# Vegetation and Floristics of the Bald Rock & Boonoo Boonoo National Parks

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**A Report to the New South Wales National Parks and Wildlife Service**

## *Summary*

The vegetation of Bald Rock and Boonoo Boonoo National Parks is described and mapped (scale 1:25 000). This forms part one of the survey of lands within these two reserves with part two of the survey incorporating newly acquired lands. Ten communities are defined based on PATN analysis and one specialised community is as circumscribed by previous surveys. These eleven communities are mapped based on ground truthing, air photo interpretation and altitude. Most communities are of a Tall Open Forest structure, however Woodlands exist along with Heaths, Sedgelands, Shrublands and Closed Forest. The distribution of communities is related to drainage, aspect, slope and soil depth. Many of the communities show considerable variation and intergrade along common boundaries. A number of specialised communities are thought to be restricted to the reserve.

A total of 898 taxa were found from 135 families and 429 genera. At present, only 6% of the flora is exotic in origin. Very few of these exotic species are considered to pose any major threat at present. Twenty-seven ROTAP taxa of which three are TSC Act listed, were found during the survey. A further 52 taxa were thought to be significant in a regional perspective and an additional eight rare species may potentially occur with further investigation.

Most management issues are related to fire regimes. Throughout most of the reserve fire frequency has been high and a considerable reduction in this frequency is suggested for most communities. It is also suggested that a variable and adaptive fire regime is adopted. Monitoring of a subset of the survey plots in subsequent years will enable a review of management practices to allow modification as new information is forthcoming. Introduced plants, pigs and stray cattle are sources of disturbance and will need to be eradicated.

These two reserves are very significant as they represent a large area conserving representatives of some major and widespread communities of the north east of New South Wales as well as some that are unique to the reserve. A very high number of restricted and regionally rare species are found within these reserves some of which are endemic.

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# Introduction

### *1.1 Objectives*

This survey of the vegetation of the Bald Rock and Boonoo Boonoo National Parks was prepared by John T. Hunter at the request of the Glen Innes District of the New South Wales National Parks and Wildlife Service. The Glen Innes District required that existing information from previous floristic surveys be collated and that up to 100 stratified sites be surveyed in order to complete a comprehensive survey of the vegetation and flora of the Bald Rock and Boonoo Boonoo National Parks. This report represents the findings of the survey. This information is to be used as a guide for management purposes.

The requirements of the investigation were:

1. Collate existing information from previous vegetation surveys conducted within the Bald Rock and Boonoo Boonoo National Parks. Data sources recovered included 38 full floristic sites:
    - Site descriptions conducted for a vegetation survey of granitic areas of the Northern Tablelands (Roberts 1983).
    - 14 sites from the NRAC vegetation survey of the Upper North East of New South Wales (1993).
    - 3 sites supplementary to the NRAC sites for incorporation into the same document above (1993).
    - 1 site conducted for the inventory of Clarence Valley Rainforest Remnants (Gilmour 1993).
    - Information compiled from University of New England student excursions in 1994 (Clarke 1998).
    - 21 sites conducted for the floristic inventory of the granitic outcrop vegetation of the New England Batholith (Hunter 1999).

- 30 (2 m x 2 m) fire trial plots sampled once a month for 12 months (402 temporal sites) conducted at Bald Rock and the Border Trail in 1996-7 (Hunter 1999).

2. Site placement to be based on selected environmental variables and be distributed based on the area they occupy.
3. Identify weed species and their occurrence.
4. Identify ROTAP and TSC Act species and their occurrence.
5. Identify regionally significant species.
6. Provide known fire ecology information on species and communities.
7. Construction of a vegetation map based on communities as defined by PATN analysis.
8. Provide management recommendations.
9. Collection of voucher specimens for reference.

## *1.2 Study area*

Bald Rock and Boonoo Boonoo National Parks occur approximately 30 km north east of Tenterfield in north eastern New South Wales (Figure 1 & 2) within the Tenterfield Shire. Bald Rock National Park incorporates two disjunct sections, the main park in the north that includes 'Bald Rock' itself and a southern section which occurs *c*. 4 km south of the main park (Figure 2). The study area incorporates land once within the boundaries of several State Forests but have now been incorporated into these present reserves, namely; Jenner State Forest and parts of Boorook State Forest and Boonoo State Forest. Girraween National Park in Queensland adjoins the majority of the western border of Bald Rock National Park. State Forest still adjoins parts of the eastern boundary of Boonoo Boonoo National Park. The eastern boundary of the main section of Bald Rock National Park adjoins a Traveling Stock Reserve (TSR) managed by the Tenterfield Rural lands Protection Board. Other boundaries occur against privately owned land, in particular the south section of Bald Rock National Park which is totally landlocked by private holdings. Both reserves are currently managed by the Glen Innes District of the New South Wales National Parks and Wildlife Service. Part one of the survey only includes areas included in the original park boundaries and as such does not include the new recent additions.

