

The vegetation of granitic outcrop communities on the New England Batholith of eastern Australia

John T. Hunter and Peter J. Clarke

Hunter, John T. and Clarke, Peter J. (Division of Botany, University of New England, Armidale, NSW 2350) 1998. The vegetation of granitic outcrop communities on the New England Batholith of eastern Australia. Cunninghamia 5 (3): 547–618. The vegetation of 22 areas of granitic outcrops on the New England Batholith has been surveyed using semi-quantitative quadrat sampling. In total 399 0.1 ha quadrats were placed on 216 outcrops. Twenty-eight plant communities in nine major groups and an additional unsurveyed community are circumscribed. A high number of nationally rare or threatened taxa, many of which are restricted to outcrop areas, have been found in these communities along with many taxa of special note. Previous studies have over-emphasised structure which can vary considerably with negligible floristic change. Suggestions are made on potential areas for reservation.

Introduction

Studies concentrating on the vegetation of granitic outcrops have been undertaken throughout the world (e.g. Whitehouse 1933; Oosting & Anderson 1937; McVaugh 1943; Keever et al. 1951; Keever 1957; Hambler 1964; Murdy et al. 1970; Sharitz & McCormick 1973; Rundel 1975; Shure & Fagsdale 1977; Wyatt 1977; Phillips 1981; Phillips 1982; Wyatt 1981; Baskin & Baskin 1982; Walters 1982; Burbank & Phillips 1983; Wyatt 1984a, b; Uno & Collins 1987; Baskin & Baskin 1988; Houle & Phillips 1988; Houle & Phillips 1989a, b; Houle 1990; Porembski et al. 1994; Ibisch et al. 1995; Porembski 1995; Porembski et al. 1996). Research into outcrops, and in particular granitic outcrops, has culminated in the formation of the 'Inselberg-Projekt' supported by the Deutsche Forschungsgemeinschaft (Porembski et al. 1994). Outcrops have been chosen worldwide for research as they constitute clearly delimited systems suited for testing hypotheses on the maintenance of biodiversity (Porembski et al. 1994). In Australia, studies involving the direct investigation of granitic outcrop vegetation have occurred particularly in Western Australia (e.g. Smith 1961; Ashton & Webb 1977; Gillham 1961; Hopper 1981; Burgman 1987; Kirkpatrick et al. 1988; Norris & Thomas 1991; Pignatti & Pignatti 1994).

The New England Batholith in eastern Australia (see Fig. 3) has approximately 175 000 ha of exposed granitic outcrops and granitic boulder fields. The batholith extends for approximately 400 km in length and 110 km in width, from Stanthorpe in Queensland to Tamworth in New South Wales (Leigh 1968). It was formed during a major period of plutonism 265–220 million years ago (Barnes et al. 1988). About 255 individual plutons form at least 20 aggregated outcropping areas (Barnes et al. 1988). These aggregated areas extend semi-continuously through the central New England Orogen (Leigh 1968; Barnes et al. 1988). This represents one of the most significant areas of

granitic outcropping in Australia. Within the batholith is Bald Rock (Figs 1 & 2), the largest granitic rock (and the second largest rock) in Australia, being 150 m high, 750 m long and 500 m wide (400 ha in total) (Leigh 1968; Walker 1982).

Within Australia the unusual nature of the vegetation communities on granitic outcrops has been recognised for many years, particularly in Western Australia. Much work has been carried out recently, particularly by Stephen Hopper of Kings Park Botanic Gardens. This culminated recently, in 1996, in a public symposium on the flora and fauna of granitic outcrops, hosted by the Royal Society of Western Australia. However very few studies have described the communities on granitic outcrops in the eastern states. Beadle (1981) describes granitic outcrop communities from Western Australia and Victoria, and other rocky outcrop communities in general, however very little is written about the extensive outcrop communities on the New England Batholith, with the only statement being: 'In some areas where large granitic tors occur, some unusual species are found'. Often rocky outcrop communities have been ignored completely. For example, the Forestry Commission of New South Wales stated in 1989 that apart from lichens, mosses and some herbs established in crevasses, rocky outcrops are usually unvegetated.

Previous studies on the vegetation of the New England Batholith have examined granitic outcrop communities, although indirectly in many instances (Maiden 1906; Williams 1969; Williams 1972; Roberts 1983; Stewart 1991; Williams 1991a, b; Williams & Wissman 1991; Binns 1992; Hosking & James 1993; Williams 1994; Binns 1995; Clarke et al. 1995; Le Brocque & Benson 1995; NSW National Parks & Wildlife Service 1995; Benson & Ashby 1996; McDonald et al. 1995; Clarke et al. 1998; Hunter 1998a, b; ERM Mitchell McCotter 1998). Some of these investigations have been on particular species that occur on granitic outcrops within the New England Batholith (Benson 1992; Hunter 1992; Hunter & Williams 1994; Hunter 1995; Hunter & Bruhl 1996; Hunter et al. 1996; Richards 1996; Hunter 1997a, b, c; Richards & Hunter 1997; Hunter et al. 1998).

This paper presents an account of 29 vegetation communities that occur on granitic outcrops of the New England Batholith based on semi-quantitative sampling and numerical analysis. The complicating affects that individual taxa have on the structural description of communities either due to chance occurrence or previous fire history are discussed.

Study area

The area surveyed comprised the granitic outcrop portions of the New England Batholith and in particular those that included extensive areas of exposed granitic surfaces. Twenty-four separate areas of granitic outcropping were chosen for investigation (Fig. 3). These included all of the larger and a majority of the smaller known aggregated plutons. The outcrop areas were confined to specific aggregated plutons and thus were naturally bounded. The vegetation was surveyed on four broad types of granitic geology: granite, leucoadamellite, adamellite and granodiorite.

The study area covered four botanical divisions: North Coast, Northern Tablelands and North Western Slopes of New South Wales and the Darling Downs of Queensland.



Fig. 1. View of the 'Granite Belt' of Girraween and Bald Rock National Parks from South Bald Rock. Bald Rock is the largest granitic outcrop in Australia (top left). The New South Wales–Queensland border runs along the top of the granite rocks in view.

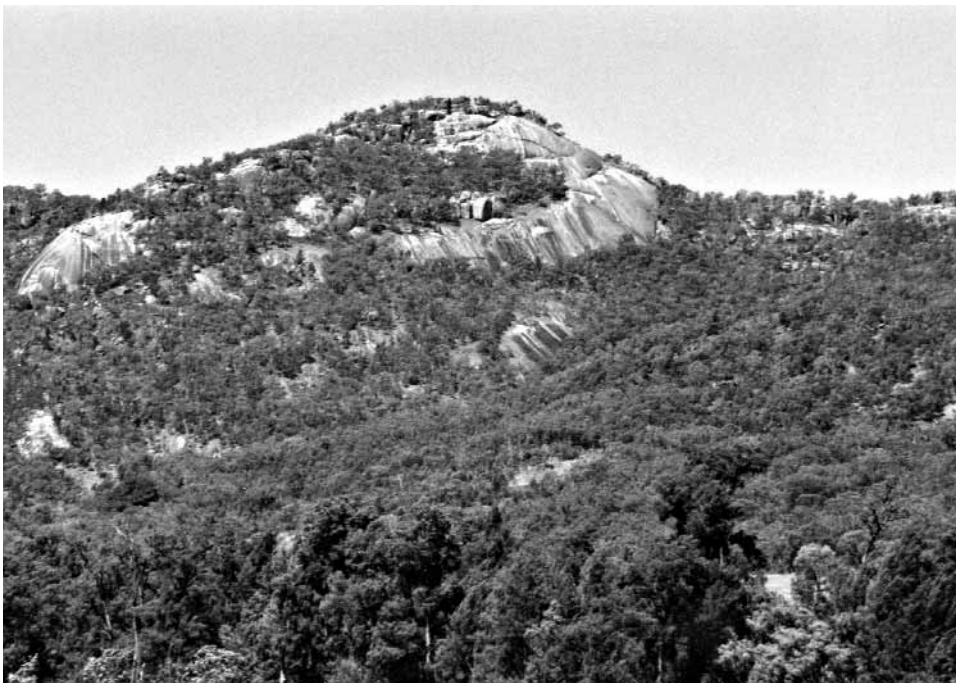


Fig. 2. Back Creek Mountain at Moore Creek Gap near Moonbi north of Tamworth is in the southern-most portion of the New England Batholith.

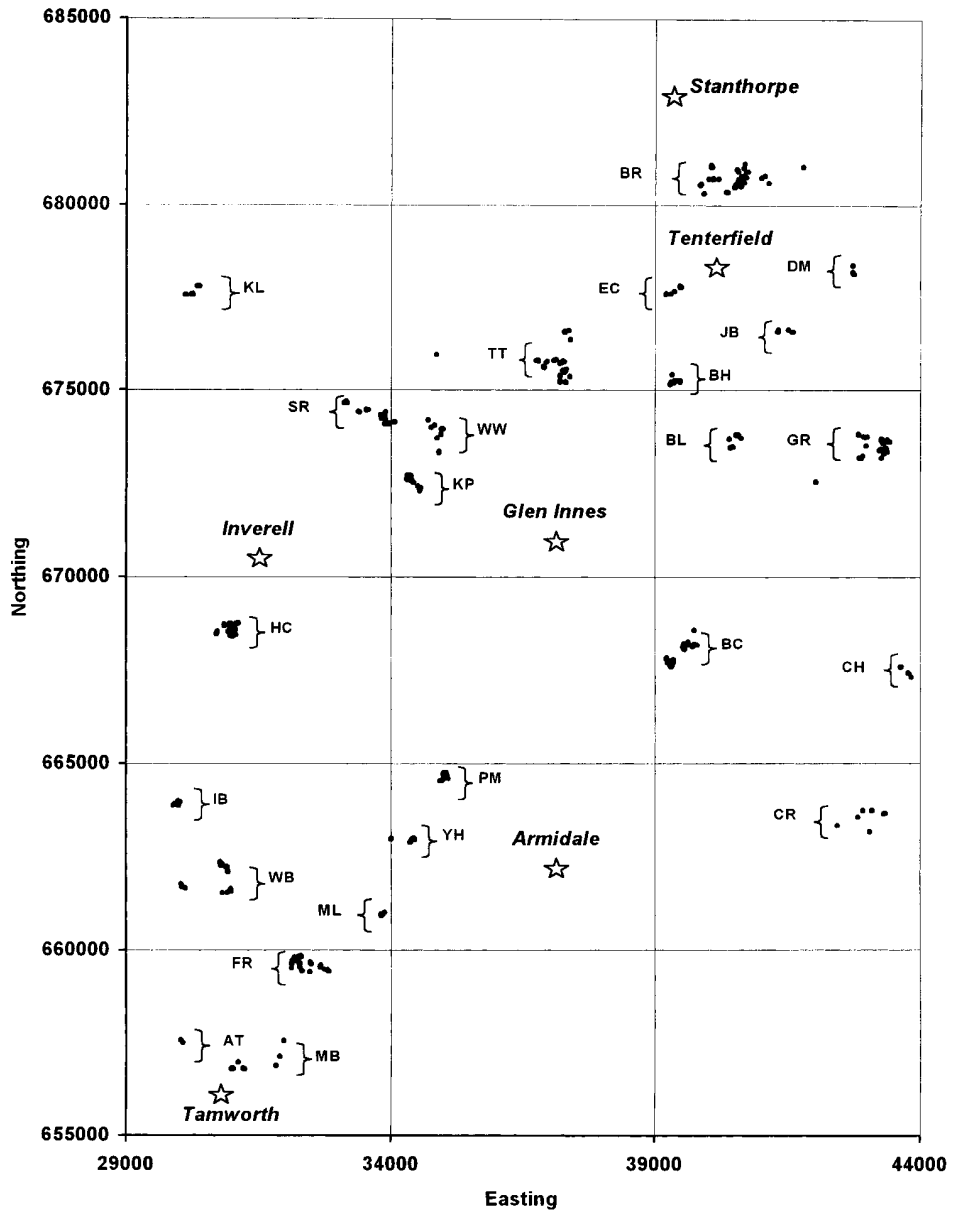


Fig 3. New England Batholith study area on the Northern Tablelands between Tamworth and Stanthorpe. Distribution of the 24 surveyed areas and placement of the 399 quadrats. The scales of the axis are in AMG coordinates. Codes to the regions surveyed are given in Table 1.

Tenure of the land included state forests, crown lands, national parks, nature reserves, travelling stock reserves, forest reserves, private reserves, private lands and various forms of leasehold land. General aspects of the 24 areas investigated are given in Table 1.

The New England Batholith generally reaches its highest elevation on the eastern escarpment and becomes lower towards the west. Kwiambal and Cathedral Rock National Parks represent extremes of climate in the area surveyed (Table 1). Kwiambal National Park had altitudes as low as 310 m above sea level. Here the rainfall is as low as 642 mm a year, the mean temperature of the hottest month is 31.9°C and the mean temperature of the coldest month is 11.4°C. Sites within Cathedral Rock National Park were at altitudes as high as 1520 m above sea level. The rainfall at Cathedral Rock is up to 1490 mm per year, the mean temperature of the hottest month is 21°C and the mean temperature of the coldest month is 4.2°C.

Granitic outcrops support the major natural vegetation remnants in some districts. Even on land in private ownership, areas with granitic outcrops are commonly left relatively unmodified in comparison to the pasture lands on other geological strata and landforms.

Methods

Sampling and stratification

The survey was conducted between April 1994 and June 1996, using 32 m × 32 m (0.1 ha) nested quadrats. The nested quadrat design was first described by Bunce and Shaw (1973) and initially tested by Outhred (1984). This method is based on a series of smaller (nested) quadrats that decrease in size geometrically within a larger quadrat. Studies by Outhred (1984), Outhred et al. (1985), Le Brocque and Buckney (1995), Morrison et al. (1995a) and Morrison et al. (1995b) have shown this method capable of detecting subtle community patterns by being functionally equivalent to frequency and directly related to plant density. The method was modified to enable approximately 0.1 ha to be surveyed and a frequency score of 10 be given to each taxon found. At the time of the survey, 0.1 ha was considered a standard size for vegetation surveys. Each quadrat was marked out by the placement of four 30 m measuring tapes marking the diagonals. Markings were placed on the measuring tapes at distances from the centre of the quadrat at 1, 1.4, 2, 2.8, 4, 5.7, 8, 11.2, 16 and 22.5 m. This divided the total quadrat into 10 subquadrats of approximate cumulative area: 2, 4, 8, 16, 32, 64, 128, 256, 512 and 1024 m². All vascular plant species were recorded for each quadrat. The presence or absence of a taxon in each of the ten subquadrats gave a frequency score out of ten for each taxon, providing a measure of relative abundance. This same alteration in design has been used by Clarke et al. (1998) and ERM Mitchell McCotter (1998) for vegetation surveys in north-east New South Wales.

The 24 granitic outcrop areas were identified from satellite and aerial photographs, local knowledge, and topographic and geological maps (Table 1). Choice of outcrops and sites was also influenced by access. The area of land covered by each outcropping area was estimated by examination of the aerial photographs and topographic maps.

Table 1: Selected attributes of the 24 granitic outcrop areas chosen for the survey. Tenure codes = SF: State Forest, PR: Private Free Hold, NP: National Park, SFR: State Forest Reserve, NR: Nature Reserve, SRA: State Recreation Area, TSR: Traveling Stock Reserve, LC: Leasehold.

Name	Geology	Altitude (m)	Annual Precipitation (mm)	Area (ha)	Locality	Tenure
Attunga (AT)	Adamellite	430–930	703–705	900	16 km NW Tamworth	SF
Backwater (BC)	Leucoadamellite	800–1372	889–979	5000	40 km SE Glen Innes	PR, SF, SFP
Bald Rock & Girraween (BR)	Adamellite	800–1277	832–972	26 000	20 km N Tenterfield	NP
Bolivia Hill (BH)	Leucoadamellite	950–1225	832–882	2000	15 km N Deepwater	PR
Butterleaf (BL)	Granite	900–1300	1002–1054	6000	40 km NE Glen Innes	PR, SF, SFP
Cathedral Rock (CR)	Leucoadamellite	1000–1580	1021–1490	3000	70 km E Armidale	NP
Demon Nature Reserve (DM)	Adamellite	470–1090	1250–1300	900	30 km E of Tenterfield	NR
Mount Chaelundi (CH)	Granite	900–1377	1168–1356	800	40 km N Ebor	NP, SF
Eagle Creek (EC)	Adamellite	700–1118	798–860	1500	12 km SW Tenterfield	PR
Flaggy Range (FR)	Adamellite	750–1149	753–838	5000	10 km N Bendemeer	PR
Gibraltar Range (GR)	Granite	900–1175	1118–1447	10 000	60 km E Glen Innes	NP, SF, LC
Howell (HC)	Granite	600–934	752–866	6500	5 km SW Tingha	PR, LC, CR
Ironbark (IB)	Leucoadamellite	640–1019	780–840	2500	25 km SW Bundarra	NR, PR
Mount Jondol (JB)	Leucoadamellite	1100–1210	943–1041	800	22 km SE Tenterfield	SF

Name	Geology	Altitude (m)	Annual Precipitation (mm)	Area (ha)	Locality	Tenure
Kwiambal (KL)	Granite	280–460	642–672	2500	30 km W Ashford	NP, PR, SF
Kings Plains (KP)	Undifferentiated	850–1009	759–793	2500	40 km NW Glen Innes	NP
Moonbi (MB)	Adamellite	550–980	740–875	2500	5 km W Moonbi	PR, TSR
Mount Balala (ML)	Adamellite	850–980	765–784	500	16 km SW Uralla	PR
Parlour Mountain (PM)	Leucoadamellite	1070–1200	844–888	2500	35 km NW Armidale	PR
Severn River (SR)	Undifferentiated	500–740	678–709	5500	50 km NW Glen Innes	NR, P
Torrington (TT)	Granite	400–1220	745–815	40 000	60 km NW Glen Innes	SRA, LC
Warrabah (WB)	Leucoadamellite	430–1042	671–832	6000	15 km W Kingstown	NP, PR
The Willows (WW)	Undifferentiated	700–850	710–726	1500	40 km NW Glen Innes	PR
Mount Yarrowyck (YH)	Granodiorite	800–1205	812–758	1500	25 km W Armidale	NR, PR

One hectare of exposed rock could be easily identified from aerial photographs and was chosen as the minimum size of outcrop to be surveyed. This size also enabled the placement of a 0.1 ha square quadrat without undesirable edge effects. The number of quadrats allocated to the 24 areas and individual outcrops was based on surface area then transformed on a logarithmic scale. The use of a logarithmic scale enabled more equitable distribution of quadrats. A total of 399 quadrats were surveyed on 216 separate granitic outcrops (Fig. 3).

To enable comparative analyses to be performed on the vegetation occurring on and off outcrops an additional 123 quadrats were surveyed in forests and woodlands surrounding the outcrops. This research is not presented here but will be incorporated in subsequent publications. The endemic status of the granite outcrop taxa was assessed on the basis of the additional forest and woodland quadrats and other available data including field observations and herbarium records.

Data analysis

The site data are stored on a relational database held by one of the authors (JTH). Analyses and data exploration were performed using options available in the PATN Analysis Package (Belbin 1995a, b). Analyses were performed using Bray & Curtis, Canberra Metric and Kulczynski association measures in combination with flexible UPGMA using positive and negative β values. Additional analyses were performed both with or without species which were recorded only once, as presence/absence data or with full abundance scores. For final presentation of results all species and their relative abundance scores were used and the analysis was performed using the Kulczynski association measure which is recommended for ecological applications (Belbin 1995a, b) along with flexible UPGMA and the default PATN settings.

Nomenclature

Species lists were compiled solely from work carried out during this survey. Lists of rare and threatened species were compiled from the national ROTAP listing maintained by the National Parks and Wildlife Service together with relevant updates from recent publications (Appendix 1). Accepted botanical names are listed in Appendix 2.

Community names are based on the two most frequently important (sum of all abundance scores) native taxa in the most consistent dominant stratum. Structural names follow Specht et al. (1995) and are based on the most consistent uppermost stratum.

Names of geological strata are based on relevant geological maps (New South Wales Geological Survey 1971, 1984, 1986, 1987a–c, 1988a–f, 1992a, b, 1993; New South Wales Department of Mines 1971, 1973a, b, 1976; New South Wales Department of Mineral Resources 1974, 1987). Not all strata have been named or dated and as such are only named by their broad granitic type (i.e. undifferentiated leucoadamellite etc.).

Results

Floristics

In total 671 vascular plant taxa from 307 genera and 99 families were recorded during the survey of granitic outcrops. Approximately 27% of the taxa were considered as predominantly occurring on granitic outcrops within the region. Only 38 taxa were exotic in origin, representing 6% of the total flora surveyed. The most common exotic taxa were *Hypochaeris radicata*, *Bidens pilosa*, *Opuntia aurantiaca*, *Conyza bonariensis*, and *Trifolium repens*.

The ten most commonly encountered taxa on granitic outcrops on the New England Batholith were: *Cheilanthes sieberi* subsp. *sieberi* (55% of sites), *Entolasia stricta* (48%), *Leucopogon neo-anglicus* (45%), *Trachymene incisa* (42%), *Hypochaeris radicata* (40%), *Tripogon loliiiformis* (39%), *Lepidosperma laterale* (38%), *Aristida jerichoensis* (37%), *Gonocarpus teucroides* (36%) and *Leptospermum novae-angliae* (36%). Eight of the ten most commonly occurring taxa were herbaceous in nature, and only two represented shrubby taxa. Ten or more taxa were found in four genera: *Acacia* (35), *Eucalyptus* (24), *Pterostylis* (13) and *Hibbertia* (13). Ten or more taxa were found in 13 families: Fabaceae (74), Poaceae (64), Myrtaceae (58), Asteraceae (55), Orchidaceae (36), Cyperaceae (24), Epacridaceae (23), Proteaceae (23), Rutaceae (21), Euphorbiaceae (20), Lamiaceae (15), Dilleniaceae (13) and Apiaceae (10).

