* (0.40), *Hypochaeris radicata* (0.50), *Juncus bufonius* (0.30), *Paspalum dilatatum* (0.30), *Petrorhagia nanteuilli* (0.60), *Plantago lanceolata* (0.90), *Polycarpon tetraphyllum* (0.40), *Rosa*

rubiginosa (0.60), *Rubus fruticosus* spp. agg. (0.70), *Rumex crispus* (0.40), *Sanguisorba minor* subsp. *muricata* (0.30), *Sonchus asper* subsp. *glaucescens* (0.30), *Sonchus oleraceus* (0.30), *Trifolium angustifolium* (0.40), *Trifolium arvense* (0.70), *Trifolium campestre* (0.50), *Vulpia myuros f. megalura* (0.70).

Threats: Unlikely to have been widely cleared. Examples on freehold land are likely to be grazed except where streambanks have been protected by fencing. The habitat of this community is moist and subject to occasional flooding disturbance and it is highly prone to invasion by riparian weeds and exotic plants of adjacent pasture lands.

Reservation Status: Plots of this community sampled in the ACT were located in Bullen Range NR, Molonglo Gorge NR and Gigerline NR. None of the plots from NSW assigned to this type were located in a conservation reserve; however plot distribution and presence of suitable rocky riparian habitat suggest that it is likely to occur in a range of reserves including Cuumbeun NR, northern Kosciuszko NP, Hattons Corner NR and Burrinjuck NP. This community was sampled and observed in a few TSRs.

Extent of clearing: Although restricted to moist riparian habitats, the rocky substrate of this type means it is unlikely to have been widely cleared.

CLASS: INLAND RIVERINE FORESTS

u173: River Red Gum ± Apple Box very tall grass-forb riparian woodland on alluvial flats in the South Eastern Highlands and upper South Western Slopes Bioregions

Scientific Name: *Eucalyptus camaldulensis* ± *Eucalyptus bridgesiana / Carex appressa - Geranium solanderi - Themeda australis - Microlaena stipoides - Lythrum hyssopifolia*

Number of samples:	6
Richness [mean (±SD)]:	16 (10)
Slope (degrees):	(1) 2-8 (13)
Altitude (m asl):	(286) 451-570 (769)
Ave. Annual Rainfall (mm):	(643) 654-753 (867)
Temp. Annual Range (°C):	(26.6) 26.7-27.8 (27.8)

Plate u173: community u173, Yass River, Grrenwood Road, Plot UMC405.

Vegetation Description: Community u173 is a woodland to open forest characterised by an open, tall to very tall canopy of River Red Gum (*Eucalyptus camaldulensis*) and/or Apple Box (*E. bridgesiana*) above occasional scattered tall shrubs of *Acacia deanei* and a moderately dense, moist groundcover commonly including patches of grasses (*Themeda australis*, *Microlaena stipoides* and *Austrodanthonia racemosa*) and forbs including *Lythrum hyssopifolia*, *Geranium solanderi* and *Rumex brownii*. Streambanks and overflow pools often support tall clumps of *Carex appressa*, *Juncus gregiflorus* and *Typha domingensis*, while calmer pools and wet exposed muddy banks may contain *Myriophyllum crispatum* and other aquatic plants.

This community is found on moderately fertile alluvial flats of meandering creeks and rivers of the western tablelands and upper slopes. This formerly widespread community has been very widely cleared and remnants are often heavily disturbed; it is defined in the current study based on only 6 survey plots, recorded along tributaries of the upper Lachlan River (at Lade Vale, Rye Park and Wheeo Creek) and the Murrumbidgee River (sampled on Yass River flats near Murrumbateman and a Tumut River tributary at Brungle, observed on Jugiong Creek at Childowla Road TSR).

Within its range, this community may be replaced by u181 [*River Bottlebrush - Burgan rocky riparian tall shrubland in the South Eastern Highlands and upper South Western Slopes Bioregions*] in confined reaches of streams where alluvium is reduced to skeletal pockets over bedrock. On sections of stream with increased flow velocity and sand/gravel/cobble alluvium, it may be replaced by p32d [*River Sheoak dry forest on sand/gravel alluvial soils along major watercourses of the South Eastern Highlands and upper South Western Slopes Bioregions*]. On riparian flats of the lower slopes and plains to the west of the current study area, u173 will grade into other River Red Gum-dominated communities, such as the *River Red Gum Forest* described by Mulvaney *et al.* (2005) from Gundagai Shire.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia deanei	1	33	1	1	P
Carex appressa	2	100	1	7	P
Eucalyptus bridgesiana	3	50	3	7	P
Eucalyptus camaldulensis	4	83	3	<1	P
Juncus gregiflorus	2	33	1	<1	P
Lythrum hyssopifolia	1	50	1	<1	P
Myriophyllum crispatum	2	33	2	<1	P
Typha domingensis	1	33	3	<1	P
Geranium solanderi	2	50	1	19	C
Microlaena stipoides	2	50	2	34	C
Themeda australis	2	50	2	21	C

Threatened Communities: Nil, although it is considered highly rare / threatened in the area.

Equivalent vegetation types: Plots allocated to this type include two plots classified by Gellie (2005) as VG43 [*Western Slopes Riparian Moist Sedge Woodland*]. There are minor affinities with VCA ID 79 [*River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion*] described by Benson *et al*. (2010).

Frequently-occurring weeds: This community is restricted to moist, moderately fertile alluvial soils, often heavily grazed and occasionally subject to

flooding disturbance, so is prone to invasion by a wide variety of exotic plant species. The following exotic plant species were recorded from 30% or more of the plots assigned to this type: *Acetosella vulgaris* (0.50), *Bromus diandrus* (0.33), *Bromus molliformis* (0.33), *Cirsium vulgare* (0.33), *Cynosurus echinatus* (0.50), *Holcus lanatus* (0.83), *Hypochaeris radicata* (0.50), *Lolium perenne* (0.33), *Paspalum dilatatum* (0.50), *Phalaris aquatica* (0.50), *Rosa rubiginosa* (0.33), *Rubus fruticosus* spp. agg. (0.33), *Rumex crispus* (0.33) and *Trifolium campestre* (0.33). Streambanks throughout much of the original extent of this type have been invaded by or planted with exotic Willow trees (*Salix* spp.).

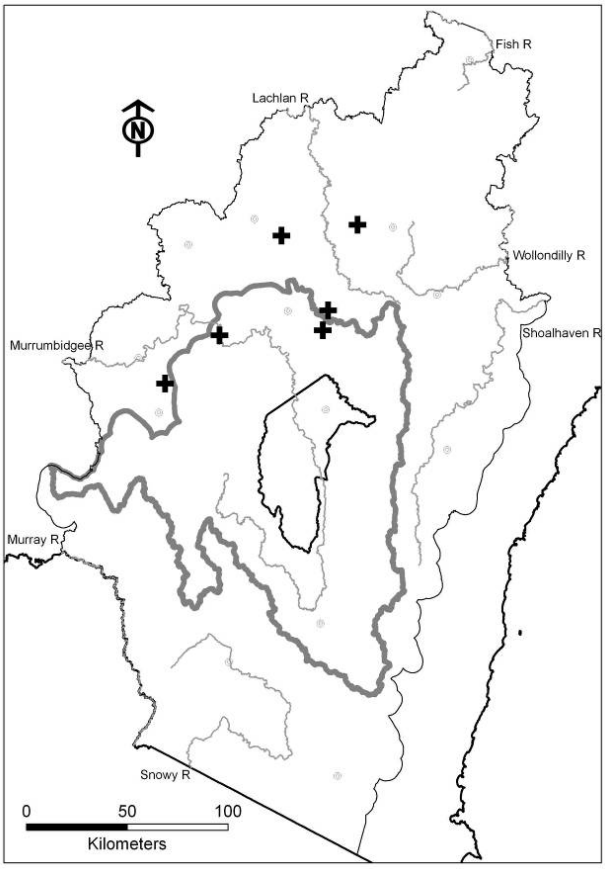


Figure u173: Distribution of field samples assigned to this community.

Threats: The productive alluvial flats occupied by this community have been very widely cleared and converted to exotic pasture and/or are regularly cropped. Many surviving remnants are likely to be subject to ongoing stock grazing and invasion by weeds. Changes to stream hydrology in some catchments resulting from dams, changed runoff rates and bed-lowering may lead to long-term shifts in the composition of remnants of this community.

Reservation Status: Only one plot assigned to this community is located in a conservation reserve (Burrinjuck NR). This community was also sampled and observed in a few TSRs.

Extent of clearing: Very widely cleared for agricultural development.

FORMATION: FRESHWATER WETLANDS

CLASS: MONTANE BOGS AND FENS

a9: Tufted Sedge - Small River-buttercup - Common Reed aquatic herbfield of waterways in the Australian Alps and South Eastern Highlands Bioregions

Scientific Name: *Carex gaudichaudiana - Epilobium pallidiflorum - Ranunculus amphitrichus - Phragmites australis - Lythrum salicaria*

Number of samples:	6
Richness [mean (±SD)]:	9 (3)
Slope (degrees):	(0) 0-1 (2)
Altitude (m asl):	(975) 978-1065 (1150)
Ave. Annual Rainfall (mm):	(772) 978-1304 (1366)
Temp. Annual Range (°C):	(24.2) 25.2-25.6 (26.5)

Plate a9: Plant community a9 at Micalong Swamp.

Vegetation Description: Community a9 is a highly variable aquatic herbfield community that, with further sampling, may represent more than one community. It includes both true aquatics with fully submerged (e.g. *Myriophyllum alpinum*), floating (*Nymphoides montana*) or emergent foliage (e.g. *Carex gaudichaudiana*), as well as semi-aquatics capable of growing as submergents for extended periods (e.g. *Lilaeopsis polyantha*, *Lythrum salicaria*, *Neopaxia australasica*, *Ranunculus pimpinellifolius*). *Phragmites australis* or *Carex gaudichaudiana* may fringe such vegetation. Plant cover is sporadic and sometimes only one or a few species will be present.

This community occurs in and beside permanent waterways (e.g. upper reaches of the Murrumbidgee River and its tributaries), in deeper pools along intermittent streams (e.g. Nungar Creek and McPhersons Plain in NSW, Sheep Station Creek and Grassy Creek in the ACT, and in Victoria), and broad flooded creek flats (e.g. Micalong Swamp in Bondo SF).

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Carex appressa	2	50	1	7	P
Carex gaudichaudiana	5	100	2	4	P
Epilobium pallidiflorum	2	33	2	<1	P
Hydrocotyle tripartita	3	33	2	<1	P
Lilaeopsis polyantha	1	33	2	<1	P
Lythrum salicaria	2	33	2	<1	P
Myriophyllum variifolium	2	33	1	<1	P
Neopaxia australasica	2	33	1	1	P
Phragmites australis	2	50	2	<1	P
Ranunculus amphitrichus	3	67	1	<1	P
Ranunculus pimpinellifolius	1	33	1	1	P
Stellaria angustifolia	2	33	1	2	P

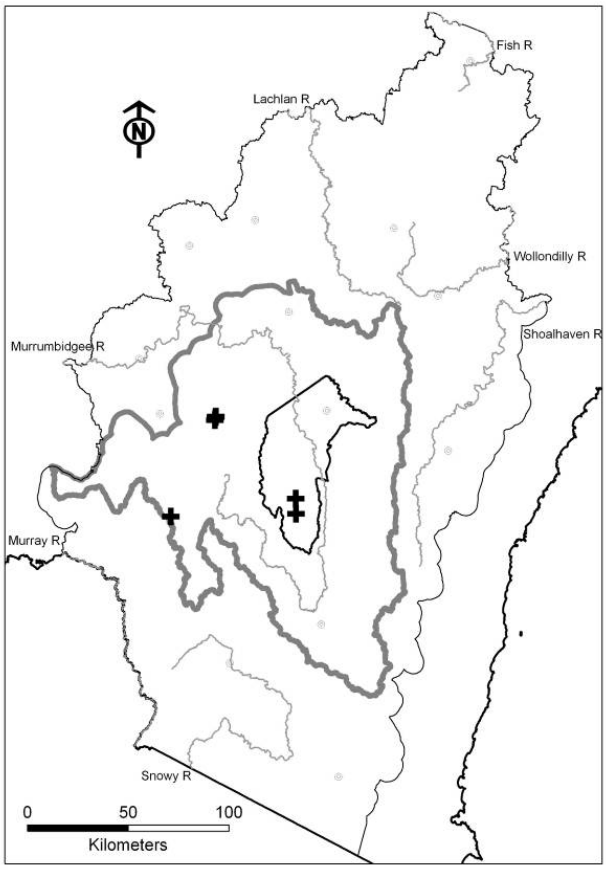


Figure a9: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Equivalent vegetation types: 9 [*Aquatic*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Holcus lanatus* (0.33), *Myosotis discolor* (0.33), *Myosotis caespitosa* (0.5).

Threats: Some trampling of creek edges by horses has been observed in the vicinity of this community. It is possible however that some sites formerly supporting this community have been degraded by past domestic grazing to the extent that they are no longer floristically analogous. The weed *Myosotis caespitosa* is locally dominant in some examples (e.g. Cooleman Plain in Kosciuszko NP and McPhersons Plain east of Tumbarumba) and may threaten the integrity of this community. Flood events and drought presumably lead to great fluctuation in species composition over time. The effect of deliberate large releases of water for environmental flows from Tantangara Dam is unknown but worth investigating.

Reservation Status: Present in Kosciuszko and Namadgi NPs, State Forest and freehold.

Extent of clearing: Nil.

e59: Small-fruited Hakea - Mountain Baeckea - Myrtle Tea-tree subalpine wet heathland on escarpment and eastern tableland ranges of the South Eastern Highlands Bioregion

Scientific Name: *Hakea microcarpa - Baeckea utilis - Leptospermum myrtifolium - Epacris breviflora / Empodisma minus - Hydrocotyle sibthorpioides - Baloskion australe - Hypericum japonicum*

Number of samples:	10
Richness [mean (±SD)]:	28 (7)
Slope (degrees):	(0) 1-4 (6)
Altitude (m asl):	(937) 953-1059 (1187)
Ave. Annual Rainfall (mm):	(747) 958-1047 (1082)
Temp. Annual Range (°C):	(22.6) 23.6-24.2 (25)

Vegetation Description: Community e59 is a sub-alpine bog heathland characterised by an open (to occasionally closed) shrub stratum (1 – 1.75 m tall) commonly dominated by *Baeckea utilis*, *Leptospermum myrtifolium* and *Epacris paludosa* and comprising many other species commonly found in the community of similar landscape position in the Australian Alps bioregion [a2: *Alpine Baeckea - Swamp Heath - Candle Heath - Sphagnum wet heathland of the Australian Alps Bioregion*], such as *Carex gaudichaudiana*, *Epacris breviflora*, *Empodisma minus*, *Luzula modesta* and *Oreomyrrhis ciliata*. *Sphagnum cristatum* often occurs as isolated clumps beneath shrubs or at the margins where a permanent supply of water permits. The community is often fringed by eucalypts (e.g. *Eucalyptus dalrympleana*, *E. pauciflora*, *E. stellulata*) and wet grasses such as *Poa labillardierei* may be locally abundant.

Small-fruited Hakea - Mountain Baeckea - Myrtle Tea-tree subalpine bog heathland occurs in the bottoms of broad, flat valleys on alluvium along the Great Dividing Range and coastal escarpment ranges. It may extend westward into the ACT (Greg Baines pers. comm.) Soils are peats and humified peat.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Allittia cardiocarpa	1	30	1	<1	P
Asperula gunnii	2	50	1	5	P
Baeckea utilis	3	70	2	1	P
Baloskion australe	3	60	1	2	P
Brachyscome scapigera	2	30	1	2	P
Carex spp.	3	30	1	2	P
Cotula alpina	1	50	1	1	P
Craspedia variabilis	2	50	1	5	P
Empodisma minus	3	80	2	3	P
Epacris breviflora	2	50	1	2	P
Epacris microphylla	2	20	1	1	P
Epacris paludosa	2	40	2	1	P
Geranium neglectum	2	40	2	2	P
Gonocarpus micranthus	2	40	1	2	P
Hakea microcarpa	2	100	1	3	P
Hookerochloa hookeriana	5	20	1	<1	P
Hydrocotyle sibthorpioides	3	80	2	4	P
Hypericum japonicum	2	60	1	3	P
Hypoxis hygrometrica	2	20	1	<1	P
Juncus sarophorus	2	40	1	<1	P
Leptospermum continentale	1	30	1	2	P
Leptospermum myrtifolium	2	70	1	3	P
Lindsaea linearis	1	20	1	<1	P
Luzula modesta	1	30	1	2	P
Mitrasacme serpyllifolia	2	60	1	<1	P
Oreobolus oxycarpus subsp. *oxycarpus*	3	20	1	<1	P
Oreomyrrhis ciliata	1	40	1	2	P
Patersonia fragilis	2	20	2	<1	P
Ranunculus pimpinellifolius	2	40	1	1	P
Stackhousia viminea	2	20	1	<1	P
Stellaria angustifolia	1	30	1	1	P
Utricularia dichotoma	2	20	1	<1	P

Velleia montana	1	40	1	<1	P
Veronica subtilis	2	20	1	<1	P
Viola caleyana	1	30	1	<1	P
Xerochrysum palustre	3	20	1	1	P
Euchiton gymnocephalus	1	40	1	15	C
Poa labillardierei	4	40	2	10	C

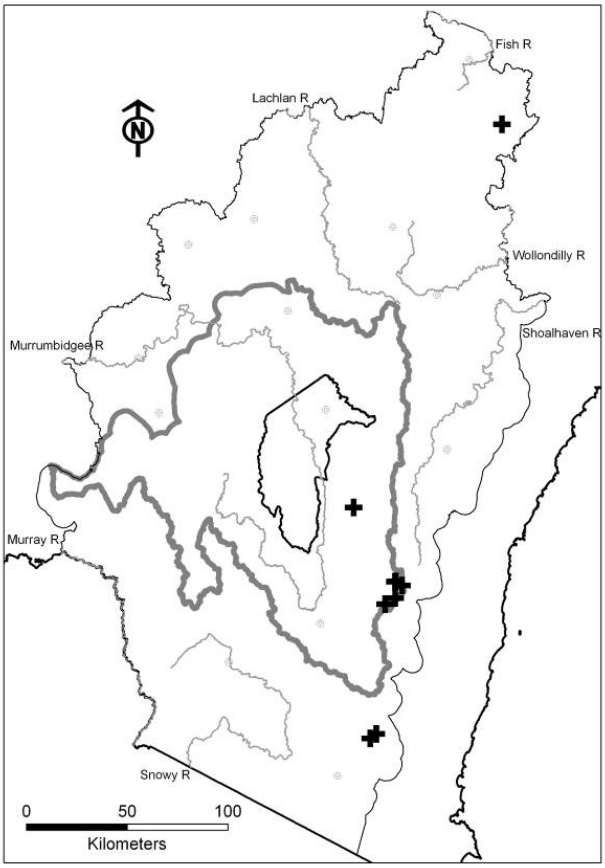


Figure e59: Distribution of field samples assigned to this community.

Threatened Communities: TSC Act 1995 - *Montane Peatlands and Swamps of the New England Tableland*, *NSW North Coast*, *Sydney Basin*, *South East Corner*, *South Eastern Highlands and Australian Alps Bioregions.*

Equivalent vegetation types: Related to FrWe59 [*Southeast Sub-alpine Bog*] (Tozer *et al.* 2010), unit 59 [*Sub-alpine Bog*] (Keith and Bedward 1999) and Floristic Group 4 [*Shrubby herbaceous Sphagnum peatlands*] (Whinam and Chilcott 2002).

Frequently-occurring weeds: *Cirsium vulgare* (0.40), *Hypochaeris radicata* (0.50), *Taraxacum officinale* (0.30), *Trifolium repens* (0.30).

Threats: Some examples on State Forest and freehold land are grazed by cattle. This community is especially sensitive to trampling damage and further degradation can be expected on these tenures. Grazing, trampling and wallowing by deer occurs on all tenures but the degree of this disturbance is unknown. Frequent burning may destroy this community by damaging *Sphagnum* and peats, which causes drying of the soil and is likely to lead to the establishment of species more commonly found on drier sites.

Reservation Status: Likely to be approximately evenly distributed in National Parks and Nature Reserves, State Forest and freehold. Recorded from survey plots in Badja Swamps NR, Deua NP, Kanangra-Boyd NP and South East Forest NP.

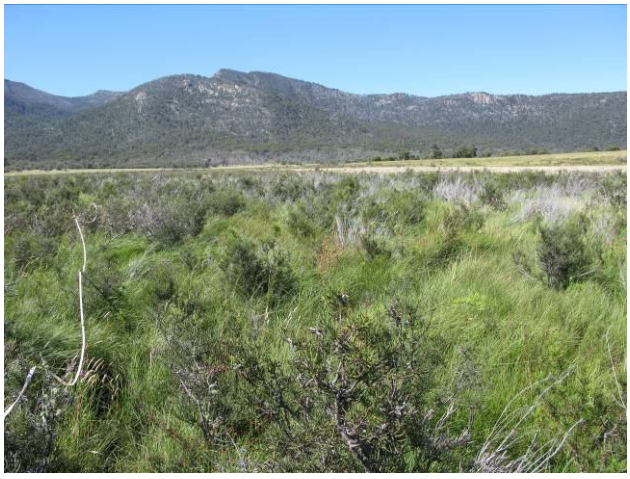
Extent of clearing: Tozer *et al.* (2010) indicate that about 70% of this community has been cleared or heavily degraded by grazing.

u193: Small-fruited Hakea - Drumstick Heath - Swamp Heath subalpine wet heathland of the Australian Alps and western South Eastern Highlands Bioregions

Scientific Name: *Eucalyptus camphora* subsp. *humeana / Hakea microcarpa - Epacris breviflora - Epacris paludosa / Empodisma minus - Carex gaudichaudiana - Asperula gunnii - Gonocarpus micranthus*

Number of samples:	14
Richness [mean (±SD)]:	28 (7)
Slope (degrees):	(0) 1-8 (13)
Altitude (m asl):	(790) 1002-1188 (1439)
Ave. Annual Rainfall (mm):	(847) 936-1331 (1495)
Temp. Annual Range (°C):	(23) 23.8-25.6 (26)

Plate u193: Community u193, Yaouk Creek Swamp, Scabby Range NR, Plot UMC421.



Vegetation Description: Community u193 is a swampy heathland to 2 m in height, typically dominated by *Baeckea utilis*, *Epacris breviflora*,

Epacris paludosa and/or *Hakea microcarpa*. The ground cover is usually a dense cover of *Empodisma minus* and sedges (*Carex* spp., *Eleocharis* spp.) interspersed with herbs such as *Gonocarpus micranthus*, *Hydrocotyle sibthorpioides*, *Poa costiniana*, *P. labillardierei* and *Ranunculus pimpinellifolius. Carex gaudichaudiana* may be abundant in areas of open water within the community. *Sphagnum cristatum* may also be present.

This community is distributed between the Brindabella Ranges and the Tumbarumba area. It is largely a treeless, shrub-dominated wetland apart from scattered or fringing Mountain Swamp Gum (*Eucalyptus camphora* subsp. *humeana*) to 5 m in height at some sites. Floristically and structurally it is similar to low altitude examples of community a2 [*Alpine Baeckea - Swamp Heath - Candle Heath - Sphagnum wet heathland of the Australian Alps Bioregion*], which typically occurs on broad frost hollows where it is bordered by grassland. Upslope, this community adjoins woodland or forest dominated by *E. pauciflora*, *E. stellulata* or *E. dalrympleana*. Examples range in size from tens of square metres where fed by permanent springs to several hectares on flat sections of streams. Soils are peaty.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Asperula gunnii	2	71	1	5	P
Baeckea gunniana	2	21	1	1	P
Baeckea utilis	3	57	2	1	P
Baloskion australe	2	64	1	2	P
Brachyscome scapigera	1	21	1	2	P
Carex appressa	2	50	1	7	P
Carex gaudichaudiana	3	79	2	4	P
Comesperma retusum	1	36	1	<1	P
Deyeuxia gunniana	2	21	1	<1	P
Eleocharis gracilis	2	29	2	<1	P
Eleocharis sphacelata	2	21	3	<1	P
Empodisma minus	4	71	2	3	P
Epacris breviflora	2	86	1	2	P
Epacris paludosa	3	57	2	1	P
Epilobium billardierianum subsp. *hydrophilum*	2	21	1	<1	P
Epilobium gunnianum	1	21	1	1	P
Eucalyptus camphora subsp. *humeana*	3	21	1	<1	P
Gonocarpus micranthus	2	71	1	2	P
Gratiola peruviana	2	29	1	1	P
Hakea microcarpa	2	86	1	3	P
Hydrocotyle algida	1	21	1	1	P
Hydrocotyle sibthorpioides	2	64	2	4	P
Hypericum japonicum	2	36	1	4	P
Hypoxis hygrometrica	2	21	1	<1	P
Juncus falcatus	1	21	1	<1	P
Juncus fockei	1	21	1	<1	P
Lachnagrostis filiformis	2	29	2	4	P
Lobelia pedunculata	2	29	1	5	P
Lobelia surrepens	2	21	2	<1	P
Luzula modesta	2	57	1	2	P
Luzula ovata	1	21	1	<1	P
Myriophyllum crispatum	2	21	2	<1	P
Oreomyrrhis ciliata	2	21	1	2	P
Pimelea bracteata	2	36	1	<1	P
Poa costiniana	2	43	2	5	P
Poa labillardierei	2	43	2	10	P
Ranunculus pimpinellifolius	1	43	1	1	P
Senecio glomeratus	2	21	2	<1	P
Stellaria angustifolia	2	43	1	1	P
Veronica subtilis	2	50	1	<1	P

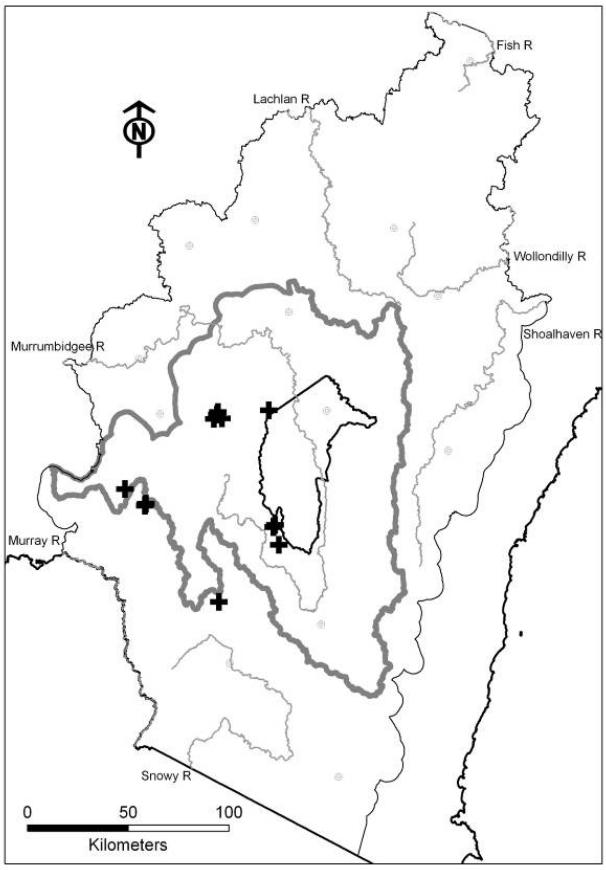


Figure u193: Distribution of field samples assigned to this community.

Threatened Communities: TSC Act 1995 - *Montane Peatlands and Swamps of the New England Tableland*, *NSW North Coast*, *Sydney Basin*, *South East Corner*, *South Eastern Highlands and Australian Alps Bioregions*.

Equivalent vegetation types: Community u193 has an affinity with VG124 [*Western Montane/Sub-alpine Wet Heath/Herb Grass Woodland*] and includes western elements of VG123 [*Montane/Sub-alpine Wet Heath/Bog*] (Gellie 2005). The new community concept appears to be a largely treeless wetland (apart from scattered or fringing *Eucalyptus camphora* ssp. *humeana*) related to community a2 [*Alpine Baeckea - Swamp Heath - Candle Heath - Sphagnum wet heathland of the Australian Alps Bioregion*], which occurs mostly at higher altitude. Western examples may have some affinities with VCA ID 285 [*Broad-leaved Sally grass - sedge woodland on valley flats and swamps in the NSW South-western Slopes and adjoining South Eastern Highlands Bioregions*] (Benson *et al.* 2010).

Frequently-occurring weeds: *Holcus lanatus* (0.75), *Hypochaeris radicata* (0.50), *Trifolium repens* (0.33).

Threats: All examples are threatened by feral horse grazing and trampling. Cattle grazing is permitted in many State Forest examples. Although most vascular plants in this community are facultative resprouters and well-adapted to fire, *Sphagnum cristatum* and the peat soils beneath may be damaged by single fire events. Infrequent fire or fire regimes that don't damage the *Sphagnum* and peat will not be a threat to this community. However, fire regimes that repeatedly cause such damage before natural recovery occurs will destroy the system through drying, which allows species of drier systems to invade. Low montane wetlands are far more susceptible to weed invasion than similar systems at high altitude. Exotic grasses such as *Holcus lanatus* can become abundant and dominating following disturbance. Alien *Juncus* species (e.g. *J. effusus*, *J. articulatus*) and *Salix cinerea* may be future threats to the integrity of this community.

Reservation Status: Recorded in Brindabella NP, Scabby Range and Yaouk NRs and the western edge of Kosciuszko NP, but mostly in State Forest and on freehold land.

Extent of clearing: Unknown and probably negligible but all examples have a history of grazing, which is likely to have severely degraded this community.

CLASS: MONTANE LAKES

rL12: Freshwater sedge-herb marsh of shallow, commonly inundated wetlands of the eastern South Eastern Highlands Bioregion

Scientific Name: *Eleocharis acuta - Amphibromus nervosus - Lachnagrostis filiformis ± Eleocharis pusilla / Glossostigma elatinoides - Ranunculus inundatus - Hydrocotyle peduncularis / Myriophyllum simulans - Potamogeton tricarinatus*

Number of samples:	29
Richness [mean (±SD)]:	17 (6)
Slope (degrees):	(0) 0-1 (4)
Altitude (m asl):	(708) 773-1035 (1239)
Ave. Annual Rainfall (mm):	(530) 584-744 (879)
Temp. Annual Range (°C):	(24.1) 24.8-26.3 (26.8)

Plate rL12: Community rL12, Molonglo Lagoon, Plot UMC419.

Vegetation Description: Community rL12 occupies frequently-inundated wetlands and is commonly dominated by the tall emergent spike-sedge *Eleocharis acuta* accompanied by scattered *Amphibromus nervosus* and *Lachnagrostis filiformis*, with a variety of other tall emergents present at varying frequency including *Eleocharis pusilla*, *Juncus australis*, *Eleocharis sphacelata* and/or *Carex tereticaulis*. Some new plots assigned to this group included as co-dominant emergents *Triglochin procera* and *Glyceria australis.* A layer of low herbaceous wetland plants commonly sprawls along wetland margins, frequently dominated by *Hydrocotyle peduncularis*, *Glossostigma elatinoides* and *Ranunculus inundatus*, with a diversity of other low wetland forbs at lower frequencies on the margins and spreading across standing water by rhizomes or stolons. Standing water is commonly occupied by floating/submerged aquatic taxa *Myriophyllum simulans* and *Potamogeton tricarinatus* and less commonly *Potamogeton ochreatus*, *Myriophyllum caput-medusae*, and occasionally the tiny gypsy floaters *Azolla filiculoides*, *Lemna disperma* or *Wolffia australiana*.

Wetland samples assigned to this community have formed on alluvium derived from a variety of substrates including basalt, granite, granodiorite and sedimentary rocks. Most samples are from Monaro lakes, in an area bounded by Cootralantra in the north, Hilltop and Ingebirah in the west, south to Bombala and east to Nimmitabel. Recent plot samples extend the range of this tableland wetland complex far to the north, with samples from Molonglo Lagoon east of Queanbeyan, along the Collector Creek chain-of-ponds system above Lake George, from Breadalbane swamps at Rowes Lagoon and Wet Lagoon, and from Burra Burra Lake on basalt north of Taralga. Also added to this group are plots from frequently-inundated river-flat wetlands on the Monaro - beside the Bombala River near Bibbenluke and the Murrumbidgee River east of Adaminaby.

This community is partly defined from whole-lake samples collected by Benson and Jacobs (1994) and is closely alligned with their Communities 1 and 2. For further information on the suitablility of whole-lake floristic data in defining wetland communities, refer to section 3.2.2 (Use of Existing Datasets). The species list below is based on data from a combination of 22 whole-lake samples and seven quadrat samples assigned to this group.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Amphibromus nervosus	2	86	2	<1	P
Brachyscome radicans	2	21	1	<1	P
Carex tereticaulis	1	21	2	<1	P
Centipeda cunninghamii	2	31	3	<1	P
Crassula helmsii	2	38	3	<1	P
Eleocharis acuta	4	93	3	1	P
Eleocharis pusilla	3	48	2	<1	P
Eleocharis sphacelata	3	28	2	<1	P
Euchiton sphaericus	2	28	1	7	P
Glossostigma elatinoides	3	62	2	<1	P
Hydrocotyle sibthorpioides	3	72	2	4	P
Isolepis platycarpa	4	24	3	<1	P
Juncus australis	2	38	1	1	P
Juncus radula	2	31	1	<1	P
Lachnagrostis filiformis	3	83	1	4	P
Limosella australis	2	28	3	1	P
Lobelia surrepens	2	24	2	<1	P
Marsilea costulifera	3	34	3	<1	P

Myriophyllum caput-medusae	3	21	3	<1	P
Myriophyllum simulans	4	66	2	<1	P
Neopaxia australasica	1	24	1	1	P
Persicaria prostrata	2	31	2	<1	P
Potamogeton ochreatus	2	28	3	<1	P
Potamogeton tricarinatus	3	79	4	<1	P
Ranunculus diminutus	2	24	3	1	P
Ranunculus inundatus	2	76	1	<1	P
Stellaria angustifolia	1	24	1	1	P

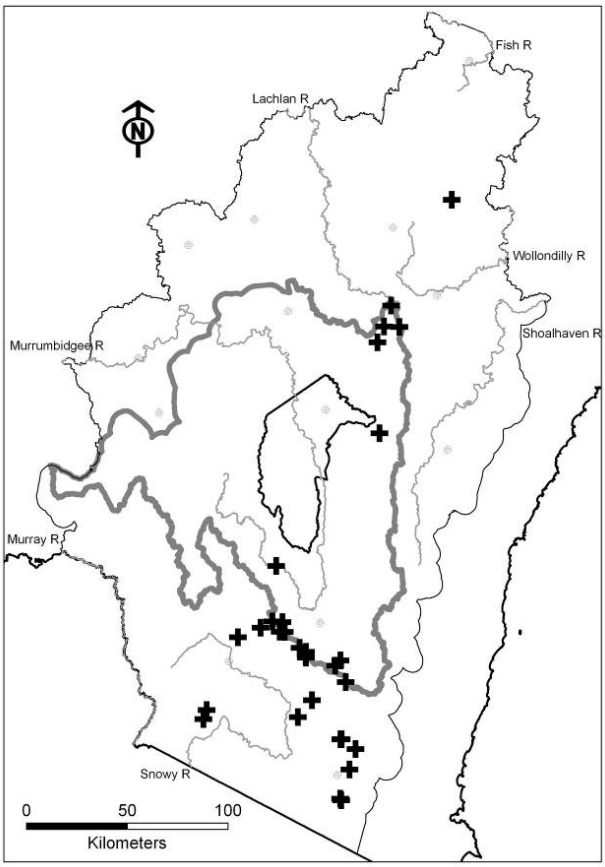


Figure rL12: Distribution of field samples assigned to this community.

Threatened Communities: TSC Act 1995 - *Upland Wetlands of the Drainage Divide of the New England Tablelands Bioregion*; EPBC Act 1999 - *Upland Wetlands of the New England Tablelands and the Monaro Plateau.*

Equivalent vegetation types: This community represents a revision of marsh communities 1 and 2 [*Shallow freshwater sedge-herb marshes*] identified by Benson and Jacobs (1994) from Monaro lakes, with the extension of this combined type to the north of that earlier study with the addition of wetland plot samples from the broader Southern Tablelands, and into floodplain marshes. This community is related to FrWp57 [*Tableland Swamp Meadow*] identified by Tozer *et al.* (2010).

Frequently-occurring weeds: *Juncus articulatus* (0.45), *Rumex crispus* (0.48).

Threats: These shallow herbaceous tableland wetlands exist in specialised habitats of concentrated moisture and nutrients with high agricultural productivity potential, so have been subject to widespread, intensive disturbances equivalent to clearing including draining, exotic pasture introductions, heavy stock grazing and cropping. Remaining undrained examples located within highly modified rural catchments may be subject to increased frequency of eutrophication and invasion by exotic plants at various stages of their wetting/drying cycles.

Reservation Status: No records of this community are from conservation reserves.

Extent of clearing: The original extent of these herbaceous wetlands is likely to have been greatly reduced across their range by widespread draining, cropping and exotic pasture establishment.

L3: Freshwater sedge-herb marsh of shallow ephemeral lakes of the eastern South Eastern Highlands Bioregion

Scientific Name: *Lachnagrostis filiformis - Eleocharis acuta - Isolepis platycarpa / Centipeda cunninghamii - Limosella australis - Persicaria prostrata* ± *Ranunculus diminutus / Potamogeton ochreatus* ± *Potamogeton tricarinatus*

Number of samples:	13
Richness [mean (±SD)]:	10 (4)
Slope (degrees):	(0) 0-1 (4)
Altitude (m asl):	(744) 916-1003 (1012)
Ave. Annual Rainfall (mm):	(512) 521-586 (758)
Temp. Annual Range (°C):	(24.6) 25.5-26.6 (27.1)

Vegetation Description: Community L3 is recorded from shallow lakes formed on basalt substrates on the Monaro. Although only sampled from the Monaro, other small ephemeral wetlands matching this community may occur (or have occurred prior to dusturbance) further north along the tablelands, for example smaller lakes/lagoons in the Lake Bathurst and Breadalbane areas.

This community is recorded from lakes which are generally small in area, shallow and ephemeral ("*probably dry for most of the year*" – Benson and Jacobs 1994), and some may be moderately saline. Common dominant native plants are ubiquitous, resilient perennial or highly vagile annual wetland species including the tufted plants *Eleocharis acuta*,

Lachnagrostis filiformis and *Isolepis platycarpa*, prostrate forbs such as *Centipeda cunninghamii*, *Limosella australis* and *Persicaria prostrata*, and the annual aquatic pondweed *Potamogeton ochreatus*. These wetlands tend to have relatively low native species richness.

This community is defined entirely from whole-lake samples collected by Benson and Jacobs (1994) and is closely alligned with their Community 3. For further information on the suitablility of whole-lake floristic data in defining wetland communities, refer to section 3.2.2 (Use of Existing Datasets).

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Amphibromus nervosus	3	31	2	<1	P
Carex bichenoviana	2	23	3	<1	P
Centipeda cunninghamii	3	92	2	<1	P
Crassula helmsii	2	38	3	1	P
Eleocharis acuta	2	77	3	2	P
Eleocharis pusilla	3	31	2	<1	P
Glossostigma elatinoides	2	23	3	<1	P
Isolepis platycarpa	3	77	3	<1	P
Lachnagrostis filiformis	3	100	2	4	P
Limosella australis	2	77	3	1	P
Marsilea costulifera	5	31	2	<1	P
Myriophyllum verrucosum	4	31	3	<1	P
Persicaria prostrata	2	54	2	<1	P
Potamogeton ochreatus	3	54	2	<1	P
Potamogeton tricarinatus	4	46	3	<1	P
Puccinellia stricta	2	23	2	<1	P
Ranunculus diminutus	3	38	2	1	P

Threatened Communities: TSC Act 1995 - *Upland Wetlands of the Drainage Divide of the New England Tablelands Bioregion*; EPBC Act 1999 - *Upland Wetlands of the New England Tablelands and the Monaro Plateau.*

Equivalent vegetation types: Largely equivalent to Community 3 [*Shallow ephemeral freshwater herb-grass marsh: Agrostis avenacea-Centipeda cunninghamii-Eleocharis acuta-Crassula helmsii-Isolepis platycarpa*] of Benson and Jacobs (1994).

Frequently-occurring weeds: *Holcus lanatus* (0.31), *Persicaria maculosa* (0.31), *Rumex crispus* (0.23), *Veronica anagallis-aquatica* (0.23).

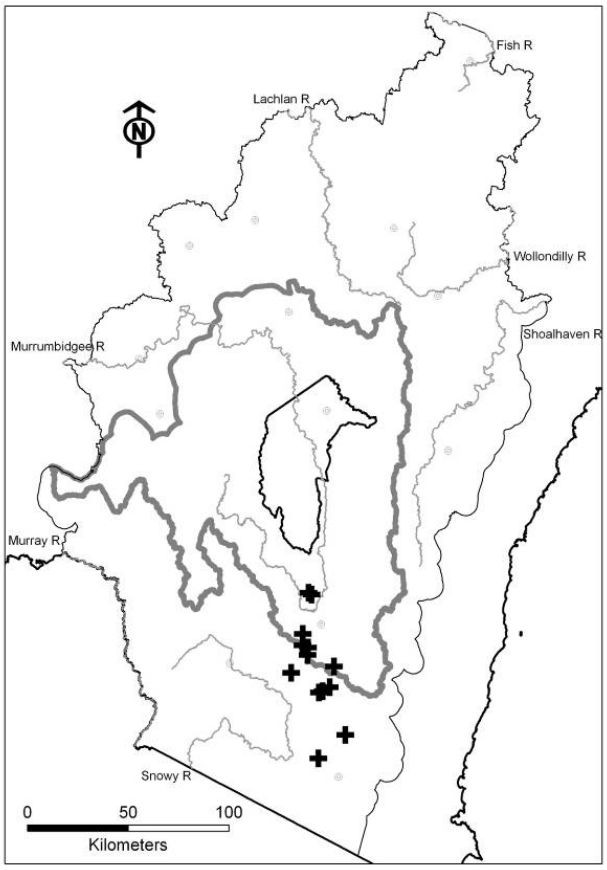


Figure L3: Distribution of field samples assigned to this community.

Threats: These ephemeral herbaceous tableland lakes are specialised habitats of concentrated moisture and nutrients with high agricultural productivity potential, so have been subject to widespread, intensive disturbances equivalent to clearing including draining, exotic pasture plant introductions, heavy stock grazing and cropping. Remaining undrained examples located within highly modified rural catchments may be subject to increased frequency of eutrophication and invasion by exotic plants at various stages of their wetting/drying cycles.

Reservation Status: No records of this community are from conservation reserves.

Extent of clearing: The original extent of these herbaceous wetlands is likely to have been greatly reduced across their range by widespread draining, cropping and exotic pasture establishment.

rL4: Freshwater sedge-herb marsh of deep semi-permanent and/or slightly saline wetlands of the eastern South Eastern Highlands Bioregion

Scientific Name: *Lachnagrostis filiformis - Carex bichenoviana - Eleocharis acuta ± Eleocharis pusilla / Ranunculus diminutus - Limosella australis - Crassula helmsii ± Persicaria prostrata / Lepilaena bilocularis*

Number of samples:	32
Richness [mean (±SD)]:	13 (5)
Slope (degrees):	(0) 0-0 (4)
Altitude (m asl):	(672) 874-987 (1165)
Ave. Annual Rainfall (mm):	(505) 531-650 (799)
Temp. Annual Range (°C):	(24.5) 25.7-26.7 (27.6)

Plate rL4: Community rL4, "The Morass", Plot LAK_B

Vegetation Description: Tableland lakes containing community rL4 are generally large in area, deep and contain permanent water ("*rarely dry*") (Benson and Jacobs 1994). Some are moderately saline at least during drying phases. Common native species of these wetlands and their margins include tall emergents *Eleocharis acuta*, *Carex bichenoviana*, *Lachnagrostis filiformis* and *Juncus vaginatus*, a mixed low forbs layer including *Crassula helmsii*, *Limosella australis*, *Ranunculus diminutus* and *Persicaria prostrata*, and aquatic taxa commonly dominated by the submerged *Lepilaena bilocularis*.

This community occurs on alluvium derived from a variety of substrates including basalt, granite, granodiorite and sedimentary rocks. Monaro Lake samples range from Dangelong, Bililingra and Dry Plain in the north, southwest to Cootralantra, Hill Top and Moonbah, and east to Bungarby, Bibbenluke and Rock Flat. Recent plot samples from the Morass and little Morass (beside Lake Bathurst) extend the range of this wetland complex far to the north. This type may also occur on other large but currently unsampled tableland lakes including some of those in the Breadalbane area.

This community is largely defined from whole-lake samples collected by Benson and Jacobs (1994) and is closely alligned with their Community 4. For further information on the suitablility of whole-lake floristic data in defining wetland communities, refer to section 3.2.2 (Use of Existing Datasets). The species list below is based on data from a combination of 29 whole-lake samples and three quadrat samples assigned to this group.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Carex bichenoviana	3	84	2	<1	P
Carex tereticaulis	3	34	1	<1	P
Chenopodium glaucum	2	31	3	<1	P
Crassula helmsii	3	75	2	<1	P
Eleocharis acuta	3	72	3	1	P
Eleocharis pusilla	2	41	2	<1	P
Hydrocotyle sibthorpioides	2	25	2	4	P
Isolepis platycarpa	3	22	3	<1	P
Juncus australis	1	25	1	1	P
Juncus vaginatus	1	38	1	<1	P
Lachnagrostis filiformis	3	88	1	3	P
Lepilaena bilocularis	4	66	0	0	P
Limosella australis	3	84	2	<1	P
Myriophyllum verrucosum	3	22	2	<1	P
Persicaria prostrata	2	44	2	<1	P
Potamogeton ochreatus	3	28	3	<1	P
Puccinellia stricta	2	34	2	<1	P
Ranunculus diminutus	3	97	2	<1	P
Schoenoplectus pungens	2	25	2	<1	P

Threatened Communities: TSC Act 1995 - *Upland Wetlands of the Drainage Divide of the New England Tablelands Bioregion*; EPBC Act 1999 - *Upland Wetlands of the New England Tablelands and the Monaro Plateau*.