The Reserves occur along the eastern escarpment of the Main Range (Figures 1 & 2) and straddles the Northern Tablelands and the North Coast Botanical Districts (the boundary of which is usually defined at around 800-900 m altitude). At present the parks include 12 083 ha, with 8046 ha in Bald Rock National Park and 4037 ha in Boonoo Boonoo National Park. This land incorporating the new additions has been previously logged in small areas and also under grazing leases for a substantial part of this century and this did not cease until after acquisition by the National Parks and Wildlife Service in 1999. The survey area is covered by two 1:25 000 topographic maps, namely; Bookookoorara and Boonoo Boonoo.

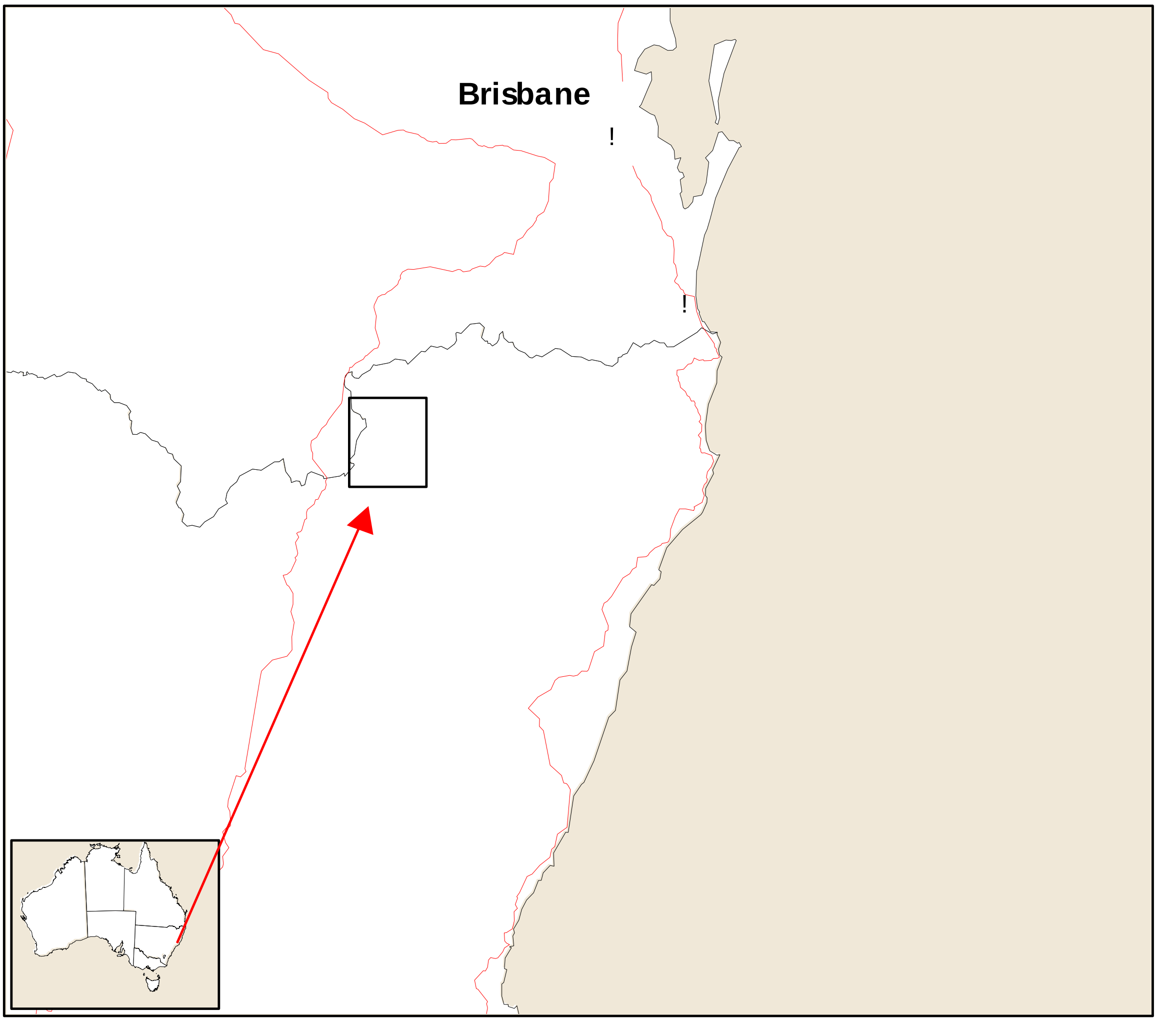


**Figure 1:** Location of the study region within north eastern New South Wales.

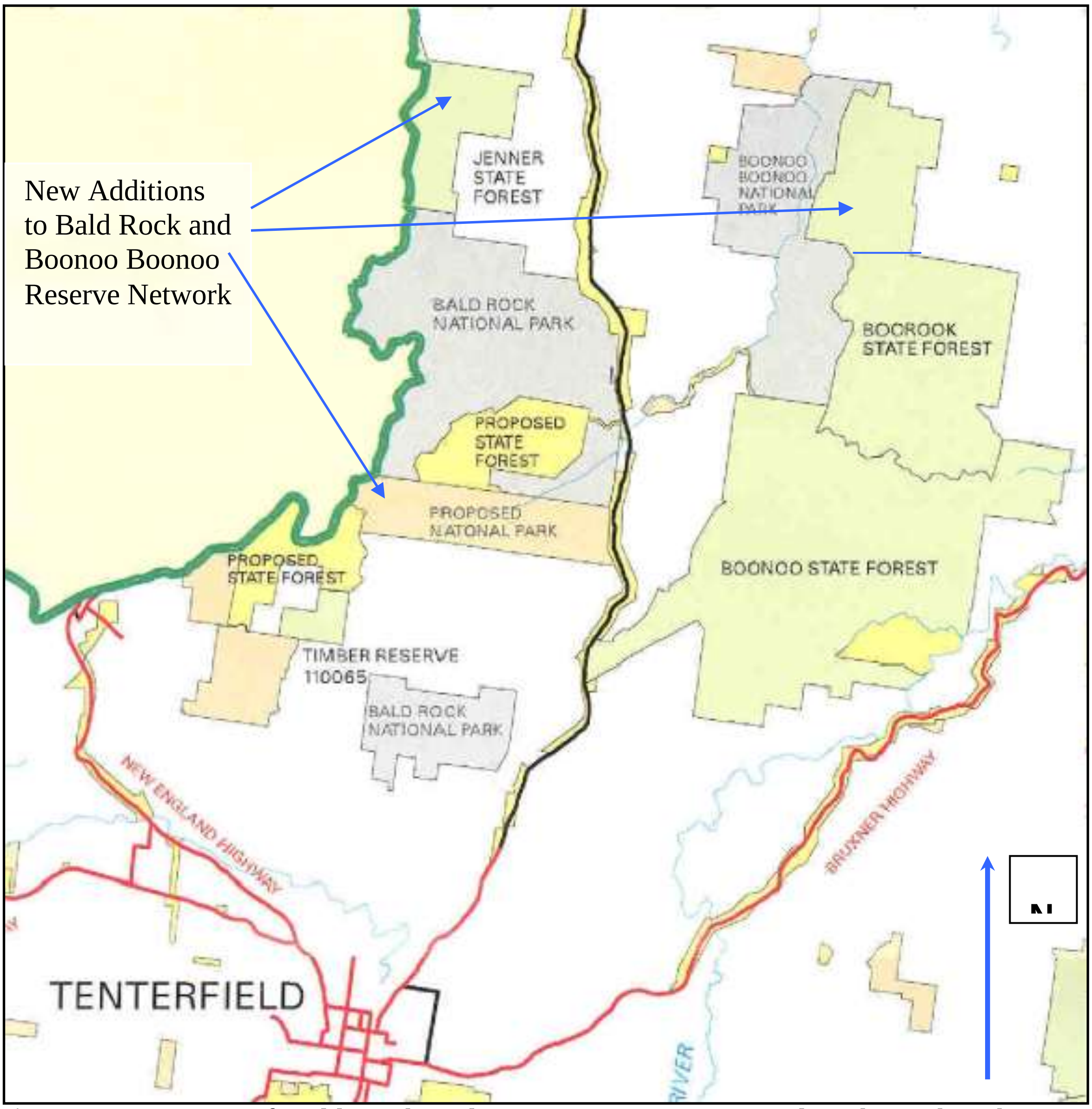


**Figure 2:** Location of Bald Rock and Boonoo Boonoo National Parks within the study area. The grey areas comprised the region encompassed by part one of the flora survey. New additions to these reserves which will be included in part two of the survey are indicated. Yellow areas constitute crown lands, green State Forests and cream are leasehold lands. (Map adapted from SFNSW 1995).