Plant Communities

A summarised dendrogram produced by the Kulczynski association measure and flexible UPGMA clustering is shown in Fig. 5. Twenty-eight vascular plant communities were defined in nine major elements (Figs 4 & 5). The nine elements were defined by the analysis at the dissimilarity level of 1.00. These nine elements coincided with the intuitive assessment of the authors. There was an additional 29th community that was totally distinct, but was not quantitatively sampled due to its rarity and inaccessibility.

In the following list of plant communities up to ten taxa are listed for each growth-form category. These taxa are listed in decreasing order of summed abundances within each community. The listing of restricted taxa is also based on decreasing summed abundances. Overall fidelity (percentage of quadrats) within the community is also given within brackets next to each taxon.

Element 1: Glen Innes Shrubby Open Scrubs and Closed Heaths

These communities are restricted to high altitude areas north and south-east of Glen Innes. Structurally they are mainly closed heaths although the mallee *Eucalyptus codonocarpa* may be present forming shrubby open scrubs. Occasionally other tree species occur, such as *Eucalyptus andrewsii*, *Eucalyptus campanulata*, *Eucalyptus williamsiana*, and *Eucalyptus cameronii*, giving a shrubby low open woodland structure. In some instances *Leptospermum novae-angliae* at its tallest and densest will form closed scrub (Fig. 6).

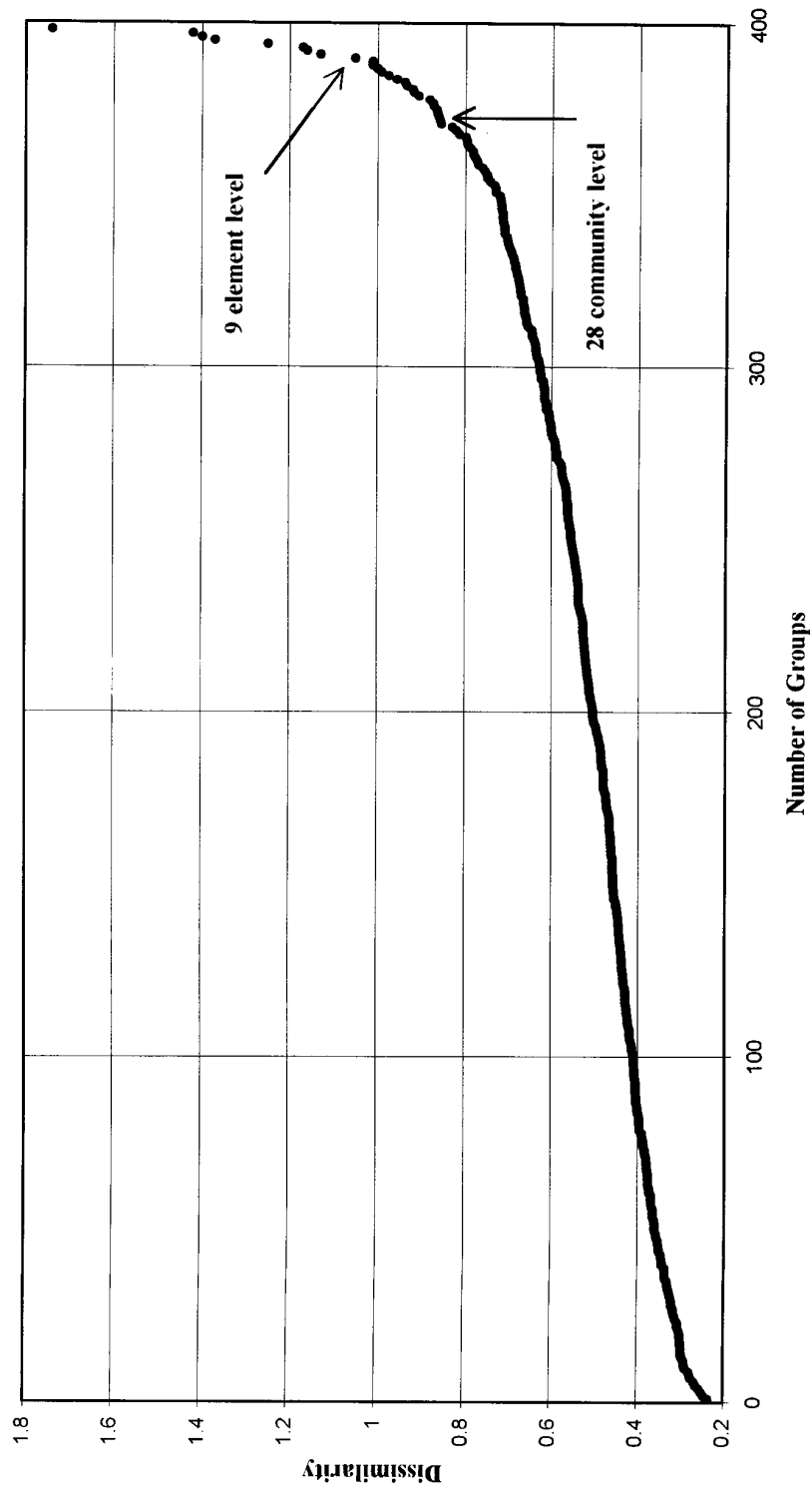


Fig. 4. Screen Plot of Kulczynski association measure and the flexible UPGMA fusion strategy results based on all sites surveyed (399 in total).

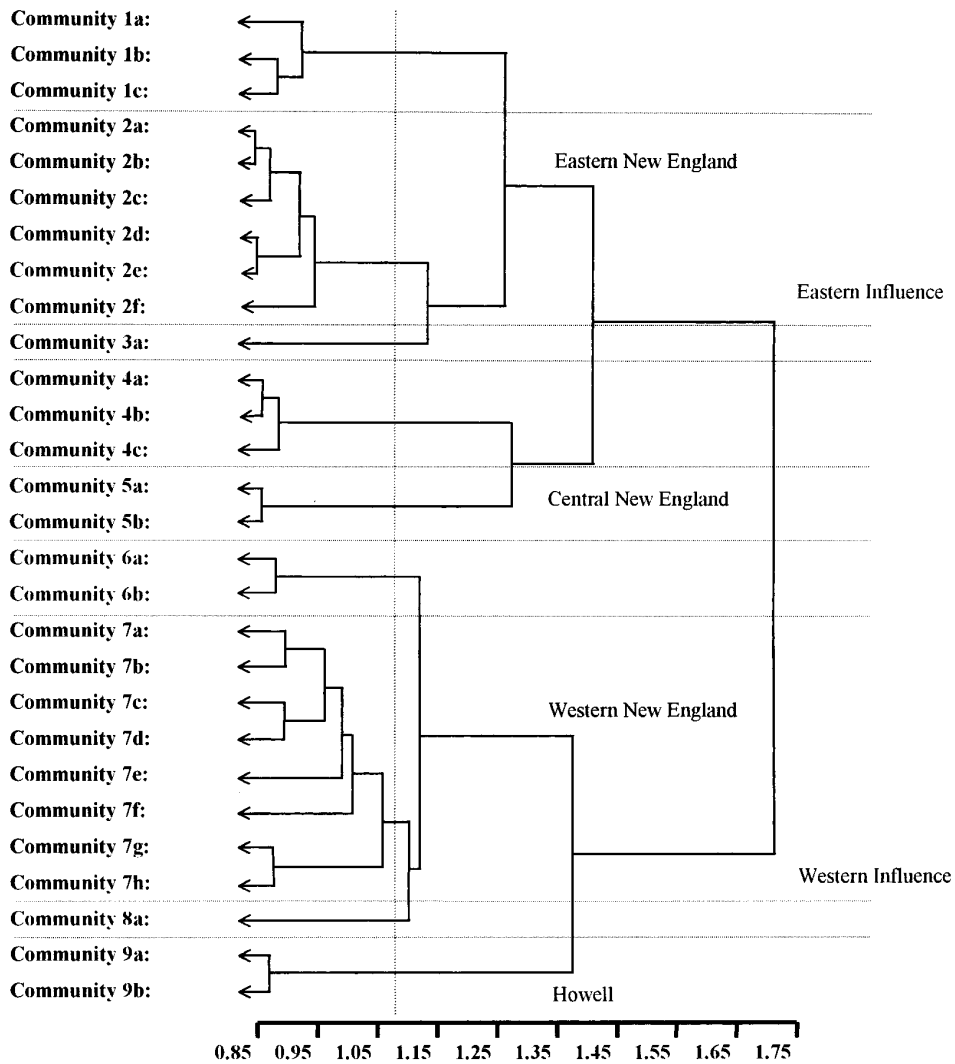


Fig. 5. Summary dendrogram of 28 floristic communities in nine major elements found on granitic outcrops on the New England Batholith, based on Kulczynski association and flexible UPGMA fusion.

Community 1a: *Leptospermum novae-angliae*–*Kunzea obovata* heath (Warra Heaths)

Geology: Oban River Leucoadamellite.

Trees: *Eucalyptus codonocarpa* (56%), *Eucalyptus acaciiformis* (38%), *Eucalyptus caliginosa* (31%).

Shrubs: *Platysace lanceolata* (94%), *Leptospermum novae-angliae* (100%), *Kunzea obovata* (94%), *Leucopogon neo-anglicus* (81%), *Allocasuarina rigida* subsp. *rigida* (69%), *Acacia ulicifolia* (81%), *Acacia venulosa* (63%), *Mirbelia confertiflora* (69%), *Hovea* sp. A (88%), *Dillwynia phyllicoides* (63%).

Herbs: *Entolasia stricta* (100%), *Monotaxis macrophylla* (75%), *Gonocarpus teucroides* (75%), *Muehlenbeckia costata* (69%), *Lepidosperma gunnii* (75%), *Actinotus gibbonsii* (81%), *Schoenus apogon* (81%), *Stypandra glauca* (56%), *Dampiera stricta* (56%), *Gonocarpus micranthus* (50%).

Restricted taxa: *Monotaxis macrophylla*, *Muehlenbeckia costata*, *Mirbelia confertiflora*, *Eucalyptus codonocarpa*, *Brachyloma saxicola*, *Phebalium ambiens*, *Phebalium ozothamnoides*.

Threats and conservation status: This community has been little degraded and almost all surveyed occurrences are within Crown Mountain Flora Reserve (Warra State Forest) and adjacent private properties. No occurrences are reserved in National Parks. A large-scale *Cannabis* plantation burnt out in 1994, and has caused disturbance within



Fig. 6. Element 1. *Leptospermum novae-angliae*–*Kunzea obovata* and is typical of the high altitude areas around Crown Mountain, Backwater and Butterleaf.

the Reserve including outcropping areas. This habitat is potentially threatened by goats, grazing of domestic stock, and hobby farm subdivisions that are near Warra State Forest.

Community 1b: *Kunzea obovata* heath (Butterleaf Heaths)

Geology: Kingsgate Granite & Oban River Leucadamellite.

Trees: *Eucalyptus codonocarpa* (39%), *Eucalyptus andrewsii* (15%), *Eucalyptus williamsiana* (15%), *Eucalyptus campanulata* (8%), *Allocasuarina littoralis* (54%).

Shrubs: *Leucopogon neo-anglicus* (85%), *Kunzea obovata* (92%), *Leptospermum novae-angliae* (77%), *Eriostemon myoporoides* subsp. *epilosus* (77%), *Brachyloma saxicola* (69%), *Calytrix tetragona* (31%), *Hibbertia riparia* (31%), *Acacia viscidula* (39%), *Allocasuarina rigida* subsp. *rigida* (39%), *Acacia venulosa* (54%), *Epacris microphylla* (23%).

Herbs: *Brachyscome stuartii* (85%), *Schoenus apogon* (92%), *Lepidosperma gunnii* (85%), *Entolasia stricta* (77%), *Gonocarpus micranthus* (54%), *Austrodanthonia monticola* (46%), *Cheilanthes sieberi* subsp. *sieberi* (46%), *Trachymene incisa* (39%), *Gonocarpus oreophilus* (46%), *Empodisma minus* (54%).

Restricted taxa: *Eriostemon myoporoides* subsp. *epilosus*, *Brachyloma saxicola*, *Eucalyptus codonocarpa*, *Leucopogon cicatricatus*, *Cryptandra lanosiflora*, *Mirbelia confertiflora*, *Muehlenbeckia costata*, *Monotaxis macrophylla*, *Lasiopetalum ferrugineum* var. *cordatum*.

Threats and conservation status: Much of this community is in private ownership. However Mount Scott, one of the largest outcrops on the New England Batholith, is within Butterleaf State Forest, parts of which have been designated as preserved native forest by the State Forests of New South Wales. One site also occurs within Crown Mountain Flora Reserve. This community is not reserved in National Parks. The community may be threatened by disturbance from goats and grazing of domestic stock.

Community 1c: *Leptospermum novae-angliae* Heath (Backwater Heaths)

Geology: Oban River Leucadamellite.

Trees: *Eucalyptus codonocarpa* (36%), *Eucalyptus caliginosa* (18%), *Eucalyptus dalrympleana* (5%).

Shrubs: *Leptospermum novae-angliae* (96%), *Leucopogon neo-anglicus* (91%), *Kunzea obovata* (91%), *Brachyloma saxicola* (91%), *Prostanthera scutellarioides* (77%), *Allocasuarina rigida* subsp. *rigida* (68%), *Calytrix tetragona* (64%), *Mirbelia confertiflora* (86%), *Hibbertia acicularis* (74%), *Boronia anemonifolia* (64%).

Herbs: *Lepidosperma gunnii* (82%), *Gonocarpus teucroides* (86%), *Entolasia stricta* (82%), *Brachyscome stuartii* (73%), *Austrodanthonia monticola* (68%), *Lomandra longifolia* (59%), *Gahnia sieberiana* (55%), *Empodisma minus* (36%), *Trachymene incisa* (55%), *Schoenus apogon* (59%).

Restricted taxa: *Brachyloma saxicola*, *Mirbelia confertiflora*, *Cryptandra lanosiflora*, *Eucalyptus codonocarpa*, *Pseudanthus divaricatissimus*, *Thelionema grande*, *Cyphanthera albicans* subsp. *albicans*.

Threats and conservation status: No sites of this community type are known within the current reservation system. Off-park reservation is provided by a conservation agreement on the property 'Wattleridge'. Community 1c is potentially threatened by change in land ownership, hobby farms, goats and grazing by domestic stock.

Element 2: New England Escarpment Shrubby Open Scrubs and Heaths

Structurally these communities are mainly closed heaths. As with element one the mallee *Eucalyptus codonocarpa* may be present, giving the appearance of shrubby open scrubs. Similarly many other eucalypt species may sporadically occur such as *Eucalyptus cameronii*, *Eucalyptus andrewsii*, *Eucalyptus banksii* and *Eucalyptus caliginosa* giving a shrubby low open woodland structure. Occasionally *Leptospermum novae-angliae* at its tallest and densest will form closed scrub. This element is widespread along the eastern escarpment of the New England Batholith from north of Tenterfield to east of Armidale.

Community 2a: *Leptospermum novae-angliae*–*Brachyloma saxicola* Heathland (Escarpment Heaths)

Geology: Kingsgate Granite, Chaelundi Complex — Granite, Stanthorpe Adamellite, Dandahra Creek Granite.

Trees: *Eucalyptus codonocarpa* (20%), *Eucalyptus cameronii* (20%), *Eucalyptus bridgesiana* (20%), *Eucalyptus andrewsii* (20%), *Eucalyptus campanulata* (20%), *Eucalyptus scias* subsp. *apoda* (20%), *Allocasuarina torulosa* (20%).

Shrubs: *Leptospermum novae-angliae* (60%), *Leucopogon neo-anglicus* (40%), *Brachyloma saxicola* (80%), *Boronia anethifolia* (60%), *Monotoca scoparia* (100%), *Kunzea bracteolata* (20%), *Pimelea linifolia* (60%), *Callitris monticola* (20%), *Acacia falciformis* (40%), *Leucopogon lanceolatus* (80%), *Acrotriche aggregata* (20%).

Herbs: *Lomandra longifolia* (100%), *Gonocarpus oreophilus* (80%), *Entolasia stricta* (100%), *Patersonia sericea* (60%), *Xanthorrhoea glauca* (40%), *Trachymene incisa* (60%), *Lepidosperma neesii* (20%), *Caustis flexuosa* (20%), *Stylidium laricifolium* (20%), *Dianella tasmanica* (60%).

Restricted taxa: *Brachyloma saxicola*, *Kunzea bracteolata*, *Eucalyptus codonocarpa*, *Muehlenbeckia costata*, *Bertya cunninghamii*, *Eriostemon myoporoides* subsp. *epilosus*, *Leucopogon cicatricatus*, *Acacia floydii*, *Acianthus apprimus*, *Eucalyptus scias* subsp. *apoda*.

Threats and conservation status: Four of the five sites surveyed are reserved. The sites are within Gibraltar Range National Park, Guy Fawkes River National Park and Demon Nature Reserve, and one of the sites at Butterleaf State Forest is within preserved native forest under the control of State Forests of New South Wales. Patches on private land are little disturbed, although areas close to cleared grazing lands are prone to disturbance from cattle and the spread of weeds.

Community 2b: *Acacia viscidula*–*Kunzea opposita* Heath (Jondol Heaths)

Geology: Billyrimba Leucoadamellite.

Trees: *Eucalyptus andrewsii* (100%), *Allocasuarina littoralis* (75%), *Eucalyptus brunnea* (25%).

Shrubs: *Acacia viscidula* (100%), *Leucopogon neo-anglicus* (100%), *Kunzea opposita* (75%), *Platysace lanceolata* (75%), *Leptospermum novae-angliae* (75%), *Prostanthera nivea* (50%), *Brachyloma saxicola* (75%), *Zieria cytisoides* (50%), *Acrotriche aggregata* (100%), *Mirbelia speciosa* subsp. *speciosa* (50%).

Herbs: *Lomandra longifolia* (100%), *Trachymene incisa* (100%), *Entolasia stricta* (75%), *Stylidium laricifolium* (75%), *Gonocarpus teucroides* (75%), *Austrodanthonia linkii* (50%), *Laxmannia compacta* (50%), *Bulbostylis densa* (75%), *Stypandra glauca* (50%), *Digitaria breviglumis* (50%).

Restricted taxa: *Brachyloma saxicola*, *Persoonia rufa*, *Phebalium dentatum*.

Threats and conservation status: This community not known to be within any reserve. Forest Lands State Forest was recently logged in 1994; however the outcrops within it are relatively undisturbed.

Community 2c: *Leptospermum novae-angliae*–*Leucopogon cicatricatus* Heath (Round Mountain Heaths)

Geology: Round Mountain Leucoadamellite.

Trees: *Eucalyptus caliginosa* (67%), *Banksia integrifolia* (33%).

Shrubs: *Leptospermum novae-angliae* (100%), *Leucopogon cicatricatus* (100%), *Leucopogon neo-anglicus* (100%), *Epacris microphylla* (67%), *Monotoca scoparia* (67%), *Platysace lanceolata* (100%), *Leucopogon lanceolatus* (67%), *Comesperma sylvestre* (33%), *Prostanthera scutellarioides* (33%), *Elaeocarpus holopetalus* (33%).

Herbs: *Trachymene incisa* (100%), *Carex gaudichaudiana* (100%), *Eragrostis brownii* (67%), *Trachymene incisa* (33%), *Poa sieberiana* (100%), *Brachyscome stuartii* (33%), *Lepidosperma laterale* (100%), *Dianella caerulea* (33%), *Austrodanthonia monticola* (33%), *Gahnia sieberiana* (100%).

Restricted species: *Leucopogon cicatricatus*, *Eucalyptus codonocarpa*.

Threats and conservation status: All sites surveyed are within Cathedral Rock National Park. Due to the dissected nature of these outcrops, visitor impact is minimal despite high visitor frequency in some areas.

Community 2d: *Leptospermum novae-angliae*–*Acacia latisepala* Heath (Granite Belt Heaths)

Geology: Stanthorpe Adamellite, Billyrimba Leucoadamellite.

Trees: *Eucalyptus andrewsii* (32%), *Eucalyptus banksii* (29%), *Eucalyptus prava* (13%), *Eucalyptus campanulata* (6%), *Eucalyptus scias* subsp. *apoda* (6%), *Callitris endlicheri* (6%), *Eucalyptus dealbata* (6%), *Eucalyptus scoparia* (3%).

Shrubs: *Eriostemon myoporoides* subsp. *epilosus* (61%), *Leptospermum novae-angliae* (71%), *Acacia latisepala* (55%), *Dodonaea viscosa* (48%), *Acacia adunca* (26%), *Leptospermum polygalifolium* subsp. *transmontanum* (58%), *Leucopogon neo-anglicus* (45%), *Kunzea bracteolata* (29%), *Leucopogon melaleucoides* (48%), *Phebalium rotundifolium* (23%).

Herbs: *Lomandra longifolia* (100%), *Entolasia stricta* (87%), *Trachymene incisa* (84%), *Gonocarpus oreophilus* (61%), *Lepidosperma laterale* (55%), *Brachyscome stuartii* (29%), *Calandrinia pickeringii* (36%), *Digitaria breviglumis* (35%), *Stylidium laricifolium* (45%), *Stypandra glauca* (32%).

Restricted taxa: *Eriostemon myoporoides* subsp. *epilosus*, *Acacia latisepala*, *Acacia adunca*, *Kunzea bracteolata*, *Phebalium rotundifolium*, *Muehlenbeckia costata*, *Phebalium ambiens*, *Prostanthera* sp. B, *Thelionema grande*, *Callitris monticola*, *Eucalyptus scias* subsp. *apoda*, *Plectranthus suaveolens*, *Homoranthus papillatus*, *Homoranthus lunatus*, *Callistemon flavovirens*, *Acacia floydii*, *Acacia macnuttiana*.