Equivalent vegetation types: Represents a modification and extension of Community 4 [*Deep freshwater sedge-herb marsh: Carex bichenoviana-Ranunculus-diminutus-Lepilaena bilocularis*] of Benson and Jacobs (1994).

Frequently-occurring weeds: *Cirsium vulgare* (0.16), *Hordeum marinum* (0.5), *Juncus articulatus* (0.41), *Juncus bufonius* (0.25), *Rumex crispus* (0.47).

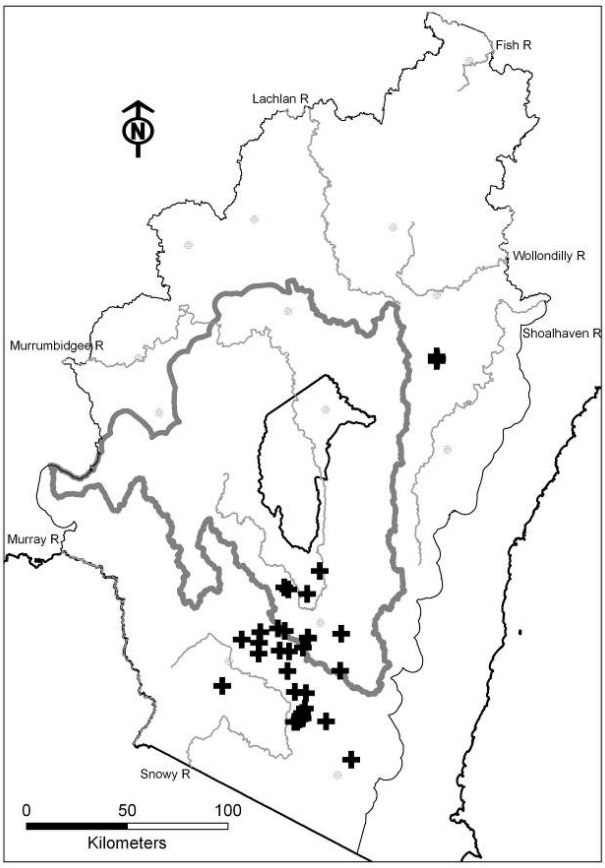


Figure rL4: Distribution of field samples assigned to this community.

Threats: This tableland wetland type generally occupies deeper, more permanent lakes than rL12 and L3, so is less prone to draining, grazing and conversion to exotic pasture or cropping. However, Benson and Jacobs (1994) reported at least one example of a large Monaro lake drained by a channel cut through an adjacent hill. Some examples of this community are located within highly modified rural catchments, and may be subject to increased frequency of eutrophication and invasion by exotic plants at various stages of their wetting/drying cycles. Climate change impacts on this community will depend on its effects on the length and frequency of inundation of these wetlands.

Reservation Status: No records of this community are from conservation reserves.

Extent of clearing: The original extent of these herbaceous wetlands is likely to have been greatly reduced across their range by widespread draining, cropping and exotic pasture establishment.

FORMATION: GRASSY WOODLANDS

CLASS: SUBALPINE WOODLANDS

a34: Weeping Snow Gum shrub-grass open woodland of the Australian Alps Bioregion

Scientific Name: *Eucalyptus lacrimans / Hakea microcarpa - Pimelea linifolia* subsp. *caesia / Poa phillipsiana*

Number of samples:	6
Richness [mean (±SD)]:	25 (1)
Slope (degrees):	(1) 3-11 (16)
Altitude (m asl):	(1241) 1321-1351 (1416)
Ave. Annual Rainfall (mm):	(1012) 1089-1251 (1499)
Temp. Annual Range (°C):	(23.2) 23.7-24 (24.6)

Plate a34:

Vegetation Description: Community a34 is mid-high open woodland dominated by Weeping Snow Gum (*Eucalyptus lacrimans*) in the canopy stratum (to a height of about 5 m) but it is invariably very sparse. The understorey ranges from grass-dominated (most commonly *Poa phillipsiana*) to shrub-dominated (mostly *Hakea microcarpa*). Several species that are uncommon on the treeless plains of Kosciuszko NP were recorded in this community including *Daviesia ulicifolia*, *Dichelachne rara*, *Grevillea lanigera*, *Lepidosperma curtisiae*, *Lomandra longifolia* var. *exilis*, *Phebalium squamulosum* subsp. *ozothamnoides* and *Tetratheca bauerifolia*.

This community occurs only in Kosciuszko NP on isolated knolls and low ridges of frost hollows between Long and Nungar Plains in Kosciuszko NP (including the Kiandra area and Currango Plain). It is especially prominent on the slopes of the Murrumbidgee River at Gulf Bend, below Tantangara Dam. This community is distinct from the Adaminaby community dominated by *E. lacrimans*, the understorey of which is dominated by *Themeda australis* and contains many elements of the Monaro Plains grassland communities such as r6 [*Dry Tussock Grassland of the Monaro in the South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acrothamnus hookeri	1	67	1	8	P
Asperula gunnii	1	67	1	5	P
Austrodanthonia spp.	1	50	1	7	P
Austrostipa nivicola	2	33	1	<1	P
Bossiaea foliosa	2	50	2	4	P
Carex breviculmis	1	83	1	13	P
Craspedia coolaminica	1	50	1	2	P
Craspedia jamesii	1	83	1	4	P
Dillwynia prostrata	3	33	3	<1	P
Eucalyptus lacrimans	2	83	3	<1	P
Geranium antrorsum	1	50	1	3	P
Hakea microcarpa	1	100	1	3	P
Hovea sp. aff. *heterophylla* (Kiandra)	1	33	1	<1	P
Leptorhynchos squamatus	1	33	1	3	P
Linum marginale	1	33	1	1	P
Microseris lanceolata	1	67	1	7	P
Olearia myrsinoides	1	33	1	<1	P
Pimelea linifolia	1	100	1	8	P
Poa clivicola	2	50	3	2	P
Poa phillipsiana	2	83	3	3	P
Poranthera microphylla	1	83	1	27	P
Ranunculus graniticola	1	67	1	4	P
Scleranthus biflorus	1	67	1	10	P
Scleranthus fasciculatus	2	33	1	1	P
Senecio pinnatifolius var. *alpinus*	1	33	1	3	P
Trisetum spicatum	1	83	1	3	P
Elymus scaber	1	50	1	21	C
Stylidium graminifolium sens. lat	1	50	1	25	C

Threatened Communities: Nil.

Equivalent vegetation types: 34 [*Eucalyptus lacrimans low open woodland*] (McDougall and Walsh 2007).

Frequently-occurring weeds: *Acetosella vulgaris* (0.50), *Cerastium vulgare* (0.33), *Hypochaeris radicata* (0.67).

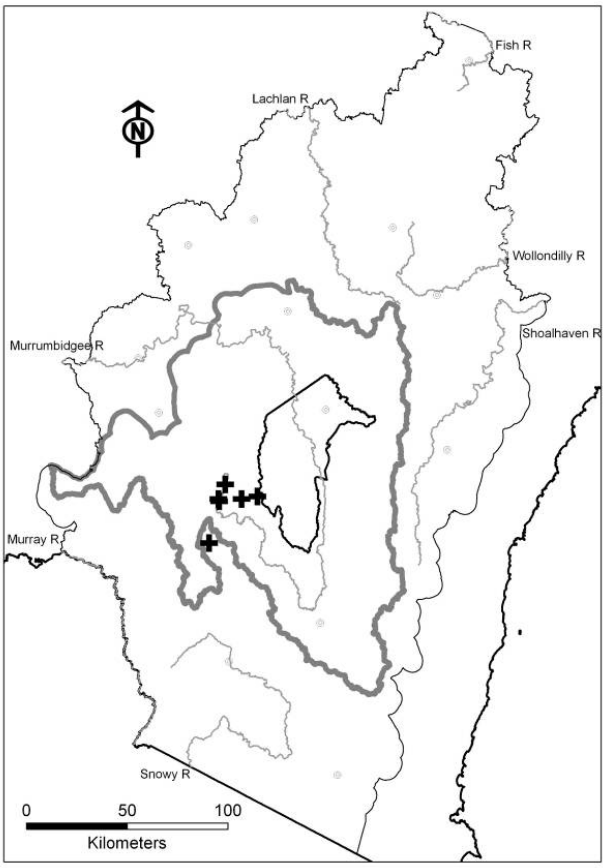


Figure a34: Distribution of field samples assigned to this community.

Threats: Weeping Snow Gum shrub-grass woodland is highly localised. Most examples contain dead trees of *Eucalyptus lacrimans* and little or no recruitment of this species. The reason for the possible decline of the dominant species in this community warrants investigation.

Reservation Status: Entirely within Kosciuszko NP.

Extent of clearing: Unknown. Large areas of Snow Gum (*Eucalyptus pauciflora*) were cleared in the vicinity of this community in the early 20th Century to increase the grazing capacity of the land. The sparse nature of *E. lacrimans* may have saved it from that fate.

u22: Mountain Gum - Snow Gum ± Robertson's Peppermint grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions

Scientific Name: *Eucalyptus dalrympleana - Eucalyptus pauciflora ± Eucalyptus robertsonii / Acacia dealbata / Poa sieberiana - Stellaria pungens - Viola betonicifolia - Lomandra longifolia*

Number of samples:	224
Richness [mean (±SD)]:	39 (11)
Slope (degrees):	(0) 6-16 (35)
Altitude (m asl):	(462) 1109-1294 (1694)
Ave. Annual Rainfall (mm):	(701) 1075-1326 (1688)
Temp. Annual Range (°C):	(22.2) 23.7-24.7 (28.2)

Plate u22:

Vegetation Description: Community u22 is a very tall grassy woodland to open forest dominated by Mountain Gum (*Eucalyptus dalrympleana*) and Snow Gum (*E. pauciflora*), occasionally with Robertson's Peppermint (*E. robertsonii*). The shrub layer is generally sparse or absent with occurrences of *Acacia dealbata*, *Coprosma hirtella*, *Olearia erubescens* and *Platylobium formosum*. The understorey is characterised by dense grassy / herbaceous cover, and is usually dominated by the grass *Poa sieberiana* infrequently with *Dichelachne sieberiana* or *Joycea pallida*, with common forbs including *Stellaria pungens*, *Viola betonicifolia*, *Lomandra longifolia*, *Acaena novae-zelandiae*, *Asperula scoparia*, *Glycine clandestina*, *Clematis aristida*, *Stylidium graminifolium sens. lat.*, *Poranthera microphylla*, *Coronidium scorpioides* and *Wahlenbergia stricta*.

Mountain Gum - Snow Gum ± Robertson's Peppermint grass-forb very tall woodland to open forest is distributed from south of Batlow in the Bago – Maragle area, through northern Kosciuszko,

Brindabella and Namadgi NPs, and extending eastwards to the Tinderry Ranges. It is found mainly on sandy-loam soils derived from granitoids. It grades into u239 [*Alpine Ash - Mountain Gum ± Snow Gum wet sclerophyll open forest of the Australian Alps and South Eastern Highlands Bioregions*] throughout its distribution except in the Tinderry Ranges. In the Brindabella ranges, it often grades into u52 [*Ribbon Gum - Robertson's Peppermint very tall wet sclerophyll open forest primarily of the Bondo Subregion of the South Eastern Highlands and northern Australian Alps Bioregions*] on sheltered slopes, and u27 [*Snow Gum - Candlebark tall grassy woodland in frost hollows and gullies primarily of the Namadgi Region*] in the Namadgi region.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia dealbata	2	58	2	24	P
Acacia melanoxylon	1	24	1	13	P
Acacia pravissima	1	8	1	<1	P
Acaena echinata	1	20	1	8	P
Acaena novae-zelandiae	2	74	1	24	P
Acrothamnus hookeri	1	25	1	7	P
Acrotriche serrulata	1	23	1	10	P
Arthrochilus huntianus	1	2	1	<1	P
Arthropodium milleflorum	1	29	1	7	P
Arthropodium sp. A	2	17	2	<1	P
Asperula scoparia	2	75	1	18	P
Austrodanthonia pilosa	1	19	2	8	P
Brachyscome aculeata	1	9	1	2	P
Brachyscome spathulata	1	41	1	9	P
Bulbine bulbosa	1	13	1	4	P
Caladenia alpina	1	3	1	<1	P
Caladenia gracilis	1	4	1	1	P
Calotis scabiosifolia var. *integrifolia*	1	12	1	2	P
Carex breviculmis	2	26	1	12	P
Cassinia aculeata	2	37	1	12	P
Chiloglottis valida	2	16	1	2	P
Chionogentias sylvicola	1	4	1	<1	P
Clematis aristata	1	72	1	20	P
Coprosma hirtella	1	52	1	9	P
Coronidium scorpioides	1	55	1	17	P
Craspedia spp.	2	16	1	3	P
Craspedia variabilis	1	39	1	3	P
Cullen tenax	2	4	1	<1	P
Cymbonotus preissianus	1	24	1	5	P
Cynoglossum australe	1	10	1	3	P
Daviesia latifolia	2	33	2	5	P
Daviesia mimosoides subsp. *mimosoides*	3	23	2	8	P
Daviesia ulicifolia	2	31	1	9	P
Derwentia derwentiana	1	35	1	5	P
Derwentia perfoliata	1	8	1	4	P
Deyeuxia monticola	2	22	1	4	P
Deyeuxia quadriseta	1	11	1	4	P
Deyeuxia rodwayi	1	7	2	<1	P
Dianella tasmanica	1	32	2	15	P
Dichelachne hirtella	1	4	1	1	P
Dichelachne inaequiglumis	2	22	2	5	P
Dichelachne sieberiana	2	24	2	4	P
Dipodium roseum	1	3	1	<1	P
Dipodium spp.	1	1	1	<1	P
Elymus scaber	2	33	1	20	P
Epacris breviflora	1	7	2	2	P
Epilobium billardierianum subsp. *cinereum*	1	19	1	4	P
Eucalyptus dalrympleana	3	86	2	15	P
Eucalyptus pauciflora	3	82	3	17	P
Eucalyptus robertsonii	3	36	3	7	P
Euchiton gymnocephalus	1	31	1	14	P
Euphrasia collina subsp. *paludosa*	1	9	1	2	P
Euphrasia collina subsp. *speciosa*	1	2	1	<1	P
Exocarpos strictus	1	29	1	11	P
Festuca asperula	1	11	1	<1	P
Galium ciliare	2	5	2	<1	P
Galium migrans	1	5	1	2	P
Gastrodia sesamoides	1	3	1	<1	P
Geranium potentilloides	1	40	1	11	P
Geranium solanderi	1	33	1	18	P
Glycine clandestina	1	75	1	26	P
Gonocarpus tetragynus	2	48	2	48	C
Hookerochloa eriopoda	1	13	2	1	P
Hovea asperifolia	4	1	0	0	P
Lachnagrostis aemula	1	6	1	<1	P
Lagenophora stipitata	1	43	1	15	P
Leptinella filicula	1	14	1	2	P
Leucopogon gelidus	1	6	1	2	P
Lobelia gibbosa	1	4	1	<1	P
Lobelia pedunculata	1	25	1	3	P
Lomandra filiformis subsp. *filiformis*	1	33	1	15	P
Lomandra longifolia	2	78	2	40	P
Lomatia myricoides	1	25	1	11	P
Lotus australis	1	2	1	<1	P
Luzula flaccida	1	42	1	11	P
Microseris lanceolata	1	15	1	6	P
Myosotis australis	1	2	1	<1	P
Olearia erubescens	1	52	1	9	P
Olearia megalophylla	1	16	1	4	P
Oreomyrrhis eriopoda	1	42	1	11	P

Ozothamnus thyrsoideus	1	6	1	2	P
Persoonia chamaepeuce	1	41	1	9	P
Persoonia subvelutina	1	5	1	1	P
Picris angustifolia	2	10	1	1	P
Picris angustifolia subsp. *angustifolia*	1	10	1	1	P
Platylobium formosum	2	43	2	8	P
Poa induta	3	17	2	5	P
Poa sieberiana	3	88	2	45	P
Poa tenera	2	8	2	2	P
Podolepis hieracioides	1	5	1	<1	P
Polyscias sambucifolia	2	3	1	<1	P
Polyscias sambucifolia subsp. *leptophylla*	1	17	2	4	P
Poranthera microphylla	1	57	1	25	P
Pterostylis coccina	1	6	1	<1	P
Pterostylis decurva	1	8	1	<1	P
Pterostylis fischii	1	1	1	<1	P
Pterostylis monticola	1	12	1	<1	P
Pultenaea juniperina	2	4	3	<1	P
Ranunculus lappaceus	1	46	1	8	P
Ranunculus plebeius	1	10	1	3	P
Ranunculus scapiger	1	4	1	1	P
Senecio biserratus	1	3	1	<1	P
Senecio diaschides	1	21	1	4	P
Senecio gunnii	1	25	1	8	P
Senecio linearifolius	1	10	1	5	P
Senecio prenanthoides	2	38	1	18	P
Stackhousia monogyna	1	33	1	11	P
Stellaria pungens	2	88	2	27	P
Stylidium graminifolium sens. lat.	1	63	1	23	P
Tasmannia lanceolata	1	9	1	3	P
Tetratheca bauerifolia	1	17	1	6	P
Tetratheca ciliata	2	10	1	<1	P
Thysanotus tuberosus	1	11	1	3	P
Veronica calycina	1	49	1	14	P
Veronica derwentiana	1	4	1	<1	P
Viola betonicifolia	2	85	1	23	P
Wahlenbergia gloriosa	1	8	1	2	P
Wahlenbergia stricta	1	54	1	16	P

Threatened Communities: Parts of this community may contain TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions.*

Frequently occurring weeds: *Hypochaeris radicata* (0.66).

Equivalent vegetation types: This community has some affinities with VG97 [*Montane Acacia Dry/ Shrub/Herb/Grass Forest*] and VG100 [*ACT Montane Dry Shrub/Grass Forest*] (Gellie 2005).

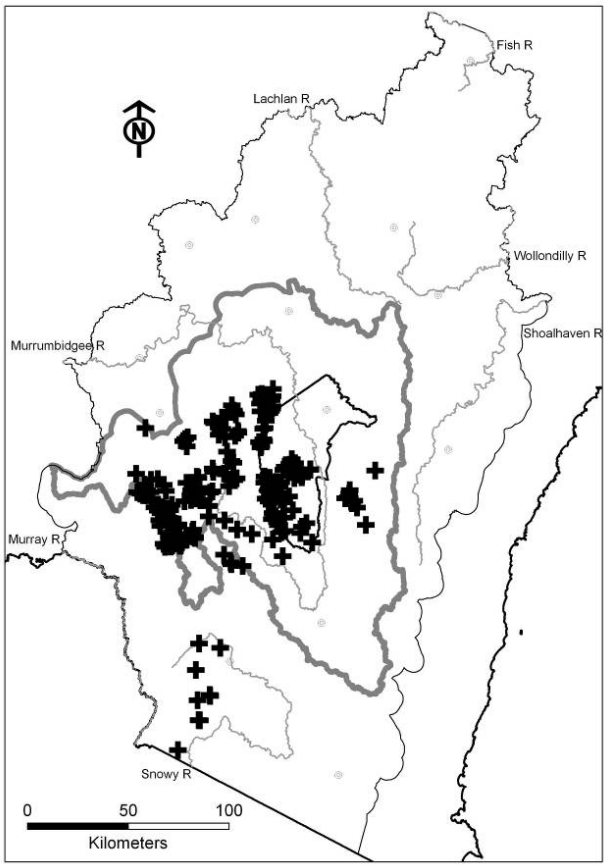


Figure u22: Distribution of field samples assigned to this community.

Threats: This community is well reserved across its range, and many non-reserved examples are managed on State Forest estate. Logging and inappropriate fire regimes may alter the floristics and structure over time.

Reservation Status: The majority of examples of this community are found in Kosciuszko NP and Namadgi NR (ACT), and it is also known from Bimberi NR, Brindabella NP, Burnt School NR, Scabby Range NR, Tinderry NR, Yanununbeyan NP and Yaouk NR.

Extent of clearing: Likely to be minimal. Patches closer to the valley floor are more likely to have been cleared.

u23: Snow Gum - Drumstick Heath - Myrtle Tea-tree tall woodland to open forest of drainage depressions primarily of the South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus pauciflora - Eucalyptus dalrympleana - Eucalyptus stellulata / Epacris breviflora - Leptospermum myrtifolium - Baeckea utilis / Acaena novae-zelandiae - Stylidium graminifolium sens. lat. - Poa sieberiana - Coronidium scorpioides*

Number of samples:	17
Richness [mean (±SD)]:	44 (12)
Slope (degrees):	(1) 2-8 (17)
Altitude (m asl):	(577) 1100-1230 (1375)
Ave. Annual Rainfall (mm):	(742) 876-1235 (1423)
Temp. Annual Range (°C):	(23.8) 24-25.2 (27.8)

Vegetation Description: Community u23 is a swampy tall eucalypt woodland to open forest dominated by Snow Gum (*Eucalyptus pauciflora*), Mountain Gum (*E. dalrympleana*) and Black Sallee (*E. stellulata*). The well developed shrub layer is dominated by *Epacris breviflora*, *Leptospermum myrtifolium*, *Baeckea utilis*, *Hakea microcarpa* and *Olearia erubescens*. Low shrubs include *Persoonia chamaepeuce*, *Acrothamnus hookeri*, *Acrotriche serrulata* and *Grevillea lanigera*. The diverse ground layer is typical of other subalpine woodland communities and includes *Poa sieberiana*, *Elymus scaber*, *Hookerochloa eriopoda*, *Poa helmsii*, *Acaena novae-zelandiae*, *Stylidium graminifolium sens. lat.*, *Coronidium scorpioides*, *Asperula scoparia*, *Viola betonicifolia*, *Carex appressa*, *Hydrocotyle peduncularis*, *Hypericum japonicum*, *Ranunculus lappaceus*, *Lomandra longifolia*, *Poranthera microphylla*, *Stellaria pungens* and *Arthropodium milleflorum*.

This is a widespread community within the study area, extending from Tallaganda NP in the east to Maragle SF in the west. The majority of plot locations occur within the central part of its range, especially in Tinderry NR, Namadgi NP and Kosciuszko NP. It is confined to sheltered locations in montane environments, generally adjacent to, or within drainage depressions. Although it is most common on granite, it also occurs on basalt and metasediments. A number of widespread montane communities occur in association with this community, including u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*], u27 [*Snow Gum - Candlebark tall grassy woodland in frost hollows and gullies primarily of the Namadgi Region*], u239 [*Alpine Ash - Mountain Gum ± Snow Gum wet sclerophyll open forest of the Australian Alps and South Eastern Highlands Bioregions*] and u150 [*Broad-leaved Peppermint - Mountain Gum tall grass-forb open forest of the South Eastern Highlands and Australian Alps Bioregions*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acaena novae-zelandiae	2	100	1	27	P
Arthropodium milleflorum	1	41	1	8	P
Asperula gunnii	2	24	1	5	P
Asperula scoparia	2	59	2	22	P
Austrodanthonia penicillata	2	24	1	3	P
Baeckea utilis	3	65	2	1	P
Baloskion australe	2	24	1	2	P
Blechnum penna-marina subsp. *alpina*	2	24	2	1	P
Bossiaea foliosa	3	24	2	4	P
Brachyscome spathulata	1	41	1	11	P
Bulbine bulbosa	2	24	1	4	P
Carex appressa	2	53	1	7	P
Chiloglottis valida	1	24	1	2	P
Coronidium scorpioides	2	71	1	20	P
Deyeuxia quadriseta	1	24	1	4	P
Empodisma minus	2	29	2	3	P
Epacris breviflora	2	94	1	2	P
Eucalyptus dalrympleana subsp. *dalrympleana*	2	76	3	20	P
Eucalyptus pauciflora	3	82	3	21	P
Eucalyptus stellulata	2	53	2	3	P
Gonocarpus micranthus	2	41	1	2	P
Grevillea lanigera	2	29	1	3	P
Hakea microcarpa	2	41	1	3	P
Haloragis heterophylla	3	24	1	2	P
Hookerochloa eriopoda	3	35	2	2	P
Hydrocotyle sibthorpioides	2	53	2	4	P
Hypericum japonicum	2	53	1	3	P
Juncus australis	2	24	1	2	P
Leptospermum grandifolium	3	24	3	2	P
Leptospermum lanigerum	4	24	2	<1	P
Leptospermum myrtifolium	2	88	1	3	P
Olearia erubescens	1	41	1	12	P
Olearia megalophylla	1	24	1	5	P
Oxylobium ellipticum	4	24	1	4	P
Poa helmsii	2	35	2	3	P
Poa labillardierei	3	35	2	10	P
Ranunculus lappaceus	2	53	1	11	P
Schoenus apogon	2	29	1	5	P

Stylidium graminifolium sens. lat.	2	88	1	25	P
Veronica subtilis	2	24	1	<1	P
Elymus scaber	2	41	1	21	C
Euchiton gymnocephalus	2	41	1	15	C
Gonocarpus tetragynus	2	41	2	48	C
Lomandra longifolia	1	47	2	42	C
Poa sieberiana	2	71	2	48	C
Poranthera microphylla	2	47	1	27	C
Stellaria pungens	2	47	2	31	C
Viola betonicifolia	1	59	1	27	C

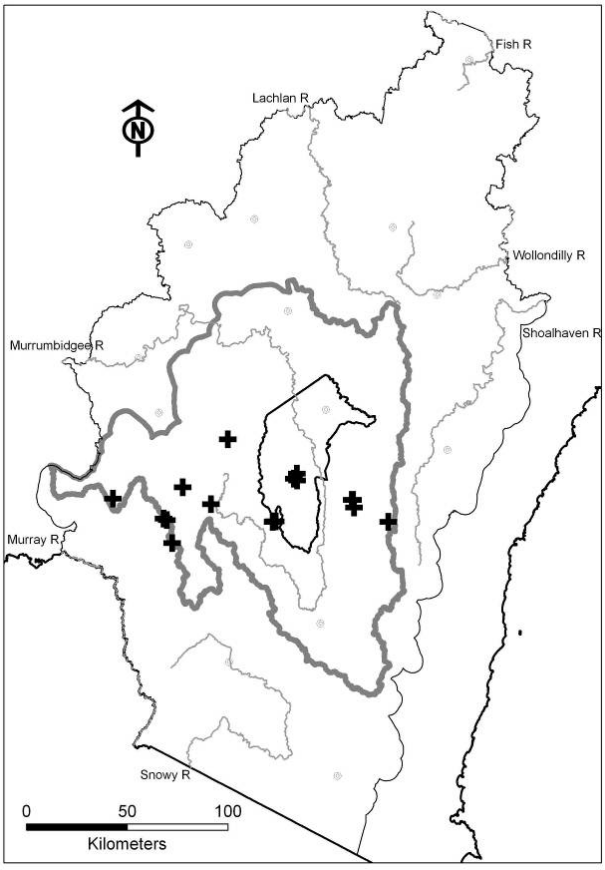


Figure u23: Distribution of field samples assigned to this community.

Threatened Communities: Parts of this community may contain TSC Act 1995 – *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions.*

Frequently occurring weeds: *Acetosella vulgaris* (0.23), *Centaurium erythraea* (0.23), *Cerastium vulgare* (0.31), *Crepis landestine* (0.31), *Holcus lanatus* (0.54), *Hypochaeris radicata* (0.77), *Mimulus moschatus* (0.31), *Prunella vulgaris* (0.69), *Rosa rubiginosa* (0.23), *Trifolium dubium* (0.23), *Trifolium repens* (0.46).

Equivalent vegetation types: Most similar to VG124 [*Western Montane/Sub-alpine Wet Heath/Herb Grass Woodland*] and VG146 [*Tableland Dry Herb/Grass Woodland*] (Gellie 2005).

Threats: Weed invasion; Grazing by feral herbivores; Frequent and intense fire.

Reservation Status: Likely to be well reserved, and is known to occur in Kosciuszko National Park, Namadgi NP, Scabby Range NR, Tallaganda NP and Tinderry NR.

Extent of clearing: Negligible.

u27: Snow Gum – Candlebark tall grassy woodland in frost hollows and gullies primarily of the Namadgi Region

Scientific Name: *Eucalyptus pauciflora – Eucalyptus rubida ± Eucalyptus dives / Acacia dealbata / Poa induta – Poa sieberiana – Glycine clandestina – Gonocarpus tetragynus*

Number of samples:	102
Richness [mean (±SD)]:	42 (8)
Slope (degrees):	(1) 7-20 (34)
Altitude (m asl):	(890) 1088-1331 (1558)
Ave. Annual Rainfall (mm):	(656) 783-988 (1253)
Temp. Annual Range (°C):	(22.7) 24.3-25.7 (26.7)

Vegetation Description: Community u27 us a tall grassy woodland to open forest dominated by Snow Gum (*Eucalyptus pauciflora*) often with Candlebark (*E. rubida*), and occasionally with Broad-leaved Peppermint (*E. dives*) or Ribbon Gum (*E. viminalis*). The shrub layer is generally sparse or absent with *Acacia dealbata* and *Cassinia longifolia* being the only frequently occurring shrub species, along with occasional occurrences of small shrubs such as *Acrotriche serrulata* and *Hibbertia obtusifolia*. *Daviesia ulicifolia* may be present in sites which have been burnt in the last 20 – 30 years. The understorey is characterised by dense grassy / herbaceous cover, and is dominated by grasses such as *Poa induta*, *Poa sieberiana*, *Elymus scaber*, *Dichelachne rara* and *Themeda australis*. Forbs include *Glycine clandestina*, *Gonocarpus tetragynus*, *Lomandra longifolia*, *Asperula scoparia*, *Viola betonicifolia*, *Stellaria pungens*, *Senecio gunnii*, *Euchiton sphaericus*, *Luzula* spp. and *Acaena novae-zelandiae*.

Plot records indicate that *Snow Gum – Candlebark tall grassy woodland in frost hollows and gullies* is distributed mostly on mid to lower slopes on ranges and frost hollow depressions in the Namadgi Region and adjacent granitic ranges. However, it is poorly sampled throughout its range and is considered to be

distributed across the Monaro region from Bredbo to Bombala, and across to Berridale. In the Namadgi region, this community generally occurs in valley floors and lower slopes associated with dry montane forests including u22 [*Mountain Gum – Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*], u29 [*Apple Box – Broad-leaved Peppermint tall shrub-grass woodland primarily on granitoids of the South Eastern Highlands Bioregion*] and u150 [*Broad-leaved Peppermint – Mountain Gum tall grass-forb open forest of the South Eastern Highlands and Australian Alps Bioregions*].

This community is primarily characterised by plots sampled in the ACT. Further sampling of such vegetation in NSW will be useful to better define character species across its range.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia dealbata	2	67	2	25	P
Acaena novae-zelandiae	1	63	1	27	P
Acaena ovina	1	49	1	7	P
Acrothamnus hookeri	1	23	1	7	P
Acrotriche serrulata	1	44	1	10	P
Ajuga australis	1	33	1	7	P
Arthropodium milleflorum	1	28	1	8	P
Asperula scoparia	2	69	2	21	P
Asplenium flabellifolium	1	21	1	8	P
Austrodanthonia penicillata	1	33	1	3	P
Bossiaea buxifolia	1	21	1	7	P
Brachyscome aculeata	1	14	1	2	P
Brachyscome rigidula	1	11	1	2	P
Brachyscome spathulata	1	32	1	10	P
Bursaria spinosa	1	25	1	10	P
Calotis scabiosifolia var. *integrifolia*	1	29	1	2	P
Carex inversa	1	46	1	7	P
Cassinia longifolia	2	60	1	15	P
Cassinia quinquefaria	2	4	1	<1	P
Chrysocephalum semipapposum	1	13	1	4	P
Craspedia spp.	1	18	1	3	P
Craspedia variabilis	1	15	1	5	P
Cullen microcephalum	1	25	1	2	P
Cymbonotus preissianus	1	15	1	6	P
Cymbonotus spp.	1	32	1	2	P
Cynoglossum australe	1	25	1	3	P
Cynoglossum suaveolens	1	11	1	3	P
Daviesia mimosoides subsp. *mimosoides*	1	31	2	9	P
Daviesia ulicifolia	1	26	2	10	P
Derwentia derwentiana	1	26	1	6	P
Deyeuxia monticola	1	25	1	5	P
Dichelachne micrantha	1	28	1	9	P
Dichelachne rara	2	59	1	7	P
Dichondra repens	1	36	2	20	P
Echinopogon cheelii	1	15	1	<1	P
Elymus scaber	2	63	1	20	P
Epilobium billardierianum subsp. *billardierianum*	1	33	1	<1	P
Eucalyptus dives	3	36	3	18	P
Eucalyptus pauciflora	3	80	3	19	P
Eucalyptus rubida	3	61	3	7	P
Eucalyptus stellulata	3	13	2	3	P
Eucalyptus viminalis	3	29	3	12	P
Euchiton sphaericus	1	64	1	5	P
Exocarpos strictus	1	29	1	12	P
Galium gaudichaudii	1	33	1	9	P
Galium migrans	1	11	1	2	P
Geranium obtusisepalum	1	5	2	<1	P
Geranium potentilloides	2	30	1	13	P
Geranium solanderi	2	42	1	19	P
Glycine clandestina	2	82	1	28	P
Gonocarpus tetragynus	2	82	2	47	P
Goodenia pinnatifida	1	4	1	<1	P
Hibbertia obtusifolia	2	45	1	34	C
Hovea linearis	1	34	1	13	P
Hypericum gramineum	1	50	1	25	P
Indigofera australis	1	20	1	7	P
Leucopogon fletcheri subsp. *brevisepalus*	1	12	1	3	P
Linum marginale	1	6	1	1	P
Lomandra filiformis subsp. *filiformis*	1	36	1	15	P
Lomandra longifolia	2	75	2	41	P
Lotus australis	1	4	1	<1	P
Luzula spp.	1	63	1	4	P
Mirbelia oxylobioides	1	12	1	3	P
Olearia erubescens	1	25	1	12	P
Oreomyrrhis eriopoda	1	55	1	12	P
Oxylobium ellipticum	1	13	2	4	P
Ozothamnus stirlingii	1	6	1	<1	P
Persoonia chamaepeuce	1	23	1	11	P
Pimelea linifolia	1	31	1	8	P
Pimelea treyvaudii	2	10	1	<1	P
Plantago varia	1	57	1	10	P
Poa induta	3	80	2	3	P
Poa sieberiana	3	78	2	47	P
Pultenaea procumbens	1	19	1	4	P
Ranunculus lappaceus	1	23	1	10	P

Schoenus apogon	1	15	1	5	P
Scleranthus biflorus	1	36	1	9	P
Scleranthus diander	1	20	1	1	P
Senecio gunnii	1	63	1	7	P
Senecio quadridentatus	2	21	1	5	P
Solenogyne gunnii	1	14	1	5	P
Stackhousia monogyna	1	51	1	11	P
Stellaria pungens	3	59	2	30	P
Stylidium graminifolium sens. lat.	1	50	1	25	P
Themeda australis	1	56	2	20	P
Veronica calycina	1	47	1	15	P
Viola betonicifolia	1	75	1	26	P
Wahlenbergia gloriosa	1	8	1	2	P
Wahlenbergia graniticola	1	9	2	<1	P
Wahlenbergia stricta	1	59	1	17	P

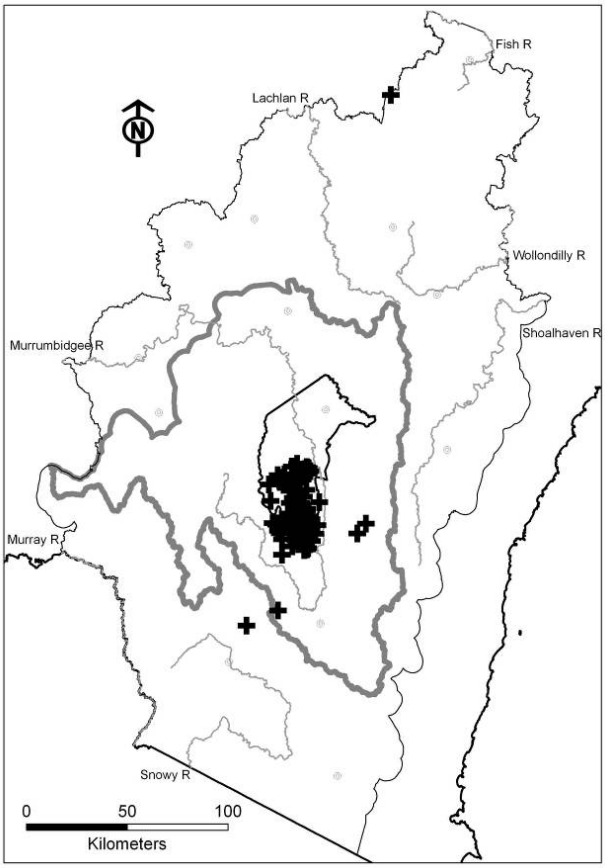


Figure u27: Distribution of field samples assigned to this community.

Threatened Communities: TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions*.

Frequently occurring weeds: *Acetosella vulgaris* (0.23), *Centaurium erythraea* (0.51), *Cirsium vulgare* (0.25), *Crepis capillaris* (0.27), *Hypochaeris radicata* (0.67), *Oxalis corniculata* (0.46).

Equivalent vegetation types: No equivalent communities, defined by plots not used in previous classifications.

Threats: Many of the plot samples of this community are in the ACT reserve system, however across its broader range it is likely to be poorly reserved. Disturbance by feral animals may alter the floristic composition of this community.

Reservation Status: The majority of examples of this community are found in Namadgi NP (ACT) but it is also known from Burnt School NR, Kosciuszko NP, Scabby Range NR, Strike-a-Light NR and Yaouk NR.

Extent of clearing: Likely to be variable, with clearing rates of this community on valley floor examples being higher than upslope examples.

u28: Snow Gum - Mountain Gum - *Daviesia mimosoides* tall dry grass-shrub subalpine open forest of the Australian Alps and South Eastern Highlands Bioregions

Scientific Name: *Eucalyptus pauciflora - Eucalyptus dalrympleana ± Eucalyptus rubida / Daviesia mimosoides* subsp*. mimosoides - Persoonia chamaepeuce / Poa sieberiana - Stellaria pungens - Lomandra longifolia*

Number of samples:	54
Richness [mean (±SD)]:	24 (7)
Slope (degrees):	(0) 6-17 (42)
Altitude (m asl):	(978) 1181-1391 (1582)
Ave. Annual Rainfall (mm):	(737) 965-1129 (1587)
Temp. Annual Range (°C):	(22.3) 23.7-24.8 (25.7)

Vegetation Description: Community u28 is a tall eucalypt woodland to open forest dominated by Snow Gum (*Eucalyptus pauciflora*) and Mountain Gum (*E. dalrympleana*). The shrubby mid-storey is dominated by *Daviesia mimosoides* subsp. *mimosoides*, *Pimelea linifolia*, *Daviesia ulicifolia*, *Derwentia perfoliata*, *Olearia erubescens* and *Exocarpos strictus*. Low shrubs include *Persoonia chamaepeuce*, *Hibbertia obtusifolia*, and *Tetratheca bauerifolia*. The diverse ground layer shares affinities with other subalpine woodlands and includes *Poa sieberiana*, *Stellaria pungens*, *Lomandra longifolia*, *Goodenia hederacea*, *Stylidium graminifolium sens. lat.*, *Poranthera microphylla*, *Viola betonicifolia*, *Senecio gunnii*, *Gonocarpus tetragynus* and *Asperula scoparia*.

This community is largely restricted to Namadgi NR, Kosciuszko NP and Scabby Range NR in the

Australian Alps bioregion. Smaller occurrences also occur in adjacent parts of the South Eastern Highlands bioregion. It is generally confined to sheltered locations on metasedimentary and granite geologies. Other communities with which u28 is associated are those characteristic of similar environments, including u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*], u27 [*Snow Gum - Candlebark tall grassy woodland in frost hollows and gullies primarily of the Namadgi Region*], u239 [*Alpine Ash - Mountain Gum ± Snow Gum wet sclerophyll open forest of the Australian Alps and South Eastern Highlands Bioregions*] and u150 [*Broad-leaved Peppermint - Mountain Gum tall grass-forb open forest of the South Eastern Highlands and Australian Alps Bioregions*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia obliquinervia	2	17	2	3	P
Bossiaea foliosa	2	20	2	4	P
Brachyscome spathulata	1	26	1	11	P
Caladenia gracilis	1	17	1	1	P
Daviesia mimosoides subsp. *mimosoides*	2	67	2	8	P
Daviesia ulicifolia	2	48	2	9	P
Derwentia perfoliata	1	33	1	4	P
Deyeuxia monticola	1	19	1	5	P
Eucalyptus dalrympleana	3	65	3	19	P
Eucalyptus pauciflora	3	94	3	20	P
Eucalyptus rubida	2	31	3	8	P
Exocarpos strictus	2	31	1	12	P
Goodenia hederacea	1	67	2	16	P
Grevillea lanigera	2	17	1	3	P
Leucopogon fletcheri subsp. *brevisepalus*	1	24	1	3	P
Lomandra longifolia	1	74	2	42	P
Lomatia myricoides	1	28	1	11	P
Olearia erubescens	1	33	1	12	P
Oxylobium ellipticum	1	26	1	4	P
Ozothamnus thyrsoideus	1	30	1	2	P
Persoonia chamaepeuce	1	67	1	10	P
Pimelea linifolia	1	50	1	8	P
Poa sieberiana	2	93	2	47	P
Podolobium alpestre	2	20	2	2	P
Poranthera microphylla	1	48	1	27	P
Senecio gunnii	1	33	1	9	P
Stellaria pungens	1	76	2	31	P
Stylidium graminifolium sens. lat	1	54	1	25	P
Tetratheca bauerifolia	1	35	1	7	P
Hibbertia obtusifolia	1	54	1	34	C
Viola betonicifolia	1	41	1	27	C

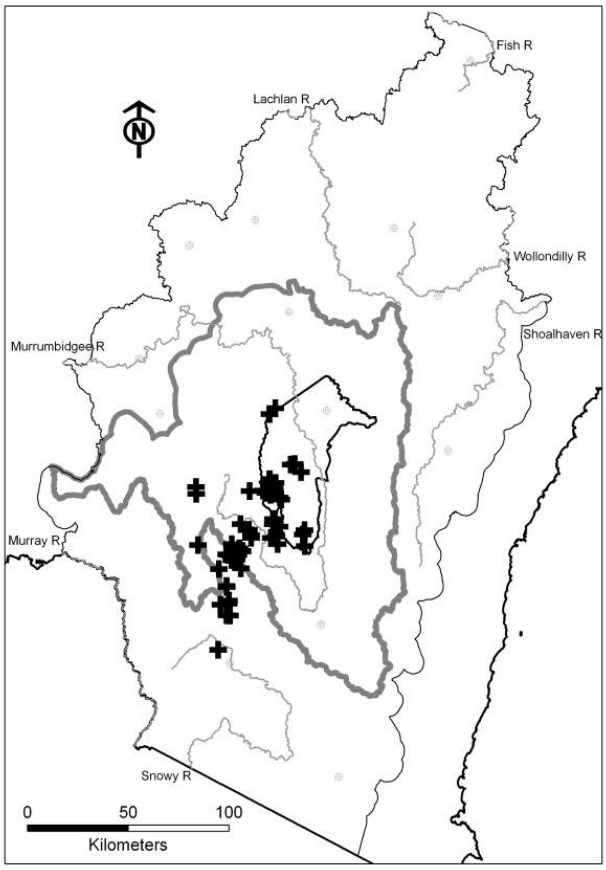


Figure u28: Distribution of field samples assigned to this community.

Threatened Communities: This community may be part of TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions*.

Frequently occurring weeds: *Hypochaeris radicata* (0.27).

Equivalent vegetation types: Mostly defined by new plots, but may have some similarity with VG98 [ ] Gellie (2005).

Threats: Grazing by feral herbivores; Frequent and intense fire.

Reservation Status: This community is likely to be well reserved, with examples occurring in Brindabella SCA, Kosciuszko NP, Namadgi NP, Scabby Range NR and Yaouk NR.