### *1.3 Conservation gains and gazettal of the additions*

Bald Rock was originally reserved within 250 ha of land declared for public recreation in 1906. After some additions in the 1970's the area was gazetted as Bald Rock National Park. 1500 ha was added in 1987 linking the park to Girraween National Park. Gazettal of the original Boonoo Boonoo National Park was made in 1982 and comprised two parcels of land with a total area of 1345 ha. Additions have been made since that time bringing the total area to 4037 ha. Both parks have since had substantial lands added to them in 1999 due to acquisitions from State Forests under the north east forests agreements a (see Figure 2).

### *1.4 Climate*

Rain falls mostly in the summer (60-70%) due to a predominantly easterly airflow from the Pacific Ocean and the effects of tropical cyclones from the north east (RACAC 1996a). Rainfall that falls on the western side of the batholith runs north and west; that on the east flows eastward towards the adjacent coast. Snow occurs occasionally at higher altitudes. Overall, rainfall ranges from 600-1000 mm annually in the west and 1000-2500 mm annually along the escarpment (RACAC 1996a). Great variability occurs in rainfall and one in every five years on average is drought declared (Division of National Mapping 1986).

The climate of the Bald Rock and Boonoo Boonoo National Parks is typical of the variation shown along the eastern escarpment of the North Coast and Northern Tablelands. The overall climate is temperate with the major variability occurring from east to west. The major regional atmospheric factors are the slow moving high pressure systems that travel from west to east and the fast low pressure systems associated with cold fronts moving from west to east (RACAC 1996a). Average rainfall and humidity decrease during winter and early spring and increase summer to early autumn. The higher tablelands experience a wider range of diurnal temperature fluctuations.

Rainfall in much of the study area is strongly influenced by orographic uplift that results in increased rainfall at the eastern (escarpment) edge of the park. Rainfall decreases with distance inland from the escarpment towards the west. Rainfall varies across the reserves with the highest levels along the eastern escarpment within Boonoo Boonoo National Park (*c.* 1300-1400 MAR). Rainfall drops sharply towards the western border of Bald Rock National Park (*c.* 800 mm MAR) (RACAC 1996a; McDonald *et al*. 1995). Mean annual temperatures are greatest within the lower altitude gorge areas (16-17°C) but are at there lowest on the higher parts of the tablelands, notably around Bald Rock (11-12°C). Dry south west to westerly winds predominate in the winter months.

The dissected nature of the terrain with a deep gorge and slopes leading to high plateau areas dominated by granitic inselbergs results in a range of microclimates. Varying inclination and aspect around the gorge and inselberg country and attendant gully systems greatly affects microclimate with some very steep and protected sites supporting lower than average evaporation rates and potentially double the precipitation due to shedding of water from outcrops.

## *1.5 Landform*

Apart from the larger landform features such as Bornhardts and the Boonoo Boonoo Falls the landforms of both reserves are generally undulating to low hilly with a series of wide flat valleys. These valleys usually contain broad meandering swampy ground fed by the high runoff from the large outcrops. Elevations vary from a maximum of 1277 m (ASL) at the apex of 'Bald Rock' to *c*. 540 m (ASL) in the lower parts of the Boonoo Boonoo gorge. Slopes within the gorge areas are steep and slopes of greater than $30^0$ are common.

Bald Rock National Park includes many bornhardts and other granite landscape features. The park includes the largest granite monolith in the Southern Hemisphere and the second largest rock within Australia (i.e. Bald Rock). Altitudes generally rise to the west and are at their highest along the NSW/Qld Border. As such most of the water flows to the east and Boonoo Boonoo River has its origins within Bald Rock National Park.