Threats and conservation status: This community is reserved within Girraween, Bald Rock and Bonoo Boonoo National Parks and Demon Nature Reserve.

Community 2e: *Leptospermum novae-angliae*–*Dodonaea viscosa* Heathland (Granite Belt Heaths)

Geology: Stanthorpe Adamellite.

Trees: *Allocasuarina littoralis* (14%), *Eucalyptus codonocarpa* (14%), *Eucalyptus campanulata* (29%), *Eucalyptus banksii* (14%), *Eucalyptus dalrympleana* (14%).

Shrubs: *Leptospermum novae-angliae* (86%), *Eriostemon myoporoides* subsp. *epilosus* (86%), *Dodonaea viscosa* (57%), *Acacia viscidula* (57%), *Acacia venulosa* (29%), *Kunzea bracteolata* (29%), *Leptospermum variable* (14%), *Plectranthus suaveolens* (14%), *Acrotriche aggregata* (29%), *Leucopogon lanceolatus* subsp. *lanceolatus* (43%).

Herbs: *Schoenus apogon* (100%), *Lepidosperma laterale* (86%), *Entolasia stricta* (71%), *Trachymene incisa* (71%), *Brachyscome stuartii* (100%), *Gonocarpus oreophilus* (57%), *Bulbostylis densa* (43%), *Austrodanthonia linkii* (43%), *Gonocarpus micranthus* (29%), *Actinotus gibbonsii* (29%).

Restricted taxa: *Eriostemon myoporoides* subsp. *epilosus*, *Kunzea bracteolata*, *Plectranthus suaveolens*, *Thelionema grande*, *Acacia latisepala*, *Eucalyptus codonocarpa*, *Homoranthus papillatus*, *Mirbelia confertiflora*, *Muehlenbeckia costata*, *Callitris monticola*, *Phebalium ambiens*.

Threats and conservation status: This community is reserved in Girraween and Bald Rock National Parks.

Community 2f: *Kunzea bracteolata*–*Leucopogon melaleuroides* Heathland (Granite Belt Heaths) (Fig. 7)

Geology: Stanthorpe Adamellite.

Trees: *Callitris endlicheri* (33%), *Eucalyptus banksii* (10%), *Eucalyptus dealbata* (14%), *Eucalyptus prava* (5%), *Eucalyptus radiata* (5%), *Eucalyptus campanulata* (5%), *Eucalyptus codonocarpa* (5%), *Eucalyptus dalrympleana* (5%), *Eucalyptus scoparia* (5%).

Shrubs: *Kunzea bracteolata* (100%), *Leucopogon neoanglicus* (90%), *Eriostemon myoporoides* subsp. *epilosus* (76%), *Leucopogon melaleuroides* (81%), *Phebalium ambiens* (29%), *Leptospermum novae-angliae* (38%), *Acacia adunca* (29%), *Callistemon pallidus* (24%), *Pimelea linifolia* (19%), *Leptospermum polygalifolium* subsp. *transmontanum* (24%).

Herbs: *Trachymene incisa* (100%), *Lomandra longifolia* (95%), *Lepidosperma laterale* (52%), *Brachyscome stuartii* (52%), *Entolasia stricta* (43%), *Crassula sieberiana* (43%), *Schoenus apogon* (29%), *Thelionema grande* (38%), *Gahnia sieberiana* (38%), *Gonocarpus teucroides* (24%).

Restricted taxa: *Kunzea bracteolata*, *Eriostemon myoporoides* subsp. *epilosus*, *Thelionema grande*, *Phebalium ambiens*, *Acacia adunca*, *Phebalium rotundifolium*, *Acacia latisepala*, *Leucopogon cicatricatus*, *Prostanthera* sp. B, *Callitris monticola*, *Eucalyptus codonocarpa*, *Eucalyptus scoparia*, *Muehlenbeckia costata*, *Plectranthus suaveolens*.

Threats and conservation status: This community is reserved within Girraween and Bald Rock National Parks.

Element 3: Gibraltar Range Shrubby Open Scrubs and Heaths

This community is composed mainly of heaths although the mallee, *Eucalyptus codonocarpa*, is present in a few localities forming shrubby open scrub. Tree species such as *Eucalyptus notabilis*, *Eucalyptus ligustrina*, *Eucalyptus radiata* and *Eucalyptus acaciiformis* may occur giving the appearance of shrubby low open woodland structure.

Community 3a: *Kunzea bracteolata*–*Leptospermum novae-angliae* Heath (Gibraltar Range Heaths)

Geology: Dandahra Creek Granite.



Fig. 7. Community 2f. *Kunzea obovata*–*Leucopogon melaleucooides* are common dominants. This community is typical of the high altitude areas near Bald Rock, Boonoo Boonoo and Girraween National Parks.

Trees: *Eucalyptus codonocarpa* (35%), *Eucalyptus notabilis* (35%), *Eucalyptus ligustrina* (35%), *Eucalyptus radiata* (4%), *Eucalyptus acaciiformis* (4%).

Shrubs: *Kunzea bracteolata* (91%), *Leucopogon neo-anglicus* (87%), *Leptospermum novae-angliae* (87%), *Callistemon comboyensis* (65%), *Calytrix tetragona* (57%), *Allocasuarina rigida* subsp. *rigida* (78%), *Platysace ericoides* (57%), *Grevillea acerata* (65%), *Epacris microphylla* (39%).

Herbs: *Lepidosperma gunnii* (87%), *Lepidosperma laterale* (91%), *Entolasia stricta* (96%), *Trachymene incisa* (83%), *Laxmannia compacta* (83%), *Lomandra longifolia* (65%), *Schoenus melanostachys* (39%), *Aristida ramosa* (52%), *Xanthorrhoea glauca* (65%), *Schoenus apogon* (48%).

Restricted taxa: *Grevillea acerata*, *Mirbelia confertiflora*, *Acacia bruniooides* subsp. *bruniooides*, *Brachyloma saxicola*, *Eucalyptus codonocarpa*, *Persoonia rufa*, *Callitris monticola*, *Cryptandra lanosiflora*, *Acacia* sp. aff. *torringtonensis*, *Hibbertia villosa*, *Phebalium dentatum*, *Acacia barringtonensis*.

Threats and conservation status: This community occurs within Gibraltar Range National Park and in most instances is relatively undisturbed. Some localities have had minor damage by stray cattle from neighbouring properties.

Element 4: Central New England Shrublands

Low shrubs dominate these communities which are more open in structure than the previous two elements and form shrubby low open shrublands. Taller shrubs such as *Acacia pycnostachya*, *Leptospermum novae-angliae* and *Kunzea bracteolata* may be present but they rarely dominate as they do in elements one and two. *Callitris endlicheri* and various eucalypt species such as *Eucalyptus prava* may also be present, giving the appearance of shrubby low open woodland. The latter structure is particularly apparent at Tarrington where the granite outcrops are highly dissected.

Community 4a: *Leucopogon neo-anglicus*–*Micromyrtus sessilis* Low Shrubland (Bolivia Hill Shrublands)

Geology: Bolivia Range Leucoadamellite, Chaelundi Complex (Granite), Mount Mitchell Adamellite (Porphyritic).

Trees: *Callitris endlicheri* (50%), *Eucalyptus prava* (36%), *Eucalyptus caliginosa* (14%), *Eucalyptus dealbata*, *Eucalyptus bridgesiana* (7%).

Shrubs: *Leucopogon neo-anglicus* (100%), *Micromyrtus sessilis* (100%), *Kunzea bracteolata* (71%), *Boronia anethifolia* (71%), *Kunzea obovata* (57%), *Leptospermum novae-angliae* (36%), *Acacia viscidula* (57%), *Acacia pycnostachya* (64%), *Leptospermum brevipes* (36%), *Cryptandra lanosiflora* (43%).

Herbs: *Digitaria breviglumis* (100%), *Gonocarpus teucrioides* (100%), *Austrodanthonia monticola* (79%), *Entolasia stricta* (93%), *Bulbostylis densa* (100%), *Lepidosperma laterale* (86%), *Brachyscome stuartii* (86%), *Tripogon loliiformis* (79%), *Cheilanthes sieberi* subsp. *sieberi* (86%), *Lepidosperma gunnii* (64%).

Restricted taxa: *Kunzea bracteolata*, *Acacia pycnostachya*, *Cryptandra lanosiflora*, *Eriostemon myoporoides* subsp. *epilosus*, *Brachyloma saxicola*, *Acacia adunca*, *Mirbelia confertiflora*, *Boronia boliviensis*, *Thelionema grande*, *Homoranthus croftianus* m.s.

Threats and conservation status: This community is almost entirely in freehold ownership with only minor occurrences in Guy Fawkes River National Park. The community is relatively undisturbed but is threatened by feral goats and changes in ownership. The area is under investigation for purchase by the National Parks and Wildlife Service of New South Wales.

Community 4b: *Prostanthera staurophylla*–*Kunzea bracteolata* Low Shrubland (Torrington Shrublands)

Geology: Mole Granite (rarely porphyritic).

Trees: *Eucalyptus prava* (90%), *Callitris endlicheri* (66%), *Eucalyptus andrewsii* (26%), *Acacia neriifolia* (11%), *Eucalyptus dealbata* (5%).

Shrubs: *Leucopogon neo-anglicus* (100%), *Prostanthera staurophylla* (82%), *Kunzea bracteolata* (53%), *Leptospermum novae-angliae* (58%), *Leucopogon melaleucoides* (74%), *Acacia viscidula* (55%), *Brachyloma saxicola* (58%), *Hibbertia* sp. B (55%), *Micromyrtus sessilis* (24%), *Calytrix tetragona* (21%).

Herbs: *Brachyscome stuartii* (84%), *Entolasia stricta* (87%), *Tripogon loliiformis* (79%), *Digitaria breviglumis* (79%), *Lepidosperma laterale* (68%), *Laxmannia compacta* (74%), *Gonocarpus teucroides* (50%), *Cheilanthes sieberi* subsp. *sieberi* (79%), *Aristida jerichoensis* (63%), *Isotoma axillaris* (53%).

Restricted taxa: *Prostanthera staurophylla*, *Kunzea bracteolata*, *Brachyloma saxicola*, *Hibbertia* sp. B, *Phebalium rotundifolium*, *Phebalium glandulosum* subsp. *eglandulosum*, *Acacia latisejala*, *Dodonaea hirsuta*, *Eriostemon myoporoides* subsp. *epilosus*, *Micranthemum ericoides*, *Boronia granitica*, *Melichrus erubescens*, *Acacia granitica*, *Persoonia terminalis* subsp. *terminalis*, *Phebalium ambiens*, *Pseudanthus pimeleoides*, *Acacia macnuttiana*, *Acacia torringtonensis*, *Acacia betchei*, *Hakea macrorhyncha*, *Pultenaea stuartiana*, *Homoranthus lunatus*, *Acacia williamsiana*.

Threats and conservation status: This community occurs within Torrington State Recreation Area under the management of the New South Wales National Parks and Wildlife Service. This reserve is at present a multi-purpose reserve that allows many activities to occur and reservation is not as secure as a formal Nature Reserve or National Park. Much of the land has been disturbed in the past by mining, grazing and, in some places, frequent fires. Some mining leases are still under option and may be taken up.

Community 4c: *Babingtonia odontocalyx*–*Brachyloma saxicola* Shrubland (Torrington Woodlands) (Fig. 8)

Geology: Mole Granite.

Trees: *Eucalyptus prava* (100%), *Callitris endlicheri* (100%), *Eucalyptus andrewsii* (100%).

Shrubs: *Babingtonia odontocalyx* (100%), *Brachyloma saxicola* (100%), *Leptospermum brevipes* (100%), *Leucopogon biflorus* (100%), *Leucopogon melaleuroides* (100%), *Boronia anethifolia* (50%), *Hibbertia obtusifolia* (50%), *Hibbertia* sp. B (50%), *Styphelia triflora* (100%), *Acacia falciformis* (50%).

Herbs: *Entolasia stricta* (100%), *Calandrinia eremaea* (50%), *Juncus remotiflorus* (50%), *Lobelia gracilis* (50%), *Patersonia sericea* (100%), *Pomax umbellata* (50%), *Trachymene incisa* (100%), *Asplenium flavellifolium* (50%), *Davallia pyxidata* (50%), *Dianella revoluta* (50%)

Restricted taxa: *Babingtonia odontocalyx*, *Brachyloma saxicola*, *Hibbertia* sp. B., *Boronia granitica*, *Persoonia terminalis* subsp. *terminalis*, *Phebalium rotundifolium*.

Threats and conservation status: The community is conserved within the Torrington State Recreation Area. Grazing and inappropriate fire regimes are threats to this community. Although only sampled here by two sites this community is apparently very common in the south-western areas of the Torrington pluton (Clarke et al. 1998).

Element 5: Severn Shrublands

These communities are restricted to the north-west of Glen Innes. *Leucopogon neo-anglicus* and *Calytrix tetragona* often dominate forming low open shrublands, or taller species may be present, such as *Allocasuarina brachystachya*, *Allocasuarina inophloia*, *Acacia williamsiana* or *Micromyrtus grandis*, giving a shrubby tall shrubland structure.



Fig. 8. Community 4c. This community is dominated by *Acacia granitica* but usually *Babingtonia odontocalyx*–*Brachyloma saxicola* are more common. This community is common the south-western parts of the Torrington State Recreation Area.

If *Eucalyptus prava*, *Eucalyptus caleyi* or *Callitris endlicheri* are present a shrubby low open woodland structure is apparent.

Community 5a: *Calytrix tetragona*–*Leptospermum novae-angliae* Shrubland (Kings Plains Shrublands) (Fig. 9)

Geology: Undifferentiated.

Trees: *Callitris endlicheri* (61%), *Eucalyptus prava* (70%), *Eucalyptus caleyi* (22%), *Acacia neriiifolia* (9%), *Eucalyptus albens* (4%), *Eucalyptus crebra* (4%), *Eucalyptus dealbata* (4%), *Eucalyptus mckieana* (4%).

Shrubs: *Leucopogon neo-anglicus* (96%), *Calytrix tetragona* (91%), *Leptospermum novae-angliae* (100%), *Melichrus urceolatus* (78%), *Cryptandra amara* var. *floribunda* (74%), *Kunzea obovata* (52%), *Allocasuarina brachystachya* (48%), *Leucopogon attenuatus* (70%), *Hibbertia riparia* (44%), *Homoranthus biflorus* (30%).

Herbs: *Tripogon loliiformis* (96%), *Aristida jerichoensis* (96%), *Cheilanthes sieberi* (91%), *Digitaria breviglumis* (87%), *Fimbristylis dichotoma* (74%), *Trachymene incisa* (83%), *Lepidosperma laterale* (87%), *Laxmannia compacta* (83%), *Entolasia stricta* (78%), *Goodenia bellidifolia* (57%).

Restricted taxa: *Allocasuarina brachystachya*, *Homoranthus biflorus*, *Acacia torringtonensis*, *Micromyrtus grandis*, *Acacia williamsiana*, *Boronia granitica*, *Phebalium rotundifolium*, *Astrotricha roddii*, *Callistemon pungens*, *Hibbertia* sp. B, *Zieria odorifera*, *Eucalyptus mckieana*.

Threats and conservation status: Conservation of this community occurs in Kings Plains National Park and Severn River Nature Reserve. Threats to the community include grazing on private property and feral goats across all tenures.

Community 5b: *Allocasuarina brachystachya* Shrubland (Severn Shrublands) (Fig. 10)

Geology: Undifferentiated.

Trees: *Eucalyptus prava* (82%), *Eucalyptus caleyi* (64%), *Callitris endlicheri* (27%), *Eucalyptus dealbata* (9%).

Shrubs: *Calytrix tetragona* (100%), *Allocasuarina brachystachya* (100%), *Leucopogon attenuatus* (91%), *Leptospermum novae-angliae* (100%), *Cryptandra amara* var. *floribunda* (91%), *Melichrus urceolatus* (91%), *Aotus subglauca* (91%), *Leucopogon neo-anglicus* (55%), *Acacia torringtonensis* (91%), *Hibbertia riparia* (73%).

Herbs: *Pterostylis daintreana* (82%), *Schoenus apogon* (91%), *Austrodanthonia monticola* (100%), *Goodenia bellidifolia* (91%), *Aristida jerichoensis* (100%), *Trachymene incisa* (82%), *Drosera peltata* (91%), *Entolasia stricta* (82%), *Cheilanthes sieberi* subsp. *sieberi* (82%), *Lepidosperma laterale* (82%).

Restricted taxa: *Allocasuarina brachystachya*, *Acacia torringtonensis*, *Persoonia terminalis* subsp. *terminalis*, *Phebalium rotundifolium*, *Astrotricha roddii*, *Hibbertia* sp. B, *Acacia williamsiana*.

Threats and conservation status: This community occurs in Severn River Nature Reserve. This reserve is relatively inaccessible and undisturbed, however feral goats are known in the area. Cattle, sheep and goats graze on neighbouring properties.



Fig. 9. Community 5a. *Leucopogon neo-anglicus*–*Calytrix tetragona* are common dominants in Kings Plains National Park, Severn River Nature Reserve and private properties along the Severn River.



Fig. 10. Community 5b. This unusual community is dominated by *Allocasuarina brachystachya* and is found within Kings Plains National Park and Severn River Nature Reserve.

Element 6: Moonbi Shrublands and Grasslands

These communities are found north and northwest of Tamworth. Those to the west are mainly graminoid while those near Moonbi often have a shrub component. Occasionally species such as *Eucalyptus prava*, *Ficus rubiginosa*, *Callitris endlicheri*, or *Callitris glaucophylla* may be present, giving the structural appearance of shrubby open scrub or grassy low open woodland. *Triodia scariosa* is also present in patches in the Moonbi area.

Community 6a: *Cymbopogon refractus*–*Tripogon loliiformis* Grassland (Attunga Grasslands) (Fig. 11)

Geology: Attunga Creek Adamellite.

Trees: *Eucalyptus prava* (50%), *Callitris endlicheri* (100%).

Shrubs: *Canthium odoratum* (100%), *Desmodium brachypodum* (50%), *Melichrus urceolatus* (50%), *Notelaea microcarpa* (50%), *Alphitonia excelsa* (50%), *Swainsona galegifolia* (50%).

Herbs: *Cymbopogon refractus* (100%), *Tripogon loliiformis* (100%), *Digitaria brownii* (100%), *Cheilanthes distans* (100%), *Cheilanthes sieberi* subsp. *sieberi* (100%), *Glycine clandestina* (100%), *Paspalidium constrictum* (100%), *Dichondra* sp. A (100%), *Aristida ramosa* (50%), *Aristida vagans* (50%).

Restricted taxa: none recorded.



Fig. 11. Community 6a. Small grasslands dominated by *Cymbopogon refractus*–*Tripogon loliiformis* are found within Attunga State Forest near Tamworth.

Threats and conservation status: This community is not reserved. Grazing by goats is the only major threat.

Community 6b: *Prostanthera nivea*-*Acacia viscidula* Shrubland (Moonbi Shrublands)

Geology: Moonbi Adamellite.

Trees: *Callitris glaucophylla* (80%), *Eucalyptus prava* (50%), *Eucalyptus dealbata* (20%), *Acacia neriifolia* (80%), *Ficus rubiginosa* (20%), *Brachychiton populneus* (20%).

Shrubs: *Prostanthera nivea* (100%), *Acacia viscidula* (100%), *Zieria cytisoides* (20%), *Hibbertia* sp. 'grandiflora' (40%), *Bertya cunninghamii* (30%), *Olearia elliptica* (40%), *Dodonaea viscosa* (20%), *Desmodium brachypodum* (10%), *Correa reflexa* (10%), *Hovea lanceolata* (10%).

Herbs: *Paspalidium constrictum* (100%), *Cheilanthes sieberi* subsp. *sieberi* (70%), *Gonocarpus teucroides* (60%), *Commelina cyanea* (90%), *Arthropodium milleflorum* (100%), *Austrodanthonia linkii* (90%), *Tripogon loliiformis* (80%), *Cyperus fulvus* (100%), *Stypandra glauca* (70%), *Microlaena stipoides* (70%).

Restricted taxa: *Hibbertia* sp. 'grandiflora', *Bertya cunninghamii*.

Threats and conservation status: This community is not reserved. The community in the past has been logged for *Callitris*, and at present is disturbed by goats. The community has a relatively high number of exotic species.

Element 7: Western New England Shrublands and Herbfields

This element is widely distributed down the western portion of the Batholith. The communities are dominated by herbaceous species that may occasionally have a scattered shrub overstorey. *Callitris endlicheri*, *Eucalyptus prava*, *Eucalyptus dealbata* and other low trees or the mallee, *Eucalyptus quinniorum* m.s. may be present, giving the appearance of low open woodland.

Community 7a: *Cheilanthes sieberi* subsp. *sieberi*-*Brachycome stuartii* Herbfield (Eagle Creek Herbfields)

Geology: Bolivia Range Leucoadamellite, Mount Mackenzie Adamellite, Mole Granite, (undifferentiated) Leucoadamellite.

Trees: *Callitris endlicheri* (63%), *Eucalyptus prava* (50%), *Eucalyptus dealbata* (19%), *Eucalyptus andrewsii* (25%), *Eucalyptus albens* (6%), *Eucalyptus caleyi* (6%).

Shrubs: *Leucopogon neo-anglicus* (69%), *Plectranthus parviflorus* (56%), *Melichrus urceolatus* (69%), *Prostanthera nivea* (50%), *Calytrix tetragona* (31%), *Acacia macnuttiana* (38%), *Cryptandra amara* var. *floribunda* (25%), *Leptospermum novae-angliae* (19%), *Acacia viscidula* (19%), *Kunzea obovata* (13%).