Extent of clearing: Considered to be minor.

u118: Black Sallee grass-herb woodland in drainage depressions and moist valley flats in the South Eastern Highlands and Australian Alps Bioregions

Scientific Name: *Eucalyptus stellulata / Rubus parvifolius - Pimelea pauciflora / Stellaria pungens - Acaena ovina - Asperula scoparia - Acaena novae-zelandiae - Dichondra repens - Poranthera microphylla*

Number of samples:	20
Richness [mean (±SD)]:	34 (7)
Slope (degrees):	(0) 3-10 (32)
Altitude (m asl):	(972) 1026-1172 (1400)
Ave. Annual Rainfall (mm):	(749) 982-1227 (1340)
Temp. Annual Range (°C):	(23.5) 25.1-25.7 (26.1)

Vegetation Description: Community u118 is a eucalypt woodland characterised by a tall canopy of Black Sallee *(Eucalyptus stellulata*). Snow Gum (*E. pauciflora*) and Candlebark (*E. rubida*) may occasionally also be present. A layer of low to medium shrubs may be present, as scattered individuals to dense patches, commonly including *Pimelea pauciflora*, *Epacris breviflora*, *Hakea microcarpa*, *Acacia siculiformis* and *Grevillea lanigera*. Groundcover of plants is generally dense to continuous, with a diverse layer of forbs and shrubs (commonly including *Acaena novae-zelandiae*, *Acaena ovina*, *Acrothamnus hookeri*, *Dichondra repens*, *Geranium solanderi*, *Poranthera microphylla*, *Rubus parvifolius*, *Stellaria pungens*, *Themeda australis*, *Viola betonicifolia*) covering the ground between tall tussocks of grasses and sedges (including *Poa sieberiana*, *P. labillardierei*, *P .phillipsiana*, *P. helmsii* and *Carex appressa).*

Black Sallee grass-herb woodland is recorded from moist footslopes of drainage depressions and margins of broad cold-air drainage flats on sandy soils, from the Upper Cotter area in the ACT, west to Yarrangobilly, south to Providence Portal, Eucumbene and Nimmo. It is also known to occur in areas east to Captains Flat and west into the upper South Western Slopes bioregion. This community is likely to be under-sampled across its geographic range.

In similar habitats at lower altitudes to the east of its range, type u118 may be replaced by r2 [*River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes*, *Drainage Lines and Flats of the South Eastern Highlands Bioregion*], while in swampier sites it may grade into u23 [*Snow Gum - Drumstick Heath - Myrtle Tea-tree tall woodland to open forest of drainage depressions primarily of the South Eastern Highlands Bioregion*] with a greater component of moisture loving shrubs, sedges and grasses.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia siculiformis	2	33	1	<1	P
Acaena novae-zelandiae	1	67	1	27	P
Acaena ovina	1	76	1	7	P
Acrothamnus hookeri	1	57	1	7	P
Asperula scoparia	1	67	2	22	P
Bulbine bulbosa	2	29	1	4	P
Carex appressa	1	48	1	7	P
Carex inversa	1	29	1	8	P
Cullen microcephalum	1	24	1	2	P
Cymbonotus preissianus	1	38	1	6	P
Dichelachne micrantha	1	33	1	10	P
Dichondra repens	1	62	2	20	P
Epacris breviflora	1	33	1	2	P
Epilobium billardierianum subsp. *cinereum*	2	29	1	5	P
Eucalyptus rubida	1	38	3	9	P
Eucalyptus stellulata	3	100	2	3	P
Geranium antrorsum	1	33	1	3	P
Geranium solanderi	1	48	1	19	P
Geum urbanum	1	24	1	<1	P
Grevillea lanigera	2	33	1	3	P
Hakea microcarpa	1	38	1	3	P
Luzula densiflora	1	24	1	6	P
Mirbelia oxylobioides	1	24	1	3	P
Oxylobium ellipticum	2	24	1	4	P
Pimelea pauciflora	1	57	1	<1	P
Poa helmsii	3	29	2	3	P
Poa labillardierei	1	33	2	10	P
Poa phillipsiana	3	24	2	3	P
Poranthera microphylla	1	62	1	27	P
Ranunculus lappaceus	1	33	1	11	P
Rubus parvifolius	1	62	1	11	P
Scleranthus fasciculatus	2	29	1	1	P
Senecio gunnii	1	33	1	9	P
Solenogyne gunnii	1	33	1	5	P
Stellaria pungens	1	90	2	31	P
Veronica gracilis	1	24	1	1	P
Poa sieberiana	2	57	2	48	C
Themeda australis	2	48	2	21	C
Viola betonicifolia	1	48	1	27	C

Threatened Communities: TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions.*

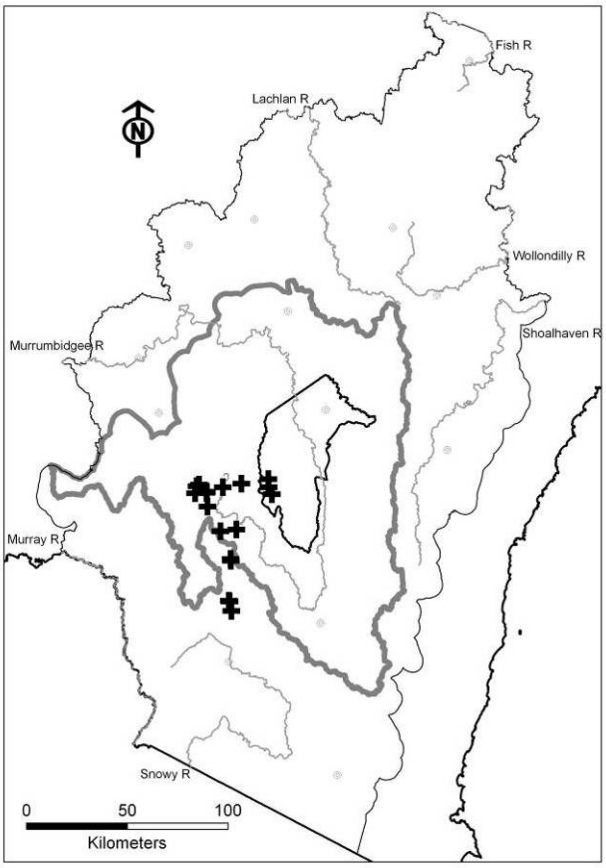


Figure u118: Distribution of field samples assigned to this community.

Equivalent vegetation types: NSW VCA ID 303 [*Black Sally grassy low woodland in valleys in the upper slopes sub-region of the NSW South-western Slopes Bioregion and western South Eastern Highlands Bioregion*] (Benson *et al*. 2010). No obvious equivalents from other classifications.

Frequently-occurring weeds: This vegetation is restricted to moist footslopes and alluvial margins, a relatively productive habitat prone to invasion by a range of exotic plant taxa. Although all plots are from conservation reserves, many of these high-country areas were historically seasonally grazed, and many common pasture weeds were recorded from more than 30% of plots assigned to this community: *Acetosella vulgaris* (0.75), *Anthoxanthum odoratum* (0.30), *Centaurium erythraea* (0.30), *Cirsium vulgare* (0.60), *Crepis capillaris* (0.70), *Holcus lanatus* (0.75), *Hypochaeris radicata* (0.80), *Rosa rubiginosa* (0.35), *Taraxacum officinale* (0.35), *Trifolium campestre* (0.45), *Trifolium repens* (0.70).

Threats: Some areas of this community at lower altitudes are likely to have been drowned by water impoundments of the Snowy scheme. However, the majority of its distribution is within conservation reserves (Kosciuszko NP and Namadgi NP). Grazed examples likely to be prone to invasion by a range of exotic pasture plants and other weeds, due to moister habitat.

Reservation Status: Recorded from Namadgi NP (ACT), Kosciuszko NP and Nimmo NR but probably extending into freehold land at Snowy Plain in the Southern Rivers CMA.

Extent of clearing: Unlikely to have been widely cleared; some examples in deeper valley-floors will have been drowned by major dams.

u158: Alpine Sallee shrub-grass subalpine mid-high woodland of the Australian Alps Bioregion

Scientific Name: *Eucalyptus niphophila / Tasmannia xerophila - Bossiaea foliosa - Hovea montana / Stellaria pungens - Oreomyrris eriopoda - Asperula scoparia*

Number of samples:	16
Richness [mean (±SD)]:	28 (6)
Slope (degrees):	(2) 9-14 (23)
Altitude (m asl):	(1398) 1541-1634 (1907)
Ave. Annual Rainfall (mm):	(1499) 1550-1649 (1910)
Temp. Annual Range (°C):	(21.1) 22-22.2 (23)

Plate u158:

Vegetation Description: Community u158 is a mid-high woodland dominated by Alpine Sallee (*Eucalyptus niphophila*). The understorey is characterised by a discontinuous, though occasionally well-developed shrub layer often to 2m tall dominated by *Bossiaea foliosa*, *Tasmannia xerophila*, *Podolobium alpestre*, *Olearia phlogopappa sens. lat*. and *Pimelea ligustrina* subsp. *ciliata*. The groundlayer is a mix of shrubs, grasses and forbs including *Hovea montana*, *Acrothamnus hookeri*, *Acrothamnus montanus*, *Poa phillipsiana*, *Stellaria pungens*, *Asperula scoparia*, *Oreomyrris eriopoda*, *Coronidium scorpioides*, *Senecio gunnii*,

Arthropodium milleflorum, *Carex breviculmis*, *Gonocarpus montanus*, *Goodenia hederacea* subsp. *alpestris*, *Microseris lanceolata* and *Stylidium graminifolium sens. lat.*.

Alpine Sallee mid-high shrub-grass subalpine woodland is largely confined to the Australian Alps bioregion, although small areas may be present in adjacent parts of the South Eastern Highlands bioregion. The community is widespread near the altitudinal limit of trees, and may be found in the vicinity of Thredbo, Charlotte's Pass and Kiandra, and on the highest ranges in the ACT. It typically occurs on meta-sedimentary geologies, but is also common on granite and basalt. At its upper altitudinal limit, co-occurring communities include those typical of the alpine zone, especially a46 [*Alpine Mint-bush - Alpine Orites - Kosciuszko Nematolepis heathland of the Australian Alps Bioregion*]. Elsewhere, the community occurs in association with u28 [*Snow Gum - Mountain Gum - Daviesia mimosoides tall dry grass-shrub subalpine open forest of the Australian Alps and South Eastern Highlands Bioregions*] and u40 [*Alpine Ash tall wet sclerophyll open forest primarily of the Australian Alps Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acaena novae-zelandiae	1	44	1	28	C
Aciphylla simplicifolia	1	38	1	2	P
Acrothamnus hookeri	1	56	1	8	P
Acrothamnus montanus	2	25	1	1	P
Arthropodium milleflorum	1	50	1	8	P
Asperula scoparia	1	69	2	22	P
Bossiaea foliosa	3	75	2	4	P
Brachyscome spathulata	1	44	1	11	P
Brachyscome spp.	1	25	1	1	P
Caladenia alpina	1	44	1	<1	P
Carex breviculmis	1	50	1	13	P
Celmisia spp.	2	25	1	<1	P
Coronidium scorpioides	2	63	1	20	P
Craspedia spp.	2	50	1	4	P
Eucalyptus niphophila	3	94	2	<1	P
Gonocarpus montanus	1	50	1	1	P
Goodenia hederacea	1	50	2	16	P
Hovea montana	1	69	1	1	P
Lobelia pedunculata	1	44	1	5	P
Luzula densiflora	1	31	1	6	P
Microseris lanceolata	1	50	1	7	P
Olearia phlogopappa	2	44	1	3	P
Oreomyrrhis ciliata	1	31	1	2	P
Oreomyrrhis eriopoda	1	69	1	13	P
Ozothamnus thyrsoideus	1	25	1	2	P
Pimelea ligustrina subsp. *ciliata*	1	25	1	<1	P
Poa phillipsiana	3	31	2	3	P
Podolepis robusta	1	25	1	<1	P
Podolobium alpestre	1	50	2	2	P
Ranunculus graniticola	1	38	1	4	P
Senecio gunnii	1	63	1	9	P
Stellaria pungens	1	94	2	31	P
Stylidium graminifolium sens. lat	1	50	1	25	C
Tasmannia xerophila	2	56	1	1	P

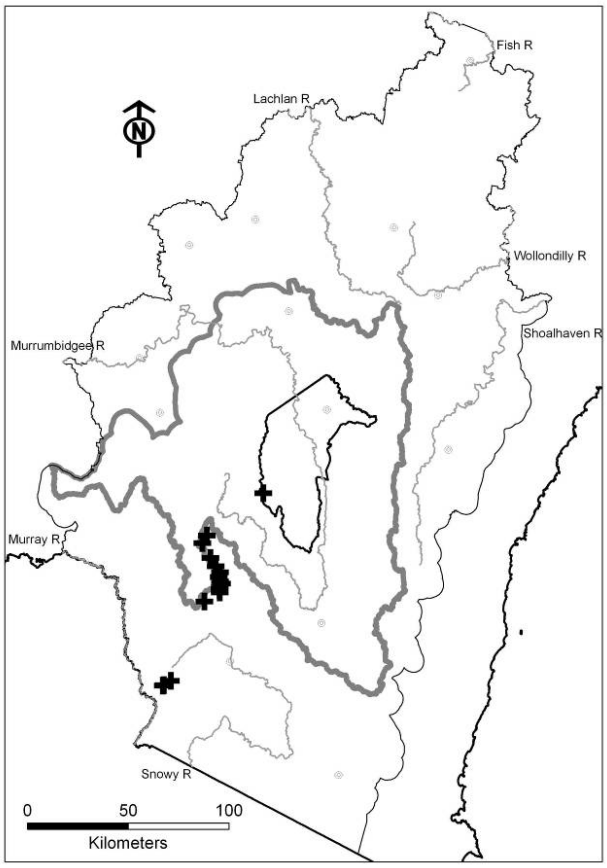


Figure u158: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Frequently occurring weeds: *Acetosella vulgaris* (0.81), *Hypochaeris radicata* (0.75), *Taraxacum officinale* (0.38).

Equivalent vegetation types: This community amalgamates VG128 [*Sub Alpine Dry Shrub/Herb Woodland*] with VG130 [*Sub-Alpine Shrub/Grass Woodland*] both previously described by Gellie (2005).

Threats: Clearing for ski resorts and associated infrastructure, including ski runs; invasion by exotic plant species including Ox-eye Daisy (*Leucanthemum*

vulgare), Sweet Vernal Grass (*Anthoxanthum odoratum*) and Orange Hawkweed (*Hieracium aurantiacum* subsp. *carpathicola*); grazing by feral herbivores; frequent and intense fire.

Reservation Status: Almost entirely within conservation reserves, including Kosciuszko NP and Namadgi NP.

Extent of clearing: Historically, this community was extensively cleared to increase the area of optimal grazing land in leases. The extent of clearing is unknown but judging from historic aerial photography would have been many thousands of hectares. In most places, trees have re-invaded since the removal of grazing from Kosciuszko NP in the 1950s and 60s. In a few places, however, repeated tree removal and burning have changed this community into a disclimax shrubland.

u207: Jounama Snow Gum - Snow Gum shrubby mid-high woodland on granitoids primarily of the Namadgi Region

Scientific Name: *Eucalyptus debeuzevillei - Eucalyptus pauciflora / Podolobium alpestre - Derwentia perfoliata - Tasmannia xerophila / Poa sieberiana - Viola betonicifolia - Stellaria pungens - Coronidium scorpioides*

Number of samples:	24
Richness [mean (±SD)]:	24 (6)
Slope (degrees):	(3) 12-22 (32)
Altitude (m asl):	(1543) 1581-1680 (1745)
Ave. Annual Rainfall (mm):	(1186) 1271-1402 (1735)
Temp. Annual Range (°C):	(21.7) 22.2-22.7 (23)

Vegetation Description: Community u207 is a mid-high shrubby woodland dominated by Jounama Snow Gum (*Eucalyptus debeuzevillei*) and Snow Gum (*E. pauciflora*). The shrubby understorey is generally diverse, often including *Derwentia perfoliata*, *Tasmannia xerophila*, *Podolobium alpestre*, *Daviesia ulicifolia*, *Oxylobium ellipticum*, *Olearia phlogopappa* and *Polyscias sambucifolia* subsp. *leptophylla*. *Acrothamnus hookeri* may be present. The ground layer is a diverse mix of grasses and herbs, many of which occur in other high altitude communities. Typical species include *Poa sieberiana*, *Stellaria pungens*, *Viola betonicifolia*, *Coronidium scorpioides*, *Senecio gunnii*, *Asperula scoparia*, *Geranium potentilloides*, *Poranthera microphylla*, *Brachyscome spathulata*, *Acaena novae-zelandiae*, *Celmisia tomentella*, *Oreomyrris eriopoda*, *Dianella tasmanica*, *Wahlenbergia gloriosa* and *Arthropodium milleflorum*.

This community is almost entirely confined to the Upper Cotter and Yaouk Creek catchments of Namadgi NP (ACT) and adjacent parts of Kosciuszko NP, Bimberi NR and Scabby Range NR in the Australian Alps bioregion. It occurs in exposed locations at high altitude, primarily but not exclusively on northerly aspects. Although it is most common on granite, it is also known from metasedimentary geologies. A number of widespread montane communities occur in association with this community, including u22 [*Mountain Gum - Snow Gum grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions*], u23 [*Snow Gum - Drumstick Heath - Myrtle Tea-tree tall woodland to open forest of drainage depressions primarily of the South Eastern Highlands Bioregion*], u28 [*Snow Gum - Mountain Gum - Daviesia mimosoides tall dry grass-shrub subalpine open forest of the Australian Alps and South Eastern Highlands Bioregions*] and u53 [*Mountain Gum - Blackwood tall wet sclerophyll open forest primarily on granitoids of the Australian Alps and western South Eastern Highlands Bioregions*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia obliquinervia	2	21	1	3	P
Acrothamnus hookeri	2	46	1	8	P
Asperula scoparia	2	58	2	22	P
Brachyscome aculeata	1	33	1	2	P
Brachyscome spathulata	2	38	1	11	P
Celmisia tomentella	2	33	1	<1	P
Coronidium scorpioides	2	75	1	19	P
Craspedia spp.	2	33	1	4	P
Daviesia ulicifolia	2	46	1	10	P
Derwentia derwentiana	2	33	1	7	P
Derwentia perfoliata	2	54	1	4	P
Eucalyptus debeuzevillei	4	54	1	<1	P
Geranium potentilloides	2	50	1	13	P
Leucopogon gelidus	1	29	1	2	P
Olearia megalophylla	2	42	1	5	P
Olearia phlogopappa	1	42	1	3	P
Oxylobium ellipticum	3	46	1	4	P
Ozothamnus thyrsoideus	2	29	1	2	P
Picris angustifolia subsp. *angustifolia*	1	21	1	2	P
Podolepis robusta	2	21	1	<1	P
Podolobium alpestre	2	54	2	2	P
Polyscias sambucifolia subsp. *leptophylla*	3	38	2	4	P
Senecio gunnii	1	75	1	9	P
Stellaria pungens	2	88	2	31	P
Tasmannia xerophila	2	50	1	1	P
Viola betonicifolia	2	92	1	27	P
Wahlenbergia gloriosa	1	29	1	2	P

Eucalyptus pauciflora	4	42	3	21	C
Poa sieberiana	3	71	2	48	C
Poranthera microphylla	2	46	1	27	C

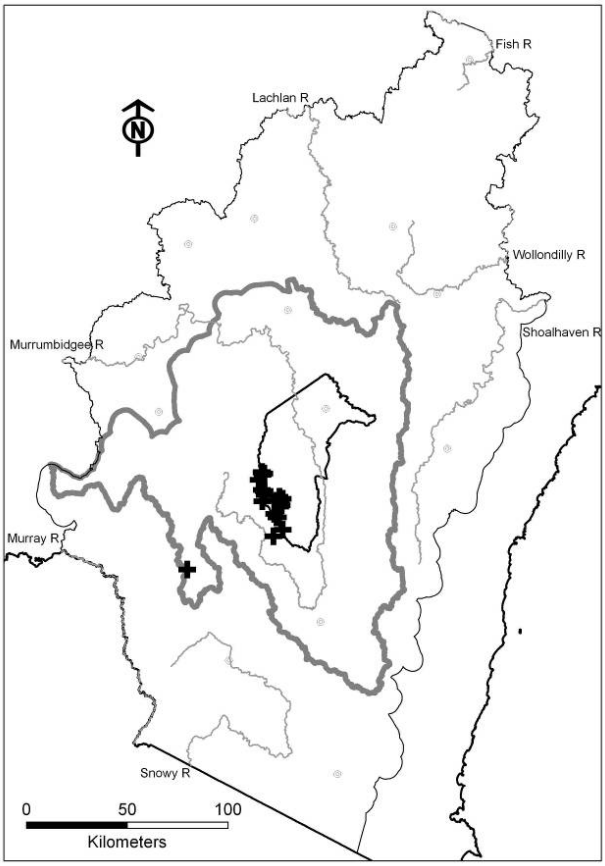


Figure u207: Distribution of field samples assigned to this community.

Threatened Communities: Nil.

Frequently occurring weeds: *Hypochaeris radicata* (0.33).

Equivalent vegetation types: This community is probably equal to VG127 [*Sub-Alpine Dry Shrub/Herb/Grass Woodland*] previously described by Gellie (2005).

Threats: Grazing by feral herbivores; frequent and intense fire.

Reservation Status: Considered likely to be entirely within conservation reserves including Bimberi NR, Kosciuszko NP, Namadgi NP, Scabby Range NR and Yaouk NR.

Extent of clearing: Unlikely to have occurred.

CLASS: SOUTHERN TABLELAND GRASSY WOODLANDS

rp24: Yellow Box - Blakely's Red Gum tall grassy woodland on undulating sedimentary and acid-volcanic substrates in the Goulburn area of the South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus melliodora* ± *Eucalyptus blakelyi - Eucalyptus mannifera - Eucalyptus dives / Acacia decurrens / Lissanthe strigosa - Pimelea curviflora / Lomandra filiformis* subsp. *coriacea - Microlaena stipoides - Poa sieberiana - Gonocarpus tetragynus*

Number of samples:	28
Richness [mean (±SD)]:	29 (9)
Slope (degrees):	(0) 2-4 (9)
Altitude (m asl):	(615) 647-705 (815)
Ave. Annual Rainfall (mm):	(654) 670-697 (734)
Temp. Annual Range (°C):	(25.7) 26.1-26.6 (26.7)

Plate rp24: Partially degraded example of Community rp24, Plot CAN038LQ.

Vegetation Description: Community rp24 is a tall grassy open eucalypt woodland, with a medium to low tree canopy commonly containing Blakely's Red Gum (*Eucalyptus blakelyi*) and/or Yellow Box (*E. melliodora*), with other tableland eucalypts occurring less frequently including Broad-leaved Peppermint (*E. dives*), Brittle Gum (*E. mannifera*), Red Stringybark (*E.macrorhyncha*) and Candlebark (*E. rubida*). A sparse to patchy shrub stratum may be present, commonly with tall *Acacia decurrens* and smaller dry shrubs including *A. genistifolia* and *Daviesia latifolia*. Groundcover in this community is generally dominated by a diverse suite of grasses (*Microlaena stipoides*, *Poa sieberiana*, *Themeda australis* and various *Aristida*, *Austrodanthonia*, *Austrostipa* and *Dichelachne* species) with a rich mix of forbs (including *Lomandra filiformis* subsp*. coriacea*, *Chrysocephalum apiculatum*, *Lomandra multiflora*, *Einadia nutans*, *Hydrocotyle laxiflora* , *Gonocarpus tetragynus*, *Goodenia hederacea*, *Plantago debilis* and *Dianella revoluta*) and a sparse scatter of low tough shrubs (commonly *Lissanthe strigosa*, *Melichrus urceolatus*, *Pimelea curviflora* and *Bossiaea buxifolia*).

This community is defined from field survey plots scattered across the relatively low, dry saddle of the great divide around Goulburn. Plots assigned to this type are located in an area bounded by Woodhouselee, Gundaroo, Manar, Kooringaroo and Canyonleigh (and extending east of the study area), and occur on gently undulating tableland country on relatively deep soils of moderately low fertility derived from volcanic rocks (porphyry, rhyolites and tuffs) and from ancient sediments/metasediments (greywacke, limestone, shale, siltstone, quartzite including Gundary and Towrang beds and various Adaminaby group strata).

This community commonly grades into rp23 [*Red Stringybark - Broad-leaved Peppermint tall dry sclerophyll grassy open forest on loamy rises primarily in the Bungonia subregion of the South Eastern Highlands Bioregion*] on footslopes of hilly country with shallower soils, or into u78 [*Snow Gum grassy mid-high woodland of the South Eastern Highlands Bioregion*] in cooler situations and/or with increasing elevation. In similar rolling country to the west with decreasing rainfall, this type is replaced by u19 [*Blakely's Red Gum - Yellow Box ± White Box tall grassy woodland of the Upper South Western Slopes and western South Eastern Highlands Bioregions*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia decurrens	2	46	1	1	P
Acacia genistifolia	2	39	1	1	P
Aristida ramosa	2	29	2	5	P
Aristida vagans	2	21	2	1	P
Asperula conferta	2	39	1	11	P
Austrodanthonia laevis	3	32	2	4	P

Austrodanthonia racemosa	2	21	2	<1	P
Austrostipa scabra subsp. *falcata*	2	25	2	<1	P
Bossiaea buxifolia	2	29	1	7	P
Cassinia arcuata	2	25	1	1	P
Cassinia laevis	1	21	2	1	P
Cheilanthes sieberi	2	29	1	9	P
Chrysocephalum apiculatum	2	61	1	6	P
Chrysocephalum semipapposum	1	21	1	4	P
Dichelachne micrantha	1	29	1	10	P
Einadia nutans	2	50	1	4	P
Eucalyptus blakelyi	3	36	3	2	P
Eucalyptus melliodora	3	54	3	5	P
Goodenia hederacea subsp. *hederacea*	2	50	2	16	P
Hydrocotyle laxiflora	2	61	2	29	P
Juncus usitatus	1	21	1	<1	P
Lissanthe strigosa	2	64	1	6	P
Lomandra filiformis subsp. *coriacea*	2	93	2	18	P
Lomandra multiflora subsp. *multiflora*	1	54	1	18	P
Melichrus urceolatus	1	39	1	13	P
Microlaena stipoides	2	82	2	34	P
Opercularia aspera	2	36	1	3	P
Pimelea curviflora	1	54	1	6	P
Plantago debilis	2	46	2	4	P
Poa sieberiana	2	79	2	48	P
Pterostylis spp.	2	21	1	6	P
Themeda australis	2	64	2	21	P
Tricoryne elatior	1	36	1	4	P
Wahlenbergia luteola	1	29	1	1	P
Dianella revoluta	2	43	1	22	C
Gonocarpus tetragynus	2	68	2	48	C

Threatened Communities: Some examples of this community may match the Final Determination description of TSC Act - *White Box Yellow Box Blakely's Red Gum Woodland* and EPBC Act - *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland*.

Equivalent vegetation types: Represents a revision of GWp24 [*Tableland Grassy Box – Gum Woodland*] identified by Tozer *et al.* (2010), including a westward extension with the addition of new plots near Gundaroo. The current study area included some 63 of the 80 plots assigned to GWp24 by Tozer *et al.* (2010). No related Forest Ecosystems; defined almost entirely by plots which were not classified by Gellie (2005).

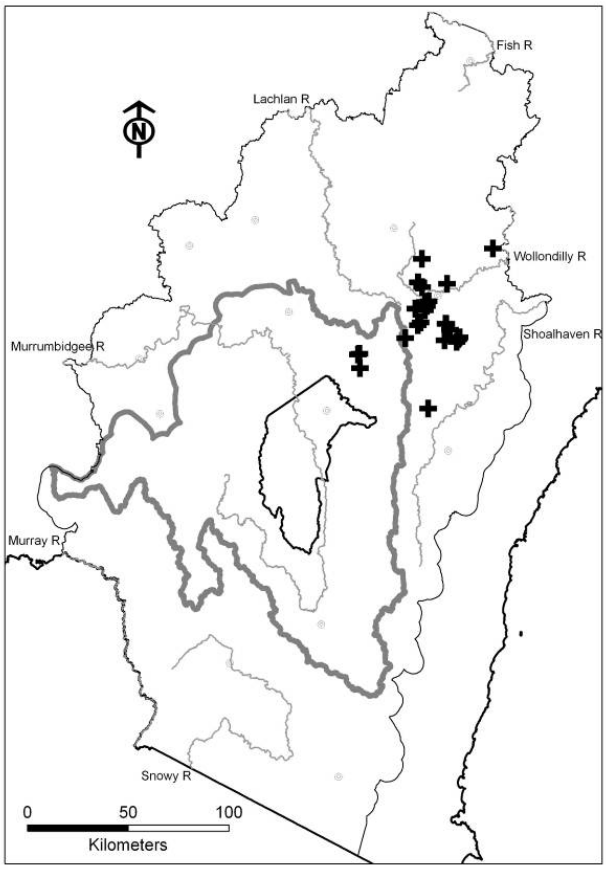


Figure rp24: Distribution of field samples assigned to this community.

Frequently-occurring weeds: *Arctotheca calendula* (0.25), *Briza maxima* (0.21), *Bromus catharticus* (0.21), *Dactylis glomerata* (0.25), *Hypochaeris radicata* (0.63), *Paspalum dilatatum* (0.29), *Plantago lanceolata* (0.33), *Rosa rubiginosa* (0.33).

Threats: This community occurs on undulating tableland country that was historically preferentially developed for stock grazing by clearing of trees and shrubs and widespread conversion of groundcover to pastures dominated by exotic annual grasses and legumes. Remnants are often regularly grazed and subject to ongoing invasion by exotic plants, and examples near towns are prone to gradual degradation and loss through recreational disturbances and rural-residential expansion.

Reservation Status: Due to the agriculturally desirable habitat of this community, it is very poorly represented in conservation reserves. The only samples from a conservation reserve are at the margins of cleared country in McLeod's Creek NR near Gundaroo.

Extent of clearing: Likely to have been historically extensively cleared.

u19: Blakely's Red Gum - Yellow Box ± White Box tall grassy woodland of the Upper South Western Slopes and western South Eastern Highlands Bioregions

Scientific Name: *Eucalyptus blakelyi - Eucalyptus melliodora* ± *Eucalyptus albens / Microlaena stipoides - Austrodanthonia racemosa - Elymus scaber - Themeda australis - Austrostipa scabra*

Number of samples:	28
Richness [mean (±SD)]:	26 (10)
Slope (degrees):	(0) 2-5 (29)
Altitude (m asl):	(267) 469-593 (811)
Ave. Annual Rainfall (mm):	(646) 681-829 (1023)
Temp. Annual Range (°C):	(25.6) 26.7-28.1 (29)

Plate u19:

Vegetation Description: Community u19 is a tall grassy eucalypt woodland dominated by Blakely's Red Gum (*Eucalyptus blakelyi*) and/or Yellow Box (*E. melliodora*) with occasional occurrences of White Box (*E. albens*). In the western part of its range, *E. albens* can be the dominant eucalypt. The shrub layer is sparse or absent and generally contains regenerating eucalypts, *Acacia implexa* or *Acacia dealbata*. The groundcover is grassy/herbaceous with grasses including *Microlaena stipoides*, *Elymus scaber*, *Themeda australis*, *Austrodanthonia racemosa*, *Bothriochloa macra* and *Poa sieberiana*, with degraded areas generally dominated by less palatable robust species such as *Bothriochloa macra* and *Austrostipa scabra*. Forbs include *Hydrocotyle laxiflora*, *Rumex brownii*, *Geranium solanderi*, *Oxalis perennans*, *Lomandra filiformis* subsp. *coriacea* and *Tricoryne elatior*. High condition sites tend to have a wide variety of forbs including *Microtis unifolia*, *Arthropodium minus*, *Dichopogon fimbriatus* and *Wurmbea dioica*.

Blakely's Red Gum - Yellow Box ± White Box tall grassy woodland occurs on flat and undulating fertile soils from north of Crookwell in the east through to west of Tumut in the upper slopes of the NSW South Western Slopes bioregion. It contains the eastern-most occurrence of *Eucalyptus albens* in the study area. To the east, u19 grades into rp24 [*Yellow Box - Blakely's Red Gum tall grassy woodland on undulating sedimentary and acid-volcanic substrates in the Goulburn area of the South Eastern Highlands Bioregion*] and u178 [*Yellow Box ± Apple Box tall grassy woodland of the South Eastern Highlands*] to the south-east in the ACT. West of the study area, this community grades into a number of Box-Gum woodland associations including the closely related VCA ID 277 [*Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-western Slopes Bioregion*] and, primarily in the South Western Slopes bioregion, the *Eucalyptus albens* dominated VCA ID 266 [*White Box grassy woodland in the upper slopes sub-region of the NSW South-western Slopes Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acaena echinata	1	29	1	9	P
Aristida ramosa	2	46	2	5	P
Arthropodium minus	1	29	1	1	P
Austrodanthonia eriantha	2	32	1	<1	P
Austrodanthonia pilosa	2	29	2	9	P
Austrodanthonia racemosa	2	50	2	10	P
Austrostipa scabra	2	46	1	4	P
Bothriochloa macra	2	57	1	3	P
Carex inversa	1	36	1	8	P
Convolvulus angustissimus	1	25	1	3	P
Crassula sieberiana	1	21	1	5	P
Dichopogon fimbriatus	1	29	1	<1	P
Drosera peltata	1	21	1	1	P
Elymus scaber	2	75	1	21	P
Eucalyptus albens	4	32	3	<1	P
Eucalyptus blakelyi	3	61	2	2	P
Eucalyptus melliodora	3	57	3	5	P
Geranium solanderi	1	61	1	19	P
Hydrocotyle laxiflora	1	68	2	29	P
Lomandra filiformis subsp. *coriacea*	1	50	2	19	P
Microlaena stipoides	3	86	2	34	P
Microtis unifolia	1	32	1	4	P
Oxalis perennans	1	57	1	13	P
Panicum effusum	1	29	1	3	P
Rumex brownii	1	68	1	9	P
Schoenus apogon	1	32	1	5	P
Solenogyne dominii	1	39	1	3	P
Themeda australis	3	54	2	21	P
Tricoryne elatior	1	50	1	3	P
Wurmbea dioica	1	25	1	3	P

Gonocarpus tetragynus	1	43	2	48	C
Poa sieberiana	1	57	2	48	C

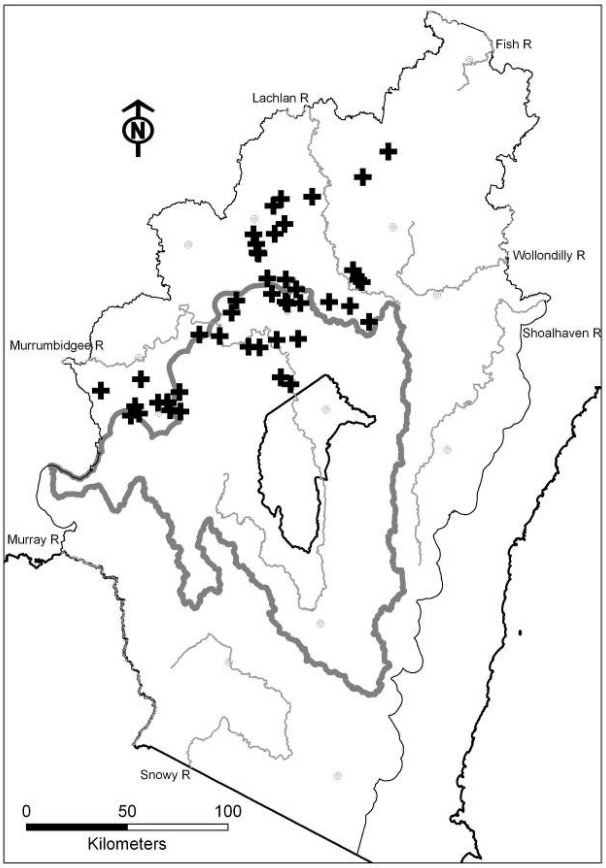


Figure u19: Distribution of field samples assigned to this community.

Threatened Communities: TSC Act 1995 - *White Box Yellow Box Blakely's Red Gum Woodland*; EPBC Act 1999 - *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland*; NC Act 1980 - *Yellow Box/Red Gum Grassy Woodland.*

Frequently occurring weeds: *Anagallis arvensis* (0.33), *Briza maxima* (0.63), *Briza minor* (0.67), *Bromus diandrus* (0.56), *Bromus molliformis* (0.59), *Cirsium vulgare* (0.48), *Cynosurus echinatus* (0.37), *Echium plantagineum* (0.33), *Hypericum perforatum* (0.7), *Hypochaeris glabra* (0.52), *Hypochaeris radicata* (0.7), *Lolium perenne* (0.44), *Orobanche minor* (0.41), *Petrorhagia nanteuilii* (0.59), *Plantago lanceolata* (0.48), *Romulea rosea* var. *australis* (0.33), *Rosa rubiginosa* (0.33), *Sherardia arvensis* (0.44), *Trifolium angustifolium* (0.63), *Trifolium arvense* (0.52), *Trifolium campestre* (0.56), *Trifolium dubium* (0.48), *Trifolium striatum* (0.41), *Trifolium subterraneum* (0.52), *Vulpia muralis* (0.37).

Equivalent vegetation types: This community is most similar to VCA ID 277 [*Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-western Slopes Bioregion*] (Benson 2008), and is similar to a number of communities in Gellie (2005) including VG116, VG117, VG154 and VG160. At the western edge of its range, there may be areas dominated by White Box which are most akin to VCA ID 266 [*White Box grassy woodland in the upper slopes sub-region of the NSW South-western Slopes Bioregion*].

Threats: Due to its high fertility and the desirability of the groundcover species to graziers, this community has been subjected to high levels of clearing. The groundcover has been highly modified in places due to the addition of nitrogen and grazing disturbance. Primarily due to grazing pressures, there is little recruitment of key canopy and shrub species.

Reservation Status: Poorly conserved. Examples are found in Burrinjuck NR.

Extent of clearing: Known to be highly cleared, and due to continued grazing large areas of healthy, regenerating overstorey are rare.

u20: Kurrajong – Blackthorn - Kangaroo Grass shrub-grass mid-high open woodland on limestone karsts in the Wee Jasper area

Scientific Name: *Brachychiton populneus - Eucalyptus bridgesiana / Grevillea iaspicula - Bursaria spinosa / Themeda australis - Poa sieberiana - Imperata cylindrica*

Number of samples:	3
Richness [mean (±SD)]:	35 (6)
Slope (degrees):	(1) 3-8 (12)
Altitude (m asl):	(375) 377-407 (436)
Ave. Annual Rainfall (mm):	(850) 851-875 (897)
Temp. Annual Range (°C):	(26.2) 26.4-26.5 (26.5)

Plate u20:

Vegetation Description: Community u20 is a mid-high open woodland with sparsely scattered trees of

Kurrajong (*Brachychiton populneus*) and Apple Box (*Eucalyptus bridgesiana*) with occasional White Box (*E. albens*) and Yellow Box (*E. melliodora*). It has a moderately dense tall shrub layer commonly dominated by *Bursaria spinosa*. Other co-occurring shrub species include *Grevillea iaspicula*, *Dodonaea viscosa*, *Rubus parviflora*, *Indigophora signata*, *Discaria pubescens* and *Olearia* spp.. There is often a dense grassy groundlayer dominated by *Themeda australis* and *Poa sieberiana*. Other groundcover species include *Microlaena stipoides*, *Bulbine glauca*, *Cymbopogon refractus*, *Sorghum leiocladum* and *Austrodanthonia* spp.

This community is endemic to limestone karst formations and is highly restricted in distribution from just south of Wee Jasper to Lake Burrinjuck. The soil is a skeletal to shallow red-brown loam. The community occurs on all aspects and the terrain varies from flat to gently sloping to very steep. At some sites within the karst there are large sinkholes or low cliffs where components of the vegetation grow on almost vertical limestone formations.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Arthropodium milleflorum	1	100	1	8	P
Arthropodium minus	1	33	1	1	P
Asperula ambleia	1	33	1	<1	P
Bothriochloa macra	1	100	1	3	P
Brachychiton populneus	2	100	1	2	P
Bulbine glauca	1	100	1	<1	P
Bursaria spinosa	2	100	1	10	P
Carex incomitata	1	33	1	1	P
Clematis microphylla	2	67	1	<1	P
Convolvulus angustissimus	1	67	1	3	P
Correa reflexa	1	33	1	<1	P
Daucus glochidiatus	1	100	1	8	P
Dianella longifolia var. *longifolia*	1	67	1	3	P
Discaria pubescens	1	33	1	<1	P
Dodonaea viscosa	1	67	1	2	P
Echinopogon cheelii	1	33	1	1	P
Elymus scaber	1	100	1	21	P
Eucalyptus bridgesiana	2	67	3	7	P
Geranium solanderi	1	100	1	19	P
Glycine clandestina	1	100	1	30	P
Glycine tabacina	1	67	1	4	P
Grevillea iaspicula	1	100	0	0	P
Hydrocotyle laxiflora	1	100	2	30	P
Imperata cylindrica	1	100	2	<1	P
Indigofera adesmiifolia	1	67	1	<1	P
Microtis spp.	1	33	1	<1	P
Olearia spp.	1	33	1	<1	P
Pleurosorus rutifolius	1	67	1	<1	P
Poa sieberiana	1	100	2	48	P
Senecio quadridentatus	1	67	1	6	P
Themeda australis	4	100	2	21	P
Wahlenbergia spp.	1	67	1	5	P
Austrodanthonia racemosa	1	67	2	10	C
Desmodium varians	1	67	1	12	C
Dichondra repens	1	67	2	21	C
Rubus parvifolius	2	67	1	11	C

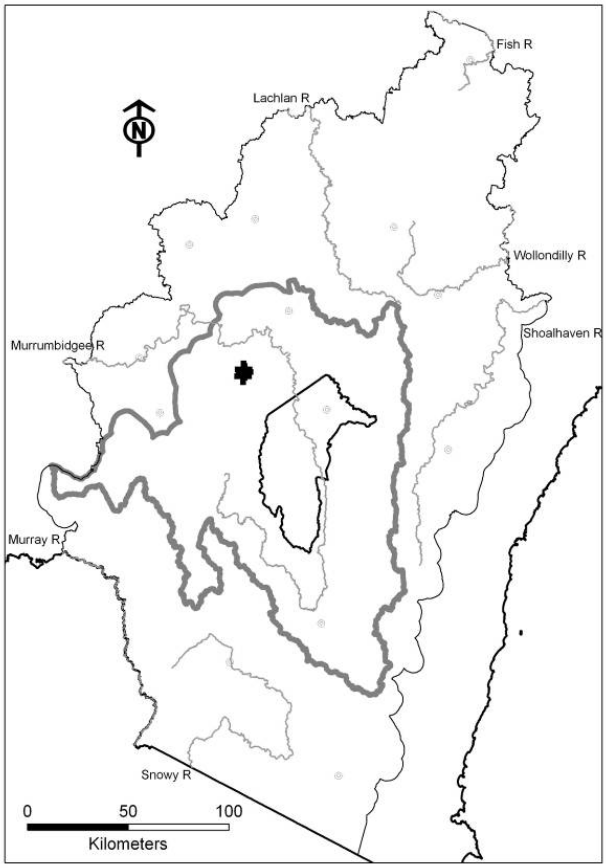


Figure u20: Distribution of field samples assigned to this community.

Threatened Communities: Not currently listed, but possibly eligible for listing as Critically Endangered.

Frequently occurring weeds: *Anagallis arvensis* (0.67), *Briza minor* (0.33), *Bromus diandrus* (0.33), *Bromus molliformis* (0.33), *Bromus tectorum* (0.67), *Carthamus lanatus* (1.00), *Centaurium erythraea* (1), *Cerastium glomeratum* (0.33), *Chondrilla juncea* (0.67), *Cirsium vulgare* (0.33), *Cotoneaster glaucophyllus* (0.33), *Cynosurus echinatus* (0.33), *Hypericum perforatum* (1.00), *Hypochaeris radicata* (0.67), *Lactuca serriola* (1.00), *Petrorhagia nanteuilii* (0.33), *Poaceae indeterminata* (0.33), *Pyracantha angustifolia* (0.33), *Rosa rubiginosa* (1.00), *Rubus fruticosus* sp. agg. (1), *Torilis nodosa* (0.67), *Trifolium angustifoliu*m (0.33), *Trifolium arvense* (0.33),

Trifolium campestre (0.33), *Vulpia myuros f. megalura* (0.33).

Equivalent vegetation types: Nil. Poory sampled community.

Threats: Highly threatened and few relatively intact examples remain. Previous clearing and heavy grazing by domestic stock have almost completely destroyed the tree and shrub layer from all but the most rocky sites where stock have had difficulty gaining access. Some of the sites which have escaped intensive stock grazing are now heavily invaded by *Rubus fruticosus* sp. agg. and *Rosa rubiginosa* and other exotic shrubs such as *Photinia serratifolia* and *Cotoneaster* spp.. Many sites also have significant infestations of *Hypericum perforatum* on their margins where there has been greater disturbance due to grazing.

Reservation Status: Extremely poorly represented within conservation reserves. A small area of one to two ha occurs in a disjunct section of Burrinjuck NR on the southern shores of Lake Burrinjuck. Unfortunately the shrub and groundlayer in this part of the reserve has been significantly degraded due to feral goat browsing.

Extent of clearing: A precise estimate of the clearing rate has not yet been obtained, however it is considered that only about 10 ha remains in a structurally reasonably intact condition.

u178: Yellow Box ± Apple Box tall grassy woodland of the South Eastern Highlands

Scientific Name: *Eucalyptus melliodora - Eucalyptus bridgesiana / Austrostipa scabra - Themeda australis - Panicum effusum - Chrysocephalum apiculatum - Oxalis perennans*

Number of samples:	33
Richness [mean (±SD)]:	46 (11)
Slope (degrees):	(1) 3-9 (18)
Altitude (m asl):	(613) 662-759 (862)
Ave. Annual Rainfall (mm):	(571) 638-664 (699)
Temp. Annual Range (°C):	(26.2) 26.5-27 (27.5)

Vegetation Description: Community u178 is a tall grassy eucalypt woodland characterised by Yellow Box (*Eucalyptus melliodora*) and/or Apple Box (*E. bridgesiana*), occasionally with Blakely's Red Gum (*E. blakelyi*) along creeklines and in moist depressions. The shrub layer is sparse or absent and may include *Acacia dealbata*, with low shrubs such as *Melichrus urceolatus*, *Astroloma humifusum* and *Cryptandra amara* occurring on less fertile sites. The

Plate u178:

ground layer is dense and dominated by grassy/herbaceous taxa, with grass species including *Themeda australis*, *Austrostipa scabra*, *Poa sieberiana*, *Panicum effusum* and *Elymus scaber.* Forbs include *Oxalis perennans*, *Hydrocotyle laxiflora*, *Acaena ovina*, *Desmodium varians*, *Chrysocephalum apiculatum*, *Cymobonotus lawsonianus*, *Geranium solanderi* and *Glycine tabacina*. Examples of this community may be dominated entirely by *E. melliodora* or *E. bridgesiana*, with a highly similar understorey.