Herbs: *Brachycome stuartii* (81%), *Cheilanthes sieberi* subsp. *sieberi* (88%), *Tripogon loliiformis* (88%), *Digitaria breviglumis* (75%), *Gonocarpus teucroides* (88%), *Fimbristylis dichotoma* (69%), *Aristida jerichoensis* (56%), *Trachymene incisa* (63%), *Entolasia stricta* (75%), *Commelina cyanea* (53%).

Restricted taxa: *Acacia macnuttiana*, *Callistemon pungens*, *Acacia pycnostachya*, *Eriostemon myoporoides* subsp. *epilosus*, *Brachyloma saxicola*, *Kunzea bracteolata*, *Acacia adunca*, *Zieria odorifera*, *Mirbelia confertiflora*.

Threats and conservation status: This community is not reserved. Most sites are in private ownership except for Severn State Forest near Ashford in New South Wales. Severn State Forest was logged in 1996. Much of the land around Eagle Creek has been severely degraded, with considerable clearing even on the outcrops. Grazing is intense from sheep and goats at Eagle Creek.

Community 7b: *Leptospermum brevipes*–*Calytrix tetragona* Shrubland (Balala Shrublands)

Geology: Banalasta Adamellite.

Trees: *Eucalyptus prava* (25%).

Shrubs: *Leptospermum brevipes* (100%), *Calytrix tetragona* (100%), *Acacia viscidula* (100%), *Hovea beckeri* (50%), *Zieria cytisoides* (25%), *Cryptandra amara* subsp. *floribunda* (25%), *Dodonaea viscosa* (25%), *Brachyloma daphnoides* subsp. *glabrum* (25%), *Prostanthera nivea* (75%).

Herbs: *Gonocarpus teucroides* (100%), *Danthonia monticola* (100%), *Cheilanthes sieberi* subsp. *sieberi* (100%), *Crassula sieberiana* (75%), *Stypandra glauca* (50%), *Trachymene incisa* (50%), *Isotoma axillaris* (75%), *Aristida jerichoensis* (25%), *Drosera peltata* (25%), *Cymbopogon refractus* (25%).

Restricted taxa: none recorded.

Threats and conservation status: The community is not reserved. Although protected by the current landholder, changes in ownership may also bring changes in management.

Community 7c: *Gonocarpus teucroides*–*Isotoma axillaris* Herbfield (Warrabah Herbfields)

Geology: Gilgai Granite, (undifferentiated) Leucoadamellite.

Trees: *Callitris endlicheri* (83.3%), *Eucalyptus prava* (50%), *Acacia neriifolia* (50%), *Eucalyptus dealbata* (50%), *Acacia falcata* (17%), *Eucalyptus andrewsii* (17%), *Eucalyptus caleyi* (17%).

Shrubs: *Ozothamnus obcordatus* (100%), *Leucopogon muticus* (83%), *Calytrix tetragona* (50%), *Hibbertia linearis* (67%), *Dodonaea viscosa* (100%), *Persoonia cornifolia* (100%), *Homoranthus prolixus* (17%), *Leucopogon melaleuroides* (17%), *Hovea lanceolata* (17%), *Grevillea ramosissima* (17%).

Herbs: *Gonocarpus teucroides* (83%), *Isotoma axillaris* (83%), *Cheilanthes sieberi* subsp. *sieberi* (100%), *Aristida jerichoensis* (50%), *Cymbopogon refractus* (50%), *Cyperus fulvus* (50%), *Lepidosperma laterale* (50%), *Pomax umbellata* (67%), *Stypandra glauca* (67%), *Brachyscome stuartii* (83%).

Restricted taxa: *Homoranthus prolixus*, *Zieria odorifera*, *Callistemon pungens*.

Threats and conservation status: This community is not reserved and is threatened by feral goats.

Community 7d: *Calytrix tetragona*–*Cryptandra amara* subsp. *amara* Shrubland (Severn Shrublands) (Fig. 12)

Geology: Undifferentiated.

Trees: *Callitris endlicheri* (50%), *Acacia neriifolia* (75%), *Eucalyptus dealbata* (75%), *Eucalyptus prava* (25%), *Eucalyptus macrorhyncha* (25%).

Shrubs: *Calytrix tetragona* (100%), *Cryptandra amara* subsp. *amara* (75%), *Melichrus urceolatus* (100%), *Beyeria viscosa* (50%), *Leucopogon meleucoides* (75%), *Leucopogon muticus* (75%), *Leptospermum brevipes* (75%), *Cassinia uncata* (75%), *Ozothamnus obcordatus* (50%), *Olearia elliptica* (50%).

Herbs: *Cheilanthes sieberi* subsp. *sieberi* (100%), *Cyperus fulvus* (100%), *Aristida jerichoensis* (75%), *Wahlenbergia graniticola* (75%), *Cymbopogon refractus* (100%), *Portulaca filifolia* (75%), *Digitaria breviglumis* (75%), *Arthropodium milleflorum* (75%), *Triodia scariosa* (25%), *Crassula sieberiana* (75%).

Restricted taxa: *Hibbertia* sp. B, *Acacia macnuttiana*, *Olearia gravis*.

Threats and conservation status: This community is not reserved. Threats to the community are mainly from goats and possible changes in management strategies.



Fig. 12. Community 7d. *Calytrix tetragona*–*Cryptandra amara* dominated shrublands occur occasionally near 'the Barbs' near Pindari Dam on the Severn River.

Community 7e: *Calytrix tetragona*–*Kunzea obovata* Shrubland (Parlour Mountain Shrublands)**Geology:** Parlour Mountain Leucoadamellite.**Trees:** *Eucalyptus prava* (89%), *Eucalyptus youmanii* (22%), *Eucalyptus dealbata* (11%).**Shrubs:** *Leucopogon neo-anglicus* (100%), *Calytrix tetragona* (100%), *Kunzea obovata* (100%), *Hibbertia riparia* (44%), *Acacia triptera* (44%), *Hibbertia* sp. aff. *monogyna* (56%), *Leucopogon melaleucoides* (78%), *Boronia anethifolia* (44%), *Persoonia cornifolia* (67%), *Prostanthera nivea* (33%).**Herbs:** *Austrodanthonia linkii* (100%), *Lepidosperma laterale* (89%), *Digitaria breviglumis* (100%), *Cheilanthes sieberi* subsp. *sieberi* (100%), *Entolasia stricta* (89%), *Gonocarpus teucrioides* (89%), *Trachymene incisa* (89%), *Aristida jerichoensis* (89%), *Paspalidium constrictum* (56%), *Lobelia gracilis* (78%).**Restricted taxa:** *Hibbertia* sp. aff. *monogyna*, *Mirbelia confertiflora*, *Eucalyptus youmanii*, *Acacia granitica*, *Boronia granitica*.**Threats and conservation status:** This community is not reserved. Selective logging has occurred over much of the area and cattle and sheep graze most properties. Furthermore, feral goats and cattle threaten some outcrops.**Community 7f: *Calytrix tetragona*–*Ozothamnus obcordatus* Shrubland (Ironbark Shrublands)****Geology:** (Undifferentiated) Leucoadamellite.**Trees:** *Callitris endlicheri* (73%), *Eucalyptus prava* (47%), *Acacia neriifolia* (33%), *Eucalyptus dealbata* (20%), *Eucalyptus quinniorum* m.s. (20%), *Eucalyptus caleyi* (7%), *Eucalyptus macrorhyncha* (7%).**Shrubs:** *Calytrix tetragona* (80%), *Leucopogon neo-anglicus* (40%), *Ozothamnus obcordatus* (53%), *Leptospermum novae-angliae* (40%), *Leucopogon muticus* (67%), *Leptospermum brevipes* (33%), *Cryptandra amara* var. *floribunda* (33%), *Homoranthus bornhardtiensis* m.s. (27%), *Prostanthera nivea* (47%), *Boronia anethifolia* (27%).**Herbs:** *Cheilanthes sieberi* subsp. *sieberi* (100%), *Gonocarpus tetragynus* (93%), *Trachymene incisa* (73%), *Austrodanthonia monticola* (80%), *Tripogon loliiformis* (67%), *Isotoma anethifolia* (73%), *Isolepis hookeriana* (53%), *Brachyscome stuartii* (33%), *Stypandra glauca* (47%), *Hydrocotyle peduncularis* (40%).**Restricted taxa:** *Homoranthus bornhardtiensis* m.s., *Eucalyptus quinniorum* m.s., *Cypanthera albicans* subsp. *albicans*, *Callistemon pungens*.**Threats and conservation status:** This community is reserved in Ironbark Nature Reserve. Feral goats and rabbits are in all areas and are the only threat.**Community 7g: *Cheilanthes sieberi* subsp. *sieberi*–*Arthropodium milleflorum* Herbfield (Flaggy Range Herbfields) (Fig. 13)****Geology:** Tilmunda Adamellite, Banalasta Adamellite, (undifferentiated) Leucoadamellite, Yarrowyck Granodiorite.

Trees: *Callitris endlicheri* (66%), *Acacia neriifolia* (56%), *Eucalyptus prava* (48%), *Eucalyptus dealbata* (30%), *Callitris glaucophylla* (7%), *Acacia leiocalyx* (18%), *Angophora floribunda* (16%), *Ficus rubiginosa* (14%), *Casuarina cunninghamiana* (2%), *Brachychiton populneus* (7%), *Eucalyptus quinniorum* m.s. (7%).

Shrubs: *Leptospermum brevipes* (30%), *Calytrix tetragona* (30%), *Prostanthera nivea* (32%), *Cryptandra amara* var. *floribunda* (43%), *Cassinia quinquefaria* (34%), *Acacia viscidula* (30%), *Leucopogon muticus* (30%), *Ozothamnus obcordatus* (18%), *Homoranthus prolixus* (7%), *Melichrus urceolatus* (35%).

Herbs: *Cheilanthes sieberi* subsp. *sieberi* (100%), *Tripogon loliiformis* (93%), *Arthropodium milleflorum* (91%), *Crassula sieberiana* (86%), *Aristida jerichoensis* (86%), *Digitaria breviglumis* (77%), *Calandrinia eremaea* (75%), *Cymbopogon refractus* (64%), *Cyperus fulvus* (57%), *Gonocarpus teucroides* (43%).

Restricted taxa: *Homoranthus prolixus*, *Acacia granitica*, *Kunzea bracteolata*, *Eucalyptus quinniorum* m.s., *Eucalyptus youmanii*, *Acacia williamsiana*.

Threats and conservation status: This community is subject to intense grazing from domestic and feral animals especially goats. Examples of this community are reserved within Warrabah National Park and Mount Yarrowyck Nature Reserve.



Fig. 13. Community 7g. Herbfields dominated by *Cheilanthes sieberi* subsp. *sieberi*–*Arthropodium milleflorum* are common along the western side of the New England Batholith from Eagle Creek to the Flaggy Range.

Community 7h: *Cheilanthes sieberi* subsp. *sieberi*–*Isotoma axillaris* Herbfeld (Flaggy Range Herbfelds)

Geology: Tilmunda Adamellite, Banalasta Adamellite.

Trees: *Acacia neriifolia* (83%), *Callitris endlicheri* (33%), *Eucalyptus prava* (50%), *Eucalyptus quinniorum* m.s. (50%), *Eucalyptus youmanii* (50%).

Shrubs: *Ozothamnus obcordatus* (33%), *Cassinia quinquefaria* (17%), *Olearia viscidula* (50%), *Persoonia cornifolia* (50%), *Cryptandra amara* var. *floribunda* (33%), *Leptospermum novae-angliae* (33%), *Melichrus urceolatus* (17%), *Acacia ulicifolia* (17%), *Calytrix tetragona* (17%), *Cassinia uncata* (17%), *Correa reflexa* (17%), *Leptospermum brevipes* (17%).

Herbs: *Cheilanthes sieberi* subsp. *sieberi* (83%), *Isotoma axillaris* (67%), *Urtica incisa* (50%), *Crassula sieberiana* (50%), *Austrodanthonia monticola* (100%), *Aristida jerichoensis* (33%), *Lobelia gracilis* (67%), *Calandrinia eremaea* (50%), *Lepidosperma laterale* (83%), *Einadia hastata* (33%).

Restricted taxa: *Eucalyptus quinniorum* m.s., *Eucalyptus youmanii*.

Threats and conservation status: This community is not reserved. Goats are the major threat to this community.

Element 8: Kwiambal Grasslands

This community is restricted to the area surrounding the junction of the Severn and Macintyre Rivers and is dominated by grasses and other herbaceous taxa. Sparsely distributed shrub species may occasionally occur such as *Melichrus urceolatus* or *Acacia williamsiana* giving the appearance of low open shrubland. *Callitris endlicheri*, *Callitris glycyphylla* or eucalypts such as *Eucalyptus dealbata* or *Eucalyptus prava* amongst others give an overall appearance of low open woodland.

Community 8a: *Aristida vagans*–*Tripogon loliiformis* Grassland (Kwiambal Grasslands) (Fig. 14)

Geology: (undifferentiated) Granite.

Trees: *Eucalyptus dealbata* (82%), *Callitris glaucophylla* (77%), *Acacia leiocalyx* (46%), *Callitris endlicheri* (27%), *Ficus rubiginosa* (27%), *Corymbia dolichocarpa* (18%), *Casuarina cunninghamiana* (9%).

Shrubs: *Melichrus urceolatus* (91%), *Plectranthus parviflorus* (82%), *Leptospermum brevipes* (64%), *Acacia williamsiana* (46%), *Astrotricha roddii* (36%), *Olearia ramosissima* (36%), *Prostanthera saxicola* (36%), *Hovea lanceolata* (18%), *Mirbelia pungens* (18%), *Phyllanthus carpentariae* (27%).

Herbs: *Aristida vagans* (100%), *Tripogon loliiformis* (90%), *Cheilanthes sieberi* subsp. *sieberi* (100%), *Commelina cyanea* (100%), *Crassula sieberiana* (82%), *Aristida ramosa* (73%), *Gonocarpus tetragynus* (73%), *Aristida jerichoensis* (46%), *Bulbostylis barbata* (24%), *Stylidium laricifolium* (55%).

Restricted taxa: *Acacia williamsiana*, *Astrotricha roddii*, *Olearia gravis*.

Threats and conservation status: The community is often disturbed and is threatened primarily from feral animals, particularly goats. Some localities within Severn River State Forest are being logged. Some areas are within the proposed Kwiambal National Park, however most are not within present park boundaries. The boundaries of the National Park are not fixed at this stage and further inclusions may add to the reservation status of this community.

Element 9: Howell Shrubland

These communities occur primarily around Copeton Dam and Goonoowigal near Inverell with a minor occurrence at Warrabah. Low shrubs, particularly *Homoranthus prolixus* and *Babingtonia densifolia* dominate. Occasionally all shrubs may be absent giving a grassland structure, or *Callitris endlicheri* and various eucalypts such as *Eucalyptus dealbata* and *Eucalyptus prava* may be present giving the appearance of a low open woodland.

Community 9a: *Babingtonia densifolia*–*Homoranthus prolixus* Shrubland (Howell Shrublands)

Geology: Gilgai Granite, (undifferentiated) Leucoadamellite.

Trees: *Callitris endlicheri* (88%), *Eucalyptus dealbata* (52%), *Eucalyptus prava* (24%), *Acacia neriifolia* (21%).

Shrubs: *Babingtonia densifolia* (91%), *Homoranthus prolixus* (85%), *Leucopogon neo-anglicus* (76%), *Acacia triptera* (58%), *Micromyrtus sessilis* (33%), *Leucopogon melaleucoides* (64%), *Ozothamnus obcordatus* (36%), *Prostanthera nivea* (39%), *Acacia granitica* (52%), *Eriostemon myoporoides* subsp. *conduplicatus* (36%).

Herbs: *Paspalidium constrictum* (97%), *Lepidosperma laterale* (97%), *Cheilanthes sieberi* subsp. *sieberi* (100%), *Tripogon loliiformis* (91%), *Gonocarpus tetragynus* (79%), *Brachyscome stuartii* (76%), *Aristida jerichoensis* (82%), *Trachymene incisa* (67%), *Lobelia gracilis* (79%), *Fimbristylis dichotoma* (61%).

Restricted taxa: *Homoranthus prolixus*, *Acacia granitica*, *Zieria odorifera*, *Dodonaea stenophylla*, *Hibbertia kaputarensis*, *Boronia granitica*, *Phebalium rotundifolium*.

Threats and conservation status: This community is probably not reserved. However as this is the most common community in the Howell area it is possible that this community may occur on the western side of Copeton Dam where small outcrops occur in the Copeton State Recreation Area. Feral goats are abundant and are a threat to this community.

Community 9b: *Homoranthus prolixus* Shrubland (Howell Shrublands) (Fig. 15)

Geology: Tingha Granite.

Trees: *Acacia neriifolia* (33%), *Eucalyptus dealbata* (17%), *Eucalyptus prava* (17%), *Callitris endlicheri* (17%).

Shrubs: *Homoranthus prolixus* (100%), *Leucopogon neo-anglicus* (68%), *Acacia triptera* (83%), *Babingtonia densifolia* (68%), *Cryptandra amara* subsp. *floribunda* (17%),



Fig. 14. Community 8a. Severn State Forest and the Kwiambal National Park have *Aristida vagans*–*Tripogon loliiformis* dominating outcrops.



Fig. 15. Community 9b. *Homoranthus prolixus* is a very noticeable dominant on the outcrops in the Howell and Copeton Dam areas.

Leucopogon melaleuroides (17%), *Eriostemon myoporoides* subsp. *conduplicatus* (17%), *Olearia elliptica* (17%), *Persoonia cornifolia* (17%), *Prostanthera nivea* (83%).

Herbs: *Paspalidium constrictum* (100%), *Cheilanthes sieberi* subsp. *sieberi* (100%), *Commelina cyanea* (100%), *Lepidosperma laterale* (100%), *Brachyscome stuartii* (100%), *Portulaca filifolia* (83%), *Einadia hastata* (100%), *Tripogon loliiformis* (100%), *Portulaca oleracea* (83%), *Oxalis chnoodes* (100%).

Restricted taxa: *Homoranthus prolixus*, *Zieria odorifera*.

Threats and conservation status: This community is not reserved. Feral goats are the major threat.

Closed Shrub

The community was not quantitatively surveyed because of its very restricted occurrence and difficulties of access. It has been included here for completeness. This community is restricted to deep crevices, clefts and sheltered areas on large granitic outcrops or between large boulders (Fig. 16).

Community 10: *Quintinia sieberi*–*Rapanea* spp. Closed Shrub (Eastern New England Closed Scrub)

Geology: Oban River Leucoadamellite, Round Mountain Leucoadamellite, Stanthorpe Adamellite.

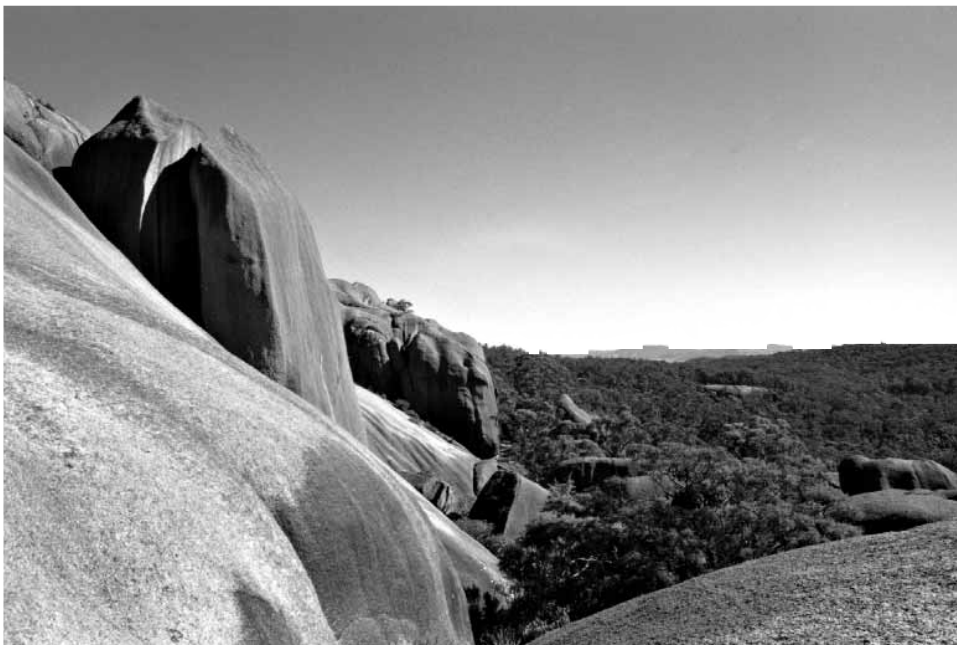


Fig. 16. Community 10. This community is very restricted and occurs usually between the crevices of very large outcrops. South Bald Rock (shown here) has two large crevices that contain *Quintinia sieberi*–*Rapanea* spp. closed scrub (not visible here).

Common taxa: *Quintinia sieberi*, *Rapanea* spp., *Notelaea* sp. A., *Leptospermum polygalifolium* subsp. *montanum*, *Tasmannia glaucophylla*, *Cyathea australis*, *Trochocarpa laurina*.

Threats and conservation status: All known occurrences are within some form of reservation. The community has been observed along the eastern escarpment of the batholith at Crown Mountain Flora Reserve, Girraween National Park, and Cathedral Rock National Park. Due to inaccessibility this community is little disturbed and not considered to be under threat.

Discussion

Comparison with previous investigations

Almost all the previous survey work on the outcrop flora of the New England Batholith deals with the areas included within elements one to three. The vegetation on the western side of the Batholith has been only described by Bowlay (1992), Clarke et al. (1995), Le Brocque and Benson (1995), Clarke et al. (1998) and Hunter (1998c).

Specht et al. (1974) describe four alliances for New South Wales of some relevance to the granitic outcrops of the New England Batholith. Problems in defining alliances based on structure are apparent. Some alliances are defined many times, for example the New England outcrop community *Leptospermum* spp.–*Allocasuarina rigida*, is defined at least three times as: tall montane shrubland, closed montane heath, and open montane heath. Furthermore, *Eucalyptus codonocarpa* is considered to be distinct from the heath alliances on the New England Tablelands. Although Specht et al. (1995) have provided a more quantitative analysis in the definition of communities, they again define the *Eucalyptus codonocarpa* community as separate from the floristically similar but structurally different adjacent heath communities, defined by these authors as *Allocasuarina rigida*–*Leptospermum* spp.–*Kunzea bracteolata*. This is surprising as Specht et al. is based on floristic analysis. Both our results and those of Benson & Ashby (1996) suggest that the heath communities on granitic outcrops and the *Eucalyptus codonocarpa* communities are floristically similar. Specht et al. (1995) and New South Wales National Parks & Wildlife Service (1995) define a *Eucalyptus scoparia* community as distinct from the heath communities. We have found that *Eucalyptus scoparia* is an infrequent species of heaths within the Girraween and Bald Rock areas and does not affect overall floristic distinction when it occurs. Individual communities described on floristic grounds may have a range of structures.

Specht et al. (1974) define three heath/shrubland alliances for New South Wales that are of relevance to our study, namely *Calytrix tetragona*, *Epacris brevifolia* and *Leptospermum novae-angliae*–*Allocasuarina rigida*. As only a few frequent taxa are given it is difficult to establish the similarity of their communities to those we have defined. However, based on the dominant species they list, the *Calytrix tetragona* alliance may approximate the communities defined in our element four. Those of the latter two alliances may somewhat approximate elements one and two, with some notable differences. The *Epacris brevifolia* group as defined by Specht et al. (1974) includes dominant taxa that are found primarily on outcrops, together with those from wet

Table 2: Selected attributes of each of the 28 communities defined by analysis and one additional recognised community.

Community Number	Number of Samples	Dominant Taxa	Common Structural Type	Locality	No. of Taxa	Mean Taxa Per Sample	No. of Exotic Taxa
1a	16	<i>Leptospermum novae-angliae</i> – <i>Kunzea obovata</i>	Heathland	BC	126	40	3
1b	14	<i>Kunzea obovata</i>	Heathland	BC BL	104	30	3
1c	22	<i>Leptospermum novae-angliae</i>	Heathland	BC	117	32	3
2a	5	<i>Leptospermum novae-angliae</i> – <i>Brachyloma saxicola</i>	Heathland	BL CH GR DM	133	44	NA
2b	4	<i>Acacia viscidula</i> – <i>Kunzea opposita</i>	Heathland	JB	67	39	1
2c	3	<i>Leptospermum novae-angliae</i> – <i>Leucopogon cicatricatus</i>	Heathland	CR	47	24	1
2d	31	<i>Leptospermum novae-angliae</i> – <i>Acacia latisejala</i>	Heathland	BR DM JB	202	29	7
2e	7	<i>Leptospermum novae-angliae</i> – <i>Dodonaea viscosa</i>	Heathland	BR	107	29	4
2f	21	<i>Kunzea bracteolata</i> – <i>Leucopogon melaleucoides</i>	Heathland	BR	103	19	5
3a	23	<i>Kunzea bracteolata</i> – <i>Leptospermum novae-angliae</i>	Heathland	GR	147	36	3
4a	14	<i>Leucopogon neo-anglicus</i> – <i>Micromyrtus sessilis</i>	Shrubland	BH CH GR	99	28	1
4b	38	<i>Prostanthera staurophylla</i> – <i>Kunzea bracteolata</i>	Shrubland	TT	169	33	2
4c	2	<i>Babingtonia odontocalyx</i> – <i>Brachyloma saxicola</i>	Shrubland	TT	42	27	1
5a	23	<i>Calytrix tetragona</i> – <i>Leptospermum novae-angliae</i>	Shrubland	KP SR WW	134	33	1
5b	11	<i>Allocasuarina brachystachya</i>	Shrubland	SR	98	44	NA

Community Number	Number of Samples	Dominant Taxa	Common Structural Type	Locality	No. of Taxa	Mean Taxa Per Sample	No. of Exotic Taxa
6a	2	<i>Cymbopogon refractus</i> – <i>Tripogon loliiiformis</i>	Grassland	AT	67	48	10
6b	10	<i>Prostanthera nivea</i> – <i>Acacia viscidula</i>	Shrubland	MB	98	32	12
7a	12	<i>Cheilanthes sieberi</i> – <i>Brachycome stuartii</i>	Herbfield	BH EC KP TT WB	150	33	3
7b	4	<i>Leptospermum brevipes</i> – <i>Calytrix tetragona</i>	Shrubland	ML	36	36	2
7c	6	<i>Gonocarpus teucrioides</i> – <i>Isotoma axillaris</i>	Herbfield	HC WB	85	29	1
7d	4	<i>Calytrix tetragona</i> – <i>Cryptandra amara</i> subsp. <i>amara</i>	Shrubland	SR	86	37	4
7e	9	<i>Calytrix tetragona</i> – <i>Kunzea obovata</i>	Shrubland	PM	100	36	2
7f	15	<i>Calytrix tetragona</i> – <i>Ozothamnus obcordatus</i>	Shrubland	IB	117	28	2
7g	44	<i>Cheilanthes sieberi</i> – <i>Arthropodium milleflorum</i>	Herbfield	FR ML SR WB YH	212	31	15
7h	6	<i>Cheilanthes sieberi</i> – <i>Isotoma axillaris</i>	Herbfield	FR ML	56	20	5
8a	11	<i>Aristida vagans</i> – <i>Tripogon loliiiformis</i>	Grassland	KL	101	34	7
9a	33	<i>Babingtonia densifolia</i> – <i>Homoranthus prolixus</i>	Shrubland	HC WB	111	29	6
9b	6	<i>Homoranthus prolixus</i>	Shrubland	HC	81	43	10
10	-	<i>Quintinia sieberi</i> – <i>Rapanea</i> spp.	Closed Scrub	BC BR CR	-	-	-

heaths in the region. For example, this alliance is defined as containing *Hakea microcarpa* and *Epacris brevifolia* which are restricted to areas of poor drainage, and *Cryptandra lanosiflora* and *Leucopogon neo-anglicus* which are granitic outcrop endemics. These combinations of species cannot be reconciled with our data.

Specht et al. (1995) define a heath community *Allocasuarina rigida*–*Leptospermum* spp.–*Kunzea bracteolata*, equivalent to elements one to three. The species *Allocasuarina rigida* was also used to define communities on the New England Batholith by Specht et al. (1974), and the New South Wales National Parks and Wildlife Service (1995). In our survey *Allocasuarina rigida* is neither frequent nor abundant, and its use as a defining species by Specht et al. (1995) in their quantitatively defined communities is anomalous. This species may certainly become dominant in areas around the Mount Warning Shield (e.g. Lamington National Park) but is infrequent in most outcrops on the New England Batholith. *Leptospermum novae-angliae* is probably the best defining species for granitic outcrop areas, particularly those within elements one to three.

The New South Wales National Parks and Wildlife Service (1995) in their survey of the upper north-east of New South Wales identified several associations of relevance to granitic outcrops that we have included within elements two and three. The associations they define are: *Kunzea bracteolata*–*Allocasuarina littoralis*, *Kunzea bracteolata*–*Boronia bipinnata*, *Kunzea bracteolata*–*Grevillea acerata*, *Kunzea bracteolata*–*Leptospermum novae-angliae* and *Leptospermum novae-angliae*–*Leptospermum variabile*. Most of these associations are narrowly defined and the first and last would fall within Community 2a, while the other three would fall within Community 3a.

Binns (1992, 1995) describes communities that occur on granite outcrops on the New England Batholith and are similar to those defined in element two. Benson & Ashby (1996) defined a community found on granitic outcrops of the Guyra area. This community was variable in structure and termed 'Mallee (*Eucalyptus codonocarpa*) and Heath on Rocky Outcrops on Leucogranite'. This community corresponds directly to Community 1c, 'Backwater Heaths'.

Bowlay (1992), Clarke et al. (1995) and Le Brocque and Benson (1995) surveyed areas and defined communities within the north-western portion of the New England Batholith. Le Brocque and Benson (1995) included our Community 5b within a broader *Eucalyptus caleyi*/*Allocasuarina inophloia* association. Clarke et al. (1995) defined two rocky outcrop communities, *Eucalyptus prava* and *Eucalyptus dealbata*–*Eucalyptus caleyi*–*Callitris endlicheri*, which are defined on the species in the upper stratum. These two communities being based on the same data are synonymous with Community 5a *Leucopogon neo-anglicus*–*Calytrix tetragona* Low Shrubland. Similarly using some of the same data Clarke et al. (1998) define a *Eucalyptus prava*–*Callitris endlicheri*–*Eucalyptus andrewsii* community that is synonymous with Community 4b and *Eucalyptus prava*–*Eucalyptus dealbata*–*Callitris endlicheri* community that is synonymous with Community 7a.

Classifying Outcrop Communities

Communities found on granitic outcrops have a high proportion of restricted taxa which make them distinct from the surrounding forest vegetation. This fact has been

noted elsewhere in Australia (Aston & Webb 1977; George et al. 1979; Beadle 1981; Benwell 1995) and within the region under investigation (Binns 1995). The communities are often visually variable from one patch to another within the same area in both structure and dominant taxa. Overall, floristic similarity may vary little between these patches yet traditionally they have been given different names often based simply on structure. Each community is derived from a limited source pool. However, the populations found within patches of vegetation on outcrops are comparatively small and isolated and prone to changes in dominant taxa based on an increase in the probability of extinction and chance colonisation and establishment. This has caused problems in the description of rocky outcrop communities.

Binns (1992, 1995) found problems in using traditional methods based on consistent structure and consistent dominant taxa for outcrop communities on the New England Batholith. Binns stated that composition appeared to be highly variable both within and between patches, with no obvious pattern, and that composition may depend on chance colonisation. Hambler (1964) who qualitatively described granite outcrop communities in western Nigeria using a structural system also noted such problems. He wrote: 'All observable communities cannot be fitted into this classification since a multiplicity of different habitats often occurs in a small area giving a mosaic community. Where a community can be typified by the occurrence of a dominant species the supporting flora may vary from place to place owing partly to variations in the age and condition of the dominant species, and perhaps partly to barriers to dissemination between the island hills'.

Many of these problems relate to the scale of sampling. Binns (1992, 1995) sampled only a small number of outcrops over a large area and did not see the consistency that is apparent in a more intensive investigation. Similarly, Hambler (1964) concentrating on a few outcrops within the same area was unable to see any consistency at the detailed scale of his survey. We have found that communities will be consistent in their overall shared taxa within each defined community regardless of the presence or absence of specific taxa in the uppermost stratum or visual differences in structure. Benson & Ashby (1996) also noted that the dominant species in the upper stratum of one patch may or may not be present in an adjacent patch (e.g. *Eucalyptus codonocarpa*) yet the similarity in overall floristics was high.

Representation in conservation reserves

Conservation often follows the ad hoc reservation of areas with the least potential for commercial land use (Pressey & Tully 1994). Granitic outcrop areas generally have a low potential for commercial land use. The more inaccessible granitic outcrop areas are the most highly represented in the reserve system while those more accessible are the least conserved. Element two occurs in six National Parks (Table 3), and all of the communities within this group are within at least one National Park. No communities of elements six and nine are in any form of reservation. Element seven has eight communities within it with five communities not reserved. Reservation priorities for granitic outcrop communities are suggested and the following priority list for the New England Batholith is presented:

Element not reserved:

Element 6: Communities 6a & 6b.

Element 9: Communities 9a & 9b.

Element under-represented in the reserve network:

Element 7: Communities 7b, 7c, 7d, 7e & 7h not reserved.

Element 2: Community 2b not reserved.

Element conserved well — all communities conserved, none within the National Park or Nature Reserve network:

Element 1: Communities 1a, 1b & 1c.

Element 4: Communities 4b & 4c.

Overall, granitic outcrop communities are generally less disturbed than other habitats. However, feral goats are a considerable problem in almost all the regions investigated particularly those in the western portion of the region.

Table 3: Summary of the current types of conservation reserves known to include the nine major vegetation elements. Private Reserve includes areas under conservation agreements with National Parks and Wildlife Service.

Element Number	Private Reserve	Designated State Forest Preserve	Nature Reserve	State Recreation Area	National Park
1	1	2	-	-	-
2	-	1	1	-	6
3	-	-	-	-	1
4	-	-	-	1	-
5	-	-	1	-	1
6	-	-	-	-	-
7	-	-	3	1	2
8	-	-	-	-	1
9	-	-	-	-	-

Conclusion

The communities found on granitic outcrops on the New England Batholith are diverse and widespread and are significant in terms of the high number of rare and restricted taxa. These communities are overlooked during most floristic surveys and in particular the areas to the west of the New England Tablelands. These communities in the past have been inadequately defined. The use of structure alone does not result in ecologically realistic community definitions and is misleading. The stochastic nature of the distribution of taxa common to a single community can change its structural appearance without affecting the overall floristic similarity. Granitic

outcrops retain remnants of native vegetation in modified rural landscapes. These communities are often not well represented within conservation reserves especially in the western parts of the tablelands. This situation needs to be addressed through appropriate regional conservation planning that ensures a comprehensive and representative reserve system.

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Appendix 1.

Published Nationally Rare or Threatened Australian Plants

A large number of nationally rare or threatened Australian plants (ROTAP) (Briggs & Leigh 1996) have been recorded in this survey growing on granitic outcrops.

Acacia adunca (Family Fabaceae) (3RC-) occurs mainly in the Girraween, Bald Rock and Boonoo Boonoo National Parks but also at Bolivia Hill north of Glen Innes. At Bolivia Hill the population is large and occurs mainly in the intervening zone between forest and outcrops. At Bald Rock and Girraween National Parks this species was seen to germinate in profusion after severe fires at altitudes under 1100 m on and around outcrops.

Acacia barringtonensis (Family Fabaceae) (3RCa) occurs mainly in the Barrington Tops area of southern portion of the New England Tablelands in New South Wales, this species is also known from the Backwater and Gibraltar Range areas. Small populations of this species were found in Gibraltar Range National Park.

Acacia betchei (Family Fabaceae) (2RC) occurs in the Torrington area of New South Wales. Populations of this species were found in the Torrington area where the species was abundant in forests and on outcrops especially in areas that had recently been burnt.

Acacia brunioides subsp. *brunioides* (Family Fabaceae) (3RC-) is known from the Gibraltar Range and Backwater (Crown Mountain) in north-eastern New South Wales. This taxon was found in isolated but extensive populations in Gibraltar Range National Park.

Acacia granitica (Family Fabaceae) (3RC-) occurs in the north-east of New South Wales and Southern Queensland. Populations of this species have previously been recorded from localities on the North Coast of New South Wales, but also at Torrington, Howell, Girraween National Park and Crown Mountain within the survey area. Populations of this species were found at Girraween National Park, Torrington, Howell, and the Flaggy Range near Bendemeer.

Acacia latisejala (Family Fabaceae) (3RC-) is known to occur in the Girraween and Bald Rock National Parks and at Torrington. This species was seen in great abundance

(Hunter 1995) in Bald Rock and Girraween National Parks and Torrington in areas recently burnt by fires.

Acacia macnutiana (Family Fabaceae) (2VC-) is known from Boonoo Boonoo Falls, Torrington and Pindari Dam (Bowley 1992) in northern New South Wales. Populations of this species were found at Torrington, Eagle Creek and Pindari Dam on the Severn River.

Acacia pycnostachya (Family Fabaceae) (2V) is known from disjunct localities in northern New South Wales, primarily from Bolivia Hill and Bluff Rock south of Tenterfield. Large populations were found at Bolivia Hill where it dominates many areas on the rock outcrops and margins.

Acacia williamsiana (Family Fabaceae) (2RCa) was found at Kings Plains and Kwiambal National Parks, Severn River Nature Reserve and Torrington. This species is restricted to rocky outcrops and is locally common where it is found.

Acacia torringtonensis (Family Fabaceae) (3RC) is known from Torrington and Kings Plains National Park. This species was found at Torrington, Kings Plains National Park, Severn River Nature Reserve, the Barbs at Pindari Dam and on private property in the Willows area.

Allocasuarina brachystachya (Family Casuarinaceae) (2RCa) is known from localities near Moredun Dam, Emmaville and Kings Plains National Park. This species was found in large numbers at Kings Plains National Park, Severn River Nature Reserve and private properties in the Willows area.

Allocasuarina rupicola (Family Casuarinaceae) (2RC-) is known from Girraween and Boonoo Boonoo National Parks in southern Queensland and northern New South Wales. This species was found at various localities within Girraween National Park.

Astrotricha roddii (Family Araliaceae) (3VCa) is known from Kings Plains National Park, Kwiambal National Park, Severn River Nature Reserve and the Barbs near Pindari Dam in New South Wales and Mount Bullgang in Queensland (Nadolny et al. 1997). Populations of this species were found at Kings Plains and Kwiambal National Park, Severn River Nature Reserve, the Barbs near Pindari Dam, Severn State Forest, and on private property near the Willows.

Bertya glandulosa (Family Euphorbiaceae) (2KC-) occurs in the granite belt in Queensland. This species was recorded from the margins of a granitic outcrop in Girraween National Park.

Boronia granitica (Family Rutaceae) (3VC-) is found in the granite belt of Queensland around Stanthorpe and at Torrington, Severn River Nature Reserve, the Barbs near Pindari Dam, Kings Plains National Park and Howell in New South Wales. Populations of this species were found at Torrington, Severn River Nature Reserve, the Barbs near Pindari Dam, Kings Plains National Park, Howell and also on private property at Parlour Mountains.

Boronia sp. J (*boliviensis* m.s.) (Family Rutaceae) (2E) (Quinn et al. 1995) is restricted to Bolivia Hill north of Glen Innes in the north-east of New South Wales. During this survey populations of this species were found on Bolivia Hill.

Brachyloma saxicola (Family Epacridaceae) (3RCa) is restricted to granitic outcrops in north-eastern New South Wales. This species was known from Torrington, Mount Jondol, Bolivia Hill, Gibraltar Range, Backwater and Mount Chaelundi. Populations were found at all of these localities with the addition of the Butterleaf area.

Callistemon flavovirens (Family Myrtaceae) (3RC-) is known from the granite belt in Queensland, Gibraltar Range State Forest (Binns 1992), Boonoo Boonoo National Park, Guy Fawkes National Park and Mann River Nature Reserve in New South Wales. The species was found in Girraween National Park.

Callistemon pungens (Family Myrtaceae) (3RC-) is known from Howell, Mount Balala, Guyra, Mann River Nature Reserve and New England National Park. Populations were found at Butterleaf, Howell, Kings Plains National Park, Parlour Mountains, Severn River and Ironbark Nature Reserves and the Willows area.

Callitris monticola (Family Cupressaceae) (3VC-) (Quinn et al. 1995) is known from south-eastern Queensland and north-eastern New South Wales. Populations of this species were found in Gibraltar Range, Boonoo Boonoo, Bald Rock and Girraween National Parks.

Cryptandra lanosiflora (Family Rhamnaceae) (3RCa) restricted to rocky exposed areas and is known from Girraween National Park in Queensland, Gibraltar Range National Park, New England National Park, Werrikimbe National Park, Black Mountain at Glen Elgin State Forest, Backwater, Bolivia Hill, the Liverpool Range and Parlour Mountains in New South Wales. This species was recorded at Backwater, Bolivia Hill, Butterleaf, Chaelundi and Gibraltar Range National Park.

Dodonaea hirsuta (Family Sapindaceae) (3RC-) is known from Copmanhurst, Bald Rock National Park, Boonoo Boonoo National Park and Torrington in New South Wales and in the Stanthorpe area of Queensland. Binns (1995) also records this species from Boorook State Forest. Populations of this species were found at Girraween National Park, Kings Plains National Park and Torrington.

Eriostemon myoporoides subsp. *epilosus* (Family Rutaceae) (3RCa) is restricted to exposed rocky outcrops. This species has been recorded from Girraween National Park in Queensland, Bald Rock National Park, Boonoo Boonoo National Park, Boorook State Forest (Binns 1995) and Bolivia Hill in New South Wales. During this survey populations were found in Bald Rock and Girraween National Parks, the Demon Nature Reserve, Bolivia Hill and Butterleaf areas.

Eucalyptus codonocarpa (Family Myrtaceae) (3RCa) is known from several disjunct localities in north-eastern New South Wales and southern Queensland. Populations were found in Cathedral Rock National Park, Backwater (including Warra State Forest and adjacent private properties), Gibraltar Range National Park, Butterleaf State Forest and Girraween National Park.

Eucalyptus mckieana (Family Myrtaceae) (2VC-) is known to occur in New South Wales between Inverell and Guyra in the Retreat, Tenterden and Gilgai areas. Populations of this species were found in Kings Plain National Park.

Eucalyptus scoparia (Family Myrtaceae) (2VCi) is restricted to the Girraween and Bald Rock National Parks. This species was recorded at Bald Rock and Girraween National Parks.

Eucalyptus youmanii (Family Myrtaceae) (2R) has been previously recorded for the Armidale and Guyra areas of the Northern Tablelands of New South Wales. This species was recorded from Flaggy Range, Howell, Moonbi, Parlour Mountains, Warrabah and Mount Yarrowyck.

Grevillea acerata (Family Proteaceae) (2RC-) is restricted to Gibraltar Range National Park and Glen Elgin in New South Wales. Populations of this species were found in Gibraltar Range National Park.