Yellow Box ± Apple Box tall grassy woodland is distributed from the Lake George area south to the Michelago / Bredbo area. It is generally found on fertile valley soils, although it may extend upslope. It is likely to have been widely distributed throughout the northern half of the ACT prior to urban expansion. In the ACT and surrounds, it often occurs downslope of less fertile communities such as u66 [*Norton's Box - Red Stringybark grass-herb mid-high open forest of the South Eastern Highlands and Upper Slopes Subregion of the South Western Slopes Bioregion*] and p14 [*Red Stringybark - Scribbly Gum - Red-anthered Wallaby Grass tall grass-shrub dry sclerophyll open forest on loamy ridges of the central South Eastern Highlands Bioregion*]. Further south around Bredbo, it often occurs downslope of u29 [*Apple Box - Broad-leaved Peppermint tall shrub-grass woodland primarily on granitoids of the South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acaena ovina	1	79	1	7	P
Aristida ramosa	1	33	2	5	P
Arthropodium minus	1	24	1	1	P
Asperula conferta	1	36	1	11	P
Astroloma humifusum	1	21	1	5	P
Austrodanthonia spp.	2	52	1	7	P
Austrostipa bigeniculata	1	27	2	<1	P

Austrostipa scabra	1	82	2	3	P
Bothriochloa macra	1	45	1	3	P
Bulbine bulbosa	1	24	1	4	P
Carex inversa	1	33	1	8	P
Cheilanthes sieberi	1	39	1	9	P
Chrysocephalum apiculatum	1	70	1	5	P
Chrysocephalum semipapposum	1	21	1	4	P
Convolvulus angustissimus	1	39	1	3	P
Crassula sieberiana	1	55	1	5	P
Cymbonotus lawsonianus	1	67	1	4	P
Cynoglossum suaveolens	1	30	1	3	P
Daucus glochidiatus	1	64	1	8	P
Desmodium varians	1	79	1	12	P
Dichelachne micrantha	1	33	1	10	P
Einadia nutans	1	48	1	4	P
Elymus scaber	1	61	1	21	P
Enneapogon nigricans	1	27	1	<1	P
Eryngium rostratum	1	21	1	<1	P
Eucalyptus blakelyi	2	21	3	2	P
Eucalyptus bridgesiana	3	52	3	7	P
Eucalyptus melliodora	3	58	3	5	P
Euchiton involucratus	1	33	1	3	P
Euchiton sphaericus	1	24	1	7	P
Euchiton spp.	1	24	1	<1	P
Geranium solanderi	1	67	1	19	P
Glycine tabacina	1	61	1	3	P
Hydrocotyle laxiflora	1	88	2	29	P
Hypericum gramineum	1	67	1	25	P
Leptorhynchos squamatus	1	33	1	3	P
Lomandra filiformis	1	48	1	2	P
Lomandra multiflora subsp. *multiflora*	1	42	1	18	P
Melichrus urceolatus	1	48	1	13	P
Oxalis perennans	1	85	1	13	P
Panicum effusum	1	67	1	3	P
Pimelea curviflora	1	39	1	6	P
Plantago gaudichaudii	1	27	1	1	P
Plantago varia	1	58	1	11	P
Poa sieberiana	1	76	2	48	P
Rumex brownii	1	67	1	9	P
Schoenus apogon	1	33	1	5	P
Sebaea ovata	1	21	1	<1	P
Senecio quadridentatus	1	33	1	5	P
Solenogyne dominii	1	58	1	3	P
Themeda australis	2	79	2	20	P
Tricoryne elatior	1	36	1	4	P
Triptilodiscus pygmaeus	1	30	1	<1	P
Vittadinia cuneata	1	21	1	2	P
Vittadinia muelleri	1	58	1	1	P
Wahlenbergia communis	1	45	1	4	P
Wahlenbergia spp.	1	48	1	5	P
Wurmbea dioica	1	45	1	2	P
Gonocarpus tetragynus	1	64	2	48	C
Microlaena stipoides	1	55	2	34	C

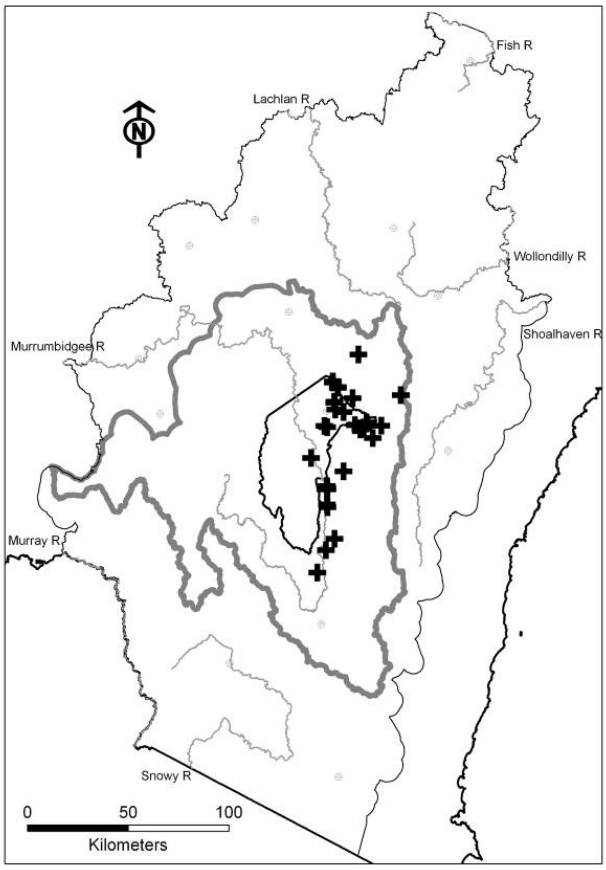


Figure u178: Distribution of field samples assigned to this community.

Threatened Communities: TSC Act 1995 - *White Box Yellow Box Blakely's Red Gum Woodland*; EPBC Act 1999 - *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland;* NC Act 1980 - *Yellow Box/Red Gum Grassy Woodland*.

Frequently occurring weeds: *Acetosella vulgaris* (0.31), *Centaurium erythrae*a (0.53), *Hypochaeris radicata* (0.81), *Linaria arvensis* (0.31), *Petrorhagia nanteuilii* (0.88), *Plantago lanceolata* (0.38), *Rosa rubiginosa* (0.59), *Trifolium arvense* (0.81), *Trifolium campestre* (0.38), *Vulpia myuros f. megalura* (0.44).

Equivalent vegetation types: This community is mostly made up of new plots, but includes plots which were used to define VG160 [*Western Slopes Dry Grass Woodland*] (Gellie 2005).

Threats: This vegetation type has been extensively cleared for various agricultural purposes, including cropping and grazing, and in the ACT for urban development. Because of its distribution on the flat,

fertile and well-watered parts of the landscape, most remaining remnants of this community have been subject to intensive domestic stock grazing and consequently have lost most of the native groundcover and shrub/midstorey diversity.

Reservation Status: Unknown, although small patches of this community are known to occur in the Mt. Majura, Mt. Ainslie and Mugga Mugga sections of Canberra Nature Park (ACT), and Stony Creek NR in NSW. Very small remnants may be represented in Mulligans Flat NR and Goorooyarroo NR (ACT).

Extent of clearing: Not fully assessed, but considered to be one of the most highly cleared and modified components of the Box-Gum EEC.

CLASS: TABLELAND CLAY GRASSY WOODLANDS

p220: Ribbon Gum - Snow Gum tableland flats tall grassy woodland primarily on granitoids in the Kybean-Gourock and Monaro subregions of the South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus viminalis - Eucalyptus pauciflora / Microlaena stipoides - Themeda australis - Poa labillardierei - Glycine clandestina - Dichondra repens - Gonocarpus tetragynus*

Number of samples:	52
Richness [mean (±SD)]:	40 (9)
Slope (degrees):	(0) 2-10 (18)
Altitude (m asl):	(585) 729-950 (1125)
Ave. Annual Rainfall (mm):	(677) 820-901 (1006)
Temp. Annual Range (°C):	(23.5) 24.5-25.6 (26.2)

Plate p220: Community p220, AraluenRoad, Araluen.

Vegetation Description: Community p220 is a tall grassy woodland dominated by Snow Gum (*Eucalyptus pauciflora*) and Ribbon Gum (*E. viminalis*), occasionally with Narrow-leaved Peppermint (*E. radiata*). The shrub layer is sparse or absent, with occasional occurrences of *Acacia melanoxylon*, *Rubus parvifolius* and low shrubs such as *Hibbertia obtusifolia* and *Bossiaea buxifolia*. The ground layer is dense and dominated by grasses such as *Microlaena stipoides*, *Themeda australis*, *Poa labillardierei*, *Elymus scaber* and *Poa meionectes*, with forbs including *Glycine clandestina*, *Dichondra repens*, *Gonocarpus tetragynus*, *Hypericum gramineum*, *Hydrocotyle laxiflora*, *Acaena novae-zelandiae* and *Desmodium varians*.

Ribbon Gum - Snow Gum tableland flats tall grassy woodland occurs primarily on granitic soils on flat to gently undulating terrain east of the Great Dividing Range from Braidwood south to Bombala area, and westward to Tinderry NR. Along drainage lines this community may grade into the floristically similar p520 [*Ribbon Gum very tall woodland on sandy alluvial soils along drainage lines of the eastern South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia melanoxylon	1	50	1	13	P
Acaena novae-zelandiae	2	63	1	27	P
Acrotriche serrulata	1	40	1	11	P
Ajuga australis	2	31	1	7	P
Austrodanthonia laevis	2	19	2	4	P
Austrodanthonia pilosa	2	29	2	9	P
Austrostipa rudis	2	15	1	3	P
Bossiaea buxifolia	2	46	1	6	P
Carex spp.	2	13	1	2	P
Cymbonotus lawsonianus	1	17	1	5	P
Cynoglossum australe	1	15	1	4	P
Desmodium gunnii	2	27	2	1	P
Desmodium varians	2	42	1	12	P
Dianella longifolia var. *longifolia*	1	31	1	2	P
Dichelachne inaequiglumis	2	33	2	6	P
Dichondra repens	2	77	2	20	P
Einadia nutans	2	17	1	4	P
Elymus scaber	1	48	1	21	P
Eucalyptus pauciflora	3	79	3	20	P
Eucalyptus radiata	3	27	3	11	P
Eucalyptus stellulata	1	15	2	3	P
Eucalyptus viminalis	3	85	3	12	P
Euchiton gymnocephalus	2	33	1	15	P
Geranium solanderi	2	40	1	19	P
Glycine clandestina	2	77	1	29	P
Gonocarpus tetragynus	2	73	2	47	P
Hovea heterophylla	1	23	1	4	P
Hovea linearis	2	33	1	13	P
Hydrocotyle laxiflora	2	60	2	29	P
Hypericum gramineum	1	67	1	25	P
Lomandra longifolia	2	63	2	42	P
Lomandra multiflora subsp. *multiflora*	1	44	1	18	P
Microlaena stipoides	2	88	2	33	P
Oxalis spp.	2	21	1	3	P
Panicum effusum	1	13	1	3	P
Poa labillardierei	3	62	2	9	P
Poa meionectes	2	52	2	16	P
Pteridium esculentum	2	52	2	27	P
Pultenaea subspicata	2	13	2	2	P

Rubus parvifolius	2	52	1	11	P
Scleranthus biflorus	1	40	1	9	P
Senecio prenanthoides	2	52	1	19	P
Solenogyne gunnii	1	15	1	5	P
Themeda australis	2	79	2	20	P
Veronica calycina	2	44	1	16	P
Veronica plebeia	1	25	1	6	P
Viola betonicifolia	2	48	1	27	P
Wahlenbergia spp.	1	17	1	5	P
Hibbertia obtusifolia	2	50	1	34	C
Poa sieberiana	3	40	2	48	C

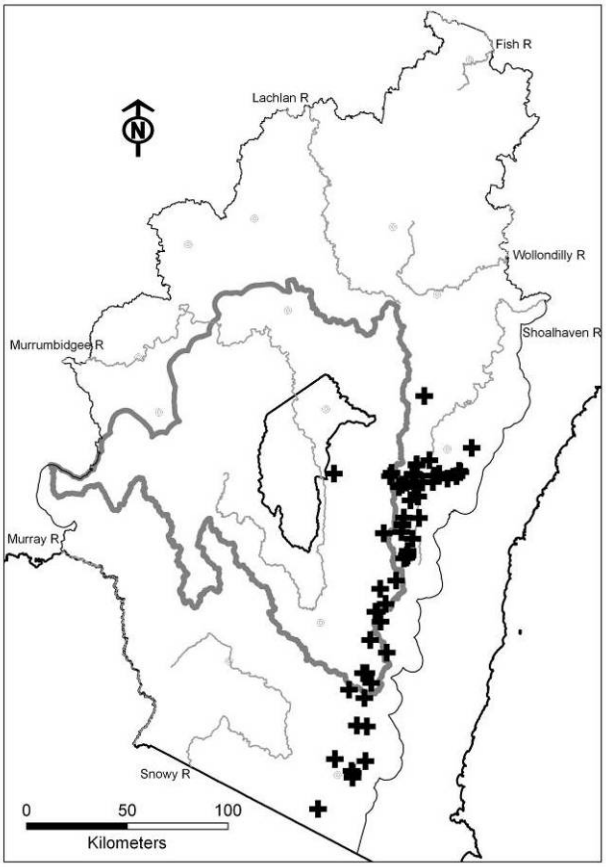


Figure p220: Distribution of field samples assigned to this community.

Threatened Communities: TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions.*

Frequently occurring weeds: *Acetosella vulgaris* (0.37), *Cirsium vulgare* (0.27), *Holcus* lanatus (0.25), *Hypochaeris radicata* (0.92), *Rosa rubiginosa* (0.27).

Equivalent vegetation types: This community is equivalent to GWp220 [*Southern Tableland Flats Forest*] (Tozer *et al.* 2010).

Threats: Remnants are subject to small-scale clearing, weed invasion and grazing pressures.

Reservation Status: Likely to be poorly reserved. Examples of this community are found in Badja Swamps NR, Coolumbooka NR, Deua NP, Monga SCA and Tinderry NR.

Extent of clearing: This community has been widely cleared across its range primarily for pastoral development.

p520: Ribbon Gum very tall woodland on sandy alluvial soils along drainage lines of the eastern South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus viminalis* ± *Eucalyptus stellulata - Eucalyptus pauciflora / Microlaena stipoides - Poa labillardierei - Dichondra repens - Acaena novae-zelandiae*

Number of samples:	42
Richness [mean (±SD)]:	33 (11)
Slope (degrees):	(0) 3-8 (19)
Altitude (m asl):	(551) 641-860 (1140)
Ave. Annual Rainfall (mm):	(639) 702-856 (968)
Temp. Annual Range (°C):	(23.7) 24.8-26.1 (26.5)

Plate p520: Community p520, Doughboy TSR.

Vegetation Description: Community p520 is a very tall woodland to open forest characterised by Ribbon Gum (*Eucalyptus viminalis*), sometimes with Black Sallee (*E. stellulata*), Snow Gum (*E. pauciflora*) or Candlebark (*E. rubida*). Occasionally, Black Gum (*E. aggregata*) may be present. The shrub layer is sparse or absent, with infrequent groves of *Acacia melanoxylon*, *Acacia mearnsii*, *Lomatia miricoides* or *Leptospermum myrtifolium*. The ground layer is dense and dominated by grasses such as *Microlaena stipoides*, *Poa labillardierei* and *Echinopogon ovatus*, with forbs including *Acaena novae-zelandiae*, *Dichondra repens*, *Hydrocotyle laxiflora*, *Stellaria pungens* and *Geranium solanderi*.

Ribbon Gum very tall woodland is distributed across eastern parts of the South Eastern Highlands bioregion, from the Abercrombie River in the north to east of the Bredbo – Cooma area. Although unsampled further west, this community is likely to occur in the ACT along the Murrumbidgee River corridor. It generally occurs on coarse sandy alluvial soils along drainage channels. Away from the riparian zone, it commonly grades into p220 [*Ribbon Gum - Snow Gum tableland flats tall grassy woodland primarily on granitoids in the Kybean-Gourock and Monaro subregions of the South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acacia mearnsii	3	19	2	3	P
Acaena novae-zelandiae	2	79	1	27	P
Austrodanthonia racemosa	2	43	2	10	P
Carex appressa	1	45	1	6	P
Carex inversa	1	29	1	8	P
Desmodium varians	2	36	1	12	P
Dichondra repens	2	83	2	20	P
Echinopogon ovatus	2	45	1	10	P
Einadia nutans	1	24	1	4	P
Eucalyptus rubida	2	26	3	9	P
Eucalyptus stellulata	3	38	2	3	P
Eucalyptus viminalis	3	62	3	12	P
Geranium solanderi	2	52	1	19	P
Glycine clandestina	1	45	1	29	C
Glycine tabacina	2	21	1	3	P
Hydrocotyle laxiflora	2	62	2	29	P
Lomandra longifolia	2	45	2	42	C
Microlaena stipoides	3	95	2	33	P
Oreomyrrhis eriopoda	2	45	1	13	P
Oxalis perennans	2	36	1	13	P
Poa labillardierei	3	69	2	9	P
Poranthera microphylla	1	48	1	27	C
Rubus parvifolius	2	36	1	11	P
Rumex brownii	1	48	1	9	P
Solenogyne gunnii	1	19	1	5	P
Stellaria pungens	2	57	2	31	P
Veronica plebeia	1	26	1	6	P
Viola betonicifolia	1	48	1	27	C

Threatened Communities: TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions.*

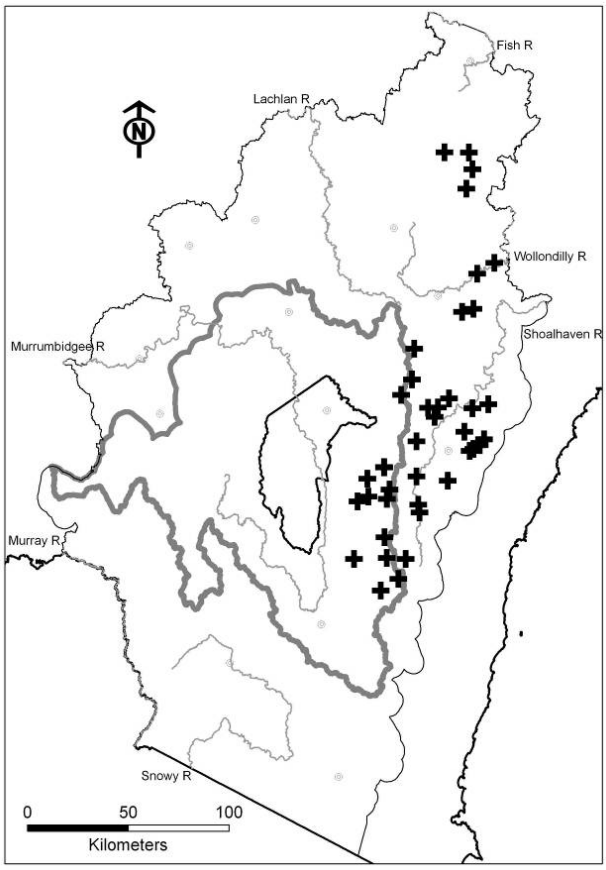


Figure p520: Distribution of field samples assigned to this community.

Frequently occurring weeds: *Acetosella vulgaris* (0.55), *Cirsium vulgare* (0.74), *Holcus lanatus* (0.5), *Hypochaeris radicata* (0.79), *Plantago lanceolata* (0.47), *Rosa rubiginosa* (0.42), *Rubus ulmifolius* (0.37), *Trifolium repens* (0.32).

Equivalent vegetation types: This community is equivalent to GWp520 [*Tableland Swamp Flats Forest*] (Tozer *et al.* 2010).

Threats: p520 has been extensively cleared and remnants are subject to small-scale clearing, weed invasion and grazing pressures.

Reservation Status: Unknown, although examples of this community are found in drainage areas in Abercrombie River NP, Badja Swamps NR, Blue Mountains NP, Deua NP, Gourock NP, Kanangra-Boyd NP, Macanally SCA, Monga SCA, Mount Dowling NR, Quidong NR, Tallaganda NP, Tinderry NR, Wiarborough NR and Yanununbeyan SCA.

Extent of clearing: This community has been widely cleared across its range primarily for pastoral development.

u78: Snow Gum grassy mid-high woodland of the South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus pauciflora* ± *Eucalyptus bridgesiana / Astroloma humifusum - Hibbertia obtusifolia / Themeda australis - Microlaena stipioides - Poa sieberiana - Chrysocephalum apiculatum*

Number of samples:	27
Richness [mean (±SD)]:	31 (8)
Slope (degrees):	(0) 1-4 (8)
Altitude (m asl):	(584) 683-792 (940)
Ave. Annual Rainfall (mm):	(641) 699-798 (874)
Temp. Annual Range (°C):	(24.3) 25.6-26.2 (26.8)

Plate u78:

Vegetation Description: Community u78 is a mid-high grassy woodland dominated by Snow Gum (*Eucalyptus pauciflora*) occasionally with Apple Box (*E. bridgesiana*). The shrub layer is sparse or absent, with infrequent occurrences of low shrubs such as *Pimelea curviflora*, *Astroloma humifusum*, *Hibbertia obtusifolia* at low abundance. The ground layer is dense and dominated by grasses such as *Themeda australis*, *Microlaena stipoides*, *Poa sieberiana*, *Elymus scaber*, *Aristida ramosa* and *Austrodanthonia racemosa.* Forb species include *Chrysocephalum apiculatum*, *Gonocarpus tetragynus*, *Hypericum gramineum*, *Lomandra filiformis* subsp. *coriacea*, *Acaena echinata* and *Asperula conferta.* Heavily grazed remnants may be dominated by less-palatable species such as *Aristida ramosa*, *Austrodanthonia* spp. and *Bothriochloa macra*.

Snow Gum grassy woodland occurs on flat to undulating clay landscapes from the Crookwell area south to the Braidwood area. It is mostly found on private grazing land and as such has been highly modified and cleared across its range. It grades into tableland grassland communities with a similar grassy understorey such as r7 [*Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion*], which can also contain scattered occurrences of *E. pauciflora*.

Characteristic Species:

Species	C/A	Freq	C/A O	Freq O	Fid
Acaena echinata	1	52	1	9	P
Aristida ramosa	2	48	2	5	P
Asperula conferta	1	44	1	10	P
Astroloma humifusum	1	33	1	5	P
Austrodanthonia laevis	2	26	2	4	P
Austrodanthonia pilosa	2	30	2	9	P
Austrodanthonia racemosa	2	44	2	10	P
Bothriochloa macra	1	26	1	3	P
Calocephalus citreus	2	22	1	<1	P
Carex inversa	2	37	1	8	P
Chrysocephalum apiculatum	2	67	1	6	P
Dichelachne micrantha	1	33	1	10	P
Einadia nutans	1	26	1	4	P
Elymus scaber	1	59	1	21	P
Eryngium rostratum	1	22	1	<1	P
Eucalyptus bridgesiana	2	26	3	7	P
Eucalyptus pauciflora	3	89	3	20	P
Hypericum gramineum	2	59	1	25	P
Lomandra filiformis subsp. *coriacea*	2	59	2	18	P
Microlaena stipoides	3	96	2	34	P
Oxalis exilis	2	22	1	5	P
Panicum effusum	2	41	1	3	P
Pimelea curviflora	2	37	1	6	P
Plantago varia	2	37	1	11	P
Poa labillardierei	2	37	2	10	P
Scleranthus biflorus	2	37	1	10	P
Solenogyne gunnii	1	22	1	5	P
Themeda australis	3	100	2	20	P
Tricoryne elatior	2	41	1	4	P
Wahlenbergia communis	1	26	1	5	P
Wahlenbergia luteola	2	26	1	1	P
Gonocarpus tetragynus	2	63	2	48	C
Hydrocotyle laxiflora	2	44	2	30	C
Poa sieberiana	3	74	2	48	C

Threatened Communities: TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions.*

Frequently occurring weeds: *Acetosella vulgaris* (0.62), *Centaurium erythraea* (0.23), *Cirsium vulgare* (0.23), *Crataegus monogyna* (0.23), *Dactylis glomerata* (0.23), *Holcus lanatus* (0.23), *Hypochaeris radicata* (0.85), *Paspalum dilatatum* (0.23), *Plantago lanceolata* (0.58), *Rosa rubiginosa* (0.46).

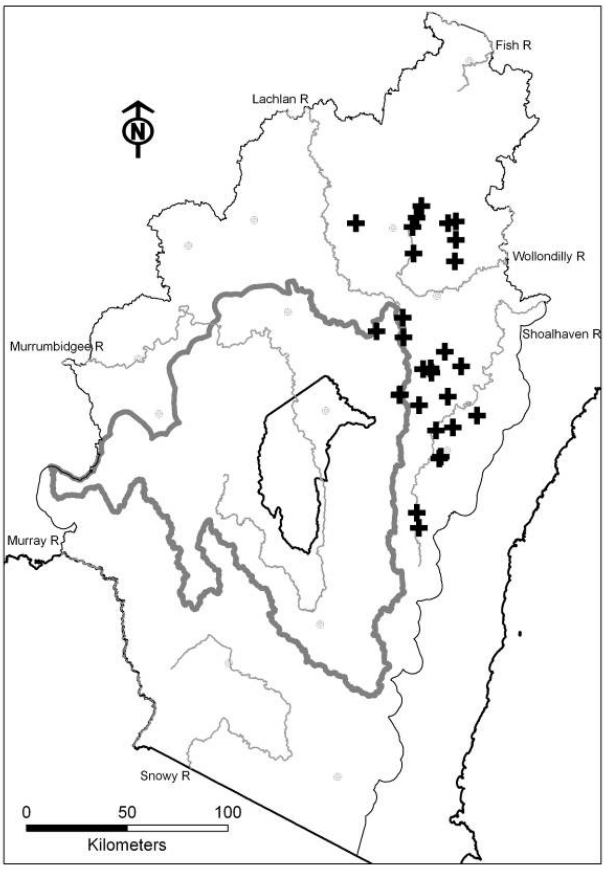


Figure u78: Distribution of field samples assigned to this community.

Equivalent vegetation types: Given the lack of adequate woodland classification, there are no clear equivalent communities. There are some affinities with p22 [*Frost Hollow Grassy Woodland*] and p24 [*Tableland Grassy Box-Gum Woodland*] as described by Tozer *et al.* (2010).

Threats: This community has been extensively cleared and remnants are subject to small-scale clearing, weed invasion and grazing pressures.

Reservation Status: This community is poorly reserved. Examples of this community occur in Oakdale NR.

Extent of clearing: Clearing of this vegetation type is known to be high.

FORMATION: GRASSLANDS

CLASS: TEMPERATE MONTANE GRASSLANDS

r1: Sub-montane Moist Tussock Grassland of the South Eastern Highlands Bioregion

Scientific Name: *Poa sieberiana - Themeda australis – Brachyscome scapigera – Plantago antarctica - Asperula* spp. *– Coronidium scorpioides*

Plate r1:

Vegetation Description: Community r1 is a dense moist tussock grassland dominated by Snow-grass (*Poa sieberiana*) and/or Kangaroo Grass (*Themeda australis*) in the upper stratum and a variety of forbs in the intertussock spaces, including *Brachyscome scapigera*, *Asperula* spp., *Coronidium scorpioides (*syn. *Helichrysum rutidolepis)*, *Plantago antarctica*, *Hydrocotyle algida*, *Ranunculus lappaceus*, *Geranium antrorsum* and *Leptorhynchos squamatus.* Other grasses are present including wallaby-grasses *Austrodanthonia* spp., *Elymus scaber* and *Hemarthria uncinata.* A variety of rushes *Juncus* spp. and sedges *Carex* spp. may also be present. Isolated or scattered trees may occur including Snow Gum (*Eucalyptus pauciflora*), Blackwood (*Acacia melanoxylon*), Mountain Gum (*E. dalrympleana*) or Swamp Gum (*E. ovata*). There may be isolated shrubs or patches of shrubs of various taxa including *Hakea microcarpa*, *Discaria pubescens*, *Banksia marginata*, *Bossiaea riparia*, *Bursaria spinosa* and *Mirbelia oxylobioides*. Trees and shrubs increase in density where this community merges into the adjacent woodland and forest communities. Sites in high condition may have a variety of uncommon grassland forbs, including *Prasophyllum wilkinsoniorum*, *Diplarrena moraea* and *Thysanotus tuberosus.*

Sub-montane Moist Tussock Grassland is found on a variety of substrates but most commonly on colluvium or alluvium on footslopes and flats respectively. It also occurs on basalt and granite lithologies and on midslopes and plateau. Poor soil drainage, seasonal waterlogging and severe frosts are the likely drivers of this community, as they restrict the establishment of woody species. Community r1 is distributed from the southern ACT (Namadgi NP) and the adjacent Yaouk area in NSW. Elsewhere in NSW, it occurs near Delegate, Nunnock Swamp area (South East Forests NP), Kydra River and the upper headwaters of the Shoalhaven River (Deua NP). It occurs at altitudes between 720 to 1120 m. Sites in lower condition (i.e. lacking some of the main species that define this community) may be difficult to distinguish from low-condition sites of r2 [*River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes*, *Drainage Lines and Flats of the South Eastern Highlands Bioregion*] and r7 [*Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq
Acaena novae-zelandiae	1	45
Acaena ovina	1	27
Asperula spp. (*A. conferta* or *A. scoparia*)	1	95
Austrodanthonia spp.	1	59
Brachyscome spathulata	1	59
Carex spp.	1	77
Carex spp. (*breviculmis* or *inversa)*	1	23
Chrysocephalum apiculatum	1	27
Coronidium scorpioides	1	64
Craspedia spp.	1	45
Cynoglossum suaveolens	1	27
Elymus scaber	1	36
Epilobium spp.	1	41
Euchiton spp.	1	23
Geranium antrorsum	1	55
Geranium spp.	1	59
Hemarthria uncinata	1	23
Hydrocotyle laxiflora	1	41
Juncus spp.	1	73
Leptorhynchos squamatus	1	55
Lomandra longifolia	1	32
Luzula spp.	1	23
Microlaena stipoides	1	27
Oreomyrrhis eriopoda	1	32
Oxalis perennans	1	36
Plantago antarctica	1	45
Plantago gaudichaudii	1	64
Poa labillardierei	1	23
Poa sieberiana	4	100
Ranunculus lappaceus	1	68
Rumex brownii	1	73

Scleranthus biflorus	1	45
Solenogyne gunnii	1	36
Stylidium graminifolium sens lat.	1	36
Themeda australis	3	100
Veronica gracilis	1	41
Viola betonicifolia	1	32
Wahlenbergia spp.	1	27

Threatened Communities: EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory*; NC Act 1980 - *Natural Temperate Grassland.*

Frequently occurring weeds: *Anthoxanthum odoratum*, *Hypochaeris radicata*, *Acetosella vulgaris.*

Equivalent vegetation types: Group 1 (Rehwinkel unpub.).

Threats: This community has been extensively cleared and remnants are subject to small-scale clearing, weed invasion and grazing pressures.

Reservation Status: Occurs in Deua NP, Namadgi NP (ACT), South East Forests NP and Yaouk NR. Also on Nature Conservation Trust covenanted lands in the upper Shoalhaven River area.

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory* EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

r2: River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes, Drainage Lines and Flats of the South Eastern Highlands Bioregion

Scientific Name: *Poa labillardierei – Themeda australis – Juncus* spp. *– Microlaena stipoides – Austrodanthonia* spp. *– Carex appressa*

Vegetation Description: Community r2 is a tall, dense or mid-dense wet tussock grassland dominated by River Tussock (*Poa labillardierei*) and with Kangaroo Grass (*Themeda australis*), Tall Sedge (*Carex appressa*) and rushes *Juncus* spp. in the upper stratum and a variety of grasses and forbs in the intertussock spaces, including *Microlaena stipoides*, *Austrodanthonia* spp., *Elymus scaber*, *Acaena ovina*, *Asperula* spp., *Euphrasia* spp., *Coronidium scorpioides* (syn. *Helichrysum rutidolepis*) and *Hemarthria uncinata.* Isolated or scattered trees may be present, including Snow Gum (*Eucalyptus*

Plate r2:

pauciflora), Ribbon Gum (*E. viminalis*), *Acacia dealbata*, *A. mearnsii*, Candlebark (*E. rubida*), *A. melanoxylon*, Black Sallee (*E. stellulata*), Black Gum (*E. aggregata*) and Apple Box (*E. bridgesiana*). Isolated shrubs or patches of shrubs may also occur including *Kunzea parvifolia*, *Melaleuca parvistaminea*, *Astroloma humifusum*, *Einadia nutans* and *Hakea microcarpa*. Trees and shrubs increase in density where this community merges into the adjacent woodland communities. Sites in high condition may have a variety of uncommon grassland forbs, including *Craspedia* spp., *Geranium antrorsum*, *Calocephalus citreus*, *Ranunculus lappaceus* and *Brachyscome decipiens.*

River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes, *Drainage Lines and Flats* is found on colluvium or alluvium and on drainage lines in footslopes and particularly on the broad flats associated with creeks and rivers. Poor soil drainage associated with frequent seasonal waterlogging, and to a lesser drgree, winter frosts, are the likely dirvers of this community as they restrict the establishment of woody taxa. Community r2 occurs at altitudes between 650m and 850m. It is distributed widely across the region, wherever suitable habitat exists. Sites in lower condition (i.e. lacking some of the main species that define this community) may be confused with low-condition sites of r3 [*Wallaby-grass – Kangaroo Grass – Rush tussock grassland of seasonally wet sites of the South Eastern Highlands Bioregion*] and r7 [*Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq
Acaena nova-zelandiae	1	25
Acaena ovina	1	44
Aristida spp.	1	21
Asperula spp. (*A. conferta* or *A. scoparia*)	1	44
Austrodanthonia spp.	1	44
Carex appressa	1	42

Carex spp. (*C. breviculmis* or *C. inversa*)	1	38
Coronidium scorpioides (syn. *Helichrysum rutidolepis*)	1	31
Craspedia spp.	1	21
Elymus scaber	1	44
Epilobium spp.	1	38
Eragrostis spp.	1	27
Euchiton spp.	1	40
Geranium spp.	1	33
Hemarthria uncinata	1	23
Hydrocotyle algida	1	29
Hypericum gramineum	1	25
Juncus spp.	2	81
Lachnagrostis spp.	1	27
Leptorhynchos squamatus	1	23
Microlaena stipoides	1	42
Oxalis perennans	1	31
Panicum effusum	1	23
Persicaria prostrata	1	21
Poa labillardierei	5	94
Poa meionectes	1	25
Rumex brownii	1	38
Schoenus apogon	1	21
Scleranthus biflorus	1	31
Solenogyne gunnii	1	23
Themeda australis	3	67

Threatened Communities: EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory*; NC Act 1980 - *Natural Temperate Grassland.*

Frequently occurring weeds: *Hypochaeris radicata*, *Acetosella vulgaris*, *Phalaris aquatica*, *Holcus lanatus*, *Bromus* spp., *Vulpia* spp., *Festuca arundinacea*, *Paspalum dilatatum*

Equivalent vegetation types: Community 8 (Benson 1994); Group 2 (Rehwinkel unpub.); Draft VCA ID 635 [*Tall wet tussock grassland on footslopes, depressions and flats of the South Eastern Highlands Bioregion*] (Benson in prep.)

Threats: This community has been extensively cleared and remnants are subject to nutrient run-on from adjacent fertilised crops and pastures, small-scale clearing, weed invasion and grazing pressures.

Reservation Status: Occurs in Deua NP, Tinderry NR and Yaouk NR, with very minor occurrence at Turallo NR. It is also found on Nature Conservation Trust covenanted land in the upper Shoalhaven River, and at the Scottsdale Bush Heritage Reserve near Cooma.

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

r3: Wallaby-grass – Kangaroo Grass – Rush tussock grassland of seasonally wet sites of the South Eastern Highlands Bioregion

Scientific Name: *Austrodanthonia* spp. – *Themeda australis* – *Juncus* spp. – *Lachnagrostis* spp. – *Schoenus apopgon*

Plate r3:

Vegetation Description: Community r3 is a dense to mid-dense, low to mid-high tussock grassland dominated by wallaby-grasses (*Austrodanthonia* spp.) and/or Kangaroo Grass (*Themeda australis*), with rushes (*Juncus* spp.) in the upper stratum and a variety of smaller grasses, sedges and forbs in the lower stratum, including *Lachnagrostis* spp., *Schoenus apogon*, *Haloragis heterophylla* and *Hydrocotyle algida*, *Carex appressa*, *Elymus scaber* and *Amphibromus* spp.. Isolated or scattered trees may be present, including Swamp Gum (*Eucalyptus ovata*), Candlebark (*E. rubida*) and Snow Gum (*E. pauciflora*). Trees increase in density where this community merges with the adjacent woodland or rarely forest communities. Sites in high condition may have a variety of uncommon grassland forbs, including *Craspedia* spp., *Dichopogon fimbriatus*, *Neopaxia australasica* and *Calotis anthemoides.*

Wallaby-grass – Kangaroo Grass – Rush tussock grassland of seasonally wet sites is found on or adjacent to drainage lines or wetlands, most commonly on flats, but also on footslope and midslope situations. Substrates are colluvium or alluvium derived from sediments or granite. Community r3 commonly occurs on lowland sites at

altitudes between 620m and 720 m. Poor soil drainage associated with frequent seasonal waterlogging, as well as severe winter frosts, are the likely drivers for this community as they restrict the establishment of woody taxa. Community r3 occurs in the south-western parts of the Southern Tablelands botanical region near Tumut and Tumbarrumba, in the Murrumbateman IBRA sub-region and the adjacent regions in the ACT, and in the Southern Tablelands portion of the Shoalhaven River valley. Sites in lower condition (i.e. lacking some of the main species that define this community) could be mis-identified as low-condition sites of r2 [*River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes*, *Drainage Lines and Flats of the South Eastern Highlands Bioregion*] and r7 [*Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion*], both of which are plant communities which r3 frequently co-occurs with.

Characteristic Species:

Species	C/A	Freq
Acaena ovina	1	29
Amphibromus spp.	1	48
Asperula spp. (*A. conferta* or *A. scoparia*)	1	43
Austrodanthonia spp.	4	100
Austrostipa bigeniculata	1	24
Calotis anthemoides	1	24
Carex appressa	1	57
Carex spp. (*C. breviculmis* or *C. inversa*)	1	57
Coronidium scorpioides (syn. *Helichrysum rutidolepis*)	1	33
Craspedia spp.	1	33
Cynodon dactylon	1	33
Deyeuxia quadriseta	1	24
Dichelachne spp.	1	33
Dichopogon fimbriatus	1	29
Drosera peltata	1	48
Elymus scaber	1	62
Epilobium spp.	1	52
Eragrostis spp.	1	43
Euchiton spp.	2	90
Gonocarpus tetragynus	1	24
Haloragus heterophyllus	2	81
Hemarthria uncinata	1	33
Hydrocotyle algida	2	62
Hypericum gramineum	1	48
Hypoxis spp.	1	33
Isotoma fluviatilis	1	33
Juncus bufonius	1	38
Juncus spp.	3	95
Lachnagrostis spp.	2	67
Luzula spp.	1	43
Lythrum hyssopifolia	1	57
Microlaena stipoides	1	48
Microtis spp.	1	38
Neopaxia australasica	1	29
Oxalis perennans	1	38
Persicaria prostrata	1	29
Poa labillardierei	1	38
Poa sieberiana	1	43
Rumex brownii	1	67
Schoenus apogon	2	81
Themeda australis	3	67
Triptilodiscus pygmaeus	1	24
Wahlenbergia spp.	1	52
Wurmbea dioica	1	24

Threatened Communities: EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory*; NC Act 1980 - *Natural Temperate Grassland*.

Frequently occurring weeds: *Anthoxanthum odoratum*, *Hypochaeris radicata*, *Acetosella vulgaris*, *Holcus lanatus*, *Paspalum dilatatum*, *Festuca arundinacea*, *Vulpia* spp., *Phalaris aquatica.*

Equivalent vegetation types: Group 3 (Rehwinkel unpub.), Draft VCA ID 637 [*Wallaby Grass – Blown Grass – Rush moist tussock grassland of seasonally wet sites in ther Douth Eastern Highlands Bioregion*] (Benson in prep.).

Threats: This community has been extensively cleared and remnants are subject to small-scale clearing, weed invasion, grazing pressures, and nutrient run-on from adjacent fertilised crops and pastures.

Reservation Status: There is a very minor occurrence at Turallo NR.

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

r4: Lacustrine Grass-forbland of the South Eastern Highlands Bioregion

Scientific Name: *Lachnagrostis* spp. - *Carex bichenoviana* - *Wilsonia rotundifolia* - *Selliera radicans* - *Juncus* spp.

Plate r4:

Vegetation Description: Community r4 is a variable lake-margin vegetation type with structure and composition responding to lake wetting and drying. Structure ranges from very open to dense, low to mid-high, forbland to tussock grassland, sometimes with patches of sedgeland. Dominants include blown grasses (*Lachnagrostis* spp.), Curly Sedge (*Carex bichenoviana*) and rushes (*Juncus* spp.) in the upper stratum and a variety of forbs and shorter grasses in the lower stratum including *Wilsonia rotundifolia*, *Selliera radicans*, *Dichondra repens*, *Ranunculus diminutus*, *Cynodon dactylon*, *Chenopodium glaucum*, *Austrodanthonia* spp., *Lythrum hyssopifolia*, *Panicum effusum* and *Centella asiatica*. During shallow inundation the forbs *W. rotundifolia*, *S. radicans* and *R. diminutus* may survive for extended periods, including their underground parts, re-emerging first during drying phases to create a forbland. *W. rotundifolia* and *S. radicans* are particularly prevalent in saline lakes such as Lake Bathurst. Grasses and other forbs re-colonise drying lake margins over time. Dry phases may last in excess of 10 years, which may allow establishment of eucalypt saplings.

The five plots in the grassland analysis were from the bed and foreshores of Lake George. The community has also been sampled from the bed of Lake Bathurst, and observed on the margins of Rowes Lagoon and Monaro lakes. Lake Bathurst is distinct in that it has isolated populations of *Dodonaea procumbens*, *Pelargonium* sp. (G. W. Carr 10345), *Schoenus nitens*, *Rulingia prostrata* and the only NSW record of *Lawrencia spicata*. Rowes Lagoon is distinct in that it has an isolated population of *Rulingia prostrata* and several daisies including *Chrysocephalum apiculatum*, *Calocephalus citreus* and *Leptorhynchos squamatus.* This community may also form on some of the Monaro lakes when they are dry, and may occur at altitudes between 660 and 1000 m. Populations of *Pelargonium* sp. (G. W. Carr 10345) have been recorded on at least two Monaro lakes and species such as *Carex bichenoviana* and *Ranunculus diminutus* are common elements on the Monaro lakes.

Lacustrine Grassland / Forbland of the South Eastern Highlands Bioregion is found on the broad bed and adjacent shorelines of Lake George (and Lake Bathurst, Rowes Lagoon and some of the Monaro Lakes, although analysis is incomplete). The beds of these tableland lakes are alluvial mud, silt and sand. The combined factors of seasonal waterlogging, cracking clays, extended dry periods and severe winds all limit the establishment of woody taxa. This community may be confused with r3 [*Wallaby-grass – Kangaroo Grass – Rush tussock grassland of seasonally wet sites of the South Eastern Highlands Bioregion*], which is recorded as occurring above the shorelines of Rowes Lagoon and Breadalbane Lagoon.

Characteristic Species:

Species	C/A	Freq
Austrodanthonia spp.	1	40
Bothriochloa macra	1	20
Brachyscome graminea	1	20
Carex bichenoviana	3	80
Centella asiatica	1	20
Chenopodium glaucum	1	60
Chloris truncata	1	20
Convolvulus angustissimus	1	20
Cynodon dactylon	1	60
Dichondra repens	1	40
Epilobium spp.	1	40
Juncus spp.	2	60
Lachnagrostis spp.	4	100
Lythrum hyssopifolia	1	40
Panicum effusum	1	20
Pennesetum alopecuroides	1	20
Persicaria prostrata	1	20
Ranunculus diminutus	1	80
Rumex brownii	1	40
Selliera radicans	2	80
Wilsonia rotundifolia	3	100

Threatened Communities: This is part of the EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory.*

Frequently occurring weeds: *Aster subulatus*, *Nassella dichotoma*, *Nassella neesiana*, *Hypochaeris*

radicata, *Plantago coronopus* and *Polygonum aviculare.*

Equivalent vegetation types: Identified by Rehwinkel (unpub.) as grassland Group 4. In its wetland state, this community is equivalent to p51 [*Tableland Lacustrine Herbfield*] identified by Tozer *et al*. (2010). Recognised as Draft VCA ID 636 [*Lacustrine Ephemeral Grassland of the South Eastern Highlands Bioregion*] (Benson in prep).