Hibbertia sp. B (Family Dilleniaceae) is a vulnerable taxon (2V) that has recorded from Torrington, Severn River and Kings Plain areas. This species was found at Torrington, Kings Plains National Park and Severn River Nature Reserve.

Hibbertia villosa (Family Dilleniaceae) (3KC-) occurs from Gibraltar Range to Werrimbbee National Park. This species was recorded from Gibraltar Range National Park and the Backwater area.

Homoranthus biflorus (Family Myrtaceae) (2VC-) is known from Kings Plains National Park and the Barbs at Pindari Dam. Populations of this species were found in Kings Plains National Park.

Homoranthus lunatus (Family Myrtaceae) (2VC-) is restricted to Boonoo Boonoo National Park. This species was recorded for Torrington State Recreation Area and Boonoo Boonoo National Park.

Homoranthus papillatus (Family Myrtaceae) (2RC) is restricted to Girraween National Park in Queensland. This species was found in Girraween National Park.

Homoranthus prolixus (Family Myrtaceae) (2V) is recorded for the Howell area of New South Wales. Populations of this species were found at Howell and on private properties in the Flaggy Range.

Kunzea bracteolata (Family Myrtaceae) (3RC-) is known from the Stanthorpe district in Queensland to Guy Fawkes River National Park in New South Wales. Several populations of this species were found at Bolivia Hill, Bald Rock, Boonoo Boonoo and Girraween, Chaelundi, Eagle Creek, Gibraltar Range and Torrington.

Leucopogon cicatricatus (Family Epacridaceae) (3RCa) has been recorded from Girraween National Park and Mt Barney National Park in Queensland, Cathedral Rock National Park, New England National Park, Rowleys Rock Flora Reserve and Dingo/Bulga State Forest in New South Wales. Populations of this species were found at Girraween and Cathedral Rock National Park and at Butterleaf State Forest.

Micromyrtus grandis (Family Myrtaceae) (2EC-) is restricted to a single ridge in the Severn River Nature Reserve and adjacent private property.

Mirbelia confertiflora (Family Fabaceae) (3RCa) has been recorded from Stanthorpe and Girraween National Park in Queensland, Boonoo Boonoo National Park, Gibraltar

Range National Park and Warra and Glen Elgin State Forests. This species was noted at Girraween National Park, Gibraltar Range National Park, Eagle Creek, Warra State Forest and adjacent private properties and the Parlour Mountains.

Muehlenbeckia costata (Family Polygonaceae) (3VCa) has been recorded from Girraween National Park in Queensland, the Blue Mountains, Mount Kaputar National Park, Bald Rock National Park, Butterleaf State Forest and Crown Mountain Flora Reserve in New South Wales. Populations of this species were found in Girraween and Bald Rock National Parks and Butterleaf and Warra State Forest all after the passage of fire.

Olearia gravis (Family Asteraceae) (3KC-) grows north from Torrington and Gibraltar Range to the granite belt in Queensland. This species was recorded from Gibraltar Range National Park, Torrington, Severn River and the proposed Kwiambal National Park.

Persoonia rufa (Family Proteaceae) (2RCa) is known primarily from Gibraltar Range National Park. Populations of this species were recorded for Gibraltar Range National Park and Forest Lands State Forest near Mount Jondol.

Persoonia terminalis subsp. *terminalis* (Family Proteaceae) (2R) is known from Torrington in New South Wales. Populations of this taxon were found at Torrington and Severn River Nature Reserve.

Persoonia terminalis subsp. *recurva* (Family Proteaceae) (3R) is known from north-west of Inverell. This taxon was found commonly within the Severn River Nature Reserve, and sometimes growing sympatrically with *Persoonia terminalis* subsp. *terminalis*.

Phebalium ambiens (Family Rutaceae) (3RC-) is known from outcrops from Guyra to Stanthorpe. This species was recorded from Girraween and Bald Rock National Parks, Warra State Forest and Torrington.

Phebalium rotundifolium (Family Rutaceae) (3RC-) is known from the Stanthorpe district of Queensland, Torrington, Ballandean, Strathbogie, Kings Plain and Howell in New South Wales. This species was recorded from Girraween National Park, Torrington, Severn River Nature Reserve, Kings Plain National Park and Howell.

Plectranthus suaveolens (Family Lamiaceae) (3RC-) is known from south-eastern Queensland and Gibraltar Range in New South Wales. This species was recorded from Girraween National Park.

Prostanthera sp. B (Family Lamiaceae) (2RC-) is known from Boonoo Boonoo, Bald Rock and Girraween National Parks and Boorook and Forest Lands State Forest. This species was recorded from Bald Rock and Girraween National Parks, and was noted to germinate readily after fire.

Prostanthera staurophylla (Family Lamiaceae) (2R) restricted to the Torrington area. This species was recorded from Torrington.

Pultenaea stuartiana (Family Fabaceae) (3VC-) is recorded from Torrington, Girraween National Park and from the Severn River area. This species was recorded from Torrington and Girraween National Park.

Thelionema grande (Family Phormiaceae) (3RC-) is known from Girraween, Mount Barney, Boonoo Boonoo, Bald Rock, Gibraltar Range and Werrikimbe National Parks, Boonoo State Forest, Torrington, Bolivia Hill and Howell. Populations of this species were found at Bald Rock and Girraween National Parks, Ironbark Nature Reserve, Howell, Bolivia Hill and on private property in the Backwater area.

Zieria odorifera (Family Rutaceae) (3RCi) is restricted mainly to the Nandewar and Warrumbungle Ranges. This species was recorded from Howell, Warrabah National Park and private properties in the Willows area.

Other Restricted Taxa

Acacia sp. aff. *torringtonensis* (Family Fabaceae) is a recently discovered species from Gibraltar Range whose ROTAP status is probably 2VCt (Rod Jones, Department of Botany, UNE, pers. comm.). This species is only known from three localities within close proximity in Gibraltar Range National Park. This species was found at one of the previously recorded localities.

Dodonaea stenophylla (Family Sapindaceae) occurs in the Northern Territory and Queensland, however it is considered as rare in New South Wales. Harden (1990–1993) lists this species as occurring in the Bingara district, however it is listed under those presumed extinct in New South Wales by the threatened species act 1995 (TSC Act). A single population of this species was found on land held under a permissive occupancy in the Howell area.

Eucalyptus sp. aff. *cypellocarpa* (*quinniorum* m.s. J.T. Hunter & J.J. Bruhl) (Family Myrtaceae) (J.T. Hunter 3723, V.H. Hunter & J. Vollmer) is a new taxon that warrants a ROTAP coding of 2RC-. This taxon was found at Warrabah National Park and surrounding private properties, Ironbark Nature Reserve, Flaggy Range, Mount Lookout and Moonbi.

Hibbertia linearis var. *grandiflora* (Family Dilleniaceae) warrants a ROTAP code of 2V- (Nano 1996). This species was found at Moore Creek Gap near Moonbi and Attunga State Forest.

Hibbertia sp. aff. *monogyna* (Family Dilleniaceae) is a restricted taxon that appears to only occur in the Backwater and Mount Yarrowyck areas of New South Wales and warrants a ROTAP code of 2V- (Nano 1996). Populations of this taxon were found at Backwater, Parlour Mountains and Mount Yarrowyck.

Homoranthus bornhardtensis m.s. (J.T.Hunter 5550) (Family Myrtaceae) is a new taxon from the Ironbark Nature Reserve and surrounding private properties that warrants a ROTAP code of 2VC-.

Homoranthus croftianus m.s. (J.T.Hunter 5167) (Family Myrtaceae) is a new taxon from Bolivia Hill that warrants a ROTAP code of 2V.

Monotaxis macrophylla (Family Euphorbiaceae) is a species listed as endangered in New South Wales (TSC Act). It has only been recorded a few times in New South Wales, from the Cobar district, Howell (Maiden 1906) and the south coast where it was found to germinate after wildfires. Large populations of this species were found in

Warra State Forest after the passage of a wildfire. All traces of this species had gone after one year.

Pseudanthus pimeleoides (Family Euphorbiaceae) is recorded from Tasmania and Victoria. Although this species was recorded for New South Wales and Queensland these reports were unsubstantiated with the putative New South Wales record from the south coast (James, T. 1995, pers. comm.). It was thought to be extinct in New South Wales (TSC Act). During the survey, this species was found in the Torrington area.

Appendix 2.

List of vascular plant species recorded from granitic outcrops of the New England Batholith.

Note that authorities are given only for species that are not in the Flora of NSW (Harden 1990–1993).

Family	Taxon	Community
Acanthaceae	<i>Rostellularia adscendens</i>	8a
Amaranthaceae	<i>Alternanthera denticulata</i>	8a
Anthericaceae	<i>Arthropodium milleflorum.</i>	1a, 1c, 4a, 4b, 6a, 6b, 7a, 7c, 7d, 7f, 7g, 7h, 8a, 9a, 9b
	<i>Arthropodium minus</i>	7c
	<i>Caesia calliantha</i>	9a
	<i>Dichopogon fimbriatus.</i>	7a, 7c, 7g, 9a, 9b
	<i>Laxmannia compacta.</i>	1b, 1c, 2b, 2d, 2e, 2f, 3a, 4a, 4b, 5a, 5b, 7a, 7c, 7d, 7e, 7f, 7g, 7h, 9a
	<i>Laxmannia gracilis</i>	1c, 2e, 3a, 9a
	<i>Thysanotus tuberosus</i> subsp. <i>tuberosus</i>	2d
	<i>Tricoryne elatior</i>	1c, 5a, 7c, 8a
Apiaceae	<i>Actinotus gibbonsii</i>	1a, 1b, 2a, 2d, 2e, 7a, 7e, 7g, 9a, 9b
	<i>Actinotus helianthi.</i>	2d, 2f, 4b, 5b, 7a, 7c, 7e, 8a, 9a, 9b
	<i>Hydrocotyle geraniifolia</i>	2d
	<i>Hydrocotyle peduncularis</i>	2d, 6a, 7a, 7c, 7e, 7f, 7g, 8a, 9a
	<i>Hydrocotyle tripartita</i>	7a
	<i>Platysace ericoides</i>	2a, 2d, 2e, 2f, 3a, 4a, 5a, 5b
	<i>Platysace lanceolata</i>	1a, 1b, 1c, 2a, 2b, 2c
	<i>Trachymene incisa</i>	1a, 1b, 1c, 2a, 2b, 2c, 2d, 2e, 2f, 3a, 4a, 4b, 4c, 5a, 5b, 6b, 7a, 7b, 7e, 7f, 7g, 7h, 8a, 9a, 9b
	<i>Trachymene</i> sp. aff. <i>pilosa</i>	1a, 1b, 1c, 2a, 2c, 4a
	<i>Xanthosia pilosa</i>	2e
Araliaceae	<i>Astrotricha longifolia</i>	1b, 2a, 2b
	<i>Astrotricha roddii</i>	5a, 5b, 7d, 8a
	<i>Polyscias sumbucofolius</i>	1a, 1b, 2a, 2c

Family	Taxon	Community
Asclepiadaceae	* <i>Gomphocarpus fruticosus</i>	7g
	<i>Marsdenia rostrata</i>	2d
Asphodelaceae	<i>Bulbine semibarbata</i>	6b, 7a
	<i>Asplenium flavellifolium</i>	1a, 1b, 1c, 2a, 2b, 2d, 2f, 4c, 5a, 7f, 7g, 7h
Aspleniaceae	<i>Pleurosorus subglandulosus</i>	6b, 7a, 7d, 7f, 7g, 8a, 9a
	<i>Actinobole uliginosum</i>	7g
Asteraceae	* <i>Bidens pilosa</i>	6a, 6b, 8a, 9b
	* <i>Bidens subalternans</i>	6a, 7g
	<i>Brachyscome microcarpa</i>	1a
	<i>Brachyscome multifida</i>	7g
	<i>Brachyscome stuartii</i>	1a, 1b, 1c, 2a, 2b, 2c, 2d, 2e, 2f, 3a, 4a, 4b, 5a, 5b, 6b, 7a, 7c, 7e, 7f, 7g, 8a, 9a, 9b
	<i>Calotis cuneifolia</i>	8a, 9a, 9b
	<i>Calotis hispidula</i>	6a, 7c, 7g
	<i>Calotis lappulaceae</i>	8a
	* <i>Carduus tenuiflorus</i>	6a, 6b
	<i>Cassinia aculeata</i>	1a, 6b
<i>Cassinia laevis</i>	2d, 7a	
<i>Cassinia quinquefaria</i>	1b, 2b, 6a, 7c, 7d, 7g, 9a, 9b	
<i>Cassinia uncata</i>	2f, 4b, 7a, 7c, 7e, 7f, 7g, 7h, 9a	
<i>Chrysocephalum apiculatum</i>	2d, 2e, 4b, 6a, 6b, 7d, 7g, 7h	
<i>Chrysocephalum semipapposum</i>	2d, 7e, 7f, 7g	
* <i>Conyza albida</i>	6b, 7g, 9b	
* <i>Conyza bonariensis</i>	1a, 7a	
<i>Cotula australis</i>	2d, 2e, 2f, 4b, 7g, 9b	
<i>Cymbonotus lawsonianus</i>	9b	
* <i>Dimorphotheca pluvialis</i>	7g	
<i>Euchiton involucratus</i> (G. Forst.) Holub	6b	
<i>Euchiton sphaericus</i> (Willd.) Holub	2f, 7a, 7f, 7g	
* <i>Gnaphalium americanum</i>	1a, 1c, 3a, 4b, 6a, 7e, 7g, 9a	
<i>Helichrysum boormanii</i>	2d, 2f	
<i>Helichrysum elatum</i>	2a	
* <i>Hypochoeris glabra</i>	1b, 2a, 2d, 4a, 6b	

Family	Taxon	Community	
Asteraceae cont.	<i>*Hypochoeris radicata</i>	1a, 1b, 1c, 2c, 2d, 2e, 2f, 3a, 4a, 4b, 4c, 5a, 6b, 7a, 7b, 7c, 7d, 7f, 7g, 7h, 8a, 9a, 9b	
	<i>Lagenifera gracilis</i>	2a	
	<i>Lagenifera stipitata</i>	7e, 7g	
	<i>Olearia elliptica</i>	2e, 6b, 7c, 7d, 7e, 7g, 9b	
	<i>Olearia gravis</i>	7d, 8a	
	<i>Olearia microphylla</i>	7a	
	<i>Olearia oppositifolia</i>	1a, 2b, 2d	
	<i>Olearia ramosissima</i>	4b, 8a	
	<i>Olearia viscidula</i>	7f, 7g, 7h	
	<i>Ozothamnus diosmifolius</i>	2d, 3a, 7g	
	<i>Ozothamnus obcordatus</i>	4b, 5a, 5b, 7c, 7d, 7e, 7f, 7g, 7h, 9a	
	<i>Podolepis neglecta</i>	7c	
	<i>Senecio daltonii</i>	5a, 7d	
	<i>Senecio diaschides</i>	7a	
	<i>Senecio hispidulus</i>	6a, 6b	
	<i>Senecio lautus</i>	6a, 7f	
	<i>Senecio</i> sp. E	1a, 2d	
	<i>Sigesbeckia australis</i>	6b, 9b	
	<i>*Silybum marianum</i>	7h	
	<i>Solenogyne bellioides</i>	1a, 1c, 2c, 2d, 2f, 3a, 4a, 6b, 7e, 7f, 7g, 7h, 9a	
	<i>Solenogyne dominii</i>	1c	
	<i>*Sonchus asper</i>	2e, 2f	
	<i>*Sonchus oleraceus</i>	2d, 7d, 7g, 8a	
	<i>*Taraxacum afficinale</i>	3a	
	<i>Vittadinia cuneata</i>	5a, 7a, 7g	
	<i>Vittadinia dissecta</i>	1c, 6a, 6b	
	<i>Vittadinia muelleri</i>	8a	
	<i>Vittadinia sulcata</i>	5a, 6a, 6b, 7f, 7g, 8a, 9b	
	<i>Pandorea pandorana</i>	7a, 7g, 8a	
	<i>Blechnum cartilagineum</i>	2a, 9a	
	<i>Doodia aspera</i>	2a	
	Bignoniaceae		
	Blechnaceae		

Family	Taxon	Community
Boraginaceae	<i>Cynoglossum australe</i>	6b
Brassicaceae	<i>Lepidium pseudohyssopifolium</i>	9b
	<i>Rorippa laciniata</i>	7g
Cactaceae	* <i>Opuntia aurantiaca</i>	6a, 6b, 8a, 9a, 9b
	* <i>Opuntia stricta</i>	6a, 6b, 7d, 7g, 7h, 8a, 9a, 9b
Campanulaceae	<i>Wahlenbergia communis</i>	4b, 6a, 6b, 7a, 7g, 9a, 9b
	<i>Wahlenbergia gracilis</i>	1a, 2c, 6b
	<i>Wahlenbergia graniticola</i>	4b, 5a, 5b, 7a, 7b, 7d, 7f, 7g, 8a
	<i>Wahlenbergia luteola</i>	1a, 1c, 2d, 5a, 7a, 7f, 7g
Caryophyllaceae	* <i>Paronychia brasiliiana</i>	5a
	* <i>Petrophagia nanteuilii</i>	6b, 7g, 9b
	<i>Scleranthus biflorus</i>	7h
	* <i>Stellaria media</i>	2d, 7a, 7b, 7d, 7g, 7h
Casuarinaceae	<i>Allocasuarina brachystachya</i>	5a, 5b
	<i>Allocasuarina gymnanthera</i>	5a
	<i>Allocasuarina inophloia</i>	5a, 5b, 7d
	<i>Allocasuarina littoralis</i>	1b, 2a, 2b, 2d, 2e, 2f, 4a
	<i>Allocasuarina rigida</i> subsp. <i>rigida</i>	1a, 1b, 1c, 2a, 2c, 3a, 4a
	<i>Allocasuarina rupicola</i>	2d
	<i>Allocasuarina torulosa</i>	2a
	<i>Casuarina cunninghamiana</i>	7g, 8a
Celastraceae	<i>Maytenus silvestris</i>	2a
Centrolepidaceae	<i>Centrolepis strigosa</i>	7e, 7f, 9a
Chenopodiaceae	<i>Chenopodium carinatum</i>	6a
	<i>Chenopodium pumilio</i>	1a, 1c, 2d, 6a, 7d, 7e, 8a, 9b
	<i>Einadia hastata</i>	6b, 7b, 7d, 7e, 7g, 7h, 9b
	<i>Einadia nutans</i>	6b
	<i>Einadia trigonos</i>	f5b
Chloanthaceae	<i>Chloanthus parviflora</i>	1b, 2a, 2b, 2d
Clusiaceae	<i>Hypericum gramineum</i>	2d, 3a, 4a, 4b, 5a, 6b, 7a, 7f, 7g, 9a
Colchicaceae	<i>Wurmbea biglandulosa</i>	4b, 7a, 7g
Commelinaceae	<i>Commelina cyanea</i>	2d, 4a, 5a, 6b, 7a, 7c, 7d, 7f, 7g, 8a, 9a, 9b
	<i>Murdannia graminea</i>	2c, 5a, 6b, 7a, 7g, 9b

Family	Taxon	Community
Convolvulaceae	<i>Dichondra repens</i>	2e, 7a, 7f
	<i>Dichondra</i> sp. A	1c, 6a, 6b, 7g, 9b
	<i>Evulvulus alsinoides</i>	6a, 6b, 7g, 8a
	* <i>Ipomoea cairica</i>	6a
	<i>Crassula sieberiana</i>	1a, 1c, 2d, 2e, 2f, 4b, 6a, 6b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 8a, 9a, 9b
	* <i>Citrullus lanatus</i>	9b
	<i>Callitris endlicheri</i>	2d, 2f, 4a, 4b, 4c, 5a, 5b, 6a, 7a, 7c, 7d, 7f, 7g, 7h, 8a, 9a, 9b
	<i>Callitris glaucophylla</i>	6b, 7g, 8a
	<i>Callitris monticola</i>	2a, 2d, 2e, 2f, 3a
	<i>Callitris rhomboidea</i>	2d
Cyatheaaceae	<i>Cyathea australis</i>	1c, 2c, 9a
	<i>Bulbostylis barbata</i>	8a
Cyperaceae	<i>Bulbostylis densa</i>	1a, 1b, 1c, 2b, 2d, 2e, 2f, 3a, 4a, 4b, 7a, 7e, 7g, 8a
	<i>Bulbostylis pyriformis</i>	9a, 9b
	<i>Carex appressa</i>	7g
	<i>Carex gaudichaudiana</i>	2c
	<i>Cautis flexuosa</i>	2a, 3a, 7e, 3a, 4b
	<i>Cyperus fulvus</i>	4b, 5a, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 8a, 9a
	<i>Cyperus gracilis</i>	6a, 6b, 7g, 9b
	<i>Eleocharis sphacelata</i>	2e
	<i>Fimbristylis dichotoma</i>	1a, 1b, 1c, 2d, 2f, 3a, 4a, 4b, 5a, 5b, 6a, 6b, 7a, 7c, 7d, 7e, 7f, 7g, 7h, 8a, 9a, 9b
	<i>Gahnia aspera</i>	8a, 9a, 9b
	<i>Gahnia sieberiana</i>	1a, 2d, 2f, 4a, 4b, 4c, 7a, 7b, 7c, 7d, 7f, 7g, 9a, 9b
	<i>Gymnoschoenus sphaerocephalus</i>	1a, 1b, 1c, 2a, 2b, 2c, 2d, 2e, 2f, 3a, 4a, 4b, 7a
	<i>Isolepis hookeriana</i>	1a, 1b, 1c, 2a, 2c, 2d, 2e, 2f, 3a, 4a, 4b, 4c, 5a, 5b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 9a, 9b
	<i>Lepidosperma gunnii</i>	1c
	<i>Lepidosperma laterale</i>	7f
	<i>Lepidosperma neesii</i>	1a, 1b, 1c, 2a, 2b, 2e, 2f, 3a, 4a, 4b, 7a
	<i>Lepidosperma tortuosum</i>	1a, 1b, 1c, 2a, 2c, 2d, 2e, 2f, 3a, 4a, 4b, 4c, 5a, 5b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 9a, 9b
<i>Schoenus apogon</i>	2a, 3a 2b	
	1a, 1b, 1c, 2a, 2b, 2d, 2e, 2f, 3a, 4a, 4b, 5a, 5b, 7d, 7g, 7h	

Family	Taxon	Community
Cyperaceae cont.	<i>Schoenus brevifolius</i>	2d
	<i>Schoenus melanostachyus</i>	1b, 2a, 2d, 2e, 3a
Davalliaceae	<i>Schoenus turbinatus</i>	3a
	<i>Scirpus polystachyus</i>	1a, 1b
	<i>Scleria mackavienensis</i>	4b, 6a, 8a
	<i>Davallia pyxidata</i>	1a, 1c, 2a, 2d, 2f, 4a, 4b, 4c, 7a
	<i>Calochaena dubia</i>	1a, 2a, 3a
	<i>Pteridium esculentum</i>	1a, 1b, 1c, 2a, 2c, 2d, 2f, 3a, 4b, 7g, 7h
	<i>Hibbertia acicularis</i>	1a, 1b, 1c, 4c, 5a
	<i>Hibbertia aspera</i>	2d, f1c, f1d, f3a
	<i>Hibbertia cistoides</i>	2d
	<i>Hibbertia kaputarensis</i>	7c
	<i>Hibbertia linearis</i>	2d, 7c, 7f, 9a
	<i>Hibbertia monogyna</i>	1a, 7e
Dilleniaceae	<i>Hibbertia obtusifolia</i>	2a, 2d, 4c, 5a, 7d, 7f, 7g, 8a
	<i>Hibbertia riparia</i>	1b, 2a, 2e, 4a, 4b, 5a, 5b, 7d, 7e, 9a
	<i>Hibbertia scandens</i>	2a
	<i>Hibbertia serpyllifolia</i>	1a, 1b, 1c, 2a, 3a, 4b
	<i>Hibbertia sp. 'grandiflora' m.s.</i>	6a, 6b
	<i>Hibbertia sp. B</i>	4b, 4c, 5a, 5b, 7d
	<i>Hibbertia villosa</i>	1c, 3a
	<i>Drosera auriculata</i>	2d
	<i>Drosera peltata</i>	1b, 1c, 2b, 3a, 4b, 5a, 5b, 7a, 7b, 7f, 7g, 8a, 9a
	<i>Drosera spatulata</i>	2e, 3a
	<i>Elaeocarpus holopetalus</i>	2a, 2c, 2d, 2f
	Elaeocarpaceae	<i>Elaeocarpus reticulatus</i>
<i>Acrotiche aggregata</i>		2a, 2b, 2d, 2e, 2f
<i>Brachyloma daphnoides</i> subsp. <i>glabrum</i> (Blakely) J.T. Hunter		1a, 1c, 2d, 2f, 4b, 5a, 5b, 7a, 7b, 7c, 7d, 7e, 7f, 7g
<i>Brachyloma saxicola</i> J.T. Hunter		1a, 1b, 1c, 2a, 2b, 3a, 4a, 4b, 4c, 7a
<i>Epacris longiflora</i>		2a, 3a
<i>Epacris microphylla</i> var. <i>microphylla</i>		1b, 1c, 2c, 3a
<i>Epacris obtusifolia</i>		3a

Family	Taxon	Community
Epacridaceae cont.	<i>Leucopogon attenuatus</i>	5a, 5b, 8a
	<i>Leucopogon biflorus</i>	4b, 4c, 7e
	<i>Leucopogon cicatricatus</i> J.M. Powell	1b, 2a, 2c, 2f
	<i>Leucopogon lanceolatus</i> var. <i>lanceolatus</i>	1a, 1b, 1c, 2a, 2b, 2c, 2d, 2f, 3a
	<i>Leucopogon melaleucoides</i>	2a, 2d, 2e, 2f, 3a, 4a, 4b, 4c, 5a, 5b, 7c, 7d, 7e, 7g, 9a, 9b
	<i>Leucopogon microphyllus</i>	1a, 1b, 1c, 3a, 4a, 4b, 5a
	<i>Leucopogon muticus</i>	4a, 4b, 5a, 5b, 7a, 7c, 7d, 7e, 7f, 7g, 9a
	<i>Leucopogon neo-anglicus</i>	1a, 1b, 1c, 2a, 2b, 2c, 2d, 2e, 2f, 3a, 4a, 4b, 4c, 5a, 5b, 7a, 7e, 7f, 9a, 9b
	<i>Lissanthe strigosa</i>	5a, 5b, 7f
	<i>Melichrus erubescens</i>	4b
	<i>Melichrus procumbens</i>	2e, 3a
	<i>Melichrus urceolatus</i>	2d, 4a, 4b, 5a, 5b, 6a, 7a, 7c, 7d, 7e, 7f, 7g, 7h, 8a
	<i>Monotoca scoparia</i>	1a, 1c, 2a, 2b, 2c, 2d, 2e, 2f, 3a, 4b, 5a, 7a, 7e
	<i>Styphelia triflora</i>	2a, 4b, 4c, 5a, 5b, 8a
	<i>Styphelia viridis</i>	2d, 2f
	<i>Trochocarpa laurina</i>	2a
	<i>Trochocarpa</i> sp. A	2c
	<i>Quintinia sieberi</i>	2f
	<i>Amperea xiphoclada</i> var. <i>xiphoclada</i>	2a, 2d, 2e, 2f
	<i>Bertya cunninghamii</i>	2a, 6b
	<i>Bertya gummifera</i>	5a, 5b
	<i>Bertya oleifolia</i>	8a
	<i>Beyeria viscosa</i>	7d, 7g, 8a
	<i>Chamaesyce drummondii</i>	7g, 8a
	<i>Euphorbia eremophila</i>	6a
	<i>Micranthemum ericoides</i>	4b
	<i>Micranthemum hexandrum</i>	2d, 7a
<i>Monotaxis macrophylla</i>	1a, 1b	
<i>Phyllanthus carpentariae</i> Muell. Arg.	8a	
<i>Phyllanthus hirtellus</i>	2e, 3a	
<i>Phyllanthus occidentalis</i> J.T. Hunter & J.J. Bruhl	4b, 5b, 7d	
<i>Phyllanthus subcrenulatus</i>	7g	
Escalloniaceae		
Euphorbiaceae		

Family	Taxon	Community
Euphorbiaceae cont.	<i>Phyllanthus virgatus</i>	1a, 6a, 7d, 8a
	<i>Poranthera corymbosa</i>	4b
Fabaceae	<i>Poranthera microphylla</i>	1a, 2d
	<i>Pseudanthus divaricatissimus</i>	1c
	<i>Pseudanthus ovalifolius</i>	4b
	<i>Pseudanthus pimeleoides</i>	3a
	<i>Acacia adunca</i>	2d, 2f, 4a, 7a
	<i>Acacia barringtonensis</i>	3a
	<i>Acacia betchei</i>	4b
	<i>Acacia brownei</i>	2d
	<i>Acacia brunioides</i>	3a
	<i>Acacia buxifolia</i>	5a, 5b, 7a
	<i>Acacia cheelii</i>	7f, 7g
	<i>Acacia eborensis</i> m.s.	7e
	<i>Acacia falcata</i>	7c
	<i>Acacia falciformis</i>	1a, 1c, 2a, 2b, 2c, 2d, 2e, 3a, 4b, 4c, 5a, 7g, 9a
	<i>Acacia fimbriata</i>	7a
	<i>Acacia floydii</i>	2a, 2d
	<i>Acacia granitica</i>	4b, 7e, 7g, 9a
	<i>Acacia gunnii</i>	5a
	<i>Acacia juncifolia</i>	7a
	<i>Acacia latisepala</i>	2d, 2e, 2f, 4b
	<i>Acacia leiocalyx</i>	7g, 8a
	<i>Acacia longifolia</i>	1b, 2a
	<i>Acacia macnutiana</i>	2d, 4b, 7a, 7d
	<i>Acacia neriifolia</i>	4b, 5a, 6a, 6b, 7a, 7c, 7d, 7f, 7g, 7h, 9a, 9b
	<i>Acacia obtusifolia</i>	1b, 2a, 2b, 3a, 4a
	<i>Acacia penninervis</i>	5b, 7f, 7g
	<i>Acacia polybotrya</i>	5b
	<i>Acacia pruinosa</i>	5a, 5b, 7a, 7c, 7g
<i>Acacia pycnostachya</i>	4a, 7a	
<i>Acacia rubida</i>	7a	

Family	Taxon	Community
Fabaceae cont.	<i>Acacia</i> sp. aff. <i>torringtonensis</i>	3a
	<i>Acacia stricta</i>	7e
	<i>Acacia suaveolens</i>	2a, 3a
	<i>Acacia torringtonensis</i>	4b, 5a, 5b
	<i>Acacia triptera</i>	7c, 7e, 7f, 9a, 9b
	<i>Acacia ulicifolia</i>	1a, 1b, 1c, 2b, 2d, 2e, 3a, 4b, 5a, 5b, 7g, 7h
	<i>Acacia venulosa</i>	1a, 1b, 1c, 2c, 2d, 2e, 2f, 3a, 4a, 4b, 5a, 5b, 7a, 7e
	<i>Acacia viscidula</i>	1a, 1b, 1c, 2b, 2d, 2e, 2f, 4a, 4b, 6b, 7a, 7b, 7e, 7f, 7g, 9a
	<i>Acacia williamsiana</i> J.T. Hunter	5a, 5b, 8a
	<i>Aotus subglauca</i>	1a, 1b, 2d, 4b, 5a, 5b, 7e
	<i>Bossiaea neo-anglica</i>	1a, 2a, 3a
	<i>Bossiaea obcordata</i>	4c
	<i>Bossiaea rhombifolia</i>	1a, 1c, 2d, 4b
	<i>Bossiaea scortechinii</i>	1a, 2a, 4b
	<i>Daviesia latifolia</i>	f1c, f2a, f4b
	<i>Daviesia ulicifolia</i> subsp. <i>pilligensis</i> G. Chandler & Crisp	4b, 5b
	<i>Desmodium brachypodium</i>	6a, 6b
	<i>Desmodium varians</i>	2d, 7g
	<i>Dillwynia phyllicoides</i>	1a, 1b, 1c, 2c, 2e, 3a, 4a, 7c, 7g
	<i>Dillwynia retorta</i>	7e
	<i>Dillwynia sieberi</i>	2a, 3a, 5a, 7g
	<i>Glycine clandestina</i>	2d, 6a, 6b, 7a, 7f, 7g, 9b
	<i>Glycine microphylla</i>	2d
	<i>Glycine tabacina</i>	7g
	<i>Gompholobium huegelii</i>	4b
	<i>Hardenbergia violacea</i>	2a, 2b, 2d, 2f, 4a, 4b, 7a, 7g, 7h
	<i>Hovea lanceolata</i>	3a, 4b, 5a, 5b, 6b, 7a, 7c, 7d, 7g, 8a, 9a
	<i>Hovea purpurea</i>	2d, 2e
	<i>Hovea</i> sp. A	1a, 1b, 1c, 2a, 2d, 2f, 3a, 4a, 4b, 7b, 7e, 7f, 7g
	<i>Indigofera australis</i>	4b
	<i>Jacksonia scoparia</i>	2d, 7a, 8a
	<i>Mirbella confertiflora</i>	1a, 1b, 1c, 2e, 3a, 4a, 7a, 7e

Family	Taxon	Community
Fabaceae cont.	<i>Mirbella pungens</i>	2d, 3a, 4b, 7c, 7f, 7g, 8a
	<i>Mirbella rubifolia</i>	3a, 4b, 7a
	<i>Mirbella speciosa</i> subsp. <i>speciosa</i>	1b, 2b, 2d, 2e, 2f, 3a, 4b, 5a, 5b
	<i>Phyllota phyllicoides</i>	2a, 3a
	<i>Podolobium arborescens</i> (R.Br.) Crisp	2f
	<i>Podolobium ellipticum</i> (Vent.) Crisp	7g
	<i>Podolobium ilicifolium</i> (Andrews) Crisp	2a, 2d
	<i>Pultenaea foliolosa</i>	5a, 5b
	<i>Pultenaea retusa</i>	3a
	<i>Pultenaea</i> sp. B	3a
	<i>Pultenaea</i> sp. C	5a, 7c, 7g
	<i>Pultenaea</i> sp. aff. <i>obovata</i>	2a
	<i>Pultenaea stuartiana</i>	2e, 4b
	<i>Senna artemisioides</i>	7d
	<i>Swainsona galegifolia</i>	6a
	* <i>Trifolium repens</i>	6a, 6b, 7g, 7h, 9b
	* <i>Geranium molle</i>	6b
	<i>Geranium solanderi</i> var. <i>grande</i>	6a
	<i>Geranium solanderi</i> var. <i>solanderi</i>	2d, 6a, 7g
	<i>Pelargonium australe</i>	2d, 2e, 7g
	<i>Gleichenia dicarpa</i>	1c
	<i>Dampiera lanceolata</i>	5a, 5b
	<i>Dampiera stricta</i>	1a, 2a, 3a
	<i>Goodenia bellidifolia</i> subsp. <i>argentea</i>	1a, 1b, 2b, 2d, 2e, 3a, 4b, 5a, 5b, 6a, 7a, 7c, 7g, 9a
	<i>Goodenia hederacea</i>	1a, 1c, 2d, 2e, 3a, 4a, 4b, 5b, 7a, 7d, 7e, 7g, 8a
	<i>Velleia paradoxa</i>	1a, 2a
	<i>Haemodorum planifolium</i>	3a
<i>Gonocarpus elatus</i>	8a	
<i>Gonocarpus micranthus</i> subsp. <i>micranthus</i>	1a, 1b, 1c, 2b, 2d, 2e, 2f, 3a, 4a, 4b, 7c, 7e, 7f, 9a	
<i>Gonocarpus oreophilus</i>	1b, 2a, 2d, 2e, 2f, 3a, 4a	
<i>Gonocarpus tetragynus</i>	1c, 2a, 2b, 2d, 4b, 5a, 6b, 7a, 7e, 7f, 7g, 8a, 9a	
<i>Gonocarpus teucroides</i>	1a, 1b, 1c, 2a, 2b, 2d, 2e, 2f, 3a, 4a, 4b, 5a, 5b, 6b, 7a, 7b, 7c, 7e, 7g, 7h, 9a, 9b	
Geraniaceae		
Gleicheniaceae		
Goodeniaceae		
Haemodoraceae		
Haloragaceae		

Family	Taxon	Community
Haloragaceae cont.	<i>Haloragis aspera</i>	7a, 7g
	<i>Hyopxis exilis</i>	7a
Hypoxidaceae	<i>Paterosnia glabrata</i>	1b, 1c, 2a, 2e, 3a, 4b
	<i>Paterosnia sericea</i>	1a, 1b, 1c, 2a, 2b, 2d, 2e, 3a, 4a, 4b, 4c, 5a, 7a, 7e, 9b
Juncaceae	<i>Juncus bufonius</i>	2d, 2e, 8a, f4a
	<i>Juncus continuus</i>	2d, 2e, 4a, 4b, 7g
	<i>Juncus firmus</i>	1b
	<i>Juncus laeviusculus</i>	7a
	<i>Juncus remotiflorus</i>	1c, 2a, 4b, 4c, 7g, 8a, 9a
Lamiaceae	<i>Juncus subsecundus</i>	4b
	<i>Luzula flaccida</i>	1a, 1c, 3a, 7e
	<i>Ajuga australis</i>	1a, 2d, 7f, 7g
	<i>*Marrubium vulgare</i>	7g
	<i>Mentha diemenica</i>	7e
	<i>Plectranthus graveolens</i>	1c, 2d, 4a, 7a
	<i>Plectranthus parviflorus</i>	2d, 4a, 5a, 7a, 7g, 8a, 9a, 9b
	<i>Plectranthus suaveolens</i>	2d, 2e, 2f
	<i>Prostanthera howelliae</i>	7f
	<i>Prostanthera nivea</i>	2b, 4a, 4b, 5a, 5b, 6b, 7a, 7b, 7c, 7e, 7f, 7g, 9a, 9b
Lauraceae	<i>Prostanthera saxicola</i>	2d, 2e, 2f, 3a, 4a, 4b, 5a, 5b, 8a
	<i>Prostanthera scutellarioides</i>	1a, 1c, 2c, 3a
	<i>Prostanthera sp. B</i>	2d, 2f
	<i>Prostanthera staurophylla</i>	4b
	<i>Prunella vulgaris</i>	2d
	<i>Scutellaria humilis</i>	6b
	<i>Westringia eremicola</i>	9a
	<i>Cassytha filiformis</i>	2a, 2c, 3a, 4a, 4b
	<i>Cassytha globella</i>	3a, 5a, 7a
	<i>Cassytha pubescens</i>	2e, 4b, 5a, 5b, 7e, 7g
	<i>Lindsaea linearis</i>	1b, 1c, 3a
	<i>Isotoma anethifolia</i>	1b, 2d, 2e, 2f, 4a, 5b, 7a, 7c, 7f, 9a, 9b
<i>Isotoma axillaris</i>	1c, 4b, 4c, 5a, 5b, 6a, 6b, 7a, 7b, 7c, 7d, 7e, 7g, 7h, 9a, 9b	

Family	Taxon	Community
Lobeliaceae cont.	<i>Lobelia gibbosa</i>	2d, 2f, 7a
	<i>Lobelia gracilis</i>	2b, 4a, 4b, 4c, 5a, 7a, 7b, 7c, 7e, 7f, 7g, 7h, 8a, 9a, 9b
	<i>Pratia purpurascens</i>	2d, 2e, 7a
Loganiaceae	<i>Logania albiflora</i>	4b
Lomandraceae	<i>Lomandra confertifolia</i>	2d
	<i>Lomandra cylindrica</i>	7e
	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	1a, 2e, 3a, 4b, 5a, 5b, 7a, 7c, 7e, 7g, 8a, 9a
	<i>Lomandra longifolia</i>	1a, 1b, 1c, 2a, 2b, 2c, 2d, 2e, 2f, 3a, 4a, 4b, 4c, 5a, 6b, 7a, 7c, 7e, 7f, 7g, 7h, 8a
Loranthaceae	<i>Lomandra multiflora</i>	4b, 5a, 5b, 7a, 7c, 7d, 7f, 7g, 8a, 9b
	<i>Amyema cambagei</i>	2d, 4b, 7g
	<i>Amyema miquelii</i>	4b, 4c, 5b, 7f, 7g
	<i>Amyema pendulum</i>	2b, 2d, 4b, 4c, 7a, 7c, 7g, 7h, 9a
	<i>Muellerina celastroides</i>	9a
	<i>Muellerina eucalyptoides</i>	4a, 7d, 8a
Luzuriagaceae	<i>Eustrephus latifolius</i>	1a, 2d, 6b
Lycopodiaceae	<i>Lycopodium laterale</i>	2e
Moraceae	<i>Ficus rubiginosa</i>	4a, 4c, 6b, 7a, 7g, 8a, 9a
Myoporaceae	<i>Myoporum montanum</i>	6b
Myrtaceae	<i>Angophora floribunda</i>	7f, 7g, 8a, 9a
	<i>Babingtonia densifolia</i> (Sm.) F. Muell.	4b, 5a, 5b, 7e, 7g, 9a, 9b
	<i>Babingtonia odontocalyx</i> A.R. Bean	4b, 4c
	<i>Baeckea omissa</i> A.R. Bean	3a, 7e
	<i>Callistemon citrinus</i>	4b, 8a
	<i>Callistemon comboynensis</i>	3a
	<i>Callistemon flavovirens</i>	2d
	<i>Callistemon pallidus</i>	1a, 1c, 2d, 2e, 2f, 3a
	<i>Callistemon pungens</i>	1b, 7a, 7c, 7f
	<i>Calytrix tetragona</i>	1a, 1b, 1c, 2f, 3a, 4a, 4b, 5a, 5b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 9a
	<i>Corymbia dolichocarpa</i> (D.J. Carr & S.G.M. Carr) K.D. Hill & L.A.S. Johnson	8a
	<i>Eucalyptus acaciiformis</i>	1a, 1b, 3a

Family	Taxon	Community
Myrtaceae cont.	<i>Eucalyptus albens</i>	7a, 7g
	<i>Eucalyptus andrewsii</i>	1b, 2a, 2b, 2d, 4b, 4c, 7a, 7c, 7e
	<i>Eucalyptus banksii</i>	2d, 2e, 2f
	<i>Eucalyptus bridgesiana</i>	2a, 4a
	<i>Eucalyptus brunnea</i>	2b
	<i>Eucalyptus caleyi</i>	5a, 5b, 7a, 7c, 7f
	<i>Eucalyptus caliginosa</i>	1a, 1c, 2c, 4a
	<i>Eucalyptus campanulata</i>	1b, 2a, 2d, 2e, 2f
	<i>Eucalyptus codonocarpa</i>	1a, 1b, 1c, 2a, 2e, 2f, 3a
	<i>Eucalyptus crebra</i>	5a
	<i>Eucalyptus dalyhympleana</i>	1a, 1c, 2e, 2f
	<i>Eucalyptus dealbata</i>	2d, 2f, 4a, 4b, 5a, 5b, 6b, 7a, 7c, 7d, 7e, 7f, 7g, 8a, 9a, 9b
	<i>Eucalyptus ligustrina</i>	3a
	<i>Eucalyptus macrorhyncha</i>	7d, 7f
	<i>Eucalyptus mckieana</i>	5a
	<i>Eucalyptus notabilis</i>	3a
	<i>Eucalyptus prava</i>	2d, 2f, 4a, 4b, 4c, 5a, 5b, 6a, 6b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 8a, 9a, 9b
	<i>Eucalyptus quiniörum</i> m.s. (sp. aff. <i>cypellocarpa</i>)	7f, 7g, 7h
	<i>Eucalyptus radiata</i>	2f, 3a
	<i>Eucalyptus scias</i> subsp. <i>apoda</i>	2a, 2d
	<i>Eucalyptus scoparia</i>	2d, 2f
	<i>Eucalyptus williamsiana</i>	1b
	<i>Eucalyptus youmanii</i>	7g, 7h
	<i>Homoranthus biflorus</i>	5a
	<i>Homoranthus bornhardtensis</i> m.s.	7f
	<i>Homoranthus papillatus</i>	2d, 2e
	<i>Homoranthus croftianus</i> m.s.	4a
	<i>Homoranthus prolixus</i>	7c, 7f, 7g, 9a, 9b
	<i>Kunzea bracteolata</i>	2a, 2d, 2e, 2f, 3a, 4a, 4b, 7a
	<i>Kunzea obovata</i>	1a, 1b, 1c, 2a, 4a, 4b, 5a, 5b, 7a, 7e, 7g
	<i>Kunzea opposita</i>	2b
	<i>Kunzea parvifolia</i>	7a, 7f