Threats: This community is severely threatened by weed invasion at Lake Bathurst. Weed control programs further threaten components of this community there. The community is subject to continuing grazing pressures at all sites.

Reservation Status: Not known to occur in any conservation reserves.

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

r5: Wallaby-grass - Tall Speargrass – Common Everlastings Tussock Grassland of the South Eastern Highlands Bioregion

Scientific Name: *Austrodanthonia carphoides - Austrodanthonia auriculata - Bothriochloa macra - Austrostipa bigeniculata - Themeda australis - Chrysocephalum apiculatum - Lomandra bracteata - Lomandra filiformis*

Plate r5:

Vegetation Description: Community r5 is a mid-dense to dense, low to tall tussock grassland dominated by wallaby-grasses (*Austrodanthonia* spp., mainly *A. carphoides* and *A. auriculata*), Red Grass (*Bothriochloa macra*), Tall Speargrass (*Austrostipa bigeniculata*) and Kangaroo Grass (*Themeda australis*). *Chrysocephalum apiculatum* and *Lomandra* spp. (either *L. bracteata* or *L. filiformis*) are the commonest components of the lower stratum. Other grasses and forbs are present, including *Panicum effusum*, *Plantago varia*, *Austrostipa scabra*, *Elymus scaber*, *Goodenia pinnatifida*, *Triptilodiscus pygmaeus*, *Calocephalus citreus*, *Schoenus apogon* and *Tricoryne elatior.* One of the very few NSW populations of *Lepidium hyssopifolium* is found in this community.

Isolated or scattered trees and tall shrubs may be present including Yellow Box (*Eucalyptus melliodora*), *Acacia dealbata*, Blakely's Red Gum (*E. blakely*i, Candlebark (*E. rubida*), Apple Box (*E. bridgesiana*) and Snow Gum (*E. pauciflora*). Smaller shrubs may occur including *Lissanthe strigosa*, *Daviesia genistifolia*, *Melichrus urceolatus* and *Acacia genistifolia.* Trees and shrubs increase in density where this community merges with the adjacent woodland communities. Sites in high condition may have a variety of uncommon grassland forbs, including *Eryngium ovinum*, *Tricoryne elatior*, *Calocephalus citreus*, *Pimelea curviflora*, *Wurmbea dioica*, *Microtis* spp., *Dichopogon fimbriatus*, *Bulbine bulbosa* and *Calotis anthemoides.*

This grassland type is found on a variety of topographic situations, including footslopes, midslopes and flats and on a variety of substrates, including sedimentary strata, colluvium, alluvium or granite. It commonly occurs at altitudes between 700 and 1120 m. The combined factors of severe winter and spring frosts, exposure to hot drying westerly winds in summer, and to a lesser degree seasonal waterlogging and cracking clays, limit the establishment of woody taxa in this community. This grassland is mainly found in the Murrumbateman IBRA sub-region, but is also found in the Southern Tablelands portion of the Shoalhaven River valley. Sites in lower condition (i.e. lacking some of the main species that define this community) may be difficult to distinguish from low-condition sites of r3 [*Wallaby-grass – Kangaroo Grass – Rush tussock grassland of seasonally wet sites of the South Eastern Highlands Bioregion*] and r7 [*Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq
Acaena ovina	1	54
Aristida spp.	1	22
Asperula conferta	1	43
Austrodanthonia carphoides	2	46
Austrodanthonia spp.	4	96
Austrostipa bigeniculata	3	85
Austrostipa scabra var. *falcata*	1	43

Bothriochloa macra	3	84
Calocephalus citreus	1	36
Chloris truncata	1	35
Chrysocephalum apiculatum	3	80
Convolvulus angustissimus	1	52
Desmodium varians	1	42
Dichondra repens	1	20
Elymus scaber	1	58
Eryngium ovinum	1	68
Euchiton involucratus	1	26
Glycine tabacina	1	27
Goodenia pinnatifida	1	58
Hypericum gramineum	1	21
Juncus spp.	1	27
Leptorhynchos squamatus	1	25
Lomandra spp. (*L. bracteata* or *L. filiformis*)	2	80
Microlaena stipoides	1	26
Oxalis perennans	1	48
Panicum effusum	1	64
Plantago varia	1	56
Poa sieberiana	1	32
Rumex brownii	1	59
Rumex dumosus	1	21
Schoenus apogon	1	33
Solenogyne dominii	1	23
Themeda australis	2	64
Tricoryne elatior	1	44
Triptilodiscus pygmaeus	1	46
Vittadinia muelleri	1	59
Wahlenbergia spp.	1	73

Threatened Communities: EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory*; NC Act 1980 - *Natural Temperate Grassland.*

Frequently occurring weeds: *Eragrostis curvula*, *Nassella trichotoma*, *Hypericum perforatum*, *Nassella neesiana*, *Hypochaeris radicata*, *Acetosella vulgaris*, *Vulpia* spp., *Cirsium vulgare* and *Phalaris aquatica.*

Equivalent vegetation types: Community 1 (Benson 1994), Group 5 (Rehwinkel unpub.).

Threats: This community has been extensively cleared and remnants are subject to small-scale clearing, weed invasion, grazing pressures, and nutrient run-on from adjacent fertilised crops and pastures.

Reservation Status: Known from Queanbeyan NR and a number of ACT reserves. Informally reserved at Days Hill Reserve (a local government reserve at Bungendore).

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

r6: Dry Tussock Grassland of the Monaro in the South Eastern Highlands Bioregion

Scientific Name: *Poa sieberiana - Austrodanthonia* spp*. - Themeda australis - Austrostipa scabra* var*. falcata - Acaena ovina - Asperula conferta*

Plate r6:

Vegetation Description: Community r6 is an open to dense, mid-high to tall tussock grassland dominated by one or more of the following in the upper stratum: Snow-grass (*Poa sieberiana*), wallaby-grasses (*Austrodanthonia* spp.), Kangaroo Grass (*Themeda australis*), Corkscrew Grass (*Austrostipa scabra* var. *falcata*) and Tall Speargrass (*Austrostipa bigeniculata*). There is a diversity of forbs and other grasses in the intertussock spaces, including *Chrysocephalum apiculatum*, *Acaena ovina*, *Asperula conferta*, *Wahlenbergia* spp., *Scleranthus diander*, *Elymus scaber*, *Plantago varia*, *Poa meionectes*, *Bothriochloa macra*, *Brachyscome heterodonta*, *Enneapogon nigricans* and *Leptorhynchos squamatus*. Isolated or scattered trees may be present, including Snow Gum (*Eucalyptus pauciflora*), *Acacia dealbata*, *Acacia rubida* and Weeping Snow Gum (*E. lacrimans*). Isolated patches of shrubs may also occur, including *Einadia nutans*, *Melicytus* sp. 'Snowfields', *Cryptandra amara*, *Pimelea glauca*, *Discaria pubescens*, *Mirbelia oxylobioides* and *Dodonaea procumbens.* Trees and shrubs increase in density where this community merges with the adjacent woodland communities or on rocky sites. Sites in high condition may have a variety of uncommon grassland forbs, including *Geranium antrorsum*, *Swainsona sericea*, *Cullen tenax*, *Pimelea curviflora* and *Stackhousia monogyna.*

Dry Tussock Grassland of the Monaro is found on a variety of substrates; most commonly on basalt and sedimentary strata, less commonly on granite, and rarely on colluvium or alluvium. It commonly occurs on midslope, upperslopes and plateaux situations, and rarely on footslopes and flats. It occurs at altitudes between 300 and 1100 m within the drier portions of the Monaro region, commonly referred to as the Monaro rainshadow. The drivers of this community are a combination of severe winter and spring frosts, exposure to hot drying westerly winds in summer, periodic snow and the occurrence of cracking clays (particularly on colluvial soils derived from basalt) all serve to limit the establishment of woody taxa. Community r2 [*River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes*, *Drainage Lines along drainage lines and valley flats*] may be found in moist depressions and drainage lines adjacent to this community. Sites along the wetter fringe of the region, especially those in lower condition (i.e. lacking some of the main species that define this community) may be confused with low-condition sites of r7 [*Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion*].

Characteristic Species:

Species	C/A	Freq
Acaena ovina	2	87
Asperula conferta	2	81
Austrodanthonia spp.	3	96
Austrostipa bigeniculata	1	44
Austrostipa scabra var. *falcata*	2	70
Bothriochloa macra	1	42
Brachyscome heterodonta	1	60
Brachyscome rigidula	1	25
Carex spp. (*C. breviculmis* or *C. inversa*)	1	57
Chrysocephalum apiculatum	3	81
Convolvulus angustissimus	1	75
Crassula sieberiana	1	30
Cryptandra amara	1	24
Cullen tenax	1	23
Cymbonotus lawsonianus	1	35
Desmodium varians	1	28
Dichelachne spp.	1	29
Dichondra repens	1	25
Dichondra sp.A	1	39
Einadia nutans	1	27
Elymus scaber	2	72
Enneapogon nigricans	1	52
Epilobium spp.	1	37
Euchiton spp.	1	20
Geranium antrorsum	1	47
Glycine clandestina	1	21
Glycine tabacina	1	22
Goodenia pinnatifida	1	22
Hymenanthera dentata	1	27
Leptorhynchos squamatus	1	40
Oxalis perennans	1	47
Pimelea curviflora	1	21
Pimelea glauca	1	22
Poa meionectes	1	51
Poa sieberiana	4	94
Rumex brownii	1	49
Scleranthus biflorus	1	33
Scleranthus diander	2	65
Solenogyne gunnii	1	30
Stackhousia monogyna	1	20
Swainsona sericea	1	33
Themeda australis	3	71
Vittadinia cuneata	1	37
Vittadinia muelleri	2	73
Vittadinia triloba	1	39
Wahlenbergia spp.	2	82

Threatened Communities: EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory.*

Frequently occurring weeds: *Eragrostis curvula*, *Nassella trichotoma*, *Hypericum perforatum*, *Hypochaeris radicata*, *Acetosella vulgaris*, *Vulpia* spp. *Cirsium vulgare* and *Onopordum acanthium.*

Equivalent vegetation types: Group 6 (Rehwinkel unpub.), which includes distinct Sub-groups 6a, 6b and 6c. These subgroups correspond with Benson (1994) communities 4, 3b and 3a respectively. The higher diversity components of community 5 (Benson 1994) also occur in this community.

Three distinct variants of this community may be discerned, which correspond with Communities 4, 3b and 3a of Benson (1994) respectively.

Threats: This community has been extensively cleared and/or modified with remnants subject to small-scale clearing, weed invasion and grazing pressures.

Reservation Status: Occurs in Kuma NR.

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory* EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

r7: Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion

Scientific Name: *Themeda australis - Austrodanthonia* spp. *- Poa sieberiana - Chrysocephalum apiculatum - Leptorhynchos squamatus*

Plate r7:

Vegetation Description: Community r7 is an open to dense, mid-high to tall tussock grassland with the upper stratum dominated by Kangaroo Grass (*Themeda australis*) and with a sub-dominance of wallaby-grasses (*Austrodanthonia* spp.) and Snow-grass (*Poa sieberiana*), with inter-tussock spaces occupied by *Chrysocephalum apiculatum*, *Leptorhynchos squamatus*, *Microlaena stipoides*, *Wahlenbergia* spp., *Asperula conferta*, *Juncus* spp., *Acaena ovina*, *Elymus scaber*, *Schoenus apogon* and *Plantago varia*. Isolated or scattered trees may be present, including Snow Gum (*Eucalyptus pauciflora*), Candlebark (*E. rubida*), *Acacia dealbata*, Black Gum (*E. aggregata*), *A. mearnsii* and Yellow Box (*E. melliodora*). Isolated shrubs or patches of shrubs may also occur, including *Melicytus sp.* 'Snowfields', *Hovea linearis*, *Pimelea glauca*, *Lissanthe strigosa*, *Daviesia latifolia*, *Daviesia mimosoides*, *Leucopogon fraseri*, *Melichrus urceolatus*, *Bossiaea buxifolia*, *Cryptandra amara* and *Kunzea parvifolia*. Trees and shrubs increase in density where this community merges into the adjacent woodland communities. Sites in high condition may have a variety of uncommon grassland forbs including *Hypericum japonicum*, *Tricoryne elatior*, *Pimelea curviflora*, *Microtis* spp. *Calocephalus citreus*, *Eryngium ovinum*, *Craspedia* spp., *Ranunculus lappaceus*, *Bulbine bulbosa*, *Stackhousia monogyna* and *Wurmbea dioica*.

This grassland type is found on midslope and footslope situations and to a lesser degree on flats. It is found on a variety of lithologies, but most commonly on sedimentary strata, colluvium and granite, and less frequently on alluvium and basalt. It is distributed widely, being found through the northern sections of the Southern Tablelands (Yass to Crookwell, Goulburn to Braidwood) and in the moister outer fringes of the Monaro region that are beyond the rainshadow areas. Outliers occur in the Tumbarrumba, Tumut, Bathurst and Orange regions. It occurs at altitudes between 300 and 1100 m. Severe winter and spring frosts, exposure to hot drying westerly winds in summer, and to a lesser degree seasonal waterlogging and the occurrence of cracking clays limit the establishment of woody taxa. It merges with r2 [*River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes, Drainage Lines and Wallaby-grass – Kangaroo Grass – Rush tussock Grassland of Seasonally Wet Sites*] in moist depressions and drainage lines. This community could be mis-identified as r6 [*Dry Tussock Grassland of the Monaro in the South Eastern Highlands Bioregion*] where a zone of overlap occurs. Confusion between this community and the others may particularly occur where the communities intergrade with each other, and especially in sites in lower condition (i.e. lacking some of the main species that define this community).

Characteristic Species:

Species	C/A	Freq
Acaena ovina	1	61
Asperula conferta	1	59
Austrodanthonia spp.	2	87
Austrostipa bigeniculata	1	21
Bothriochloa macra	1	21
Carex spp. (*C. breviculmis* or *C. inversa*)	1	35
Chrysocephalum apiculatum	2	79
Convolvulus angustissimus	1	40
Dichelachne spp.	1	26
Drosera peltata	1	26
Elymus scaber	1	50
Epilobium spp.	1	29
Eryngium ovinum	1	21
Euchiton spp.	1	64
Glycine tabacina	1	20
Gonocarpus tetragynus	1	42
Haloragus heterophyllus	1	26
Hypericum japonicum	1	39
Juncus spp.	1	63
Leptorhynchos squamatus	2	70
Lomandra spp. (*L. bracteata* or *L. filiformis*)	1	40
Luzula spp.	1	36
Microlaena stipoides	1	49
Microtis spp.	1	26
Oxalis perennans	1	46

Panicum effusum	1	29
Pimelea curviflora	1	32
Poa labillardierei	1	25
Poa sieberiana	2	77
Rumex dumosus	1	54
Schoenus apogon	1	41
Scleranthus biflorus	1	21
Scleranthus fasciculatus	1	20
Solenogyne dominii	1	30
Solenogyne gunnii	1	24
Themeda australis	6	100
Tricoryne elatior	1	39
Triptilodiscus pygmaeus	1	39
Vittadinia muelleri	1	27
Wahlenbergia spp.	1	69

Threatened Communities: EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory*; NC Act 1980 - *Natural Temperate Grassland.*

Frequently occurring weeds: *Eragrostis curvula*, *Nassella trichotoma*, *Hypericum perforatum*, *Hypochaeris radicata*, *Acetosella vulgaris*, *Vulpia* spp. *Cirsium vulgare* and *Onopordum acanthium.*

Equivalent vegetation types: Community 2 (Benson 1994), Group 7 (Rehwinkel unpub.).

Threats: This community has been extensively cleared and/or modified with remnants subject to small-scale clearing, weed invasion and grazing pressures.

Reservation Status: Occurs in Turallo NR and Yaouk NR, as well as several conservation reserves in the ACT. Likely to occur at Dangelong NR. It is also known from a local government reserve near Bungendore (Days Hill Reserve) and Nature Conservation trust covenanted lands in the upper Shoalhaven catchment.

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory* EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

r8: Kangaroo Grass - Purple Wire-grass – Wattle Mat-rush dry tussock grassland in the Southern Tablelands region of the South Eastern Highlands Bioregion

Scientific Name: *Themeda australis - Aristida ramosa - Lomandra filiformis - Austrodanthonia* spp. - *Chrysocephalum apiculatum*

Plate r8:

Vegetation Description: Community r8 is an open to dense, mid to tall tussock grassland with the upper stratum dominated by Kangaroo Grass (*Themeda australis*), with high cover of Purple Wire-grass (*Aristida ramosa*), Wattle Mat-rush (*Lomandra filiformis*) and Brush-tailed Speargrass (*Austrostipa densiflora*) and with the inter-tussock spaces occupied by *Austrodanthonia* spp., *Chrysocephalum apiculatum*, *Microlaena stipoides*, *Wahlenbergia* spp., *Pimelea curviflora*, *Goodenia hederacea* subsp. *hederacea*, *Lomandra multiflora*, *Austrostipa scabra* var. *falcata*, *Gonocarpus tetragynus* and *Poa sieberiana.* Isolated or scattered trees may be present, including Snow Gum (*Eucalyptus pauciflora*), *Jacksonia scoparia*, *Acacia mearnsii*, Yellow Box (*E. melliodora*) and *A. dealbata*. Isolated patches of shrubs may also occur including *Lissanthe strigosa*, *Hibbertia obtusifolia*, *Melichrus urceolatus*, *Astroloma humifusum*, *Bursaria spinosa*, *Dillwynia sericea* and *Dodonaea boroniifolia.* Trees and shrubs increae in density where this community merges with the adjacent woodland communities and shrubs may be especially dense in rocky areas. Sites in high condition may have a variety of uncommon grassland forbs including *Pimelea curviflora*, *Tricoryne elatior*, *Dianella revoluta*, *Boerhavia dominii*, *Stylidium graminifolium sens. lat.*, *Bulbine glauca*, *Cymbopogon refractus* and *Dianella longifolia.*

This grassland type is most commonly found on midslope and upperslope situations and to a lesser degree on rocky flats adjacent to creeks. It is found most commonly on soils derived from sedimentary

strata and infrequently from granite, usually on steep, exposed sites including in river gorges. Such slopes are north-westerly in aspect and overlook extensive valleys or plains; they are thus subjected to hot drying north-westerly winds in summer, which is a main driver of this community. It is sparsely distributed through the northern sections of the Southern Tablelands, in principally the Yass, Goulburn, Tarago and Braidwood districts. It occurs at altitudes between 500 and 740 metres. It is sometimes adjacent to r7 [*Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion*], which occurs on moister sites downslope. Confusion between these two communities is expected to occur where the communities intergrade with each other, and especially in sites in lower condition (i.e. those lacking some of the main species that define this community).

Characteristic Species:

Species	C/A	Freq
Acacia rubida	1	21
Acaena ovina	1	21
Aristida ramosa	1	58
Astroloma humifusum	1	26
Austrodanthonia spp.	2	68
Austrostipa bigeniculata	1	21
Austrostipa densiflora	2	47
Austrostipa scabra var. *falcata*	1	47
Boerhavia dominii	1	32
Bothriochloa macra	1	37
Brachyloma daphnoides	1	21
Bulbine glauca	1	26
Bursaria spinosa	1	26
Carex spp. (*C. breviculmis* or *C. inversa*)	1	21
Cheilanthes spp. (*C. austrotenuifolia* or *C. sieberi*)	1	37
Chrysocephalum apiculatum	2	63
Convolvulus angustissimus	1	21
Crassula sieberiana	1	21
Cryptandra amara	1	21
Cymbopogon refractus	1	26
Dianella longifolia	1	26
Dianella revoluta	1	42
Dillwynia sericea	1	26
Diuris punctata	1	21
Dodonaea boroniifolia	1	26
Elymus scaber	1	26
Enneapogon nigricans	1	26
Eragrostis spp.	1	26
Euchiton spp.	1	53
Glycine tabacina	1	37
Gonocarpus tetragynus	1	42
Goodenia hederacea subsp. *hederacea*	1	53
Hibbertia obtusifolia	1	42
Hovea linearis	1	21
Hypericum gramineum	1	21
Joycea pallida	1	21
Laxmannia gracilis	1	21
Leptorhynchos squamatus	1	32
Lissanthe strigosa	1	47
Lomandra filiformis	2	100
Lomandra longifolia	1	32
Lomandra multiflora	1	58
Luzula spp.	1	26
Melichrus urceolatus	1	37
Microlaena stipoides	2	63
Microtis spp.	1	21
Opercularia hispida	1	21
Oxalis perennans	1	42
Panicum effusum	1	37
Pimelea curviflora	1	63
Plantago varia	1	21
Poa sieberiana	1	42
Rumex brownii	1	26
Schoenus apogon	1	26
Solenogyne dominii	1	42
Stylidium graminifolium sens. lat.	1	32
Thelymitra spp.	1	21
Themeda australis	5	95
Tricoryne elatior	1	53
Triptilodiscus pygmaeus	1	26
Vittadinia muelleri	1	26
Wahlenbergia spp.	2	74
Westringia eremicola	1	21

Threatened Communities: EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory*; Although not yet quantified in the ACT, if confirmed this community would be listed under the NC Act 1980 - *Natural Temperate Grassland.*

Frequently occurring weeds: *Eragrostis curvula*, *Nassella trichotoma*, *Hypericum perforatum*, *Hypochaeris radicata*, *Acetosella vulgaris*, *Vulpia* spp. *Cirsium vulgare* and *Onopordum acanthium.*

Equivalent vegetation types: Group 8 (Rehwinkel unpub.).

Threats: This community has been extensively cleared and/or modified with remnants subject to small-scale clearing, weed invasion and grazing pressures.

Reservation Status: Not known to occur in any formal conservation reserves, however it occurs on Nature Conservation Trust covenanted land in the upper Shoalhaven catchment.

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the *Natural Temperate Grassland of the*

Southern Tablelands of NSW and the Australian Capital Territory EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

ADDITIONAL COMMUNITIES

Note: The following plant communities were not quantified in this study from analyses of field survey quadrat data. Rather, these additional plant communities were proposed during expert workshop and review, and are presented here as potential units to target for future sampling and investigation, and for potential recognition in any future vegetation mapping work in the Murrumbidgee catchment.

q1: Drooping She-oak low woodland to open forest on shallow infertile hillslopes in the Australian Capital Territory and surrounds

Scientific Name: *Eucalyptus polyanthemos – Eucalyptus nortonii – Eucalyptus rossii / Allocasuarina verticillata* / *Bursaria spinosa*

Plate q1: Drooping She-oak low woodland to open forest in Tuggeranong Hill NR ACT

Vegetation Description: Community q1 has been described from Hueneke (1976). Community q1 occurs in a variety of structural states from low mid-dense forest to mid-high sparse woodland. Some stands are almost pure Drooping She-oak (*Allocasuarina verticillata*) whilst other sites are co-dominated by eucalypts. In the southern half of its range, especially on Mt. Clear soil landscapes, the canopy may be composed of *A. verticillata*, Red Box (*Eucalyptus polyanthemos*), Norton's Box (*E. nortonii*), Scribbly Gum (*E. rossii*) and Broad-leaved Peppermint (*E. dives*). In northern areas where the Campbell soil landscape predominates, *A .verticillata* occurs with Apple Box (*E. bridgesiana*), Blakely's Red Gum (*E. blakelyi*), Yellow Box (*E. melliodora*) and Brittle Gum (*E. mannifera*). Kurrajong (*Brachychiton populneus*) is a widespread sub-dominant tree in this community. *Bursaria spinosa*, *Cassinia longifolia* and *Cassinia aculeata* are the most common species in a spare to very spare midstorey along with younger age classes of *A. verticillata*. The groundcover is usually sparse to very spare and includes *Austrostipa scabra*, *Austrostipa densiflora*, *Joycea pallida*, *Austrodanthonia caespitosa*, *Lomandra filiformis*, *Lomandra bracteata*, *Oxalis perrenans*, *Hydrocotyle laxiflora* and *Cheilanthes* spp.

A. verticillata will become more dominant if the vegetation is disturbed. The clearing and grazing activities of European settlers on the hills around Canberra provided optimum conditions for an increase in the area dominated by this community (Hueneke 1976). Whilst this may be a seral community there is little evidence that the species is replaced in any direct successional way by eucalypts, and old growth trees and multiple age classes are known from Tuggeranong Hill NR and Mt. Rob Roy NR. Some authors have speculated that Tuggeranong Hill NR supports *A. verticillata* that is well in excess of 100 years old (Hueneke 1976).

Stands of *Drooping Sheoak low woodland to open forest* are generally observed on well- drained soils derived from granites or sandstone at altitudes up to approximately 1100 m above sea level. This community can occur on any aspect but is most common on northern to western slopes. It is seen on Mt. Clear and Campbell soil landscapes, and there are small stands on the transferral Burra soil landscape. All observed occurrences are typified by steep slopes, shallow to skeletal soils and low fertility.

Characteristic Species: Not assessed. Refer to vegetation description for further qualititave information.

Note that the above species were not derived from this upper Murrumbidgee study as the community was not identified in the analysis.

Threatened Communities: May occur in patches amongst TSC Act 1995 - *White Box Yellow Box Blakely's Red Gum Woodland*; EPBC Act 1999 - *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland*; NC Act 1980 - *Yellow Box/Red Gum Grassy Woodland.*

Equivalent vegetation types: *Casuarina stricta* type (E. Ingwersen *et.al*. 1974), *Casuarina stricta* type (C. Ingwersen *et.al*. 1974), *Casuarina stricta* (Hueneke 1976).

Threats: Many areas of this community have been impacted by clearing, grazing and fire resulting in changed structure and dominance. Current threats include changed disturbance regimes, rabbit grazing and sheep grazing. This community is very sensitive to disturbance with long term changes to canopy dominance determined by the type and duration of the disturbance. Grazing can simplify the groundcover and reduce shrub cover due to the low fertility of the soils and their tendency to erode.

Reservation Status: The community is relatively well conserved in the ACT and is found in a number of reserves including Mt. Majura NR, Mt. Ainslie NR, Mt. Taylor NR, Tuggeranong Hill NR and Rob Roy NP. It is also found in Namadgi NP. Stands of this community also occur on Urban Open Space and on agricultural leases in the Naas Valley.

Extent of clearing: Unknown, but likely to be minimal. Some stands may be derived from histiroc clearing or fire in other plant communities.

q2: Weeping Snow Gum – Kangaroo Grass - Snow-grass open woodland of the Adaminaby region of the South Eastern Highlands Bioregion

Scientific Name: *Eucalyptus lacrimans / Melicytus* sp. 'Snowfields' – *Bossiaea foliosa – Mirbelia oxylobioides / Themeda australis – Poa sieberiana*

Vegetation Description: Community q2 is a grassy mid-high open woodland dominated by Weeping Snow Gum (*Eucalyptus lacrimans*). The shrub layer is mid-dense to sparse and includes *Melicytus* sp. 'Snowfields', *Bossiaea foliosa* and *Mirbelia oxylobioides*. The ground cover is generally sparse to mid-dense. Common grasses include *Themeda australis*, *Poa sieberiana* and *Austrodanthonia* spp.. Forbs include *Chrysocephalum apiculatum*, *Plantago varia*, *Asperula conferta*, *Scleranthus diander*, *Leptorhynchos squamatus*, *Scleranthus biflorus* and *Brachyscome heterodonta*.

This community generally occurs on rocky sites, often with exposed sedimentary strata on gently rolling terrain in rainshadow areas in the Adaminaby area of the Monaro region of the South Eastern Highlands bioregion. It differs from a34 [*Weeping Snow Gum - Small-fruited Hakea - Blue Snow-grass grassy open woodland of the Australian Alps Bioregion*] with respect to distribution and floristics. Understorey taxa for q2 are commonly found in other grassy woodlands and grasslands of the Monaro, whereas a34 is characterised by shrubby and herbaceous taxa that are found primarily in the Australian Alps.

Characteristic Species: Not assessed. Refer to vegetation description for qualitative species information.

Threatened Communities: Some sites may be part of the TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions.*

Frequently occurring weeds: *Hypochaeris radicata.*

Equivalent vegetation types: Nil. A poorly sampled community.

Threats: Substantially cleared and with the groundlayer highly modified. The structurally dominant *Eucalyptus lacrimans* is in severe decline in most private land remnants, possibly because of drought and insect attack. As a woodland, this community is likely to disappear from most of its range in the coming decades because of tree decline and lack of recruitment caused by grazing.

Reservation Status: This community is not reserved.

Extent of clearing: Considered to be highly cleared.

q3: Tall Speargrass – Corkscrew Grass – Wallaby-grass Disclimax Grassland of the South Eastern Highlands Bioregion

Scientific Name: *Austrostipa bigeniculata – Austrostipa scabra – Austrodanthonia* spp.

Vegetation Description: Community q3 is an open to mid-dense, low to tall tussock grassland dominated or co-dominated by Tall Speargrass (*Austrostipa bigeniculata*), Corkscrew (*Austrostipa scabra* var. *falcata*) and/or wallaby-grasses (*Austrodanthonia* spp.). Other grasses may occur, including *Chloris truncata* and *Panicum effusum.* Few forbs occur; those that do include the most resilient, grazing and/or fertiliser-tolerant species such as *Solenogyne dominii*, *Cymbonotus lawsonianus*, *Euchiton* spp., *Vittadinia* spp., *Geranium* spp. and *Wahlenbergia* spp. A variety of *Juncus* spp. and *Carex* spp. may also be present. Isolated or scattered trees and shrubs may be present; these will be those species that occur in the less disturbed communities from which this grassland type is derived.

This grassland type occurs on dryer sites throughout, like the grassland types from which it is derived. In its disclimax form, it is known from altitudes between 300 and 1100 m.

The drivers that result in this disclimax grassland are principally historic high grazing pressures, including pressures from stock and feral animals. It usually occurs on sites with depleted soil nutrient levels. Grasslands of this type can be kept in a disclimax state by continued kangaroo grazing, as at Queanbeyan NR. In grasslands of this type, there may be a high cover of exotic species, particularly pasture grass species, exotic weeds and annual exotic grasses.

Community q3 is derived from several grassland types including r5 [*Tall Speargrass – Common Everlastings Tussock Grassland of the South Eastern Highlands Bioregion*], r6 [*Dry Tussock Grassland of the Monaro in the South Eastern Highlands Bioregion*] and r7 [*Kangaroo Grass - Wallaby-grass -*

Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion]. As a secondary grassland, q3 also derives from some woodland communities, particularly those previously dominated or co-dominated by Snow Gum (*Eucalyptus pauciflora*), Candlebark (*E. rubida*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) and Apple Box (*E. bridgesiana*). It may also be derived from adjacent dry forests where edge clearing has occurred, such as those containing Brittle Gum (*E. mannifera*), Broad-leaved Peppermint (*E. dives*), Red Box (*E. polyanthemos*) and Red Stringybark (*E. macrorhyncha*).

Characteristic Species: Not assessed as part of this study. The below species list is extracted from community 5 of Benson (1994), with some taxa considered uncommon in the disclimax state of this communuity excluded.

Species	C/A	Freq
Acaena ovina	-	10
Asperula conferta	-	20
Austrodanthonia carphoides	-	70
Austrodanthonia laevis	-	30
Austrodanthonia linkii	-	30
Austrodanthonia racemosa	-	50
Austrostipa bigeniculata	-	90
Austrostipa blackii	-	20
Austrostipa scabra	-	90
Bothriochloa macra	-	10
Carex inversa	-	40
Chamaesyce drummondii	-	40
Chloris truncata	-	10
Convolvulus angustissimus	-	40
Cymbonotus lawsonianus	-	10
Elymus scaber	-	60
Enneapogon nigricans	-	70
Oxalis exilis	-	30
Oxalis perennans	-	20
Poa sieberiana	-	40
Rumex brownii	-	50
Solenogyne dominii	-	30
Vittadinia muelleri	-	50
Wahlenbergia communis	-	60
Wahlenbergia gracilis	-	20

Threatened Communities: Community q3 may be derived from the following threatened communities: EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory*; NC Act 1980 - *Natural Temperate Grassland;* TSC Act 1995 - *White Box Yellow Box Blakely's Red Gum Woodland;* EPBC Act 1999 - *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland*; NC Act 1980 - *Yellow Box/Red Gum Grassy Woodland*; TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions.*

Frequently occurring weeds: *Eragrostis curvula*, *Nassella trichotoma*, *Hypericum perforatum*, *Nassella neesiana*, *Hypochaeris radicata*, *Acetosella vulgaris*, *Vulpia* spp., *Cirsium vulgare* and *Phalaris aquatica.*

Equivalent vegetation types: It is equivalent to Benson (1994) Community 5 and community 9 or Rehwinkel (unpub.).

Threats: Whilst it is a derived community, it continues to be extensively cleared and/or modified with remaining remnants subject to small-scale clearing, weed invasion and grazing pressures.

Reservation Status: Occurs in parts of Queanbeyan NR.

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory* EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

q4: Weeping Grass – Wallaby-grass Disclimax Grassland of the South Eastern Highlands Bioregion

Scientific Name: *Microlaena stipoides* - *Austrodanthonia* spp.

Vegetation Description: Community q4 is an open to mid-dense, low tussock grassland dominated or co-dominated by Weeping Grass (*Microlaena stipoides*) and wallaby-grasses (*Austrodanthonia* spp.). Other grasses may occur, including various native *Poa*, *Lachnagrostis* and *Eragrostis* species. Few forbs occur; those that do include the most resilient, grazing and/or fertiliser-tolerant species scuh as *Solenogyne dominii*, *Solenogyne gunnii*, *Cymbonotus lawsonianus*, *Dichondra repens*, *Euchiton* spp., *Geranium* spp. and *Wahlenbergia* spp.. A variety of *Juncus* spp. and *Carex* spp. may also be present. Isolated or scattered trees may be present, including Snow Gum (*Eucalyptus pauciflora*), Candlebark (*E. rubida*), Black Gum (*E. aggregata*), Swamp Gum (*E. ovata*) and Ribbon Gum (*E. viminalis*).

This grassland type occurs on moister sites in the eastern parts of the South Eastern Highlands (i.e., the upper Shoalhaven River valley and adjacent

catchments). It is derived from r7 [*Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion*]. This grassland type is also derived from some woodland types, particularly those previously dominated or co-dominated by eucalypts mentioned above as well as Yellow Box (*E. melliodora*) and Apple Box (*E. bridgesiana*), and the adjacent forest communities, particularly those previously dominated or co-dominated by *E. viminalis*, Broad-leaved Peppermint (*E. dives*) and Narrow-leaved Peppermint (*E. radiata*). It is known from altitudes between 250 and 850 m.

The drivers that result in this disclimax grassland are principally historic high grazing pressures, including pressures from stock and feral animals, and application of agricultural fertilisers. In grasslands of this type, there may be a high cover of exotic species, particularly pasture grass species, exotic weeds and annual exotic grasses. It may be derived from r7 [*Kangaroo Grass – Wallaby-grass – Snow-grass Moinst Tussock Grassland of the South EasternHighlands Bioregion*]. As a secondary grassland, it also derives from some woodland communities, particularly those dominated or co-dominated by Snow Gum (*E. pauciflora*), Candlebark (*E. rubida*), Apple Box (*E. bridgesiana*) and Ribbon Gum (*E. viminalis*). Where edge cleaing has occurred, it may be derived from moist forest communities such as those containing *E. viminalis*, Braod-leaved Peppermint (*E. dives*) or Narrow-leaved Peppermint (*E. radiata*).

Characteristic Species: Not assessed. Refer to vegetation description for further qualitative information.

Threatened Communities: Community q4 is part of the following threatened communities: EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory*; TSC Act 1995 - *White Box Yellow Box Blakely's Red Gum Woodland*; EPBC Act 1999 - *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland*; TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions.*

Frequently occurring weeds: *Hypericum perforatum*, *Nassella neesiana*, *Hypochaeris radicata*, *Acetosella vulgaris*, *Vulpia* spp. *Cirsium vulgare*, *Dactylis glomerata* and *Phalaris aquatica.*

Equivalent vegetation types: Community 10 of Rehwinkel (unpub.). As a disclimax grassland, it is derived from Community 2 (Benson 1994).

Threats: Community q4 continues to be extensively cleared and/or further modified with remaining remnants subject to small-scale clearing, weed invasion and grazing pressures.

Reservation Status: Not known from any conservation reserves.

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory* EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

q5: River Tussock – Snow-grass Disclimax Grassland on upper and midslopes of the South Eastern Highlands Bioregion

Scientific Name: *Poa labillardierei - Poa sieberiana*

Vegetation Description: Community q5 is a dense medium to tall tussock grassland dominated or co-dominated by River Tussock (*Poa labillardierei*) and/or Snow-grass (*Poa sieberiana*). Other grasses occur as minor components in this community including *Microlaena stipoides*, *Austrodanthonia* spp., *Austrostipa* spp., *Lachnagrostis* spp. and *Eragrostis* spp.. Few forbs occur; those that do include the most resilient, grazing and/or fertiliser-tolerant species *Asperula conferta*, *Solenogyne dominii*, *S. gunnii*, *Cymbonotus lawsonianus*, *Euchiton* spp., *Geranium* spp. and *Wahlenbergia* spp. A variety of *Juncus* spp. and *Carex* spp. may also be present. Isolated or scattered trees may be present including Snow Gum (*Eucalyptus pauciflora*), Candlebark (*E. rubida*), Ribbon Gum (*E. viminalis*), Black Gum (*E. aggregata*), Mountain Gum *E. dalrympleana*) and Swamp Gum (*E. ovata*).

This grassland type occurs on moist, fertile sites in the eastern parts of the South Eastern Highlands (i.e., the upper Shoalhaven River valley and adjacent catchments) and also the moister, non-rainshadow parts of the Monaro region. It is derived from r7 [*Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion*]. Grasslands of this type are distinct from the drainage-line community r2 [*River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes*, *Drainage Lines and Flats of the South Eastern Highlands Bioregion*], as they occur in upslope situations. The fertility is derived from addition of artificial fertilisers as part of production systems. This grassland type also derives from some woodland types, particularly those previously dominated or co-dominated by eucalypts mentioned

above. Species that may occur in an ecotone with adjacent moist forest communities also include Broad-leaved Peppermint (*E. dives*) and Narrow-leaved Peppermint (*E. radiata*). It is known from altitudes between 680 and 1100 m.

The drivers that result in this disclimax grassland are principally historic high grazing pressures, including pressures from stock and feral animals, and addition of agricultural fertilisers. In grasslands of this group, there may be a high cover of exotic species, particularly pasture grass species, exotic forbs and annual exotic grasses.

Characteristic Species: Not assessed. Refer to vegetation description for further qualitative information.

Threatened Communities: Community q5 is part of the following threatened communities: EPBC Act 1999 – *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory*; TSC Act 1995 - *Tablelands Snow Gum*, *Black Sallee*, *Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands*, *Sydney Basin*, *South East Corner and NSW South Western Slopes Bioregions.*

Frequently occurring weeds: *Hypericum perforatum*, *Nassella neesiana*, *Hypochaeris radicata*, *Acetosella vulgaris*, *Vulpia* spp. *Cirsium vulgare*, *Dactylis glomerata* and *Phalaris aquatica.*

Equivalent vegetation types: Community 11 (Rewinkel unpub.). As a disclimax grassland, this **c**ommunity is derived from community 8 (Benson 1994).

Threats: Community q5 continues to be extensively cleared and/or further modified with remaining remnants subject to small-scale clearing, weed invasion and grazing pressures.

Reservation Status: Not known from any conservation reserves.

Extent of clearing: Clearing figures are unavailable for grassland communities. Throughout its range, only 3% of the *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory* EEC remains in high ecological integrity, relative to its pre-European settlement extent (Environment ACT 2006).

VCA344: Argyle Apple – Black Wattle valley open forest of the Yass - Rye Park region of the South Eastern Highlands and adjoining NSW South Western Slopes Bioregions

Scientific Name: *Eucalyptus cinerea* subsp. *cinerea - Eucalyptus macrorhyncha - Eucalyptus goniocalyx - Eucalyptus mannifera* subsp. *mannifera / Acacia mearnsii - Acacia genistifolia - Daviesia leptophylla - Cassinia aculeata / Poa sieberiana - Microlaena stipoides - Dianella revoluta - Hydrocotyle laxiflora*

Plate VCA344: Plant Community VCA344 (Benson *et al.* 2010).

Vegetation Description: This community is identified as VCA ID 344 by Benson *et al.* (2010) and the following description comes from those authors. VCA344 is a mid-high open forest dominated by Argyle Apple (*Eucalyptus cinerea* subsp. *cinerea*) often with Red Stringybark (*Eucalyptus macrorhyncha*), Long-leaved Box (*Eucalyptus goniocalyx*) or Brittle Gum (*Eucalyptus mannifera* subsp. *mannifera*). Yellow Box (*Eucalyptus melliodora*) or Red Box (*Eucalyptus polyanthemos*) may occasionally be present. The shrub layer is sparse and includes *Acacia mearnsii*, *Acacia dealbata*, *Acacia genistifolia*, *Daviesia leptophylla*, *Cassinia aculeata*, *Cassinia arcuata*, *Indigofera australis* and *Pultenaea subspicata*. In moist areas along creeks *Leptospermum myrtifolium*, *Leptospermum juniperinum* or *Callistemon sieberi* may be present. The ground cover may be dense after rain but is generally sparse to mid-dense. Common grass species include *Poa sieberiana*, *Microlaena stipoides*, *Echinopogon ovatus* and *Themeda australis*. The graminoid *Lomandra filiformis* subsp. *filiformis* is often common. Forb species include *Dianella revoluta*, *Poranthera microphylla*, *Hydrocotyle laxiflora*, *Acaena novae-zelandiae*, *Gonocarpus tetragynus*, *Goodenia hederacea* subsp. *hederacea*, *Dichondra repens*, *Senecio prenanthoides* and *Wahlenbergia stricta*. The rock fern *Cheilanthes austrotenuifolia* may be

present. The sedges *Schoenus apogon* and *Carex appressa* and the rush *Luzula flaccida* are common in moister areas. Bracken Fern (*Pteridium esculentum*) may be present in some valleys.

This community generally occurs on brown to grey or yellow clay loam soils, that may be sodic and highly erodable, and derived from sedimentary or metamorphic substrates. Occasionally, it may occur on alluvium along creeks and on colluvial footslopes. It is mainly distributed in the Yass to Rye Park region of the South Eastern Highlands and the upper NSW South-western Slopes bioregions (Benson *et al.* 2010).

Characteristic Species: Not assessed. Refer to vegetation description for qualitative information.

Threatened Communities: Not currently listed under legislation but assessed as Endangered by Benson *et al.* (2010). Sites with Yellow Box (*Eucalyptus melliodora*) and other components of Box-Gum Woodland are part of the TSC Act 1995 – *White Box – Yellow Box – Blakely's Red Gum Woodland* and the EPBC Act 1999 – *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland.*

Frequently occurring weeds: Benson *et al.* (2010) list the following weed taxa as common in VCA ID 344: *Hypochaeris radicata*, *Vulpia muralis*, *Briza maxima*, *Aira caryophyllea*, *Anagallis arvensis*, *Trifolium campestre*, *Cirsium vulgare*, *Briza minor*, *Conyza albida*, *Sonchus asper* subsp. *glaucescens*, *Holcus lanatus*, *Rubus discolor* and *Phalaris aquatica.*

Equivalent vegetation types: Identified by Benson *et al.* (2010) as VCA ID 344. These authors refer to vegetation type 2 identified by Doherty (1997) for Mundoonen NR, VG8 of Gellie and Fanning (2004) and VG92 [*Tablelands Acacia/Grass/Herb Dry Forest*] described by Gellie (2005). It is a minor part of Biolandscape EasS84 in Priday (2006).

Threats: Described by Benson *et al.* (2010) as substantially cleared and weed infested.

Reservation Status: Benson *et al.* (2010) identified that areas of this community are reserved in Burrinjuck NR (150 ha), Oak Creek NR (12 ha), Razorback NR (10 ha) and Mundoonen NR (4 ha).

Extent of clearing: Benson *et al.* (2010) estimated that approximately 30% of the original extent of this community remains.

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8. APPENDICES

Appendix 1: Equivalent plant communities from other major classifications

Prefixes: **a** (McDougall and Walsh 2007); **b** (Benson 1994); **bj** (Benson and Jacobs 1994); **g** (Gellie 2005); **e, m** and **p** (Tozer *et al.* 2010), **r** (Rehwinkel unpub.), **VCA** (Benson *et al.* 2010)

NOTE: In a new classification such as this, where new plot data are added and the spatial extent is different from previous classifications, exact equivalence between communities identified in different classifications is unlikely. In this table we identify the closest match to previous classifications and, where previous communities found no match in the current classification, we indicate which new communities the majority of plots were assigned to.