Family	Taxon	Community	
Orchidaceae cont.	<i>Dendrobium pugioniforme</i>	2d, 2e, 3a	
	<i>Dendrobium speciosum</i>	2a, 2d	
	<i>Dipodium variegatum</i>	6b	
	<i>Diuris abbreviata</i>	4b, 7a	
	<i>Genoplesium fimbriatum</i>	3a	
	<i>Glossodia major</i>	5b	
	<i>Microtis unifolia</i>	1c	
	<i>Prasophyllum brevilabre</i>	1a, 1b, 3a, 4b	
	<i>Pterostylis boormanii</i>	7g	
	<i>Pterostylis coccinea</i>	5a, 7f	
	<i>Pterostylis daintreana</i>	2a, 2d, 2f, 4b, 5a, 5b, 7b, 7d, 7g, 8a	
	<i>Pterostylis decurva</i>	1a, 1b	
	<i>Pterostylis fischii</i>	1a	
	<i>Pterostylis furcata</i>	4a	
	<i>Pterostylis longifolia</i>	1c, 2c, 2d, 2e, 2f, 3a, 4a, 7g	
	<i>Pterostylis mutica</i>	4b, 7a, 7g	
	<i>Pterostylis parviflora</i>	3a, 5a	
	<i>Pterostylis praetermissa</i>	7g	
	<i>Pterostylis reflexa</i>	7e	
	<i>Pterostylis setifera</i>	4b, 9a	
	<i>Pterostylis woollsi</i>	9a	
	<i>Thelymitra pauciflora</i>	1b, 4b	
	Oxalidaceae	<i>Oxalis chnoodes</i>	2d, 6b, 7a, 7g, 9a, 9b
		<i>Oxalis exilis</i>	6a
		<i>Oxalis perennans</i>	6a, 7d, 8a
		<i>Oxalis radicata</i>	9a
		<i>Dianella caerulea</i> var. <i>assera</i>	2a
		<i>Dianella caerulea</i> var. <i>caerulea</i>	1a, 2a, 2b, 2c, 2d, 3a, 4a, 4b, 5a, 5b, 7a, 7c, 7d, 7e, 7f, 7g, 8a, 9a, 9b
		<i>Dianella longifolia</i>	9a
		<i>Dianella revoluta</i>	1c, 2a, 2b, 2d, 2e, 2f, 4a, 4b, 4c, 5a, 5b, 6b, 7a, 7d, 7g
		<i>Dianella tasmanica</i>	1a, 1b, 1c, 2a, 2c, 3a, 4a, 4b, 7a
		<i>Stypantra glauca</i>	1a, 1b, 2b, 2d, 2e, 2f, 4a, 4b, 5a, 5b, 6b, 7a, 7b, 7c, 7e, 7f, 7g, 8a, 9a

Family	Taxon	Community
Phormiaceae cont.	<i>Thelionema caespitosum</i>	1a, 1b, 1c, 2c, 3a, 7c, 7h
	<i>Thelionema grande</i>	2d, 2e, 2f, 4a
Phytolaccaceae	* <i>Phytolacca octandra</i>	1b, 2d, 2f, 3a, 6a
Pittosporaceae	<i>Billiardiera scandens</i>	1a, 1c, 2d
	<i>Bursaria spinosa</i>	1a, 2a, 6b, 7g
	<i>Rhizidoporum procumbens</i>	5a, 5b, 8a
Plantaginaceae	<i>Plantago debilis</i>	6b, 7e, 7g
	* <i>Plantago lanceolata</i>	7g, 9a
	<i>Plantago varia</i>	7d
Poaceae	<i>Agrostis avenacea</i>	7e
	<i>Agrostis</i> sp. A	2c
	<i>Amphipogon strictus</i>	3a
	<i>Aristida jerichoensis</i> subsp. <i>subspinulifera</i>	1b, 2a, 2b, 2d, 2e, 2f, 4a, 4b, 5a, 5b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 8a, 9a
	<i>Aristida ramosa</i>	1c, 2e, 3a, 4a, 4b, 6a, 7c, 8a
	<i>Aristida vagans</i>	6a, 6b, 7a, 7d, 7f, 7g, 8a, 9a, 9b
	<i>Arundinella nepalensis</i>	4b, 7a, 7c, 7d, 7g, 8a, 9a
	<i>Austrodanthonia induta</i> (Vickery) H.P. Linder	7e
	<i>Austrodanthonia linkii</i> (Kunth) H.P. Linder	2b, 2d, 2e, 2f, 5a, 6b, 7a, 7c, 7e, 7f, 7g, 9a, 9b
	<i>Austrodanthonia monticola</i> (Vickery) H.P. Linder	1a, 1b, 1c, 2c, 4a, 4b, 5a, 5b, 7a, 7b, 7d, 7f, 7g, 7h, 9a
	<i>Austrodanthonia penicillata</i> (Labill.) H.P. Linder	7d
	<i>Austrodanthonia pilosa</i> (R.Br.) H.P. Linder	1a
	<i>Austrodanthonia racemosa</i> (R.Br.) H.P. Linder	2e, 2f, 6a
	<i>Austrodanthonia richardsonii</i> (Cashmore) H.P. Linder	3a, 4a
	<i>Austrostipa aristiglumis</i> (F. Muell.) S.W.L. Jacobs & J. Everett	7a, 7g
	<i>Austrostipa bigeniculata</i> (Hughes) S.W.L. Jacobs & J. Everett	3a, f4d
	<i>Austrostipa pubescens</i> (R.Br.) S.W.L. Jacobs & J. Everett	2a, 2d
	<i>Austrostipa scabra</i>	3a, 4a
	<i>Austrostipa setacea</i>	1a, 4b, 7a, 7c, 7g
	<i>Austrostipa tuckeri</i>	9a
	<i>Bothriochloa macra</i>	6b
	* <i>Bromus catharticus</i>	9a, 9b
	<i>Chionochloa pallida</i>	4b

Family	Taxon	Community
Poaceae cont.	<i>Cleistochloa rigida</i>	3a, 5a, 6b, 7c, 7d, 7g, 9a, 9b
	<i>Cymbopogon obiectus</i>	5a, 7a, 7g, 8a
	<i>Cymbopogon refractus</i>	2d, 4a, 4b, 5a, 5b, 6a, 6b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 8a, 9a
	<i>Cynodon dactylon</i>	1b, 8a, 9a
	<i>Deyeuxia mckiei</i>	7f
	<i>Dichanthium setosum</i>	6b
	<i>Dichelachne micrantha</i>	2d, 4b, 4c, 7a, 7c, 7g, 7h
	<i>Dichelachne rara</i>	2d
	<i>Dichelachne sieberiana</i>	7e, 7f
	<i>Digitaria breviglumis</i>	1a, 1b, 1c, 2b, 2d, 2f, 3a, 4a, 4b, 5a, 5b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 8a, 9a
	<i>Digitaria brownii</i>	5a, 6a, 6b, 7g
	<i>Digitaria longiflora</i>	2d
	<i>Echinopogon caespitosus</i>	1a, 1b, 2a, 2d, 4b, 6a, 7a, 7g, 9a, 9b
	<i>Echinopogon ovatus</i>	2d, 4a, 4b, 7a, 7d, 7g
	<i>Enneapogon nigricans</i>	6a, 6b
	<i>Entolasia stricta</i>	1a, 1b, 1c, 2a, 2b, 2c, 2d, 2e, 2f, 3a, 4a, 4b, 4c, 5a, 5b, 6a, 6b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 8a, 9a, 9b
	<i>Eragrostis benthamii</i>	4a
	<i>Eragrostis brownii</i>	2c, 4a, 4b, 5a, 6a, 6b, 7a, 7f, 7g, 9a, 9b
	<i>Eragrostis elongata</i>	2d, 4b, 7a, 7d, 7g, 8a
	<i>Eragrostis leptostachya</i>	2b, 2d, 2f, 4b, 5a, 5b, 7d, 7g, 8a
	<i>Eragrostis mollybdea</i>	7e
	<i>Eragrostis tenuifolia</i>	1a, 1c
	<i>Eulalia aurea</i>	7g, 8a, 9b
	<i>Imperata cylindrica</i>	2d, 7g
	* <i>Lolium multiflorum</i>	1c
	<i>Microlaena stipoides</i>	1a, 1b, 2d, 6a, 6b, 7a, 7d, 7e, 7f, 7g, 9b
	<i>Panicum effusum</i>	1c, 2c, 2e
* <i>Panicum miliaceum</i>	6a, 6b, 9b	
<i>Panicum simile</i>	5b, 7g	
<i>Paspalidium constrictum</i>	1a, 1c, 2a, 2b, 2d, 3a, 4a, 4b, 5a, 5b, 6a, 6b, 7a, 7c, 7e, 7g, 7h, 8a, 9a, 9b	

Family	Taxon	Community
Poaceae cont.	<i>Paspalum distichum</i>	1c
	<i>Poa fax</i>	6b, 7g
	<i>Poa labillardieri</i>	2d
	<i>Poa sieberiana</i>	1a, 1b, 1c, 2a, 2c, 2d, 2e, 3a, 4a, 4b, 7a, 7b, 7c, 7f, 7g, 7h, 9a
	* <i>Setaria verticillata</i>	2e, 9a
	<i>Sporobolus creber</i>	7d, 7f, 8a
	<i>Tetrarrhena juncea</i>	2a, 2e, 3a
	<i>Themeda australis</i>	2a, 2b, 2d, 2e, 3a, 6b, 7f
	<i>Thonandia longifolia</i> (R.Br.) H.P. Linder	2e, 4b
	<i>Triodia scariosa</i>	5a, 6b, 7d
	<i>Tripogon loliiformis</i>	1c, 2d, 2f, 3a, 4a, 4b, 5a, 5b, 6a, 6b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 8a, 9a, 9b
Polygalaceae	<i>Comesperma ericinum</i>	1a, 2a, 3a
	<i>Comesperma sylvestre</i>	2c
Polygonaceae	* <i>Acetosella vulgaris</i>	1b, 1c
	<i>Muehlenbeckia costata</i> m.s.	1a, 1b, 2a, 2d, 2e, 2f
	<i>Muehlenbeckia rhytidarya</i>	2a
	<i>Rumex brownii</i>	7e, 7f, 7g, 7h, 9b
	<i>Platynerium bifurcatum</i>	2a, 2d, 7a
	<i>Pyrrosia confluens</i>	2a
	<i>Pyrrosia rupestris</i>	1a, 1b, 1c, 2a, 2c, 2d, 2f, 7a
	<i>Calandrinia eremaea</i>	1b, 2e, 3a, 4b, 4c, 6b, 7a, 7c, 7e, 7f, 7g, 7h, 9a
	<i>Calandrinia pickeringii</i>	2d, 2e, 2f, 4a
	<i>Calandrinia</i> sp.	1c
	<i>Portulaca bicolor</i>	1b, 1c, 5a, 6a, 6b, 7a, 7d, 7f, 7g, 8a, 9a, 9b
	<i>Portulaca filifolia</i>	6b, 7d, 8a, 9b
	<i>Portulaca oleracea</i>	6a, 9b
	* <i>Anagallis arvensis</i>	6a, 6b, 7e, 7g
Primulaceae	<i>Banksia integrifolia</i> subsp. A	1c, 2c
Proteaceae	<i>Banksia spinulosa</i> var. <i>collina</i>	1a, 1b, 1c, 2a, 2e, 3a
	<i>Grevillea acerata</i>	3a
	<i>Grevillea floribunda</i>	5a, 5b
	<i>Grevillea linearifolia</i>	4b

Family	Taxon	Community
Proteaceae cont.	<i>Grevillea mucronulata</i>	3a
	<i>Grevillea ramosissima</i>	7c
	<i>Grevillea triternata</i>	5a, 5b
	<i>Hakea dactyloides</i>	1a, 1b, 1c, 2a, 2b, 2d, 3a, 5a, 5b, 7e
	<i>Hakea decurrens</i>	5b
	<i>Hakea eriantha</i>	2d
	<i>Hakea macrorrhyncha</i> W.R. Barker	3a, 4b
	<i>Isopogon petiolaris</i>	3a, 5a, 5b
	<i>Lomatia fraseri</i>	1a, 1b
	<i>Lomatia silaifolia</i>	1a, 1c, 2a, 2d, 2e
	<i>Persoonia cornifolia</i>	1a, 1b, 1c, 2a, 2d, 2e, 2f, 3a, 4b, 4c, 5a, 7a, 7b, 7c, 7d, 7e, 7g, 7h, 9a, 9b
	<i>Persoonia oleoides</i>	1b, 2a, 2d
	<i>Persoonia rufa</i>	2a, 2b, 3a
	<i>Persoonia sericea</i>	5a, 5b
	<i>Persoonia tenuifolia</i>	2d
	<i>Persoonia terminalis</i> subsp. <i>recurva</i>	5b
	<i>Persoonia terminalis</i> subsp. <i>terminalis</i>	4b, 4c, 5b
	<i>Petrophile canescens</i>	2d, 2e, 3a
	<i>Clematis glycinoides</i>	6b, 7g
	<i>Ranunculus lappaceus</i>	2d
<i>Ranunculus sessiliflorus</i>	6b, 7g, 9a	
<i>Empodisma minus</i>	1b, 1c, 2a, 2b, 3a	
<i>Lepyrodia anarthria</i>	3a	
<i>Lepyrodia leptocaulis</i>	2a, 3a, 4a, 7c	
<i>Lepyrodia scariosa</i>	3a, 4b	
<i>Restio fimbriatus</i>	1a	
<i>Alphitonia excelsa</i>	6a, 7a, 8a	
<i>Cryptandra amara</i> subsp. <i>amara</i>	9a	
<i>Cryptandra amara</i> subsp. <i>floribunda</i>	1b, 1c, 4b, 5a, 5b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 9a, 9b	
<i>Cryptandra lanosiflora</i>	1b, 1c, 3a, 4a	
<i>Pomaderris andromedifolia</i>	2a, 2b, 8a	
<i>Pomaderris lanigera</i>	2e	
Ranunculaceae		
Restionaceae		
Rhamnaceae		

Family	Taxon	Community
Rhamnaceae cont.	<i>Pomaderris nitidula</i>	1c
	<i>Pomaderris notata</i>	2d
Rosaceae	<i>Acaena novae-zelandiae</i>	7g
	* <i>Rosa rubiginosa</i>	7g
Rubiaceae	<i>Rubus fruticosus</i>	7g, 9b
	<i>Rubus parvifolius</i>	7a, 7e
	<i>Canthium odoratum</i>	6a, 7a, 7d, 7g
	<i>Galium gaudichaudii</i>	8a
	<i>Galium migrans</i>	6b, 7a, 7b, 7g, 7h
	<i>Opercularia aspera</i>	1a, 7d, 7g
	<i>Opercularia hispida</i>	1a, 2c, 4b, 5b, 7d, 7f, 7g, 9a
	<i>Pomax umbellata</i>	1a, 1c, 2d, 2f, 3a, 4a, 4b, 4c, 5a, 5b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 9a, 9b
	<i>Boronia algida</i>	1c, 3a, 4b
	<i>Boronia amabilis</i>	2d
	<i>Boronia anemonifolia</i>	1a, 1c, 2b, 7a
	<i>Boronia anethifolia</i>	1b, 2a, 3a, 4a, 4c, 5a, 7e, 7f
<i>Boronia granitica</i>	4b, 4c, 5a, 7e, 9a	
<i>Boronia microphylla</i>	3a, 4b	
<i>Boronia boliviensis</i> m.s.	4a	
<i>Correa reflexa</i>	1a, 2a, 2b, 6b, 7e, 7f, 7g, 7h, 8a	
<i>Eriostemon australasius</i>	3a	
<i>Eriostemon myoporoides</i> subsp. <i>conduplicatus</i>	4b, 5a, 9a, 9b	
<i>Eriostemon myoporoides</i> subsp. <i>epilosus</i>	1b, 2a, 2d, 2e, 2f, 4a, 7a	
<i>Phebalium ambiens</i>	1a, 2d, 2e, 2f, 4b	
<i>Phebalium dentatum</i>	2b, 3a	
<i>Phebalium glandulosum</i>	4b	
<i>Phebalium ozothamnoides</i> F. Muell.	1a	
<i>Phebalium rotundifolium</i>	2d, 2f, 4b, 4c, 5a, 5b, 9a	
<i>Phebalium squamulosum</i>	2a, 2d, 2f, 3a, 4b, 4c, 7d	
<i>Zieria cytisoides</i>	1c, 2b, 6b, 7a, 7b, 7f	
<i>Zieria fraseri</i>	1a, 1c, 3a, 4a, 5a, 7a, 7e	
<i>Zieria laevigata</i>	1a, 1b, 4b	
<i>Zieria odorifera</i> m.s.	5a, 7a, 7c, 9a, 9b	

Family	Taxon	Community
Santalaceae	<i>Choretrum candollei</i>	2a
	<i>Choretrum</i> sp. A	3a
Sapindaceae	<i>Exocarpus cupressiformis</i>	1a, 1c, 2a, 2b, 2d, 2e, 2f, 4a, 4b, 7a, 7e, 7f, 7g
	<i>Exocarpus strictus</i>	2a
	<i>Dodonaea boroniifolia</i>	5b, 7g
	<i>Dodonaea falcata</i>	5b
	<i>Dodonaea hirsuta</i>	2d, 4b, 5a
	<i>Dodonaea stenophylla</i>	9a
	<i>Dodonaea triquetra</i>	7d, 7g
	<i>Dodonaea viscosa</i>	1a, 1b, 1c, 2d, 2e, 2f, 4b, 5a, 5b, 6b, 7a, 7b, 7c, 7e, 7f, 7g
	<i>Schizaea bifida</i>	2a, 2e
	<i>*Gratiola peruviana</i>	6a, 8a
Scrophulariaceae	<i>*Verbascum thapsus</i>	7g
Sinopteridaceae	<i>Veronica calycina</i>	2d, 7g, 7h
	<i>Cheilanthes distans</i>	2d, 6a, 6b, 7d, 7f, 7g, 8a, f4b, f5a, f5b
	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	1a, 1b, 1c, 2b, 2d, 2e, 2f, 3a, 4a, 4b, 5a, 5b, 6a, 6b, 7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 8a, 9a, 9b
	<i>Pellaea falcata</i> var. <i>falcata</i>	1a, 7g
	<i>Smilax australis</i>	1b, 2a, 3a
Smilacaceae	<i>Smilax glycyphylla</i>	2a
	<i>Cyphanthera albicans</i> subsp. <i>albicans</i>	1c
Solanaceae	<i>*Datura stamonium</i>	8a
	<i>Solanum campanulatum</i>	2d
	<i>Solanum cinereum</i>	2d, 6b, 9b
	<i>Solanum elegans</i>	2d
	<i>Solanum opacum</i>	1a, 7e, 9b
	<i>Stackhousia monogyna</i>	1a, 2d
	<i>Stackhousia muricata</i>	2d
	<i>Stackhousia viminea</i>	1a, 1b, 1c, 2b, 2d, 2e, 4a, 4b, 6a, 7e, 9a
	<i>Brachychiton populneus</i>	6b
	<i>Lasiopetalum ferrugineum</i> var. <i>cordatum</i>	1b
Sterculiaceae	<i>Styloidium graminifolium</i>	2b, 2e, 2f
	<i>Styloidium laricifolium</i>	2a, 2b, 2d, 2e, 2f, 3a, 4a, 4b, 8a

Family	Taxon	Community
Thymelaeaceae	<i>Pimelea linifolia</i>	1a, 1b, 1c, 2a, 2d, 2e, 2f, 3a, 5a, 5b, 7a, 7d, 7g
Urticaceae	<i>Urtica incisa</i>	7e, 7g, 7h, 8a, 9b
Verbenaceae	* <i>Verbena bonariensis</i>	2d
	* <i>Verbena rigida</i>	7g
Violaceae	<i>Hybanthus monopetalus</i>	1b, 5a
	<i>Viola betonicifolia</i>	2d
	<i>Viola hederacea</i>	2d, 4b
Viscaceae	<i>Notothixos cornifolius</i>	6b
Winteraceae	<i>Tasmania glaucifolia</i>	1a
	<i>Tasmania stipitata</i>	2c
Xanthorrhoeaceae	<i>Xanthorrhoea acaulis</i>	3a, 7c
	<i>Xanthorrhoea glauca</i>	1a, 2a, 3a
	<i>Xanthorrhoea johnsonii</i>	2d, 4b, 5a, 5b, 7a, 7d, 7g, 8a