Plant Community (described in this study)	Equivalents and similar communities
a14: Prickly Snow-grass - Tufted Sedge subalpine valley grassland of the Australian Alps Bioregion	**a14**: Subalpine valley grassland; **b7**: Poa costiniana – Epilobium billardierianum subsp. cinereum – Brachyscome scapigera – Asperula gunnii montane, sod-tussock grassland
a2: Alpine Baeckea - Swamp Heath - Candle Heath - Sphagnum wetland of the Australian Alps Bioregion (Bog)	Combination of **a2**: Richea continentis – Carpha nivicola – Sphagnum cristatum wet heathland and **a3**: Baeckea gunniana – Callistemon pityoides - Sphagnum cristatum wet heathland
a22: Snow-grass - Herbfield Celmisia - Woolly Billy-button grassland of the Australian Alps Bioregion	Combination of **a18**: Poa fawcettiae - Uncinia sulcata grassland and **a22**: Poa fawcettiae – Euphrasia collina grassland
a30: Dwarf Snow-grass - Fine-leaved Snow-grass - Silver Carraway - Granite Buttercup grassland of the Australian Alps Bioregion	Combination of **a30**: Poa hiemata – Poa clivicola grassland and **a31**: Poa hookeri grassland; **b6**: Poa spp. – Geranium antrosum – Scleranthus biflorus – Leptorhynchos squamatus – Ranunculus graniticola montane, sod-tussock grassland
a33: Leafy Bossiaea - Mountain Cassinia - Yellow Kunzea - Alpine Hovea heathland of the Australian Alps Bioregion	Combination of **a33**: Northern Alps *Hovea montana* open heathland, **a35**: *Bossiaea foliosa* – *Epacris petrophila* heathland and **a36**: Broadway *Bossiaea foliosa* closed heathland
a34: Weeping Snow shrub-grass woodland of the Australian Alps Bioregion	**a34**: *Eucalyptus lacrimans* low open woodland
a38: Kangaroo Grass - Rodd's Bedstraw - Alpine Sunray grassland of steep limestone slopes in the Australian Alps Bioregion	**a38**: Themeda triandra – Leucochrysum albicans grassland
a39: Feldmark Heath - Carpet Heath - Snow Grass heath of the Australian Alps Bioregion	**a39**: Kosciuszko alpine *Epacris - Kunzea* open heathland
a42: Epacris - Fine-leaved Snow-grass - Bog Parrot-pea grassy heathland of the Australian Alps Bioregion	**a42**: Epacris celata – Poa clivicola open Heathland
a43: Dwarf Bossiaea - Kangaroo Grass low open heathland of the Australian Alps Bioregion	**a43:** *Bossiaea riparia* dwarf heathland
a46: Alpine Mint-bush - Alpine Orites - Kosciuszko Nematolepis shrubland in the Australian Alps Bioregion	Combination of **a23**: Grevillea australis – Nematolepis ovatifolia open heathland and **a46**: Nematolepis ovatifolia – Prostanthera cuneata closed heathland
a51: Mountain Plum Pine - Crag Wallaby-grass - Snow-daisy low sparse shrubland of rock outcrops of the Australian Alps Bioregion	**a51**: Austrodanthonia alpicola – Grevillea australis open heathland

a54: Mountain Plum Pine – Tall Rice-flower shrubland of screes and boulder-fields of the Australian Alps Bioregion	**a54**: *Podocarpus lawrencei* closed heathland
a6: Dwarf Buttercup - Mud Pratia - Tufted Sedge herbfield of shallow depressions in the Australian Alps Bioregion	**a6**: Lobelia surrepens – Ranunculus millanii herbfield
a7: Bog Buttercup – Creeping Raspwort herbfield of wetland margins in the Australian Alps Bioregion	**a7**: Hypericum japonicum – Ranunculus pimpinellifolius herbfield
a8: Tufted Sedge - Mud Water-milfoil - Tufted Hair-grass sedgeland of the Australian Alps Bioregion (Fen)	**a8**. Fen
a9: Tufted Sedge - Small River-buttercup - Common Reed aquatic herbfield of waterways in the Australian Alps and South Eastern Highlands Bioregions	**a9**: Aquatic
e24: Mountain Gum - Snow Gum (White Sallee) very tall dry shrubby woodland to open forest primarily in the Kybeyan - Gourock subregion of the South Eastern Highlands Bioregion	Largely equivalent to **e24**: Subalpine Dry Shrub Forest (but includes plots originally assigned to **p338**). **g64**: Southern East Tableland Edge Shrub/Grass Dry Forest is divided between e24 and e26 (the latter of which occurs to the east outside the study area)
e59: Small-fruit Hakea - Mountain Baeckea - Myrtle Tea-tree subalpine bog heathland on the coastal ranges of the South Eastern Highlands Bioregion	**e59**: Southeast Sub-alpine Bog
g36: Button Tea-tree - Yellow Kunzea - Burgan dry shrubland on skeletal ridges primarily of the Namadgi Region	**g36**: Montane / Sub-Alpine Dry Rocky Shrubland
m31: Ribbon Gum - Snow Gum (White Sallee) - Shiny Cassinia tall shrub-grass woodland to open forest of gullies in quartz-rich ranges in the Monaro and Kybeyan-Gourock subregions of the NSW South Eastern Highlands	Largely a combination of **g73**: Eastern Tableland Dry Shrub/Grass Forest and **g74**: South Eastern Tablelands Dry Shrub/Grass/Herb Forest
m51: Brittle Gum - Scribbly Gum shrub-grass tall dry sclerophyll woodland on exposed quartz-rich slopes and ridges at primarily in the Monaro and Kybeyan-Gourock subregions of the South Eastern Highlands Bioregion	Closest to **g115**: South East Tablelands Dry Shrub/Tussock Grass Forest but including some plots originally assigned to other communities (mainly **g73**, **g75**, **g109**, **g110**)
p10: Black Sheoak - Silvertop Ash tall shrubby dry sclerophyll woodland to open forest primarily in the Bungonia subregion of the South Eastern Highlands Bioregion	A westward extension of **p10:** Eastern Tablelands Dry Forest; **g15**: North East Tableland Dry Shrub Forest
p14: Red Stringybark - Scribbly Gum - Redanther Wallaby Grass tall grass-shrub dry sclerophyll woodland to open forest on loamy ridges of the central South Eastern Highlands Bioregion	A westward extension of **p14**; largely a combination of **g114**: Tablelands Dry Shrub/Tussock Grass Forest; and parts of **g109**: Widespread Tablelands Dry Shrub/Tussock Grass Forest and **g121**: Western Slopes Grass/Herb Dry Forest.

p220: Ribbon Gum - Snow Gum (White Sallee) tableland flats tall grassy woodland primarily on granitoids in the Kybean-Gourock and Monaro subregions of the South Eastern Highlands Bioregion	Largely equivalent to **p220**: Southern Tableland Flats Forest but contains several plots assigned in the same classification to **p520**: Tableland Swamp Flats Forest. Contains plots from **g73**: Eastern Tableland Dry Shrub/Grass Forest and **g74**: South Eastern Tablelands Dry Shrub/Grass/Herb Forest.
p32d: River Sheoak dry forest on sand/gravel alluvial soils along major watercourses of the South Eastern Highlands and upper South Western Slopes Bioregions	**VCA 85**: River Oak forest and woodland wetland of the NSW South-western Slopes and South Eastern Highlands Bioregions
p338: Brown Barrel wet sclerophyll very tall grass-herb open forest primarily of the Gourock and Tallaganda Ranges in the South Eastern Highlands Bioregion	**p338**: Southern Range Wet Forest; combination of **g55**: Eastern Tableland Fern/Herb/Grass Moist Forest, **g56**: Tableland and Escarpment Moist Herb/Fern Grass Forest and part of **g95**: Tableland Acacia Moist Herb Forest.
p520: Ribbon Gum swamp very tall woodland on sandy alluvial soils along drainage lines of the eastern South Eastern Highlands Bioregion	Largely equivalent to **p520**: Southern Tableland Flats Forest. Contains plots from **g89**: Eastern Tablelands Acacia/Herb/Grass Forest and **g146**: Tableland Dry Herb/Grass Woodland.
p56: Mountain Tea-tree - Small-fruit Hakea - River Lomatia riparian shrubland of the eastern South Eastern Highlands Bioregion	Equivalent to **p56**
p8: Silvertop Ash - Narrow-leaved Peppermint tall shrubby dry sclerophyll woodland to open forest primarily on sedimentary ridges of the eastern South Eastern Highlands Bioregion	**p8**: Tableland Ridge Forest; a combination of **g59**: Eastern Tableland and Escarpment Shrub/Fern Dry Forest and **g112**: Eastern Tablelands Dry Shrub Forest.
q1: Drooping Sheoak low woodland to open forest on shallow infertile hillslopes in the Australian Capital Territory and surrounds	No equivalent.
q2: Weeping Snow Gum – Kangaroo Grass - Snow-grass –open woodland of the Adaminaby region of the South Eastern Highlands Bioregion	No equivalent; plots referable to this community were originally assigned to **g152**: Tableland Herb/Grassland, probably because of under-sampling
q3: Speargrass – Corkscrew – Wallaby-grass Disclimax Grassland of the South Eastern Highlands Bioregion	**r9**: Speargrass – Corkscrew – Wallaby-grass Disclimax Grassland of the South Eastern Highlands Bioregion; **b5**: *Stipa scabra* subsp. *falcata* – *Stipa bigeniculata* grassland
q4: Weeping Grass – Wallaby-grass Disclimax Grassland of the South Eastern Highlands Bioregion	**r10**: Weeping Grass – Wallaby-grass Disclimax Grassland of the South Eastern Highlands Bioregion
q5: River Tussock Disclimax Grassland of the South Eastern Highlands Bioregion	**r11**: River Tussock Disclimax Grassland of the South Eastern Highlands Bioregion
r1: Sub-montane Moist Tussock Grassland of the South Eastern Highlands Bioregion	**r1**: Sub-montane Moist Tussock Grassland of the South Eastern Highlands Bioregion.
r2: River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes, Drainage Lines and Flats of the South Eastern Highlands Bioregion	**b8**: *Poa labillardieri* tall tussock grassland, **r2**: River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes, Drainage Lines and Flats of the South Eastern Highlands Bioregion. **VCA635:** River Tussock - Kangaroo - Grass - Rush Wet Tussock Grassland of Footslopes, Drainage Lines and Flats of the South Eastern Highlands Bioregion.

r3: Wallaby-grass – Kangaroo Grass – Rush tussock grassland of seasonally wet sites of the South Eastern Highlands Bioregion	**r3:** Wallaby-grass – Kangaroo Grass – Rush tussock grassland of seasonally wet sites of the South Eastern Highlands Bioregion. **VCA637:** Wallaby-grass – Kangaroo Grass – Rush tussock grassland of seasonally wet sites of the South Eastern Highlands Bioregion.
r4: Lacustrine Ephemeral Grassland of the South Eastern Highlands Bioregion	**r4**: Lacustrine Ephemeral Grassland of the South Eastern Highlands Bioregion. **VCA636:** Lacustrine Ephemeral Grassland of the South Eastern Highlands Bioregion.
r5: Wallaby-grass - Tall Speargrass – Common Everlastings Tussock Grassland of the South Eastern Highlands Bioregion	**b1**: *Danthonia* spp. – *Asperula conferta* – *Bothriochloa macra* low grassland on the northern Monaro, **r5**: Wallaby-grass - Tall Speargrass – Common Everlastings Tussock Grassland of the South Eastern Highlands Bioregion.
r6: Dry Tussock Grassland of the Monaro in the South Eastern Highlands Bioregion	Combination of **b3:** *Themeda australis – Poa sieberiana – Chrysocephalum apiculatum – Acaena ovina* tall grassland and **b4**: *Poa sieberiana – Acaena ovina* grassland on basalt, southern Monaro; **r6**: Dry Tussock Grassland of the Monaro in the South Eastern Highlands Bioregion.
r7: Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion	**b2**: *Themeda australis – Juncus filiformis* grassland of the ACT; **r7**: Kangaroo Grass - Wallaby-grass - Snow-grass Moist Tussock Grassland of the South Eastern Highlands Bioregion.
r8: Kangaroo Grass - Purple Wire-grass – Wattle Mat-rush dry tussock grassland in the Southern Tablelands region of the South Eastern Highlands Bioregion	**r8**: Kangaroo Grass - Purple Wire-grass – Wattle Mat-rush dry tussock grassland in the Southern Tablelands region of the South Eastern Highlands Bioregion.
rp23: Red Stringybark - Broad-leaved Peppermint tall dry sclerophyll grassy woodland on loamy rises primarily in the Bungonia subregion of the South Eastern Highlands Bioregion	Largely equivalent to **p23**: Tableland Hills Grassy Woodland but with many new plots to the west and some plots originally assigned to **p24**: Tableland Grassy Box-Gum Woodland.
rp24: Yellow Box - Blakely's Red Gum tall grassy woodland on undulating sedimentary and acid-volcanic substrates in the Goulburn area of the South Eastern Highlands Bioregion	Largely equivalent to **p24**: Tableland Grassy Box-Gum Woodland. but with many new plots to the west
rp9: Brittle Gum - Scribbly Gum tall shrubby dry sclerophyll woodland on infertile low ridges and hills primarily of the Bungonia subregion of the South Eastern Highlands Bioregion	Largely equivalent to **p9**: Tableland Low Woodland but including some plots originally assigned to **p14, p15** and **p23.**
u101: Freshwater sedge-herb marsh of shallow, commonly inundated wetlands of the eastern South Eastern Highlands Bioregion	Combination of **bj1** and **bj2**.
u105: Broad-leaved Peppermint - Brittle Gum - Red Stringybark tall shrub-grass dry sclerophyll woodland to open forest of lower ranges of the western South Eastern Highlands and upper South Western Slopes Bioregions	Largely a combination of **g108**: Western Tablelands Dry Herb/Grass Forest and **g110**: Tablelands Dry Shrub/Grass Forest but with some plots originally assigned to other communities (mainly **g103** and **g109**).
u116: Freshwater sedge-herb marsh of shallow ephemeral wetlands of the eastern South Eastern Highlands Bioregion	Approximately equivalent to **bj3**

u117: Freshwater sedge-herb marsh of deep semi-permanent and/or slightly saline wetlands of the eastern South Eastern Highlands Bioregion	A modification and range extension of **bj4**
u118: Black Sallee grass-herb woodland in drainage depressions and moist valley flats in the South Eastern Highlands and Australian Alps Bioregions	No equivalent. All but one plot was not available for previous classifications.
u148: Red Stringybark - Red Box grass-forb tall woodland to open forest of the upper South Western Slopes and western South Eastern Highlands Bioregions	No clear equivalent; contains many new plots and plots originally assigned to **g116**: Western Slopes Herb/Grass Woodland, **g119**: Western Tablelands Dry Shrub/Grass Forest, **g120**: Western Slopes Shrub/Herb/Grass Dry Forest and **g121**: Western Slopes Grass/Herb Dry Forest and has affinities with **VCA290**: Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South-western Slopes Bioregion
u150: Broad-leaved Peppermint - Mountain Gum tall grass-forb woodland to open forest of the South Eastern Highlands and Australian Alps Bioregions	Most similar to **g103**: Western Montane Dry Fern/Grass Forest but contains plots originally assigned to several other communities (mainly **g75**, **g105**, **g107**, **g109**, **g110**).
u152: Robertson's Peppermint - Red Stringybark very tall grass-forb sheltered woodland to open forest of the southwest South Eastern Highlands and upper South Western Slopes Bioregions	Largely a combination of **g93**: Western Tablelands Herb/Grass Dry Forest and **g94**: South West Slopes Acacia Dry Herb/Grass Forest but including some plots originally assigned to other communities (mainly **g103**, **g104** and **g119**)
u158: Snow Gum (Alpine Sallee) mid-high shrub-grass subalpine woodland of the Australian Alps Bioregion	Combination of **g128**: Sub-alpine Dry Shrub/Herb Woodland and **g130**: Sub-alpine Shrub/Grass Woodland with many new plots.
u159: Black Sassafras temperate rainforest of wet sheltered slopes in the Australian Alps Bioregion	Largely equivalent to **g172**: Kosciuszko Western Escarpment Cool Temperate Rainforest
u165: Robertson's Peppermint very tall shrubby woodland to open forest primarily of the Bondo subregion of the South Eastern Highlands	Similar to **VCA295**; incorporates **g106**: Montane Dry Shrub/Tussock Forest but including some plots originally assigned to other communities (mainly **g103**, **g104** and **g82**)
u173: River Red Gum +/- Apple Box very tall grass-forb riparian woodland on alluvial flats in the South Eastern Highlands and upper South Western Slopes Bioregions	Largely defined by new plots but incorporates **g43**: Western Slopes Riparian Moist Sedge Woodland.
u178: Yellow Box - Apple Box tall grassy woodland of the South Eastern Highlands	Largely defined by new plots but contains several plots previously assigned to **g160**: Northern Slopes Dry Grass Woodland
u18: Bundy - Broad-leaved Peppermint mid-high shrubby woodland to open forest on granite substrates primarily in the Namadgi Region	Probably simiar or equivalent to **g79**: Montane Dry Shrub/Tussock Grass Forest.
u181: River Bottlebrush - Burgan rocky riparian shrubland in the South Eastern Highlands and upper South Western Slopes Bioregions	Largely defined by new plots; contains plots originally assigned to **g82**: Western Montane Acacia Fern/Herb Forest.
u19: Blakely's Red Gum - Yellow Box +/- White Box tall grassy woodland of the Upper South Western Slopes and western South Eastern Highlands Bioregions	Incorprates **g117**: Western Slopes Dry Grass Woodland and contains plots previously assigned to **g116**: Western Slopes Herb/Grass Woodland, **g154**: Tableland Dry Grassy Woodland and **g160**: Northern Slopes Dry Grass Woodland
u191: Black Cypress Pine - Brittle Gum tall dry woodland on hills primarily in the Cooma Region	No equivalent but possibly related to **g79**: Montane Dry Shrub/Tussock Grass Forest.

u193: Small-fruit Hakea - Drumstick Heath - Swamp Heath Subalpine Swamp Heathland of the Australian Alps and western South Eastern Highlands Bioregions	Largely defined by new plots; contains plots originally assigned to **g123**: Montane Wet Heath/Bog and **g124**: Western Montane Wet Heath/Herb Grass Woodland.
u20: Kurrajong – Blackthorn - Kangaroo Grass mid-high shrub-grass open woodland on limestone karsts in the Wee Jasper area	No equivalent; defined by new plots.
u207: Jounama Snow Gum - Snow Gum (White Sallee) mid-high shrubby woodland on granitoids primarily of the Namadgi Region	Probably equivalent to **g127**: Sub-alpine Dry Shrub/Herb/Grass Woodland but mostly defined by new plots.
u21: Broad-leaved Peppermint - Candlebark tall dry sclerophyll woodland to open forest of quartz-rich ranges of the upper South East Highlands and lower Australian Alps Bioregions	Largely defined by new plots but contains plots previously assigned to **g74**: South Eastern Tablelands Dry Shrub/Grass/Herb Forest and **g75**: Tablelands Shrub/Tussock Grass Forest
u22: Mountain Gum - Snow Gum (White Sallee) grass-forb very tall woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions	Incorporates **g97**: Montane Acacia/Dry Shrub/Herb/Grass Forest and **g100**: ACT Montane Dry Shrub/Grass Forest with plots from **g95**: Tableland Acacia Moist Herb Forest, **g96**: Tableland Tussock Grass/Herb Forest, **g99**: Montane Dry Shrub/Herb/Grass Forest, **g101**: North-Western Montane Dry Shrub/Herb/Grass Forest, **g102**: Brindabella Montane Dry Fern/Grass Forest, **g103**: Western Montane Dry Fern/Grass Forest, and **g104**: Tableland Acacia/Herb/Grass Forest
u23: Snow Gum (White Sallee) - Drumstick Heath - Myrtle Tea-tree tall woodland to open forest of drainage depressions primarily of the South Eastern Highlands Bioregion	Defined by many new plots but includes plots previously assigned to **g124**: Western Montane Wet Heath/Herb Grass Woodland and **g146**: Tableland Dry Herb/Grass Woodland.
u239: Alpine Ash - Mountain Gum +/- Snow Gum (White Sallee) wet sclerophyll open forest of the Australian Alps and South Eastern Highlands Bioregions	No clear equivalent; mostly new plots but incorporates some plots from **g86**, **g87**, **g99** and **g102**
u27: Snow Gum (White Sallee) - Candlebark tall grassy woodland in frost hollows and gullies primarily of the Namadgi Region	No equivalent. Defined by plots not used in previous classifications.
u28: Snow Gum (White Sallee) - Mountain Gum - Daviesia mimosoides tall dry grass-shrub subalpine woodland to open forest of the Australian Alps and South Eastern Highlands Bioregions	Mostly defined by new plots but contains some plots previously assigned to **g98**: Western Montane Moist Shrub Forest
u29: Apple Box - Broad-leaved Peppermint tall shrub-grass woodland primarily on granitoids of the South Eastern Highlands Bioregion	No equivalent; defined by plots not used in previous classifications.
u40: Alpine Ash very tall wet sclerophyll woodland primarily of the Australian Alps Bioregion	Closest to **g87**: Western Escarpment Moist Shrub/Herb/Grass Forest but with many new plots and a few plots from **g82** and **g86**
u43: Bundy - Hickory Wattle - Drooping Sheoak - Western Wedding Bush tall grassy open woodland Serpentinite in the Coolac-Goobarragandra area of the upper NSW Southwestern Slopes Bioregion	Equivalent to **VCA301:** Drooping Sheoke - Ricinocarpus bowmannii - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt.

u52: Ribbon Gum - Robertson's Peppermint very tall wet sclerophyll open forest primarily of the Bondo Subregion of the South Eastern Highlands Bioregion	Largely a combination of **g82**: Western Montane Acacia Fern/Herb Forest, **g83**: Montane Riparian Moist Shrub/Grass/Herb Forest and **g102**: Brindabella Montane Dry Fern/Grass Forest
u53: Mountain Gum - Blackwood tall wet sclerophyll open forest primarily on granitoids of the Australian Alps and western South Eastern Highlands Bioregions	Most closely related to **g86**: Western Sub-alpine Moist Shrub Forest but including some plots originally assigned to **g85**
u66: Bundy - Red Stringybark mid-high grassy herbaceous open woodland of the South Eastern Highlands and Upper Slopes Subregion of the South Western Slopes Bioregion	No equivalent; defined by plots not used in previous classifications.
u78: Snow Gum (White Sallee) mid-high grassy woodland of the South Eastern Highlands Bioregion	Comprises plots mostly from **p22**: Frost Hollow Grassy Woodland and **p24**: Tableland Grassy Box-Gum Woodland. The community is effectively a subset of those communities.
VCA344: Argyle Apple – Black Wattle valley open forest of the Yass - Rye Park region of the South Eastern Highlands and adjoining NSW South Western Slopes Bioregions	**VCA 344**: Argyle Apple - Acacia mearnsii valley open forest of the Yass - Rye Park region of the South Eastern Highlands and adjoining NSW South Western Slopes Bioregions

Appendix 2: Example of quadrat survey proforma

(Adapted for UMC surveys, based on NSW Government Standard Version 16)

Location			Survey Name	Plot No.	Recorder(s)		
Date	**29/9/2010**	**Site No.**	**UMC**	**001**	**ARMRC etc…**		
AMG grid reference	zone **55**	datum **GDA94**	Easting 699821		Northing 6084171		Position in quadrat NE
Base Plot size	20 x 20 m	**Orientation of 0.1ha plot**	127° (SSE)	**marked**	no	**photo # / orientation**	n/a

NVIS Level V (within 0.04 ha quadrat)

Stratum	Growth form	Species name	Cover[1]	For The Entire stratum			Field No.
Upper	T	*Eucalyptus melliodora*	20	Upper Stratum Height to crown (m)			
Upper	T	*Eucalyptus bridgesiana*	<1	min	mode	max	
Upper				12	17	20	
Mid	S	*Acacia dawsonii*	<1	Mid Stratum Height to crown (m)			
Mid	S	*Acacia rubida*	<1	min	mode	max	
Mid	S	*Cassinia quinquefaria*	<1	0.5	1	1.5	X
Ground	F	*Hydrocotyle laxiflora*	10	Ground Stratum Height to crown (m)			
Ground	G	*Austrodanthonia* sp.	10	min	mode	max	
Ground	G	*Poa sieberiana*	5	0.01	0.05	0.2	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub

Cover (PFC): <1,1,2,3,4,5, 10,15,20,25,30,35, etc.

[1] Projected foliage cover

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %		Condition (within 0.1ha quadrat)		
Native richness	3	8	8	6	5	**Litter**	55	**No. trees with hollows**	0	
Native cover	20	1	15	1	20	**Bare ground**	4	**Woody debris** lineal metres	1	
Exotic cover	0	<1	<1	0	3	**Crypt-ogam**	<1	**Woody regeneration** No. upper stratum sp. & abund.	2	30

(within 0.1ha quadrat)

Tree health	no evidence	**branchlets dead**	small branches dead	main branches dead	trees dead

Physiography

Morphological Type: Lower Slope	Landform Element: Footslope	Lithology: Metasediment
Slope: 5 degrees	Aspect: 353 ° (N)	Site Soil Type: Loamy Clay
Free text site description:		

Land Use (dominant)	**nature conservation**	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover (upper stratum)	none	**native**	environmental planting	native plantation	exotic plantation	exotic other:	

Land Cover (ground stratum)	none	**native**	environmental planting	native plantation	exotic crop	exotic other:
Age structure	early regeneration	advanced regeneration	**uneven age**	mature	senescent	

Plot Disturbance	**Severity code**	**Age code**	Observational evidence:
Clearing (inc. logging)	1	O	Some minor stump evidence
Cultivation (inc. pasture)	0	-	
Soil erosion	0	-	
Firewood collection	0	-	None observed, but not a lot of fallen dead timber
Grazing	2	R	macropods
Fire damage	1	O	Small fire scar
Storm damage	0	-	
Other	0	-	

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Floristics

(within 0.04 ha quadrat)

Sub-Stratum	Growth form	Field name	Species name	Cover	Field No.	RBG No.
U,M,G	T	*Eucalyptus melliodora*	*Eucalyptus melliodora*	20		
U,M,G	T	*Eucalyptus bridgesiana*	*Eucalyptus bridgesiana*	1		
M,G	S	*Acacia rubida*	*Acacia rubida*	<1		
M	S	*Acacia dawsonii*	*Acacia dawsonii*	<1		
M	S	*Acacia dealbata*	*Acacia dealbata*	<1		
M	S	*Bursaria spinosa*	*Bursaria spinosa*	<1		
M	S	*Rosa rubiginosa* *	*Rosa rubiginosa* *	<1		
M,G	S	*Styphelia triflora*	*Styphelia triflora*	<1		
U	S	*Amyema* sp.	*Amyema* sp.	<1		
G	S	*Astroloma humifusum*	*Astroloma humifusum*	<1		
G	F	*Chrysocephalum semipapposum*	*Chrysocephalum semipapposum*	1		
G	F	*Xerochrysum viscosum*	*Xerochrysum viscosum*	<1		
G	F	*Leptorhynchos squamatus*	*Leptorhynchos squamatus*	<1		
G	F	*Wurmbea dioica*	*Wurmbea dioica*	<1		
G	F	*Crassula sieberiana*	*Crassula sieberiana*	<1		
G	F	*Glycine* sp.	*Glycine* sp. (needs further investigation)	<1	X	
G	F	*Chamaesyce drummondii*	*Chamaesyce drummondii*	<1		
G	F	*Hypericum gramineum*	*Hypericum gramineum*	<1		
G	F	*Hypericum perforatum* *	*Hypericum perforatum* *	<1		
G	F	*Convolvulus angustifolium*	*Convolvulus angustifolium*	<1		
G	F	*Daucus glochidiatus*	*Daucus glochidiatus*	<1		
G	F	*Hydrocotyle laxiflora*	*Hydrocotyle laxiflora*	10		
G	F	*Goodenia hed hed*	*Goodenia hederacea* ssp. *hederacea*	<1		
G	F	*Plantago varia*	*Plantago varia*	<1	X	
G	F	*Plantago lanceolata*	*Plantago lanceolata*	<1		

G	F	*Oxalis perennans*	*Oxalis perennans*	<1		
G	G	*Aristida ramose*	*Aristida ramose*	<1		
G	F	*Ajuga australis*	*Ajuga australis*	<1		
G	F	*Hypochaeris radicata* *	*Hypochaeris radicata* *	<1		
G	F	*Pterostylis* sp. (rosette only)	*Pterostylis* sp.	<1		
G	F	*Petrorhagia nanteuilii* *	*Petrorhagia nanteuilii* *	<1		
G	G	*Microlaena stipioides*	*Microlaena stipioides*	<1		
G	F	*Luzula densiflora*	*Luzula densiflora*	<1		
G	G	*Elymus scaber*	*Elymus scaber*	1		
G	F	*Acaena ovina*	*Acaena ovina*	<1		
G	V	*Carex inversa*	*Carex inversa*	<1		
G	F	*Chrysocephalum apiculatum*	*Chrysocephalum apiculatum*	<1		
G	F	*Wahlenbergia* sp.	*Wahlenbergia* sp.	<1		
G	G	*Themeda australis*	*Themeda australis*	<1		
G	F	*Gonocarpus elatus*	*Gonocarpus elatus*	<1		
G	F	*Geranium solanderi* var. *solanderi*	*Geranium solanderi* var. *solanderi*	<1		
G	F	*Vittadinia muelleri*	*Vittadinia muelleri*	<1		
G	F	*Scuttelaria humulis*	*Scuttelaria humulis*	<1		
G	F	*Sonchus asper* *	*Sonchus asper* *	<1		
G	F	*Veronica plebia*	*Veronica plebia*	<1		
G	S	*Davesia genistifolia*	*Davesia genistifolia*	<1		
G	S	*Hibbertia obtusifolia*	*Hibbertia obtusifolia*	<1		
G	G	*Poa sieberiana*	*Poa sieberiana*	5		
G	V	*Carex breviculmis*	*Carex breviculmis*	<1		
M	S	*Cassinia* sp.	*Cassinia quinquefaria*	<1		
G	F	*Trifolium* sp.	*Trifolium* sp.	<1		
G	F	*Tricoryne elatior*	*Tricoryne elatior*	<1		
G	F	*Bulbine bulbosa*	*Bulbine bulbosa*	<1		
G	R	*Juncus* sp.	*Juncus* sp.	<1		
G	F	*Desmodium varians*	*Desmodium varians*	<1		
G	G	*Bothriochloa macra*	*Bothriochloa macra*	<1		
G	F	*Scleranthus fascicularis*	*Scleranthus fascicularis*	<1		
G	F	*Dichopogon fimbriatus*	*Dichopogon fimbriatus*	<1		
G	F	*Lactuca serriola* *	*Lactuca serriola* *	<1		
G	G	*Austrodanthonia* sp.	*Austrodanthonia* sp.	10		
G	G	*Austrostipa* sp.	*Austrostipa* sp.	<1		
G	F	*Rumex brownil*	*Rumex brownil*	<1		

G	F	*Sonchus oleraceus* *	*Sonchus oleraceus* *	<1		
G	F	Caryphyllaceae	*Cerastium glomeratum* * ??	<1		
G	F	*Cynoglossum suaveolans*	*Cynoglossum suaveolans*	<1		
G	C	*Einadia nutans* ssp. *nutans*	*Einadia nutans* ssp. *nutans*	<1		
G	F	*Taraxicum officianale* *	*Taraxicum officianale* *	<1		
G	F	*Brachycome rigidula*??	*Cotula australis*	<1		
G	G	*Bromus* sp. *	*Bromus* sp. *	<1		
G	F	*Verbascum thapsus* *	*Verbascum thapsus* *	<1		
G	V	*Lomandra multiflora* ssp. *multiflora*	*Lomandra multiflora* ssp. *multiflora*	<1		
G	F	*Cymbonotus lawsonianus*	*Cymbonotus lawsonianus*	<1		
G	F	*Euchiton / Stuartina* sp.	*Euchiton* sp.?, needs further check *	<1		
G	V	*Dianella revoluta* var. *revoluta*	*Dianella revoluta* var. *revoluta*	<1		
G	S	*Leucopogon* sp.	*Leucopogon attenuatus*	<1	X	

Additional Overstorey species (within the same vegetation type to a maximum of 50m from the plot)

Stratum	Growth form	Field name	Species name	Cover	Field No.	RBG No.
AdU						
AdU						
AdU						
AdU						
AdU						

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover (PFC): <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover %

Appendix 3: Specifications for quadrat survey data collection

Module 1. Minimum Requirements

Location

Date	Write as dd/mm/yy.	
Site Number		Site identification is in two parts (**NB The limit on the number of characters is dictated by software limitations on row labels.**)
	Survey ID	Three digit Alpha Code for the Survey Area (for this project it will be **UMC**), this must be unique and registered in a central repository
	Plot No	The Plot Number is a three digit numeric, as assigned by the field staff. Contractors will be given a range of numbers to avoid duplication with other contractors. For example, UMC123.
Recorders	Official codes for each person involved in description of that site. These must also be registered in a central repository to avoid duplication. The id code will be the first three letters of the Surname followed by the person's initials or the first two letters of their first given name. Eg Peter L. Smith will be SMIPL	
Grid Reference	**NB** Grid reference is chosen as the standard in order to accommodate old and new technologies. The DECCW survey database automatically converts grid references to Latitude and Longitude and can export plot locations in either form. The NSW Department of Lands Geodetic standard is GDA94 rather than Latitude and Longitude. **By convention grid references are recorded from the SW corner of the plot.**	
	Zone – NSW contains three grid zones; the correct zone must be chosen.	
	Datum – Record the datum being used. The Standard Datum is GDA94 (Geocentric Datum Australia) which is the same as WGS84 (World Geodetic System); some GPS may not be programmed for GDA94 but all will be programmed for WGS84. If grid references are calculated from an existing map the DATUM may not be GDA94.	
	Easting and Northing are read off the GPS.	
	Position in quadrat – record the position of the GPS in general terms; i.e SW corner.	
Base Plot Dimensions	External dimensions of the plot (meters) i.e 20x20m. **Note:** The plot size can be altered to 1 x 40 for linear communities in order to not sample across an ecotones, particularly important for riparian communities.	
Plot Orientation	Rectangular plot - compass bearing of the long axis 20x50 (0.1ha) plot (In a square plot the orientation is that same as the Aspect)	
Marked	Has the quadrat position been marked for later re-visiting? YES or NO. For this survey, no.	
Photo Number/s	The frame or sequence numbers for each photo taken at the site. A "Photo-board" *may be* placed in the site; so that site details (site number and date) are recorded on the photograph.	
Site photo orientation	Not important for this survey, take photos which best characterise the site/community.	

NVIS Level 5 (Vegetation Structure)

Stratum	A stratum is a distinct height class in the vegetation and must have a crown cover of 5% or more. The descriptors **Upper**, **Mid** and **Ground** reflect the major expected growth forms. In non-woody vegetation only the Ground stratum is present and will be confined to the lowest three entries on the form.
	It is sometimes evident that a stratum contains more than one layer (eg the mid-stratum may consist of shrubs comprising two or three distinct height classes); the Standard allows for up to three **layers** in each stratum (layers do not have to be present).
Growth Form	Record the dominant growth form in each stratum. In some cases it may be necessary to record more than one growth form, eg where grasses and low shrubs are of equal height and importance in a stratum (see Table App 6.3).
Dominant Species	List the three most common species in decreasing order of commonality in each stratum.
[1]Cover	Record the percent cover for each recorded dominant species. For the UMC survey, use projected foliage cover
Height	Record the height of each stratum. Height is always measured to the top of the crowns, tussocks etc. Record the tallest height (max), the lowest height (min) and the most commonly occurring (mode) height for each stratum.

Condition

Native richness	Number of native species found within each stratum – spp such as mistletoe should be counted for the stratum they inhabit. Within **20x20m** plot. This variable can be calculated after field work.
Native Cover	Total Cover of native species in each Stratum. Within **20x20m** plot. This variable needs to be estimated in the field.
Exotic Cover	Total [1]Cover of exotic species in each Stratum. Within **20x20m** plot. This variable needs to be estimated in the field.
Cover non-vegetation	The percent area of the plot covered by LITTER and BARE GROUND respectively. Within **20x20m** plot. This variable needs to be estimated in the field.
Number of trees with hollows	Estimated by counting the number of trees that have hollows visible from the ground. Within **20x50m** plot. Only hollows occurring >1m above the ground, with a diameter of 5cm and "perceived" depth are counted. This variable needs to be estimated in the field.
Woody debris	Total length of woody material on the ground in the plot; greater than 10cm in diameter. Within **20x50m** plot. This variable needs to be estimated in the field.
Woody regeneration	Two measures are required. 1. The number of overstorey species regenerating (this includes shrubs when they comprise the overstorey). 2. Combined abundance of regenerating individuals. Abundance scores are as per the floristic classes. Within **20x50m** plot. This variable needs to be estimated in the field.
Tree Health	An assessment of general tree health in the plot expressed in terms of observable dieback from larger to smaller braches. These are Yes/No answers; do not count dead branches etc. Within **20x50m** plot. This variable needs to be estimated in the field.

Landuse and Land Cover

Landuse (dominant)	Dominant land use as per options available; if "other" specify land use
Land Cover (upper stratum)	[1]Cover percent of the tallest stratum. For the purposes of this field the Upper Stratum is defined as the tallest stratum in the plot, independent of its Growth Form
Land Cover (ground stratum)	[2]Foliage Projective Cover percent of the ground stratum
Age Structure	Relative age classes of the vegetation in the plot; more particularly the age of trees and shrubs present (See Table App 6.1 and Figure App 6.1)

Site History ([5]frequency and age)

Note: These are just estimations. For variables which are difficult to estimate (such as pasture improvement…), leave blank.

Site history is intended to be gleaned from land managers or owners; subjects must be acquainted with the nature of the questions prior to interview; **no data can practically be treated as confidential** and is intended for entry into a public database	
Grazing management	refers to domestic stock only (not feral or native)
Farming	all forms of cropping and horticulture
Erosion control	all forms of erosion control and conservation farming
Pasture Improvement rates kg/ha (fertilizer)	rates of application (see data sheet)
Pasture Improvement rates kg/ha (dolomite or lime)	rates of application (see data sheet)
Timber extraction	all forms including fence post and firewood
Regrowth management	any way in which regrowth is managed (eg grazing, burning, slashing)
Weed control	any way in which weeds are managed
Pest animal control	poisoning, shooting, ripping
Burning	any burning used as a deliberate management tool (weeds, stubble)
Other	

Plot Disturbance (severity[3] and age[4])

Note: These are just estimations.

Clearing	Includes logging of individual stems. Evidence of past logging/clearing.
Cultivation	Includes existing crops, exotic (improved) pastures and recently coopped land (may be evidence of recent cropping, eg plough lines).
Soil Erosion	Accelerated, human induced erosion. Observational evidence to include the main type/s of erosion: sheet, rill, gully and a subjective assessment of severity
Grazing	Estimate impact of total grazing pressure (ferals and domestic stock)
Fire Damage	Estimate impact of fire; observations re severity (heat) of fire.
Storm Damage	Estimate impact of storm damage
Other	Nominate and estimate any other major plot disturbance impacts

Physiography

Morphological Type	The form of the land at the plot site. REFER TO: McDonald et al (1998), page 13; see also Table App 6.2 for the relationship between Morphological Type and Landform Element
Landform Element	Recorded for landforms within a 20 metre radius of the plot centre. REFER TO: McDonald et al (1998) pp 24-34; see also Table App 6.2 for the relationship between Morphological Type and Landform Element
Site Lithology	Rock type/s observed at the site.
Site soil type	Broad descriptive name for the soil observed at the site (eg grey clay, red earth, sand)
Slope	The angle of slope in degrees of the survey site
Slope method	Method of measuring slope (eg clinometer, Abney level).
Aspect	The compass bearing of slope in degrees
Aspect method	Method of measuring aspect (eg compass on site; topographic map)

Module 2 Floristics

Stratum (layer)	Record the stratum and layer in which each species occurs. U1, U2, U3, M1, M2, M3, G1, G2, G3.
Growth Form	Record the growth form for each recorded species (see Table App 6.3).
Field Name	Scientific name or a descriptive field name where the plant identity is uncertain or unknown. Descriptive names are expected to be used consistently until formal identification is known. NB descriptive name will not be entered into the database.
Confirmed Species Name	Full scientific name.
[1]Cover	A measure or estimate of the appropriate cover measure for each recorded species; recorded from 1-5 and then to the nearest 5%.
Field #	A number supplied for each individual collection made in a plot. (Use adhesive labels or jewellery tags.)
Royal Botanic Gardens number (RBG#)	Individual collector's numbers which identify specimens sent to the RBG for formal identification.

Definitions, Tables and Figures

Definitions

[1]**Cover** refers to the area of a plot or polygon covered by vegetation of various types. The Standard recognises two main cover measures; Crown Cover and Foliage Projective Cover.

[2]**Foliage Projective Cover**	Equivalent to the vertical shadow cast by an individual crown's photosynthetic material only (leaves, phyllodes, needles); the area covered by the sum of photosynthetic material in a crown; the area of a plot or polygon covered by covered by the combined total fpc of individual crowns present. This is required for this survey as it is comparative to other existing datasets which will be used in the project.

Stratum (plural **Strata**) - is a major horizontal structural division of a stand of vegetation. In this Standard three major strata are recognised the Upper (Tree), Mid and Ground. It is possible in some situations to observe further horizontal divisions within these major strata; these divisions within strata are called **Layers**. The Standard recognises up to three (3) layers in each stratum.

[3]**Severity** - a relative measure or estimate of the degree to a site or reference point has altered from a natural or benchmark condition. The following are a series of statements intended to guide field practitioners in assigning one of four severity classes.

None	no departure from the natural or benchmark state; no observable evidence
Light (slight)	small departure from the natural or benchmark state; no major alteration of composition or structure; evidence of change not immediately obvious; careful observation needed to ascertain change at the site
Moderate	clearly observable (conspicuous, common) departure from a natural or benchmark state; some departure in terms of composition and/or structure; clear evidence of change; a readily recognisable characteristic of the site
Severe	a major observable (heavy, extensive) departure from a natural or benchmark state; major departures in terms of composition and/or structure; compelling evidence of a specific change; an inescapable characteristic of the site

[4]**Age –** an arbitrary set of time classes intended to provide some guidance as to the likely degree of recovery of the native vegetation towards a natural or benchmark state following disturbance. Three age classes are recognised:

Recent	less that about three (3) years
Not Recent	about three (3) to ten (10) years
Old	greater than about ten (10) years

[5]**Frequency** – an arbitrary set of time classes intended to provide a relative guide to the repeat cycle of various land management activities.

Not Done	not done; not ever repeated
Rare	repeated about once every five (5) years
Occasional	repeated on a cycle of about two (2) to five (5) years
Frequent	repeated on a cycle of less than two (2) years

Table App 2.1. Age Structure Classes.

1	Early Regeneration	Dominated by small, dense to open regenerating plants, with few older, emergent plants.
2	Advanced Regeneration	Dominated by dense to open regenerating plants, with scattered larger plants (NOTE In treed habitats, if there are reasonable numbers of large 'habitat' trees scattered amongst smaller regenerating plants this may be better described as 'uneven-aged').
3	Uneven Age	Mixture of different sizes and age classes present amongst species recorded in the tallest stratum.
4	Mature Age	Well-spaced mature-sized plants, but with few 'over mature' plants.
5	Senescent	Dominated by 'over mature' plants, evidence senescence in many plants, some to no disturbance evident. Stags (ie large dead trees) may be present.

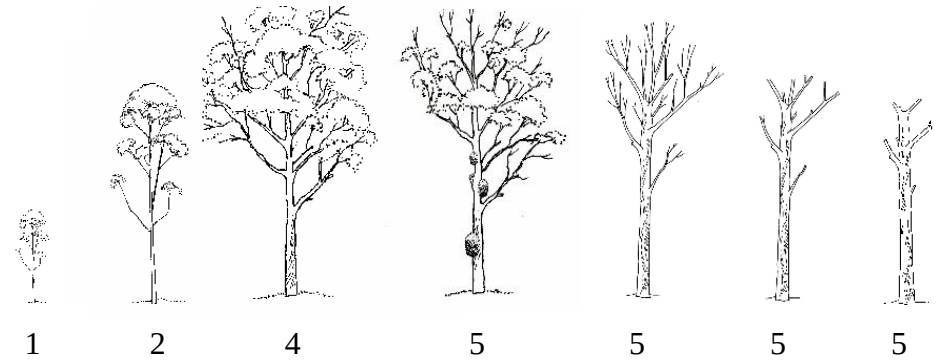


Figure App 2.1. Growth Stages forest (from Eyre *et al* 2002).

Table App 2.2. Morphological Types and Potential Landform Elements.

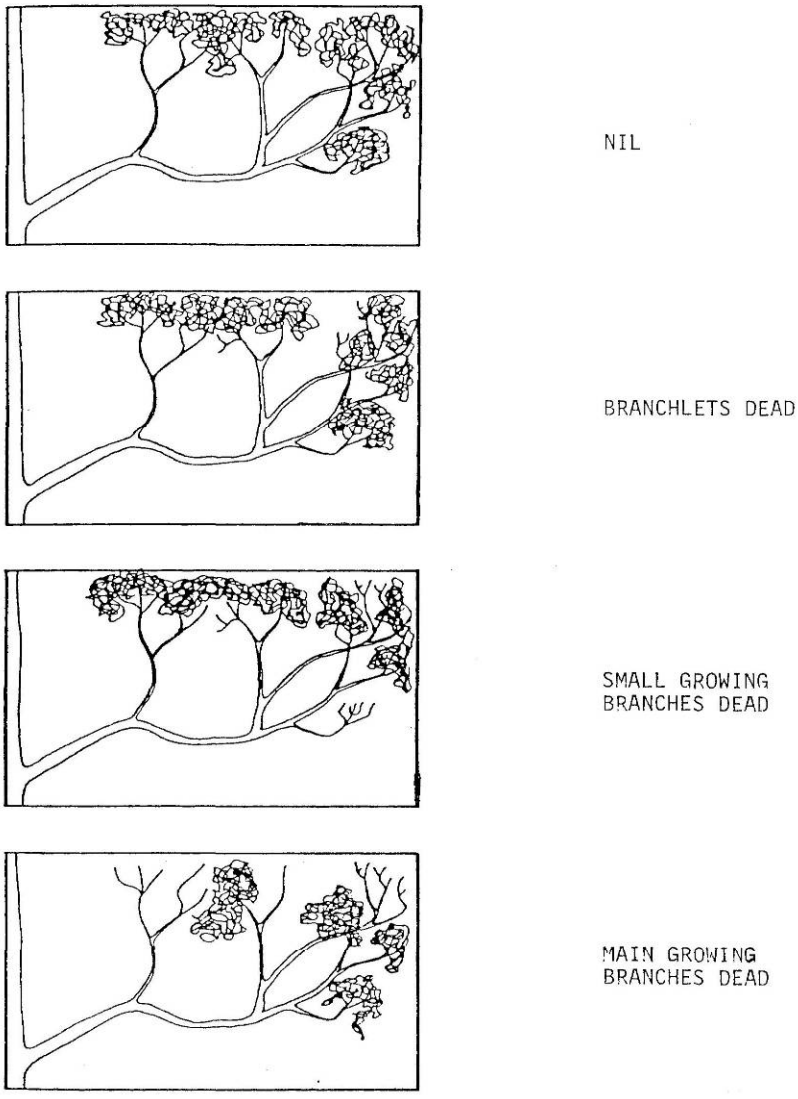
Morphological type	**Possible landform elements**	**Morphological type**	**Possible landform elements**	**Morphological type**	**Possible landform elements**
Crest	Hillcrest	*Simple slope*	Bank	*Open Depression*	Alcove
	Summit surface		Beach		Gully
	Dunecrest		Duneslope		Cirque
					Drainage depression
Hillock	Tor	*Mid slope*	Breakaway		Stream Channel
	Tumulus		Cliff-foot slope		Stream bed
	Dune		Scarp-foot slope		Tidal creek
	Cone Mound		Bench		Estuary
			Berm		Swamp
Ridge	Levee				Swale
	Bar	*Lower slope*	Cliff-foot slope		Trench
	Scroll		Scarp-foot slope		
	Prior Stream		Pediment	*Closed depression*	Lake
	Dune		Footslope		Playa
	Foredune		Talus		Doline
	Lunette				Ox-bow
	Beach ridge	*Flat*	Plain		Lagoon
	Embankment		Rock flat		Swamp
	Dam		Rock platform		Blow out
			Cut-over surface		Cirque
Slope – unspecified	Cliff		Scald		Maar
	Scarp		Pediment		Crater
	Hillslope		Fan		Pit
	Cut face		Valley Flat		
	Landslide		Terrace flat		
	Embankment		Channel bench		
			Back plain		
			Scroll plain		
			Flood out		
			Terrace plain		
			Tidal flat		
			Intertidal flat		
			Supratidal flat		
			Fill top		
			Berm		
			Reef flat		

Table App 2.3. Growth Forms likely to be encountered in most survey in NSW.

T	Tree	Woody plant >2m tall with a single stem or branches well above the base
M	Tree Mallee	Woody perennial plant usually of the genus *Eucalyptus*. Multi-stemmed with <5 trunks of which at least 3 exceed 100 mm dbh, usually >8m tall.
S	Shrub	Woody plant, multi-stemmed at the base (or within 200 mm from ground level) or, if single stemmed, <2m tall.
Y	Mallee Shrub	Commonly <8m tall, usually with >5 trunks, of which at least 3 of the largest do not exceed 100 mm dbh.
Z	Heath Shrub	Shrub usually <2m tall, commonly with ericoid leaves (nanophyll or smaller categories).
C	Chenopod Shrub	Xeromorphic single or multi-stemmed halophyte exhibiting drought or salt tolerance.
G	Tussock Grass	Forms discrete but open tussocks usually with distinct individual shoots, or if not, then not forming a hummock, eg. *Poa*.
H	Hummock Grass	Coarse xeromorphic grass with s mound-like form, often dead in the middle eg: *Triodia*.
D	Sod Grass	Grass of short to medium height forming compact tussocks in close compact at their base and uniting as a densely interfacing leaf canopy eg: couch and kikuyu.
V	Sedge	Herbaceous, usually perennial, erect plants generally with a tufted habit and of the families Cyperaceae and Restionaceae.
R	Rush	Herbaceous, usually perennial erect plants. Rushes are grouped in the families Juncaceae, Typhaceae, Restionaceae and the genus *Lomandra*.
F	Forb	Herbaceous or slightly woody annual or sometimes perennial plant; not a grass.
E	Fern	Characterised by large usually branched leaves (fronds), herbaceous to arborescent and terrestrial to aquatic; spores in sporangia on leaves.
L	Vine	Climbing, twining, winding or sprawling plant usually with a woody stem.
A	Cycad	Palm-like plant, stemless to arborescent with fruit in cones.
P	Palm	Arborescent monocotyledon with pinnate to palmate leaves.
X	Xanthorrhoea	Stemless to arborescent grasstrees.
U	Samphire Shrub	Leafless Chenopods of the genus *Halosarcia* (samphire) with fleshy, jointed stems.

Woody Vegetation Dieback Classes

Figure App 2.2. Woody Vegetation Dieback Classes.



Assessment of Dead Branches (After Grimes, 1978)

Appendix 4: Plant taxa recorded in the study area

FILICOPSIDA (Ferns)

	Freq. (%)
Adiantaceae	
Adiantum aethiopicum	5.1
Anogramma leptophylla	0.1
Cheilanthes austrotenuifolia	7.1
Cheilanthes distans	0.2
Cheilanthes lasiophylla	0.2
Cheilanthes sieberi subsp. *sieberi*	9.2
Cheilanthes spp.	0.6
Aspleniaceae	
Asplenium australasicum	0.1
Asplenium flabellifolium	10.4
Asplenium flaccidum subsp. *flaccidum*	0.2
Asplenium spp.	0.1
Asplenium trichomanes	0.1
Pleurosorus rutifolius	0.9
Marsileaceae	
Marsilea costulifera	0.4
Marsilea drummondii	0.2
Marsilea hirsuta	0.1
Ophioglossaceae	
Botrychium australe	0.1
Ophioglossum lusitanicum	0.5

CONIFEROPSIDA (Conifers)

Callitrichaceae	
Callitriche spp.	0.2
**Callitriche stagnalis*	1.3
Pinaceae	
**Pinus radiata*	0.7
**Pinus* spp.	0.1
**Pinus sylvestris*	0.1

MAGNOLIOPSIDA (Flowering Plants)

Aceraceae	
**Acer* spp.	0.1
Adoxaceae	
**Sambucus nigra*	0.1

Alismataceae	
Alisma plantago-aquatica	0.1
Amaranthaceae	
Alternanthera denticulata	0.4
Alternanthera sp. A	0.1
Alternanthera spp.	0.2
Ptilotus spp.	0.1
Amygdalaceae	
**Prunus* spp.	0.1
Anthericaceae	
Laxmannia gracilis	0.1
Arthropodium milleflorum	16.8
Arthropodium minus	2.7
Arthropodium sp. A	1.9
Arthropodium sp. B	0.4
Arthropodium spp.	1.3
Caesia alpina	0.3
Caesia calliantha	0.1
Dichopogon fimbriatus	1.1
Dichopogon spp.	0.1
Dichopogon strictus	0.7
Laxmannia gracilis	0.1
Thysanotus patersonii	1.2
Thysanotus spp.	0.1
Thysanotus tuberosus	4.7
Thysanotus tuberosus subsp. *parviflorus*	0.1
Thysanotus tuberosus subsp. *tuberosus*	3.5
Tricoryne elatior	4.2
Apiaceae	
Aciphylla simplicifolia	1.9
**Conium maculatum*	0.3
Daucus glochidiatus	18.7
Daucus glochidiatus f. A	0.1
Daucus glochidiatus f. F	0.1
Eryngium rostratum	0.8
Gingidia algens	0.1
Gingidia harveyana	0.7
Hydrocotyle algida	1.1
Hydrocotyle callicarpa	0.1
Hydrocotyle foveolata	0.1
Hydrocotyle hirta	0.1
Hydrocotyle laxiflora	39.7
Hydrocotyle peduncularis	5.7
Hydrocotyle spp.	0.9
Hydrocotyle tripartita	1.8
Lilaeopsis polyantha	0.4
Oreomyrrhis argentea	1.3
Oreomyrrhis ciliata	2.4
Oreomyrrhis eriopoda	19.0

Oreomyrrhis spp.	0.1
Platysace lanceolata	1.3
**Torilis nodosa*	0.4
Trachymene composita	0.1
Trachymene humilis subsp. *humilis*	0.6
Araliaceae	
Astrotricha ledifolia	3.5
Astrotricha longifolia	0.1
Astrotricha spp.	0.1
**Hedera helix*	0.1
Polyscias sambucifolia	0.5
Polyscias sambucifolia subsp. *leptophylla*	6.4
Polyscias sambucifolia subsp. *sambucifolia*	0.4
Asphodelaceae	
Bulbine bulbosa	7.9
Bulbine glauca	1.6
Azollaceae	
Azolla filiculoides	0.1
Asteliaceae	
Astelia psychrocharis	0.2
Asteraceae	
**Achillea millefolium*	0.1
Ammobium craspedioides	1.4
**Arctotheca calendula*	1.9
**Argyranthemum frutescens*	0.1
Argyrotegium fordianum	0.1
Argyrotegium mackayi	0.2
Arrhenechthites mixtus	1.4
**Aster subulatus*	0.1
Bedfordia arborescens	2.2
Brachyscome aculeata	5.1
Brachyscome angustifolia var. *angustifolia*	0.1
Brachyscome angustifolia var. *heterophylla*	0.2
Brachyscome cardiocarpa	0.1
Brachyscome ciliaris var. *ciliaris*	0.4
Brachyscome decipiens	2.4
Brachyscome dentata	0.2
Brachyscome diversifolia var. *diversifolia*	0.4
Brachyscome graminea	0.7
Brachyscome nivalis	0.1
Brachyscome obovata	0.4
Brachyscome radicans	0.5
Brachyscome rigidula	2.9
Brachyscome scapigera	3.2
Brachyscome spathulata	23.0
Brachyscome spp.	1.4
Brachyscome tenuiscapa var. *tenuiscapa*	0.1
Calocephalus citreus	0.6

Calotis anthemoides	0.2
Calotis cuneifolia	0.1
Calotis glandulosa	0.6
Calotis lappulacea	0.3
Calotis pubescens	0.1
Calotis scabiosifolia var. *integrifolia*	6.1
**Carduus nutans* subsp. *nutans*	0.3
**Carduus pycnocephalus*	2.9
**Carduus* spp.	0.2
**Carduus tenuiflorus*	1.4
Carthamus lanatus	1.4
Cassinia aculeata	23.6
Cassinia arcuata	0.1
Cassinia laevis	2.3
Cassinia longifolia	38.2
Cassinia quinquefaria	1.3
Cassinia monticola	1.2
Cassinia sp. D	0.2
Cassinia spp.	1.9
Cassinia uncata	1.6
Celmisia pugioniformis	1.6
Celmisia pulchella ms	0.2
Celmisia spp.	1.0
Celmisia tomentella	1.2
**Centaurea melitensis*	0.1
**Centaurea solstitialis*	0.1
Centipeda cunninghamii	1.0
Centipeda minima var. *minima*	0.9
Centipeda spp.	0.1
**Chondrilla juncea*	2.0
Chrysocephalum apiculatum	7.1
Chrysocephalum semipapposum	8.8
**Cichorium intybus*	0.1
**Cirsium vulgare*	27.0
**Conyza bonariensis*	9.7
**Conyza canadensis* var. *canadensis*	0.2
**Conyza* spp.	2.9
**Conyza sumatrensis*	0.7
Coronidium elatum	0.1
Coronidium scorpioides	25.1
Coronidium waddelliae	0.1
Cotula alpina	1.7
Cotula australis	1.3
Cotula spp.	0.2
Craspedia adenophora	0.1
Craspedia aurantia	0.4
Craspedia canens	0.1
Craspedia coolaminica	2.8
Craspedia costiniana	0.1
Craspedia crocata	0.4
Craspedia jamesii	4.8
Craspedia lamicola	0.1
Craspedia maxgrayi	0.1

Craspedia paludicola	0.2
Craspedia spp.	7.1
Craspedia variabilis	12.2
**Crepis capillaris*	10.3
**Crepis foetida* subsp. *vulgaris*	1.6
**Crepis* spp.	0.5
Cymbonotus lawsonianus	5.1
Cymbonotus preissianus	9.5
Cymbonotus spp.	8.3
Erigeron bellidioides	1.2
Erigeron nitidus	0.2
Erigeron paludicola	0.1
Euchiton gymnocephalus	24.5
Euchiton involucratus	4.1
Euchiton poliochlorus	0.1
Euchiton sphaericus	11.6
Euchiton spp.	3.6
Euchiton traversii	0.2
Ewartia nubigena	0.1
**Gamochaeta americana*	0.3
**Gamochaeta spicata*	0.1
**Gamochaeta* spp.	0.1
**Hedypnois rhagadioloides* subsp. *cretica*	0.1
Helichrysum leucopsideum	0.1
**Hypochaeris glabra*	10.3
**Hypochaeris radicata*	61.5
**Hypochaeris* spp.	0.5
Isoetopsis graminifolia	0.4
**Lactuca serriola*	5.0
Lagenophora gracilis	0.2
Lagenophora montana	0.2
Lagenophora spp.	0.1
Lagenophora stipitata	20.6
Leiocarpa semicalva	0.1
**Leontodon taraxacoides* subsp. *taraxacoides*	0.1
Leptinella filicula	4.3
Leptorhynchos elongatus	0.6
Leptorhynchos spp.	0.1
Leptorhynchos squamatus	3.6
Leptorhynchos squamatus subsp. *alpinus*	0.7
Leptorhynchos squamatus subsp. *squamatus*	2.6
**Leucanthemum vulgare*	1.4
Leucochrysum albicans	0.4
Leucochrysum albicans subsp. *albicans* var. *albicans*	0.4
Leucochrysum albicans subsp. *alpinum*	0.3
Microseris lanceolata	10.7
Minuria leptophylla	0.1
Olearia algida	0.2
Olearia argophylla	1.0
Olearia brevipedunculata	0.1
Olearia erubescens	19.2
Olearia lirata	0.1
Olearia megalophylla	8.1

Olearia microphylla	0.1
Olearia myrsinoides	0.6
Olearia phlogopappa sens. lat.	3.2
Olearia ramulosa	0.1
Olearia spp.	0.6
Olearia stellulata	1.9
Olearia stenophylla	0.1
Olearia tenuifolia	1.2
Olearia viscidula	0.2
**Onopordum acanthium* subsp. *acanthium*	0.2
**Onopordum illyricum* subsp. *illyricum*	0.1
Ozothamnus alpinus	0.1
Ozothamnus argophyllus	0.1
Ozothamnus conditus	1.3
Ozothamnus ferrugineus	0.1
Ozothamnus hookeri sens. lat.	0.2
Ozothamnus rosmarinifolius	0.1
Ozothamnus secundiflorus	0.6
Ozothamnus stirlingii	2.0
Ozothamnus thyrsoideus	3.5
Picris angustifolia	1.5
Picris angustifolia subsp. *merxmuelleri*	2.4
Picris angustifolia subsp. *angustifolia*	3.4
Podolepis hieracioides	1.2
Podolepis jaceoides	2.7
Podolepis robusta	0.8
Podolepis sp. aff. *robusta*	0.3
Podolepis spp.	0.4
Pseudognaphalium luteoalbum	0.5
Rhodanthe anthemoides	1.8
Rutidosis leiolepis	0.6
Senecio bathurstianus	4.9
Senecio bipinnatisectus	0.1
Senecio biserratus	1.1
Senecio diaschides	14.3
Senecio distalilobatus	1.3
Senecio extensus	0.1
Senecio glomeratus	0.3
Senecio gunnii	16.3
Senecio hispidulus	2.2
Senecio interpositus	0.1
Senecio lageniformis	0.4
Senecio pinnatifolius var. *alpinus*	3.1
Senecio pinnatifolius var. *pinnatifolius*	0.1
Senecio linearifolius	8.6
Senecio longipilus	0.5
Senecio microbasis	0.1
Senecio minimus	0.8
Senecio pectinatus var. *major*	0.1
Senecio prenanthoides	16.7
Senecio quadridentatus	13.8
Senecio spp.	10.7
Senecio tenuiflorus	2.1

Sigesbeckia australiensis	0.4
Sigesbeckia orientalis subsp. *orientalis*	0.5
**Silybum marianum*	0.7
Solenogyne bellioides	0.1
Solenogyne dominii	4.9
Solenogyne gunnii	5.8
Solenogyne spp.	0.7
**Soliva sessilis*	0.2
**Sonchus asper* subsp. *glaucescens*	5.7
**Sonchus oleraceus*	6.7
**Sonchus* spp.	1.0
Stuartina hamata	0.2
Stuartina muelleri	0.5
Taraxacum aristum	0.2
**Taraxacum officinale sens. lat.*	7.5
**Tolpis barbata*	1.7
**Tragopogon dubius*	1.2
**Tragopogon porrifolius*	0.2
**Tragopogon* spp.	0.2
Triptilodiscus pygmaeus	2.1
Velleia montana	0.9
Velleia paradoxa	0.8
Vittadinia cuneata	1.1
Vittadinia cuneata var. *cuneata*	1.9
Vittadinia cuneata var. *cuneata f. cuneata*	0.1
Vittadinia cuneata var. *hirsuta*	0.1
Vittadinia gracilis	0.2
Vittadinia muelleri	3.1
Vittadinia spp.	0.2
Vittadinia triloba	0.1
**Xanthium spinosum*	0.1
Xerochrysum bracteatum	1.0
Xerochrysum palustre	0.1
Xerochrysum spp.	0.1
Xerochrysum subundulatum	1.2
Xerochrysum viscosum	2.8
Bignoniaceae	
Pandorea pandorana	0.1
Blechnaceae	
Blechnum minus	2.8
Blechnum nudum	2.6
Blechnum penna-marina subsp. *alpina*	1.5
Blechnum spp.	0.1
Blechnum wattsii	0.4
Doodia aspera	0.1
Doodia caudata	0.1
Boraginaceae	
**Buglossoides arvensis*	0.1
Cynoglossum australe	6.9
Cynoglossum spp.	1.0

Cynoglossum suaveolens	6.7
**Echium plantagineum*	1.8
**Echium* spp.	0.1
**Echium vulgare*	2.0
**Heliotropium europaeum*	0.1
Myosotis australis	0.5
**Myosotis discolor*	4.5
**Myosotis laxa* subsp. *caespitosa*	1.7
Myosotis spp.	0.6
Brassicaceae	
Barbarea spp.	0.1
**Capsella bursa-pastoris*	0.2
Cardamine astoniae	0.5
Cardamine gunnii	0.1
**Cardamine hirsuta*	0.1
Cardamine lilacina	0.8
Cardamine papillata	0.2
Cardamine paucijuga	0.5
Cardamine spp.	1.0
Cardamine tenuifolia	0.1
Drabastrum alpestre	0.5
**Erophila verna*	0.6
**Hirschfeldia incana*	0.5
**Lepidium africanum*	0.2
Lepidium pseudohyssopifolium	0.2
Rorippa dictyosperma	0.4
Rorippa gigantea	0.1
**Rorippa nasturtium-aquaticum*	0.4
**Rorippa palustris*	0.2
Rorippa spp.	0.1
**Sisymbrium officinale*	0.2
**Sisymbrium orientale*	0.1
Campanulaceae	
Wahlenbergia ceracea	1.4
Wahlenbergia communis	6.6
Wahlenbergia densifolia	0.2
Wahlenbergia gloriosa	4.9
Wahlenbergia gracilenta	1.5
Wahlenbergia gracilis	3.8
Wahlenbergia graniticola	1.4
Wahlenbergia littoricola	0.2
Wahlenbergia luteola	1.1
Wahlenbergia multicaulis	1.8
Wahlenbergia planiflora subsp. *planiflora*	0.7
Wahlenbergia spp.	7.1
Wahlenbergia stricta subsp. *stricta*	35.6
Caryophyllaceae	
**Arenaria leptoclados*	0.1
**Cerastium balearicum*	0.2
**Cerastium glomeratum*	9.2

**Cerastium* spp.	0.7
**Cerastium vulgare sens.lat.*	2.9
Colobanthus affinis	0.1
Colobanthus pulvinatus	0.1
**Dianthus armeria*	0.1
Gypsophila tubulosa	0.2
**Lychnis coronaria*	0.1
**Moenchia erecta*	0.6
**Paronychia brasiliana*	0.6
**Petrorhagia nanteuilii*	12.8
**Petrorhagia* spp.	0.3
**Petrorhagia velutina*	0.1
**Polycarpon tetraphyllum*	0.7
**Sagina apetala*	0.4
Scleranthus biflorus	12.8
Scleranthus diander	3.9
Scleranthus fasciculatus	1.7
Scleranthus singuliflorus	0.2
**Sherardia arvensis*	2.5
**Silene gallica*	0.9
**Silene gallica* var. *gallica*	0.5
**Silene gallica* var. *quinquevulnera*	0.1
**Silene nocturna*	0.1
**Silene* spp.	0.1
**Silene vulgaris* subsp. *vulgaris*	0.1
**Spergula arvensis*	0.1
**Spergularia rubra*	0.3
Stellaria angustifolia	2.8
Stellaria filiformis	0.1
Stellaria flaccida	0.6
**Stellaria media*	4.0
Stellaria multiflora	0.6
Stellaria pungens	51.4
Casuarinaceae	
Allocasuarina littoralis	0.5
Allocasuarina nana	0.4
Allocasuarina spp.	0.1
Allocasuarina verticillata	1.9
Casuarina cunninghamiana	0.5
Celastraceae	
Celastrus australis	0.1
Centrolepidaceae	
Centrolepis strigosa	0.1
Chenopodiaceae	
**Chenopodium album*	0.1
Chenopodium erosum	0.1
Chenopodium glaucum	0.2
Chenopodium pumilio	0.5
Chenopodium spp.	0.1

Einadia hastata	0.2
Einadia nutans	2.9
Einadia nutans subsp. *nutans*	1.0
Einadia trigonos subsp. *trigonos*	0.1
Tetragonia tetragonioides	0.1
Clusiaceae	
**Hypericum androsaemum*	0.1
Hypericum gramineum	30.4
Hypericum japonicum	5.4
**Hypericum patulum*	0.1
**Hypericum perforatum*	8.3
Colchicaceae	
Burchardia umbellata	1.1
Wurmbea biglandulosa	1.1
Wurmbea dioica subsp. *dioica*	4.8
Convolvulaceae	
Calystegia marginata	0.1
Convolvulus angustissimus subsp. *angustissimus*	5.2
Dichondra repens	28.0
Dichondra sp. *A*	0.1
Crassulaceae	
Crassula helmsii	0.8
Crassula peduncularis	0.1
Crassula sieberiana	9.6
Crassula spp.	0.2
Cucurbitaceae	
**Citrullus* spp.	0.1
**Cucumis myriocarpus* subsp. *leptodermis*	0.1
Cupressaceae	
Callitris endlicheri	3.3
Callitris glaucophylla	0.1
Cyatheaceae	
Cyathea australis	0.1
Cyperaceae	
Baumea gunnii	0.2
Baumea rubiginosa	0.4
Bolboschoenus caldwellii	0.1
Bolboschoenus fluviatilis	0.2
Bolboschoenus medianus	0.1
Carex appressa	12.5
Carex bichenoviana	0.6
Carex blakei	0.3
Carex breviculmis	15.3
Carex capillacea	0.1
Carex chlorantha	0.2

Carex echinata	0.1
Carex fascicularis	0.5
Carex gaudichaudiana	4.9
Carex hebes	1.6
Carex incomitata	1.7
Carex inversa	13.4
Carex iynx	0.2
Carex jackiana	0.2
Carex longebrachiata	0.1
Carex polyantha	0.2
Carex raleighii	0.1
Carex spp.	3.6
Carex tereticaulis	0.4
**Cyperus brevifolius*	0.1
**Cyperus eragrostis*	0.4
Cyperus gunnii subsp. *gunnii*	0.1
Cyperus lucidus	0.4
Cyperus sanguinolentus	0.1
Cyperus sphaeroideus	0.2
Cyperus spp.	0.5
Cyperus tenellus	0.2
Eleocharis acuta	1.6
Eleocharis atricha	0.1
Eleocharis gracilis	0.6
Eleocharis plana	0.1
Eleocharis pusilla	1.0
Eleocharis sphacelata	0.5
Eleocharis spp.	0.1
Fimbristylis dichotoma	0.1
Gahnia radula	0.1
Gymnoschoenus sphaerocephalus	0.1
Isolepis aucklandica	0.1
Isolepis cernua	0.1
Isolepis congrua	0.1
Isolepis crassiuscula	0.2
Isolepis fluitans	0.5
Isolepis gaudichaudiana	0.2
Isolepis habra	0.1
Isolepis hookeriana	1.6
Isolepis inundata	0.2
Isolepis montivaga	0.1
Isolepis platycarpa	0.6
Isolepis spp.	1.5
Isolepis subtilissima	0.6
Lepidosperma elatius	0.1
Lepidosperma filiforme	0.1
Lepidosperma gunnii	1.1
Lepidosperma laterale	9.7
Lepidosperma limicola	0.1
Lepidosperma spp.	0.4
Lepidosperma urophorum	0.1
Oreobolus distichus	0.2
Oreobolus oxycarpus subsp. *oxycarpus*	0.1

Schoenoplectus pungens	0.2
Schoenoplectus validus	0.2
Schoenus apogon	9.2
Schoenus ericetorum	0.6
Schoenus latelaminatus	0.1
Schoenus maschalinus	0.1
Schoenus spp.	0.1
Scirpus polystachyus	0.5
Uncinia flaccida	0.1
Uncinia tenella	0.1
Dennstaedtiaceae	
Histiopteris incisa	0.1
Hypolepis glandulifera	0.1
Hypolepis muelleri	0.1
Hypolepis rugosula	0.1
Hypolepis spp.	0.1
Pteridium esculentum	27.4
Dicksoniaceae	
Calochlaena dubia	0.1
Dicksonia antarctica	0.2
Dilleniaceae	
Hibbertia calycina	0.7
Hibbertia incana	0.2
Hibbertia obtusifolia	45.7
Hibbertia pedunculata	0.4
Hibbertia riparia	1.3
Hibbertia serpyllifolia	0.2
Hibbertia spp.	0.2
Hibbertia vestita	0.2
Droseraceae	
Drosera auriculata	4.5
Drosera binata	0.1
Drosera peltata	1.7
Drosera spp.	0.7
Dryopteridaceae	
Polystichum australiense	0.1
Polystichum proliferum	8.6
Elaeocarpaceae	
Tetratheca bauerifolia	15.8
Tetratheca ciliata	1.1
Tetratheca labillardierei	0.1
Tetratheca spp.	0.1
Tetratheca thymifolia	0.4
Elatinaceae	
Elatine gratioloides	0.2

Ericaceae	
Acrothamnus hookeri	12.9
Acrothamnus maccraei	0.1
Acrothamnus montanus	0.9
Acrotriche divaricata	0.5
Acrotriche leucocarpa	0.1
Acrotriche serrulata	18.4
Astroloma humifusum	4.4
Astroloma pinifolium	0.1
Astroloma spp.	0.1
Brachyloma daphnoides	18.8
Epacris breviflora	5.2
Epacris celata	0.4
Epacris gunnii sens. lat.	0.9
Epacris impressa	0.1
Epacris microphylla	0.9
Epacris paludosa	1.4
Epacris petrophila	0.2
Epacris rhombifolia	0.2
Epacris spp.	0.1
Gaultheria appressa	0.1
Leucopogon attenuatus	3.4
Leucopogon ericoides	1.0
Leucopogon fletcheri	0.5
Leucopogon fletcheri subsp. *brevisepalus*	5.8
Leucopogon fletcheri subsp. *fletcheri*	0.1
Leucopogon fraseri	2.9
Leucopogon gelidus	2.5
Leucopogon juniperinus	0.2
Leucopogon lanceolatus var. *lanceolatus*	4.2
Leucopogon microphyllus var. *microphyllus*	0.4
Leucopogon microphyllus var. *pilibundus*	1.6
Leucopogon neoanglicus	0.1
Leucopogon spp.	2.9
Leucopogon virgatus	2.9
Lissanthe strigosa	2.0
Melichrus procumbens	0.3
Melichrus urceolatus	12.7
Monotoca elliptica	0.4
Monotoca scoparia	20.6
Richea continentis	0.4
Styphelia angustifolia	0.1
Styphelia spp.	0.1
Styphelia triflora	0.4
Woollsia pungens	0.1
Euphorbiaceae	
Adriana tomentosa var. *tomentosa*	0.1
Chamaesyce drummondii	1.3
**Euphorbia lathyrus*	0.2
**Euphorbia peplus*	0.2
Ricinocarpos bowmanii	0.2

Fabaceae

Acacia alpina	0.4
Acacia aureocrinita	0.1
Acacia buxifolia	2.4
Acacia buxifolia subsp. *buxifolia*	1.2
Acacia costiniana	0.1
Acacia dawsonii	0.5
Acacia dealbata	29.9
Acacia dealbata subsp. *dealbata*	0.1
Acacia dealbata subsp. *subalpina*	13.3
Acacia deanei	0.2
Acacia deanei subsp. *deanei*	0.1
Acacia deanei subsp. *paucijuga*	0.4
Acacia decora	0.1
Acacia decurrens	0.2
Acacia doratoxylon	0.2
Acacia falciformis	5.3
Acacia genistifolia	0.7
Acacia gunnii	6.7
Acacia implexa	3.3
Acacia kettlewelliae	0.4
Acacia lucasii	0.1
Acacia mearnsii	3.5
Acacia melanoxylon	20.1
Acacia myrtifolia	0.2
Acacia obliquinervia	2.5
Acacia paradoxa	0.9
Acacia parramattensis	0.6
Acacia penninervis var. *penninervis*	0.8
Acacia pravissima	3.2
Acacia pycnantha	0.1
Acacia rubida	16.5
Acacia siculiformis	1.9
Acacia spp.	0.6
Acacia terminalis	0.4
Acacia ulicifolia	3.3
Acacia uncinata	0.4
Acacia verniciflua	0.6
Bossiaea buxifolia	8.5
Bossiaea foliosa	8.4
Bossiaea grayi	0.1
Bossiaea heterophylla	0.2
Bossiaea obcordata	0.1
Bossiaea prostrata	2.6
Bossiaea riparia	0.7
Bossiaea spp.	0.1
Senna spp.	0.3
Cullen microcephalum	4.4
Cullen tenax	0.6
**Cytisus scoparius* subsp. *scoparius*	0.1
Daviesia genistifolia	0.4
Daviesia latifolia	5.0
Daviesia leptophylla	5.8

Daviesia mimosoides	0.5
Daviesia mimosoides subsp. *acris*	0.1
Daviesia mimosoides subsp. *mimosoides*	18.0
Daviesia ulicifolia	14.3
Daviesia ulicifolia subsp. *ruscifolia*	0.5
Daviesia ulicifolia subsp. *ulicifolia*	0.1
Desmodium brachypodum	0.2
Desmodium gunnii	0.8
Desmodium varians	15.5
Dillwynia palustris	0.1
Dillwynia phylicoides	3.7
Dillwynia prostrata	0.6
Dillwynia retorta	0.4
Dillwynia sericea	5.1
Dillwynia sieberi	0.6
Dillwynia spp.	0.3
Glycine clandestina	49.5
Glycine microphylla	0.2
Glycine spp.	0.4
Glycine tabacina	3.5
Glycine tabacina subsp. A	0.1
Glycine tabacina subsp. B	0.1
Gompholobium huegelii	6.7
Gompholobium inconspicuum	0.4
Gompholobium minus	0.2
Gompholobium spp.	0.1
Hardenbergia violacea	17.1
Hovea asperifolia subsp. *asperifolia*	0.2
Hovea heterophylla	3.3
Hovea linearis	19.5
Hovea montana	1.9
Hovea purpurea	1.1
Hovea sp. *aff. heterophylla* (Kiandra)	0.9
Hovea spp.	0.2
Indigofera adesmiifolia	0.5
Indigofera australis	10.7
Lespedeza juncea	0.2
Lotus australis	0.9
**Lotus corniculatus*	0.2
**Lotus* spp.	0.1
**Lotus uliginosus*	0.1
**Medicago lupulina*	0.2
**Medicago polymorpha*	0.2
**Medicago sativa*	0.1
**Medicago* spp.	1.4
Mirbelia oxylobioides	4.7
Mirbelia platylobioides	0.1
Oxylobium arborescens	0.3
Oxylobium ellipticum	7.9
Platylobium formosum subsp. *formosum*	19.0
Podolobium alpestre	3.5
Podolobium procumbens	0.2
Pultenaea altissima	0.1

Pultenaea capitellata	0.2
Pultenaea fasciculata	0.7
Pultenaea foliolosa	0.1
Pultenaea humilis	0.1
Pultenaea juniperina	2.2
Pultenaea microphylla	0.5
Pultenaea polifolia	1.6
Pultenaea procumbens	8.6
Pultenaea retusa	0.1
Pultenaea setulosa	0.1
Pultenaea spinosa	5.5
Pultenaea spp.	1.1
Pultenaea subspicata	0.9
Sphaerolobium vimineum	0.1
Swainsona behriana	0.2
Swainsona galegifolia	0.2
Swainsona monticola	0.8
Swainsona recta	0.1
Swainsona sericea	1.1
Swainsona spp.	0.1
**Trifolium angustifolium*	4.7
**Trifolium arvense*	18.2
**Trifolium campestre*	12.5
**Trifolium cernuum*	0.2
**Trifolium dubium*	9.2
**Trifolium fragiferum*	0.1
**Trifolium glomeratum*	5.2
**Trifolium pratense*	0.1
**Trifolium repens*	13.4
**Trifolium* spp.	5.0
**Trifolium striatum*	1.3
**Trifolium subterraneum*	2.3
**Vicia monantha*	0.1
**Vicia sativa*	0.1
**Vicia sativa* subsp. *sativa*	0.2
**Vicia* spp.	0.6
**Vicia tetrasperma*	0.1
Zornia dyctiocarpa var. *dyctiocarpa*	0.2
Fumariaceae	
**Fumaria* spp.	0.2
Gentianaceae	
**Centaurium erythraea*	23.2
**Centaurium* spp.	1.9
**Centaurium tenuiflorum*	2.2
Chionogentias muelleriana	0.1
Chionogentias muelleriana subsp. *jingerensis*	0.1
Chionogentias sylvicola	0.3
**Cicendia quadrangularis*	0.4
Sebaea ovata	0.8

Geraniaceae	
**Erodium botrys*	0.1
**Erodium cicutarium*	0.5
Erodium crinitum	0.1
**Erodium moschatum*	0.2
Geranium antrorsum	5.2
Geranium dissectum	0.1
Geranium graniticola	0.1
Geranium homeanum	0.5
**Geranium molle* subsp. *molle*	1.1
Geranium neglectum	2.7
Geranium obtusisepalum	0.8
Geranium potentilloides	8.1
Geranium potentilloides var. *abditum*	0.5
Geranium potentilloides var. *potentilloides*	11.2
Geranium retrorsum	4.8
Geranium sessiliflorum subsp. *brevicaule*	0.3
Geranium solanderi	5.9
Geranium solanderi var. *grande*	0.1
Geranium solanderi var. *solanderi*	26.1
Geranium sp. 7	0.2
Geranium spp.	5.7
Pelargonium australe	4.2
Pelargonium inodorum	0.1
Pelargonium spp.	0.1
Goodeniaceae	
Brunonia australis	1.1
Dampiera lanceolata var. *lanceolata*	0.5
Goodenia bellidifolia subsp. *bellidifolia*	0.1
Goodenia hederacea	1.8
Goodenia hederacea subsp. *alpestris*	3.7
Goodenia hederacea subsp. *hederacea*	4.7
Goodenia heterophylla subsp. *heterophylla*	0.1
Goodenia humilis	0.1
Goodenia pinnatifida	0.8
Goodenia spp.	0.2
Grammitidaceae	
Grammitis billardierei	0.1
Haloragaceae	
Gonocarpus elatus	0.6
Gonocarpus micranthus	0.8
Gonocarpus micranthus subsp. *micranthus*	1.6
Gonocarpus micranthus subsp. *ramosissimus*	0.4
Gonocarpus montanus	1.3
Gonocarpus spp.	0.2
Gonocarpus tetragynus	62.8
Gonocarpus teucrioides	0.5
Haloragis aspera	0.1
Haloragis heterophylla	3.4

Haloragis serra	0.2
Myriophyllum alpinum	0.2
Myriophyllum caput-medusae	0.2
Myriophyllum crispatum	0.4
Myriophyllum pedunculatum	0.1
Myriophyllum pedunculatum subsp. *pedunculatum*	0.1
Myriophyllum simulans	0.5
Myriophyllum spp.	0.4
Myriophyllum variifolium	0.8
Myriophyllum verrucosum	0.2
Hydrocharitaceae	
Ottelia ovalifolia subsp. *ovalifolia*	0.1
Vallisneria australis	0.1
Hypoxidaceae	
Hypoxis hygrometrica	0.4
Hypoxis hygrometrica var. *hygrometrica*	0.9
Hypoxis hygrometrica var. *villosisepala*	0.1
Hypoxis spp.	0.2
Iridaceae	
Patersonia glabrata	0.1
Patersonia longifolia	0.1
Patersonia sericea	0.5
**Romulea rosea* var. *australis*	1.2
**Sisyrinchium* sp. A	0.1
Juncaceae	
Juncus alexandri subsp. *alexandri*	0.2
**Juncus articulatus*	0.7
Juncus australis	1.8
Juncus brevibracteus	0.6
**Juncus bufonius*	1.8
**Juncus capitatus*	0.6
Juncus continuus	0.1
Juncus falcatus	1.3
Juncus filicaulis	2.7
Juncus fockei	0.4
Juncus gregiflorus	0.4
Juncus holoschoenus	0.2
Juncus homalocaulis	0.8
Juncus pauciflorus	0.2
Juncus planifolius	0.8
Juncus prismatocarpus	0.2
Juncus procerus	0.2
Juncus radula	0.2
Juncus sandwithii	0.1
Juncus sarophorus	1.1
Juncus spp.	2.9
Juncus subsecundus	3.1
Juncus usitatus	0.9
Juncus vaginatus	0.5

Luzula alpestris	0.4
Luzula densiflora	7.8
Luzula flaccida	23.0
Luzula meridionalis	0.2
Luzula modesta	2.4
Luzula novae-cambriae	0.6
Luzula ovata	0.8
Luzula spp.	10.7
Juncaginaceae	
Triglochin procera	0.2
Lamiaceae	
Ajuga australis	9.9
Lycopus australis	0.7
**Melissa officinalis* subsp. *officinalis*	0.2
Mentha australis	0.1
Mentha diemenica	5.2
Mentha laxiflora	1.2
**Mentha pulegium*	0.2
Mentha satureioides	0.1
Mentha spp.	0.2
**Mentha* x *piperita*	0.1
Prostanthera cuneata	0.3
Prostanthera decussata	0.1
Prostanthera lasianthos	1.4
Prostanthera rotundifolia	0.5
**Prunella vulgaris*	5.9
**Salvia verbenaca*	0.8
Scutellaria humilis	3.4
Westringia eremicola	0.5
Westringia lucida	0.1
Lauraceae	
Cassytha glabella f. glabella	1.2
Cassytha melantha	0.2
Cassytha pubescens	3.0
Cassytha spp.	0.5
Lentibulariaceae	
Utricularia australis	0.1
Utricularia dichotoma	0.2
Utricularia monanthos	0.1
Linaceae	
Linum marginale	2.9
Linum spp.	0.1
Lobeliaceae	
Isotoma axillaris	0.1
Isotoma fluviatilis	0.1
Isotoma fluviatilis subsp. *australis*	0.2
Lobelia dentata	0.4

Lobelia gibbosa	1.8
Lobelia pedunculata	8.0
Lobelia puberula	1.1
Lobelia purpurascens	0.9
Lobelia spp.	0.2
Lobelia surrepens	0.5
Loganiaceae	
Logania pusilla	0.1
Mitrasacme serpyllifolia	0.4
Lomandraceae	
Lomandra bracteata	0.4
Lomandra confertifolia subsp. *rubiginosa*	0.2
Lomandra confertifolia subsp. *similis*	0.2
Lomandra filiformis	3.2
Lomandra filiformis subsp. *coriacea*	20.6
Lomandra filiformis subsp. *filiformis*	32.3
Lomandra glauca	0.1
Lomandra longifolia	53.2
Lomandra micrantha subsp. *tuberculata*	0.2
Lomandra multiflora subsp. *multiflora*	14.3
Lomandra spp.	1.1
Loranthaceae	
Amyema cambagei	0.2
Amyema miquelii	0.8
Amyema pendulum subsp. *pendulum*	1.7
Amyema spp.	0.8
Muellerina eucalyptoides	0.1
Luzuriagaceae	
Drymophila cyanocarpa	0.6
Lycopodiaceae	
Lycopodium fastigiatum	0.2
Lythraceae	
Lythrum hyssopifolia	1.1
Lythrum salicaria	0.5
Malaceae	
**Cotoneaster glaucophyllus*	0.2
**Cotoneaster* spp.	0.1
**Crataegus monogyna*	1.8
**Malus pumila*	0.1
**Pyracantha angustifolia*	0.2
**Pyracantha* spp.	0.1
Malvaceae	
Gynatrix pulchella	3.6
**Malva neglecta*	0.1
**Malva parviflora*	0.1

**Modiola caroliniana*	0.8
Sida spp.	0.1
Menyanthaceae	
Nymphoides geminata	0.2
Nymphoides montana	0.1
Monimiaceae	
Atherosperma moschatum	0.1
Hedycarya angustifolia	0.3
Moraceae	
Ficus spp.	0.1
Myrsinaceae	
**Anagallis arvensis*	10.8
Myrtaceae	
Baeckea gunniana	1.1
Baeckea latifolia	0.1
Baeckea utilis	3.7
Callistemon pallidus	0.5
Callistemon pityoides	0.4
Callistemon sieberi	1.3
Callistemon spp.	0.1
Callistemon subulatus	0.2
Calytrix tetragona	2.3
Corymbia gummifera	0.1
Eucalyptus aggregata	0.5
Eucalyptus albens	1.4
Eucalyptus amplifolia subsp. *amplifolia*	0.1
Eucalyptus bicostata	3.2
Eucalyptus blakelyi	3.6
Eucalyptus bridgesiana	13.3
Eucalyptus camaldulensis	0.4
Eucalyptus camphora	0.1
Eucalyptus camphora subsp. *humeana*	1.6
Eucalyptus cinerea	1.3
Eucalyptus dalrympleana	3.8
Eucalyptus dalrympleana subsp. *dalrympleana*	27.6
Eucalyptus dealbata	0.2
Eucalyptus debeuzevillei	1.2
Eucalyptus delegatensis subsp. *delegatensis*	5.9
Eucalyptus dives	31.6
Eucalyptus dwyeri	0.1
Eucalyptus fastigata	3.4
Eucalyptus goniocalyx	6.2
Eucalyptus lacrimans	0.6
Eucalyptus macrorhyncha	27.1
Eucalyptus mannifera	15.4
Eucalyptus mannifera subsp. *mannifera*	0.2
Eucalyptus melliodora	7.8
Eucalyptus niphophila	0.7

Eucalyptus nitens	0.1
Eucalyptus nortonii	8.0
Eucalyptus ovata	0.1
Eucalyptus parvula	0.1
Eucalyptus pauciflora	35.7
Eucalyptus perriniana	0.1
Eucalyptus polyanthemos	2.4
Eucalyptus polyanthemos subsp. *polyanthemos*	3.3
Eucalyptus polyanthemos subsp. *vestita*	0.8
Eucalyptus pulverulenta	0.2
Eucalyptus radiata	0.4
Eucalyptus radiata subsp. *radiata*	1.8
Eucalyptus robertsonii	1.6
Eucalyptus robertsonii subsp. *robertsonii*	17.9
Eucalyptus rossii	7.1
Eucalyptus rubida	3.3
Eucalyptus rubida subsp. *rubida*	12.7
Eucalyptus sclerophylla	0.1
Eucalyptus sideroxylon	0.5
Eucalyptus sieberi	0.8
Eucalyptus spp.	0.5
Eucalyptus stellulata	5.5
Eucalyptus viminalis	18.3
Kunzea ambigua	0.1
Kunzea ericoides	7.2
Kunzea muelleri	0.6
Kunzea parvifolia	0.6
Leptospermum brevipes	1.3
Leptospermum continentale	2.0
Leptospermum grandifolium	2.7
Leptospermum juniperinum	1.6
Leptospermum lanigerum	1.1
Leptospermum micromyrtus	1.2
Leptospermum multicaule	1.2
Leptospermum myrsinoides	0.1
Leptospermum myrtifolium	5.5
Leptospermum namadgiensis	0.2
Leptospermum obovatum	0.9
Leptospermum polygalifolium subsp. *polygalifolium*	0.1
Leptospermum spp.	0.1
Leptospermum squarrosum	0.9
Leptospermum trinervium	0.1
Melaleuca parvistaminea	0.1
Nyctaginaceae	
Boerhavia dominii	0.1
Oleaceae	
**Ligustrum lucidum*	0.1
**Ligustrum sinense*	0.2
**Ligustrum vulgare*	0.1
Nestegis ligustrina	0.1
Notelaea spp.	0.1

Onagraceae

Epilobium billardiereanum	2.2
Epilobium billardiereanum subsp. *billardiereanum*	3.8
Epilobium billardiereanum subsp. *cinereum*	9.2
Epilobium billardiereanum subsp. *hydrophilum*	1.5
Epilobium curtisiae	0.2
Epilobium gunnianum	1.8
Epilobium hirtigerum	1.4
Epilobium pallidiflorum	0.2
Epilobium sarmentaceum	0.1
Epilobium spp.	3.4
**Ludwigia palustris*	0.1
Ludwigia peploides subsp. *montevidensis*	0.1

Orchidaceae

Acianthus exsertus	0.1
Acianthus spp.	0.5
Arthrochilus huntianus	0.3
Caladenia alpina	1.1
Caladenia capillata	0.5
Caladenia carnea	2.2
Caladenia catenata	0.2
Caladenia congesta	0.1
Caladenia cucullata	0.1
Caladenia fuscata	0.2
Caladenia gracilis	3.8
Caladenia sp. C	0.1
Caladenia spp.	1.0
Caleana major	0.2
Caleana minor	0.1
Calochilus campestris	0.1
Calochilus paludosus	0.1
Calochilus robertsonii	0.2
Calochilus spp.	0.1
Chiloglottis pluricallata	1.2
Chiloglottis spp.	1.4
Chiloglottis trapeziformis	0.2
Chiloglottis valida	3.9
Corybas spp.	0.8
Cyanicula caerulea	0.1
Cyrtostylis reniformis	0.5
Dipodium punctatum	1.0
Dipodium roseum	2.0
Dipodium spp.	0.6
Diuris goonooensis	0.1
Diuris lanceolata	0.2
Diuris maculata	0.6
Diuris monticola	0.9
Diuris semilunulata	0.1
Diuris spp.	1.1
Diuris sulphurea	3.7
Eriochilus cucullatus	1.5
Gastrodia sesamoides	0.9

Gastrodia spp.	0.1
Genoplesium archeri	0.1
Genoplesium fimbriatum	0.1
Genoplesium nudum	0.2
Genoplesium sagittiferum	0.1
Genoplesium spp.	0.3
Glossodia major	0.2
Microtis parviflora	0.2
Microtis spp.	1.5
Microtis unifolia	6.9
Prasophyllum brevilabre	0.1
Prasophyllum sphacelatum	0.4
Prasophyllum spp.	1.3
Prasophyllum tadgellianum	0.1
Pterostylis aciculiformis	0.1
Pterostylis coccina	1.6
Pterostylis concinna	0.1
Pterostylis curta	0.1
Pterostylis cycnocephala	0.1
Pterostylis decurva	1.3
Pterostylis fischii	0.2
Pterostylis furcata	0.2
Pterostylis hamata	0.1
Pterostylis laxa	0.1
Pterostylis longifolia	0.3
Pterostylis longipetala	0.1
Pterostylis monticola	1.6
Pterostylis mutica	0.2
Pterostylis nana	0.6
Pterostylis nutans	1.2
Pterostylis oreophila	0.1
Pterostylis pedunculata	0.6
Pterostylis reflexa	0.1
Pterostylis sp. F	0.2
Pterostylis spp.	5.1
Pterostylis parviflora	0.2
Spiranthes australis	0.4
Stegostyla dimorpha	0.1
Stegostyla sp. aff. *gracilis*	0.1
Stegostyla spp.	0.4
Thelymitra cyanea	0.4
Thelymitra ixioides var. *ixioides*	0.2
Thelymitra nuda	0.4
Thelymitra pauciflora sens. lat.	1.3
Thelymitra spp.	2.7
Oxalidaceae	
Oxalis chnoodes	0.4
**Oxalis corniculata*	7.4
Oxalis exilis	5.8
Oxalis perennans	14.7
Oxalis radicosa	0.1
Oxalis spp.	7.7

Oxalis thompsoniae	0.4
Papaveraceae	
**Eschscholzia californica*	0.1
**Papaver dubium*	0.1
Philydraceae	
Philydrum lanuginosum	0.1
Phormiaceae	
Dianella caerulea	0.1
Dianella caerulea var. *caerulea*	0.6
Dianella caerulea var. *producta*	0.1
Dianella longifolia var. *longifolia*	2.0
Dianella revoluta var. *revoluta*	27.4
Dianella spp.	0.8
Dianella tasmanica	16.4
Stypandra glauca	4.4
Phyllanthaceae	
Phyllanthus hirtellus	0.6
Poranthera microphylla	36.6
Picrodendraceae	
Micrantheum hexandrum	0.1
Pittosporaceae	
Billardiera macrantha	0.3
Billardiera scandens	5.9
Billardiera spp.	0.1
Bursaria spinosa	9.1
Bursaria spinosa subsp. *lasiophylla*	4.9
Bursaria spinosa subsp. *spinosa*	0.4
Cheiranthera linearis	2.8
Pittosporum bicolor	0.1
Rhytidosporum alpinum	0.5
Rhytidosporum procumbens	1.0
Plantaginaceae	
Plantago alpestris	0.1
Plantago antarctica	1.1
**Plantago coronopus*	0.1
Plantago debilis	1.6
Plantago euryphylla	1.3
Plantago gaudichaudii	1.8
Plantago hispida	1.4
**Plantago lanceolata*	4.8
**Plantago major*	0.3
Plantago spp.	0.5
Plantago varia	19.7
Poaceae	
Agrostis bettyae	0.4

**Agrostis capillaris* var. *capillaris*	0.5
**Agrostis gigantea*	0.2
Agrostis parviflora	0.3
Agrostis propinqua	0.1
Agrostis spp.	1.2
**Agrostis stolonifera*	0.1
Agrostis thompsoniae	0.1
Agrostis venusta	0.7
**Aira caryophyllea*	3.1
**Aira cupaniana*	0.6
**Aira elegantissima*	10.5
**Aira* spp.	10.4
Amphibromus neesii	0.1
Amphibromus nervosus	0.7
Amphibromus spp.	0.1
**Anthoxanthum odoratum*	4.2
Aristida behriana	0.2
Aristida benthamii var. *spinulifera*	0.1
Aristida calycina var. *calycina*	0.4
Aristida jerichoensis	0.1
Aristida jerichoensis var. *jerichoensis*	0.2
Aristida ramosa	1.6
Aristida ramosa var. *ramosa*	1.5
Aristida ramosa var. *scaberula*	0.5
Aristida spp.	0.1
Aristida vagans	0.3
**Arrhenatherum elatius* var. *bulbosum*	0.1
Australopyrum retrofractum	0.1
Australopyrum velutinum	0.9
Austrodanthonia alpicola	0.1
Austrodanthonia auriculata	0.5
Austrodanthonia bipartita	0.1
Austrodanthonia caespitosa	2.1
Austrodanthonia carphoides	0.9
Austrodanthonia duttoniana	0.2
Austrodanthonia eriantha	2.1
Austrodanthonia fulva	0.5
Austrodanthonia laevis	4.1
Austrodanthonia monticola	1.0
Austrodanthonia penicillata	5.5
Austrodanthonia pilosa	12.4
Austrodanthonia racemosa var. *racemosa*	12.0
Austrodanthonia richardsonii	0.1
Austrodanthonia setacea	1.3
Austrodanthonia spp.	5.7
Austrodanthonia tenuior	0.3
Austrofestuca eriopoda	4.4
Austrofestuca hookeriana	2.7
Austrofestuca littoralis	0.5
Austrostipa bigeniculata	1.4
Austrostipa densiflora	1.5
Austrostipa gibbosa	0.1
Austrostipa mollis	0.1

Austrostipa nivicola	0.6
Austrostipa ramosissima	0.1
Austrostipa rudis subsp. *nervosa*	0.6
Austrostipa rudis subsp. *rudis*	2.8
Austrostipa scabra	3.1
Austrostipa scabra subsp. *falcata*	3.5
Austrostipa scabra subsp. *scabra*	0.5
Austrostipa setacea	0.1
Austrostipa spp.	2.9
Austrostipa verticillata	0.1
**Avena barbata*	0.8
**Avena fatua*	1.4
**Avena* spp.	0.8
Bothriochloa macra	5.1
**Briza maxima*	9.2
**Briza minor*	8.7
**Bromus alopecuros*	0.1
**Bromus brevis*	0.1
**Bromus catharticus*	0.4
**Bromus diandrus*	5.8
**Bromus hordeaceus*	1.4
**Bromus hordeaceus* subsp. *molliformis*	4.9
**Bromus rubens*	1.2
**Bromus* spp.	1.1
**Bromus tectorum*	0.2
Chloris spp.	0.1
Chloris truncata	0.6
Cymbopogon refractus	0.5
**Cynodon dactylon*	0.8
**Cynosurus echinatus*	3.4
**Cynosurus* spp.	0.1
**Dactylis glomerata*	1.2
Danthonia spp.	5.9
Deschampsia caespitosa	0.2
**Desmazeria rigida*	0.1
Deyeuxia accedens	0.2
Deyeuxia angustifolia	0.1
Deyeuxia brachyathera	0.9
Deyeuxia carinata	0.1
Deyeuxia contracta	0.1
Deyeuxia crassiuscula	0.1
Deyeuxia gunniana	1.4
Deyeuxia microseta	0.1
Deyeuxia monticola	0.6
Deyeuxia monticola var. *monticola*	6.3
Deyeuxia monticola var. *valida*	0.9
Deyeuxia nudiflora	0.1
Deyeuxia parviseta var. *parviseta*	0.1
Deyeuxia quadriseta	9.9
Deyeuxia rodwayi	1.8
Deyeuxia spp.	2.9
Dichanthium sericeum subsp. *sericeum*	0.4
Dichelachne crinita	5.3

Dichelachne hirtella	2.5
Dichelachne inaequiglumis	6.3
Dichelachne micrantha	11.9
Dichelachne parva	1.2
Dichelachne rara	14.8
Dichelachne sieberiana	8.5
Dichelachne spp.	5.0
Digitaria brownii	0.1
Echinopogon caespitosus var. *caespitosus*	0.3
Echinopogon cheelii	1.8
Echinopogon intermedius	0.8
Echinopogon ovatus	14.4
Echinopogon spp.	1.1
**Ehrharta erecta*	0.1
Elymus scaber var. *scaber*	33.6
Enneapogon nigricans	1.3
Enneapogon spp.	0.1
Entolasia stricta	0.1
Eragrostis benthamii	0.1
Eragrostis brownii	0.6
**Eragrostis curvula*	0.7
Eragrostis leptostachya	0.1
Eragrostis parviflora	0.1
**Eragrostis pilosa*	0.1
Eragrostis spp.	0.2
Festuca asperula	1.9
**Festuca arundinacea*	0.1
Festuca muelleri	0.3
**Festuca pratensis*	0.2
**Festuca rubra* subsp. *rubra*	0.1
Festuca spp.	0.2
Glyceria australis	0.2
**Hainardia cylindrica*	0.1
Hemarthria uncinata var. *uncinata*	1.2
Hierochloe redolens	0.1
**Holcus lanatus*	12.1
Hookerochloa hookeriana	0.1
**Hordeum leporinum*	0.9
**Hordeum marinum*	0.6
**Hordeum* spp.	0.1
Imperata cylindrica var. *major*	0.2
Isachne globosa	0.3
Joycea pallida	25.1
Lachnagrostis aemula	1.8
Lachnagrostis aequata	0.1
Lachnagrostis billardierei subsp. *billardierei*	0.1
Lachnagrostis filiformis	5.7
Lachnagrostis meionectes	0.2
**Lagurus ovatus*	0.1
**Lolium perenne*	1.4
**Lolium rigidum*	0.5
**Lolium* spp.	0.5
Microlaena stipoides var. *stipoides*	36.5

**Nassella neesiana*	0.1
**Nassella trichotoma*	1.5
Notodanthonia longifolia	0.2
Panicum effusum	4.9
Panicum simile	0.4
Panicum spp.	0.3
**Paspalum dilatatum*	0.9
Paspalum distichum	0.2
Pennisetum alopecuroides	0.1
**Pennisetum clandestinum*	0.1
Pentapogon quadrifidus	0.2
**Pentaschistis airoides*	0.6
**Phalaris aquatica*	1.0
**Phalaris* spp.	0.4
**Phleum pratense*	0.2
Phragmites australis	0.5
**Poa annua*	0.4
**Poa bulbosa*	0.2
Poa clivicola	2.8
Poa costiniana	3.5
Poa ensiformis	0.8
Poa fawcettiae	1.5
Poa helmsii	6.4
Poa hiemata	1.4
Poa hookeri	2.0
Poa induta	11.7
Poa labillardierei var. *labillardierei*	13.0
Poa meionectes	12.1
Poa petrophila	0.6
Poa phillipsiana	3.6
**Poa pratensis*	0.8
Poa saxicola	0.4
Poa sieberiana	5.3
Poa sieberiana var. *cyanophylla*	13.0
Poa sieberiana var. *hirtella*	6.2
Poa sieberiana var. *sieberiana*	64.8
Poa spp.	10.1
Poa tenera	3.4
**Polypogon monspeliensis*	0.2
**Polypogon* spp.	0.1
**Psilurus incurvus*	0.1
Puccinellia stricta	0.4
**Rostraria cristata*	0.4
Rytidosperma nudiflorum	1.0
Sorghum leiocladum	1.3
**Setaria viridis*	0.1
Sporobolus creber	0.1
Sporobolus elongatus	0.1
Sporobolus spp.	0.1
Themeda australis	27.4
Tripogon loliiformis	0.1
Trisetum spicatum	1.9
**Triticum aestivum*	0.1

**Vulpia bromoides*	5.7
**Vulpia muralis*	4.2
**Vulpia myuros f. megalura*	3.0
**Vulpia* spp.	5.8
Podocarpaceae	
Podocarpus lawrencei	0.2
Polygalaceae	
Comesperma ericinum	0.2
Comesperma retusum	0.9
Comesperma spp.	0.1
Comesperma volubile	0.2
Polygala japonica	0.2
Polygala spp.	0.1
Polygonaceae	
**Acetosella vulgaris*	18.1
Persicaria decipiens	0.5
Persicaria hydropiper	0.5
Persicaria lapathifolia	0.1
**Persicaria maculosa*	0.2
Persicaria prostrata	1.2
Persicaria spp.	0.4
**Polygonum arenastrum*	0.1
**Polygonum aviculare*	0.1
**Polygonum* spp.	0.4
Rumex brownii	17.1
**Rumex conglomeratus*	0.2
**Rumex crispus*	2.2
Rumex dumosus	0.5
Rumex spp.	0.4
Rumex tenax	0.1
Portulacaceae	
Calandrinia eremaea	0.2
Calandrinia spp.	0.1
Montia fontana	0.1
Neopaxia australasica	1.3
Portulaca oleracea	0.1
Potamogetonaceae	
Potamogeton crispus	0.1
Potamogeton ochreatus	0.5
Potamogeton pectinatus	0.1
Potamogeton tricarinatus	1.0
Proteaceae	
Banksia canei	0.5
Banksia marginata	1.9
Banksia spinulosa var. *spinulosa*	0.1
Grevillea alpina	0.4
Grevillea arenaria subsp. *arenaria*	0.1

Grevillea australis	0.7
Grevillea floribunda subsp. *floribunda*	0.1
Grevillea iaspicula	0.2
Grevillea lanigera	7.4
Grevillea longifolia	0.1
Grevillea neurophylla subsp. *neurophylla*	0.1
Grevillea oxyantha subsp. *ecarinata*	0.1
Grevillea oxyantha subsp. *oxyantha*	0.2
Grevillea ramosissima subsp. *ramosissima*	0.9
Grevillea rosmarinifolia subsp. *rosmarinifolia*	0.6
Grevillea spp.	0.1
Grevillea victoriae subsp. *nivalis*	0.1
Grevillea wilkinsonii	0.1
Hakea dactyloides	0.1
Hakea decurrens	0.1
Hakea decurrens subsp. *decurrens*	0.1
Hakea eriantha	0.1
Hakea laevipes subsp. *laevipes*	0.2
Hakea lissosperma	0.5
Hakea microcarpa	5.4
Hakea sericea	0.1
Hakea spp.	0.1
Isopogon anethifolius	0.1
Lomatia fraseri	0.3
Lomatia ilicifolia	0.1
Lomatia myricoides	14.5
Lomatia silaifolia	0.1
Persoonia asperula	0.4
Persoonia chamaepeuce	21.7
Persoonia chamaepitys	0.2
Persoonia confertiflora	0.1
Persoonia linearis	0.5
Persoonia rigida	4.1
Persoonia silvatica	2.3
Persoonia spp.	0.2
Persoonia subvelutina	1.4
Pteridaceae	
Pellaea falcata	0.4
Pellaea nana	0.2
Pellaea spp.	0.1
Pteris tremula	0.1
Ranunculaceae	
Clematis aristata	33.3
Clematis glycinoides var. *glycinoides*	0.5
Clematis leptophylla	1.6
Clematis microphylla	1.2
Clematis spp.	0.4
Ranunculus amphitrichus	0.6
Ranunculus collinus	0.3
Ranunculus diminutus	0.9
Ranunculus graniticola	5.3

Ranunculus inundatus	1.4
Ranunculus lappaceus	20.7
Ranunculus millanii	0.4
Ranunculus muricatus	0.6
Ranunculus papulentus	0.3
Ranunculus pimpinellifolius	1.9
Ranunculus plebeius	4.8
Ranunculus pumilio var. *pumilio*	0.9
Ranunculus scapiger	2.5
**Ranunculus sceleratus*	0.2
Ranunculus sessiliflorus var. *sessiliflorus*	2.4
Ranunculus spp.	3.7
Resedaceae	
**Reseda luteola*	0.1
Restionaceae	
Baloskion australe	2.9
Empodisma minus	2.9
Lepyrodia scariosa	0.1
Rhamnaceae	
Cryptandra amara	0.8
Cryptandra amara var. *amara*	0.7
Cryptandra amara var. *longiflora*	0.5
Cryptandra propinqua	0.1
Cryptandra spp.	0.1
Discaria pubescens	0.6
Pomaderris andromedifolia	0.1
Pomaderris andromedifolia subsp. *andromedifolia*	0.2
Pomaderris angustifolia	0.7
Pomaderris aspera	3.7
Pomaderris betulina	0.3
Pomaderris betulina subsp. *actensis*	0.1
Pomaderris elachophylla	0.1
Pomaderris eriocephala	1.1
Pomaderris pallida	0.2
Pomaderris phylicifolia subsp. *ericoides*	0.6
Pomaderris prunifolia var. *prunifolia*	0.1
Pomaderris spp.	0.5
Pomaderris subcapitata	0.4
Pomaderris velutina	0.1
Spyridium parvifolium	2.0
Rosaceae	
Acaena agnipila	0.8
Acaena anserovina	0.2
Acaena echinata	13.3
Acaena novae-zelandiae	41.1
Acaena ovina	17.3
Acaena sp. A	0.2
Acaena spp.	0.9
Acaena 'X anserovina'	0.2

**Aphanes arvensis*	0.1
Aphanes australiana	2.4
Aphanes spp.	0.1
Geum urbanum	0.8
**Potentilla anserina* subsp. *anserina*	0.1
**Potentilla recta*	0.3
**Rosa rubiginosa*	15.7
**Rosa* spp.	0.1
**Rubus anglocandicans*	0.4
**Rubus fruticosus* sp. agg.	7.0
Rubus parvifolius	17.6
Rubus rosifolius	0.2
Rubus spp.	0.9
**Rubus ulmifolius*	1.6
**Sanguisorba minor* subsp. *muricata*	0.4
Rubiaceae	
Asperula ambleia	0.1
Asperula conferta	14.4
Asperula gunnii	5.7
Asperula pusilla	0.8
Asperula scoparia	39.9
Asperula spp.	1.1
Coprosma hirtella	23.9
Coprosma nivalis	0.3
Coprosma quadrifida	7.5
**Galium aparine*	1.8
Galium binifolium	0.3
Galium ciliare	1.4
**Galium divaricatum*	1.4
Galium gaudichaudii	18.8
Galium liratum	0.1
Galium migrans	2.5
**Galium murale*	0.8
Galium propinquum	5.1
Galium roddii	0.1
Galium spp.	2.2
Leptostigma reptans	0.1
Nertera granadensis	0.1
Opercularia aspera	0.9
Opercularia diphylla	0.2
Opercularia hispida	2.3
Opercularia spp.	0.3
Opercularia varia	0.4
Pomax umbellata	1.7
Rutaceae	
Asterolasia trymalioides	0.1
Boronia algida	0.6
Boronia nana var. *hyssopifolia*	0.4
Correa lawrenceana var. *rosea*	0.1
Correa reflexa	0.3
Correa reflexa var. *reflexa*	0.8

Nematolepis ovatifolia	0.2
Phebalium squamulosum	0.2
Phebalium squamulosum subsp. *ozothamnoides*	0.7
Phebalium squamulosum subsp. *squamulosum*	0.1
Salicaceae	
**Salix alba* var. *alba*	0.1
**salix babylonica*	0.1
**Salix nigra*	0.2
**Salix spp.*	0.1
**Salix x rubens*	0.1
Santalaceae	
Choretrum candollei	0.1
Choretrum pauciflorum	4.2
Exocarpos cupressiformis	6.0
Exocarpos spp.	0.2
Exocarpos strictus	17.2
Omphacomeria acerba	1.7
Sapindaceae	
Dodonaea boroniifolia	0.3
Dodonaea viscosa	0.6
Dodonaea viscosa subsp. *angustifolia*	0.6
Dodonaea viscosa subsp. *angustissima*	1.8
Dodonaea viscosa subsp. *cuneata*	0.8
Dodonaea viscosa subsp. *spatulata*	2.5
Scrophulariaceae	
Derwentia derwentiana	4.3
Derwentia derwentiana subsp. *derwentiana*	9.2
Derwentia derwentiana subsp. *maideniana*	0.5
Derwentia perfoliata	10.7
Derwentia spp.	0.1
Euphrasia caudata	0.2
Euphrasia collina subsp. *collina*	0.1
Euphrasia collina subsp. *diversicolor*	0.2
Euphrasia collina subsp. *paludosa*	3.5
Euphrasia collina subsp. *speciosa*	0.6
Euphrasia spp.	0.1
Glossostigma elatinoides	0.4
Gratiola nana	0.1
Gratiola peruviana	4.4
Limosella australis	1.2
**Linaria arvensis*	2.1
**Linaria pelisseriana*	1.4
**Marrubium vulgare*	0.2
**Mimulus moschatus*	0.9
**Orobanche minor*	3.9
**Parentucellia latifolia*	0.9
**Parentucellia* spp.	0.1
**Verbascum* spp.	0.2
**Verbascum thapsus* subsp. *thapsus*	3.4

**Verbascum virgatum*	1.7
**Veronica anagallis-aquatica*	1.1
**Veronica arvensis*	1.9
Veronica calycina	23.3
Veronica gracilis	2.1
Veronica notabilis	0.1
**Veronica persica*	0.1
Veronica plebeia	2.7
**Veronica serpyllifolia*	0.1
Veronica spp.	0.8
Veronica subtilis	1.4
Smilacaceae	
Smilax australis	0.1
Solanaceae	
**Datura* spp.	0.1
**Solanum aviculare*	0.5
**Solanum chenopodioides*	0.1
Solanum cinereum	0.2
Solanum linearifolium	0.1
**Solanum nigrum*	1.5
Solanum opacum	0.1
Solanum spp.	0.4
**Solanum triflorum*	0.1
Stackhousiaceae	
Stackhousia monogyna	24.3
Stackhousia viminea	0.5
Sterculiaceae	
Brachychiton populneus subsp. *populneus*	2.7
Lasiopetalum ferrugineum var. *cordatum*	0.1
Stylidiaceae	
Stylidium armeria	0.6
Stylidium graminifolium sens. lat.	36.1
Stylidium montanum	2.4
Stylidium spp.	0.2
Thymelaeaceae	
Pimelea alpina	0.3
Pimelea axiflora subsp. *axiflora*	0.1
Pimelea biflora	0.6
Pimelea bracteata	0.5
Pimelea curviflora	3.7
Pimelea curviflora var. *acuta*	0.1
Pimelea curviflora var. *gracilis*	0.3
Pimelea curviflora var. *sericea*	5.7
Pimelea glauca	0.6
Pimelea latifolia subsp. *hirsuta*	0.2
Pimelea ligustrina	0.2
Pimelea ligustrina subsp. *ciliata*	0.7

Pimelea ligustrina subsp. *ligustrina*	0.4
Pimelea linifolia	1.8
Pimelea linifolia subsp. *caesia*	5.7
Pimelea linifolia subsp. *collina*	0.8
Pimelea linifolia subsp. *linifolia*	4.1
Pimelea pauciflora	1.5
Pimelea spp.	1.5
Pimelea treyvaudii	1.8
Typhaceae	
Typha domingensis	0.2
Typha orientalis	0.1
Ulmaceae	
**Ulmus* spp.	0.1
Urticaceae	
Australina pusilla	1.2
Parietaria debilis	0.1
Urtica incisa	4.4
**Urtica urens*	0.2
Uvulariaceae	
Schelhammera undulata	0.1
Verbenaceae	
**Verbena bonariensis*	0.8
**Verbena officinalis*	0.7
**Verbena* spp.	0.1
Violaceae	
Melicytus dentatus sens. lat.	1.6
Viola betonicifolia	42.2
Viola caleyana	0.4
Viola fuscoviolacea	0.4
Viola hederacea	16.8
Vitaceae	
**Parthenocissus quinquefolia*	0.1
Winteraceae	
Tasmannia lanceolata	3.1
Tasmannia xerophila subsp. *xerophila*	1.8
Xanthorrhoeaceae	
Xanthorrhoea glauca subsp. *angustifolia*	3.1
Zannichelliaceae	
Lepilaena bilocularis	0.4

Poaceae	
Agrostis bettyae	0.4
**Agrostis capillaris* var. *capillaris*	0.5
**Agrostis gigantea*	0.2
Agrostis parviflora	0.3
Agrostis propinqua	0.1
Agrostis spp.	1.2
**Agrostis stolonifera*	0.1
Agrostis thompsoniae	0.1
Agrostis venusta	0.7
**Aira caryophyllea*	3.1
**Aira cupaniana*	0.6
**Aira elegantissima*	10.5
**Aira* spp.	10.4
Amphibromus neesii	0.1
Amphibromus nervosus	0.7
Amphibromus spp.	0.1
**Anthoxanthum odoratum*	4.2
Aristida behriana	0.2
Aristida benthamii var. *spinulifera*	0.1
Aristida calycina var. *calycina*	0.4
Aristida jerichoensis	0.1
Aristida jerichoensis var. *jerichoensis*	0.2
Aristida ramosa	1.6
Aristida ramosa var. *ramosa*	1.5
Aristida ramosa var. *scaberula*	0.5
Aristida spp.	0.1
Aristida vagans	0.3
**Arrhenatherum elatius* var. *bulbosum*	0.1
Australopyrum retrofractum	0.1
Australopyrum velutinum	0.9
Austrodanthonia alpicola	0.1
Austrodanthonia auriculata	0.5
Austrodanthonia bipartita	0.1
Austrodanthonia caespitosa	2.1
Austrodanthonia carphoides	0.9
Austrodanthonia duttoniana	0.2
Austrodanthonia eriantha	2.1
Austrodanthonia fulva	0.5
Austrodanthonia laevis	4.1
Austrodanthonia monticola	1.0
Austrodanthonia penicillata	5.5
Austrodanthonia pilosa	12.4
Austrodanthonia racemosa var. *racemosa*	12.0
Austrodanthonia richardsonii	0.1
Austrodanthonia setacea	1.3
Austrodanthonia spp.	5.7
Austrodanthonia tenuior	0.3
Austrofestuca eriopoda	4.4
Austrofestuca hookeriana	2.7
Austrofestuca littoralis	0.5
Austrostipa bigeniculata	1.4

Austrostipa densiflora	1.5
Austrostipa gibbosa	0.1
Austrostipa mollis	0.1
Austrostipa nivicola	0.6
Austrostipa ramosissima	0.1
Austrostipa rudis subsp. *nervosa*	0.6
Austrostipa rudis subsp. *rudis*	2.8
Austrostipa scabra	3.1
Austrostipa scabra subsp. *falcata*	3.5
Austrostipa scabra subsp. *scabra*	0.5
Austrostipa setacea	0.1
Austrostipa spp.	2.9
Austrostipa verticillata	0.1
**Avena barbata*	0.8
**Avena fatua*	1.4
**Avena* spp.	0.8
Bothriochloa macra	5.1
**Briza maxima*	9.2
**Briza minor*	8.7
**Bromus alopecuros*	0.1
**Bromus brevis*	0.1
**Bromus catharticus*	0.4
**Bromus diandrus*	5.8
**Bromus hordeaceus*	1.4
**Bromus hordeaceus* subsp. *molliformis*	4.9
**Bromus rubens*	1.2
**Bromus* spp.	1.1
**Bromus tectorum*	0.2
Chloris spp.	0.1
Chloris truncata	0.6
Cymbopogon refractus	0.5
**Cynodon dactylon*	0.8
**Cynosurus echinatus*	3.4
**Cynosurus* spp.	0.1
**Dactylis glomerata*	1.2
Danthonia spp.	5.9
Deschampsia caespitosa	0.2
**Desmazeria rigida*	0.1
Deyeuxia accedens	0.2
Deyeuxia angustifolia	0.1
Deyeuxia brachyathera	0.9
Deyeuxia carinata	0.1
Deyeuxia contracta	0.1
Deyeuxia crassiuscula	0.1
Deyeuxia gunniana	1.4
Deyeuxia microseta	0.1
Deyeuxia monticola	0.6
Deyeuxia monticola var. *monticola*	6.3
Deyeuxia monticola var. *valida*	0.9
Deyeuxia nudiflora	0.1
Deyeuxia parviseta var. *parviseta*	0.1
Deyeuxia quadriseta	9.9
Deyeuxia rodwayi	1.8

Deyeuxia spp.	2.9
Dichanthium sericeum subsp. *sericeum*	0.4
Dichelachne crinita	5.3
Dichelachne hirtella	2.5
Dichelachne inaequiglumis	6.3
Dichelachne micrantha	11.9
Dichelachne parva	1.2
Dichelachne rara	14.8
Dichelachne sieberiana	8.5
Dichelachne spp.	5.0
Digitaria brownii	0.1
Echinopogon caespitosus var. *caespitosus*	0.3
Echinopogon cheelii	1.8
Echinopogon intermedius	0.8
Echinopogon ovatus	14.4
Echinopogon spp.	1.1
**Ehrharta erecta*	0.1
Elymus scaber var. *scaber*	33.6
Enneapogon nigricans	1.3
Enneapogon spp.	0.1
Entolasia stricta	0.1
Eragrostis benthamii	0.1
Eragrostis brownii	0.6
**Eragrostis curvula*	0.7
Eragrostis leptostachya	0.1
Eragrostis parviflora	0.1
**Eragrostis pilosa*	0.1
Eragrostis spp.	0.2
Festuca asperula	1.9
**Festuca arundinacea*	0.1
Festuca muelleri	0.3
**Festuca pratensis*	0.2
**Festuca rubra* subsp. *rubra*	0.1
Festuca spp.	0.2
Glyceria australis	0.2
**Hainardia cylindrica*	0.1
Hemarthria uncinata var. *uncinata*	1.2
Hierochloe redolens	0.1
**Holcus lanatus*	12.1
Hookerochloa hookeriana	0.1
**Hordeum leporinum*	0.9
**Hordeum marinum*	0.6
**Hordeum* spp.	0.1
Imperata cylindrica var. *major*	0.2
Isachne globosa	0.3
Joycea pallida	25.1
Lachnagrostis aemula	1.8
Lachnagrostis aequata	0.1
Lachnagrostis billardierei subsp. *billardierei*	0.1
Lachnagrostis filiformis	5.7
Lachnagrostis meionectes	0.2
**Lagurus ovatus*	0.1
**Lolium perenne*	1.4

**Lolium rigidum*	0.5
**Lolium* spp.	0.5
Microlaena stipoides var. *stipoides*	36.5
**Nassella neesiana*	0.1
**Nassella trichotoma*	1.5
Notodanthonia longifolia	0.2
Panicum effusum	4.9
Panicum simile	0.4
Panicum spp.	0.3
**Paspalum dilatatum*	0.9
Paspalum distichum	0.2
Pennisetum alopecuroides	0.1
**Pennisetum clandestinum*	0.1
Pentapogon quadrifidus	0.2
**Pentaschistis airoides*	0.6
**Phalaris aquatica*	1.0
**Phalaris* spp.	0.4
**Phleum pratense*	0.2
Phragmites australis	0.5
**Poa annua*	0.4
**Poa bulbosa*	0.2
Poa clivicola	2.8
Poa costiniana	3.5
Poa ensiformis	0.8
Poa fawcettiae	1.5
Poa helmsii	6.4
Poa hiemata	1.4
Poa hookeri	2.0
Poa induta	11.7
Poa labillardierei var. *labillardierei*	13.0
Poa meionectes	12.1
Poa petrophila	0.6
Poa phillipsiana	3.6
**Poa pratensis*	0.8
Poa saxicola	0.4
Poa sieberiana	5.3
Poa sieberiana var. *cyanophylla*	13.0
Poa sieberiana var. *hirtella*	6.2
Poa sieberiana var. *sieberiana*	64.8
Poa spp.	10.1
Poa tenera	3.4
Polypogon monspeliensis	0.2
Polypogon spp.	0.1
**Psilurus incurvus*	0.1
Puccinellia stricta	0.4
**Rostraria cristata*	0.4
Rytidosperma nudiflorum	1.0
Sorghum leiocladum	1.3
Setaria viridis	0.1
Sporobolus creber	0.1
Sporobolus elongatus	0.1
Sporobolus spp.	0.1
Themeda australis	27.4

Tripogon loliiformis	0.1
Trisetum spicatum	1.9
**Triticum aestivum*	0.1
**Vulpia bromoides*	5.7
**Vulpia muralis*	4.2
**Vulpia myuros f. megalura*	3.0
**Vulpia* spp.	5.8
Podocarpaceae	
Podocarpus lawrencei	0.2
Polygalaceae	
Comesperma ericinum	0.2
Comesperma retusum	0.9
Comesperma spp.	0.1
Comesperma volubile	0.2
Polygala japonica	0.2
Polygala spp.	0.1
Polygonaceae	
**Acetosella vulgaris*	18.1
Persicaria decipiens	0.5
Persicaria hydropiper	0.5
Persicaria lapathifolia	0.1
**Persicaria maculosa*	0.2
Persicaria prostrata	1.2
Persicaria spp.	0.4
**Polygonum arenastrum*	0.1
**Polygonum aviculare*	0.1
Polygonum spp.	0.4
Rumex brownii	17.1
**Rumex conglomeratus*	0.2
**Rumex crispus*	2.2
Rumex dumosus	0.5
Rumex spp.	0.4
Rumex tenax	0.1
Portulacaceae	
Calandrinia eremaea	0.2
Calandrinia spp.	0.1
Montia fontana	0.1
Neopaxia australasica	1.3
Portulaca oleracea	0.1
Potamogetonaceae	
Potamogeton crispus	0.1
Potamogeton ochreatus	0.5
Potamogeton pectinatus	0.1
Potamogeton tricarinatus	1.0
Proteaceae	
Banksia canei	0.5
Banksia marginata	1.9

Banksia spinulosa var. *spinulosa*	0.1
Grevillea alpina	0.4
Grevillea arenaria subsp. *arenaria*	0.1
Grevillea australis	0.7
Grevillea floribunda subsp. *floribunda*	0.1
Grevillea iaspicula	0.2
Grevillea lanigera	7.4
Grevillea longifolia	0.1
Grevillea neurophylla subsp. *neurophylla*	0.1
Grevillea oxyantha subsp. *ecarinata*	0.1
Grevillea oxyantha subsp. *oxyantha*	0.2
Grevillea ramosissima subsp. *ramosissima*	0.9
Grevillea rosmarinifolia subsp. *rosmarinifolia*	0.6
Grevillea spp.	0.1
Grevillea victoriae subsp. *nivalis*	0.1
Grevillea wilkinsonii	0.1
Hakea dactyloides	0.1
Hakea decurrens	0.1
Hakea decurrens subsp. *decurrens*	0.1
Hakea eriantha	0.1
Hakea laevipes subsp. *laevipes*	0.2
Hakea lissosperma	0.5
Hakea microcarpa	5.4
Hakea sericea	0.1
Hakea spp.	0.1
Isopogon anethifolius	0.1
Lomatia fraseri	0.3
Lomatia ilicifolia	0.1
Lomatia myricoides	14.5
Lomatia silaifolia	0.1
Persoonia asperula	0.4
Persoonia chamaepeuce	21.7
Persoonia chamaepitys	0.2
Persoonia confertiflora	0.1
Persoonia linearis	0.5
Persoonia rigida	4.1
Persoonia silvatica	2.3
Persoonia spp.	0.2
Persoonia subvelutina	1.4
Pteridaceae	
Pellaea falcata	0.4
Pellaea nana	0.2
Pellaea spp.	0.1
Pteris tremula	0.1
Ranunculaceae	
Clematis aristata	33.3
Clematis glycinoides var. *glycinoides*	0.5
Clematis leptophylla	1.6
Clematis microphylla	1.2
Clematis spp.	0.4
Ranunculus amphitrichus	0.6

Ranunculus collinus	0.3
Ranunculus diminutus	0.9
Ranunculus graniticola	5.3
Ranunculus inundatus	1.4
Ranunculus lappaceus	20.7
Ranunculus millanii	0.4
Ranunculus muricatus	0.6
Ranunculus papulentus	0.3
Ranunculus pimpinellifolius	1.9
Ranunculus plebeius	4.8
Ranunculus pumilio var. *pumilio*	0.9
Ranunculus scapiger	2.5
**Ranunculus sceleratus*	0.2
Ranunculus sessiliflorus var. *sessiliflorus*	2.4
Ranunculus spp.	3.7
Resedaceae	
Reseda luteola	0.1
Restionaceae	
Baloskion australe	2.9
Empodisma minus	2.9
Lepyrodia scariosa	0.1
Rhamnaceae	
Cryptandra amara	0.8
Cryptandra amara var. *amara*	0.7
Cryptandra amara var. *longiflora*	0.5
Cryptandra propinqua	0.1
Cryptandra spp.	0.1
Discaria pubescens	0.6
Pomaderris andromedifolia	0.1
Pomaderris andromedifolia subsp. *andromedifolia*	0.2
Pomaderris angustifolia	0.7
Pomaderris aspera	3.7
Pomaderris betulina	0.3
Pomaderris betulina subsp. *actensis*	0.1
Pomaderris elachophylla	0.1
Pomaderris eriocephala	1.1
Pomaderris pallida	0.2
Pomaderris phylicifolia subsp. *ericoides*	0.6
Pomaderris prunifolia var. *prunifolia*	0.1
Pomaderris spp.	0.5
Pomaderris subcapitata	0.4
Pomaderris velutina	0.1
Spyridium parvifolium	2.0
Rosaceae	
Acaena agnipila	0.8
Acaena anserovina	0.2
Acaena echinata	13.3
Acaena novae-zelandiae	41.1
Acaena ovina	17.3

Acaena sp. A	0.2
Acaena spp.	0.9
Acaena 'X anserovina'	0.2
**Aphanes arvensis*	0.1
Aphanes australiana	2.4
Aphanes spp.	0.1
Geum urbanum	0.8
Potentilla anserina subsp. *anserina*	0.1
Potentilla recta	0.3
**Rosa rubiginosa*	15.7
**Rosa* spp.	0.1
**Rubus anglocandicans*	0.4
**Rubus fruticosus* sp. agg.	7.0
Rubus parvifolius	17.6
Rubus rosifolius	0.2
Rubus spp.	0.9
**Rubus ulmifolius*	1.6
**Sanguisorba minor* subsp. *muricata*	0.4
Rubiaceae	
Asperula ambleia	0.1
Asperula conferta	14.4
Asperula gunnii	5.7
Asperula pusilla	0.8
Asperula scoparia	39.9
Asperula spp.	1.1
Coprosma hirtella	23.9
Coprosma nivalis	0.3
Coprosma quadrifida	7.5
**Galium aparine*	1.8
Galium binifolium	0.3
Galium ciliare	1.4
**Galium divaricatum*	1.4
Galium gaudichaudii	18.8
Galium liratum	0.1
Galium migrans	2.5
**Galium murale*	0.8
Galium propinquum	5.1
Galium roddii	0.1
Galium spp.	2.2
Leptostigma reptans	0.1
Nertera granadensis	0.1
Opercularia aspera	0.9
Opercularia diphylla	0.2
Opercularia hispida	2.3
Opercularia spp.	0.3
Opercularia varia	0.4
Pomax umbellata	1.7
Rutaceae	
Asterolasia trymalioides	0.1
Boronia algida	0.6
Boronia nana var. *hyssopifolia*	0.4

Correa lawrenceana var. *rosea*	0.1
Correa reflexa	0.3
Correa reflexa var. *reflexa*	0.8
Nematolepis ovatifolia	0.2
Phebalium squamulosum	0.2
Phebalium squamulosum subsp. *ozothamnoides*	0.7
Phebalium squamulosum subsp. *squamulosum*	0.1
Salicaceae	
**Salix alba* var. *alba*	0.1
**salix babylonica*	0.1
**Salix nigra*	0.2
**Salix spp.*	0.1
**Salix x rubens*	0.1
Santalaceae	
Choretrum candollei	0.1
Choretrum pauciflorum	4.2
Exocarpos cupressiformis	6.0
Exocarpos spp.	0.2
Exocarpos strictus	17.2
Omphacomeria acerba	1.7
Sapindaceae	
Dodonaea boroniifolia	0.3
Dodonaea viscosa	0.6
Dodonaea viscosa subsp. *angustifolia*	0.6
Dodonaea viscosa subsp. *angustissima*	1.8
Dodonaea viscosa subsp. *cuneata*	0.8
Dodonaea viscosa subsp. *spatulata*	2.5
Scrophulariaceae	
Derwentia derwentiana	4.3
Derwentia derwentiana subsp. *derwentiana*	9.2
Derwentia derwentiana subsp. *maideniana*	0.5
Derwentia perfoliata	10.7
Derwentia spp.	0.1
Euphrasia caudata	0.2
Euphrasia collina subsp. *collina*	0.1
Euphrasia collina subsp. *diversicolor*	0.2
Euphrasia collina subsp. *paludosa*	3.5
Euphrasia collina subsp. *speciosa*	0.6
Euphrasia spp.	0.1
Glossostigma elatinoides	0.4
Gratiola nana	0.1
Gratiola peruviana	4.4
Limosella australis	1.2
**Linaria arvensis*	2.1
**Linaria pelisseriana*	1.4
**Marrubium vulgare*	0.2
**Mimulus moschatus*	0.9
**Orobanche minor*	3.9
**Parentucellia latifolia*	0.9

**Parentucellia* spp.	0.1
**Verbascum* spp.	0.2
**Verbascum thapsus* subsp. *thapsus*	3.4
**Verbascum virgatum*	1.7
**Veronica anagallis-aquatica*	1.1
**Veronica arvensis*	1.9
Veronica calycina	23.3
Veronica gracilis	2.1
Veronica notabilis	0.1
**Veronica persica*	0.1
Veronica plebeia	2.7
**Veronica serpyllifolia*	0.1
Veronica spp.	0.8
Veronica subtilis	1.4
Smilacaceae	
Smilax australis	0.1
Solanaceae	
**Datura* spp.	0.1
**Solanum aviculare*	0.5
**Solanum chenopodioides*	0.1
Solanum cinereum	0.2
Solanum linearifolium	0.1
**Solanum nigrum*	1.5
Solanum opacum	0.1
Solanum spp.	0.4
**Solanum triflorum*	0.1
Stackhousiaceae	
Stackhousia monogyna	24.3
Stackhousia viminea	0.5
Sterculiaceae	
Brachychiton populneus subsp. *populneus*	2.7
Lasiopetalum ferrugineum var. *cordatum*	0.1
Stylidiaceae	
Stylidium armeria	0.6
Stylidium graminifolium sens. lat.	36.1
Stylidium montanum	2.4
Stylidium spp.	0.2
Thymelaeaceae	
Pimelea alpina	0.3
Pimelea axiflora subsp. *axiflora*	0.1
Pimelea biflora	0.6
Pimelea bracteata	0.5
Pimelea curviflora	3.7
Pimelea curviflora var. *acuta*	0.1
Pimelea curviflora var. *gracilis*	0.3
Pimelea curviflora var. *sericea*	5.7
Pimelea glauca	0.6

Pimelea latifolia subsp. *hirsuta*	0.2
Pimelea ligustrina	0.2
Pimelea ligustrina subsp. *ciliata*	0.7
Pimelea ligustrina subsp. *ligustrina*	0.4
Pimelea linifolia	1.8
Pimelea linifolia subsp. *caesia*	5.7
Pimelea linifolia subsp. *collina*	0.8
Pimelea linifolia subsp. *linifolia*	4.1
Pimelea pauciflora	1.5
Pimelea spp.	1.5
Pimelea treyvaudii	1.8
Typhaceae	
Typha domingensis	0.2
Typha orientalis	0.1
Ulmaceae	
**Ulmus* spp.	0.1
Urticaceae	
Australina pusilla	1.2
Parietaria debilis	0.1
Urtica incisa	4.4
**Urtica urens*	0.2
Uvulariaceae	
Schelhammera undulata	0.1
Verbenaceae	
**Verbena bonariensis*	0.8
**Verbena officinalis*	0.7
**Verbena* spp.	0.1
Violaceae	
Melicytus dentatus sens. lat.	1.6
Viola betonicifolia	42.2
Viola caleyana	0.4
Viola fuscoviolacea	0.4
Viola hederacea	16.8
Vitaceae	
**Parthenocissus quinquefolia*	0.1
Winteraceae	
Tasmannia lanceolata	3.1
Tasmannia xerophila subsp. *xerophila*	1.8
Xanthorrhoeaceae	
Xanthorrhoea glauca subsp. *angustifolia*	3.1
Zannichelliaceae	
Lepilaena bilocularis	0.4