Boonoo Boonoo National Park as with Bald Rock also includes many large scale granite features with Mount Prentice, a large bornhardt, being a significant feature of the western side of the Park. Much of the park however is dominated by the Boonoo Boonoo River which more or less travels through the centre of the reserve. The lands systems within this reserve thus primarily fall towards the river. Boonoo Boonoo Falls is one of the more dramatic landscape features of the reserve and is situated near the northern boundary of the park. The falls have a 60° slide and a 210 m drop into a deep granite gorge.

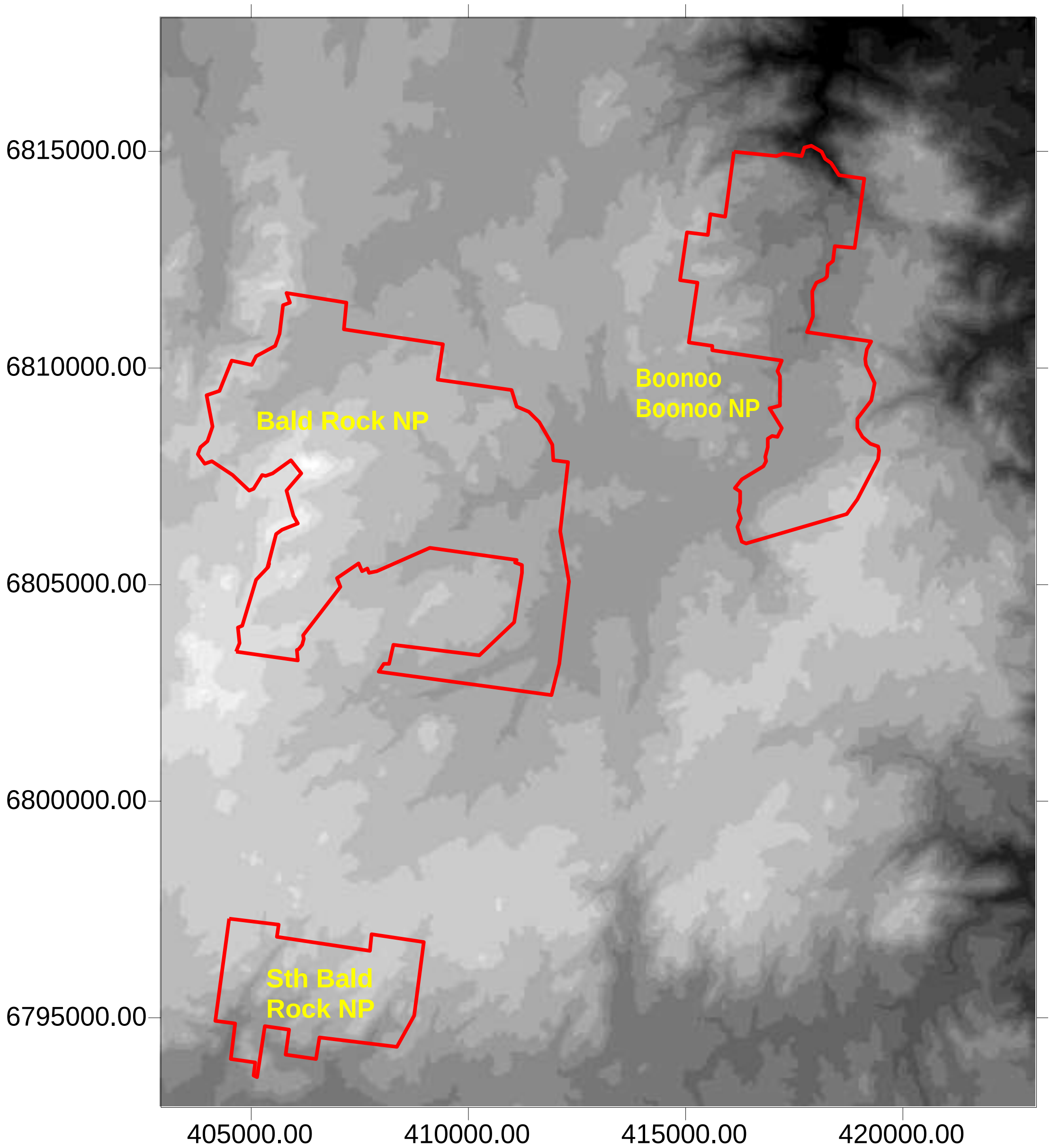


**Figure 3:** Topographic patterns in the area containing the Bald Rock and Boonoo Boonoo National Parks, boundaries for the reserve do not include more recent additions. Drainage patterns run west to east. Axes are in AMG Co-ordinates.

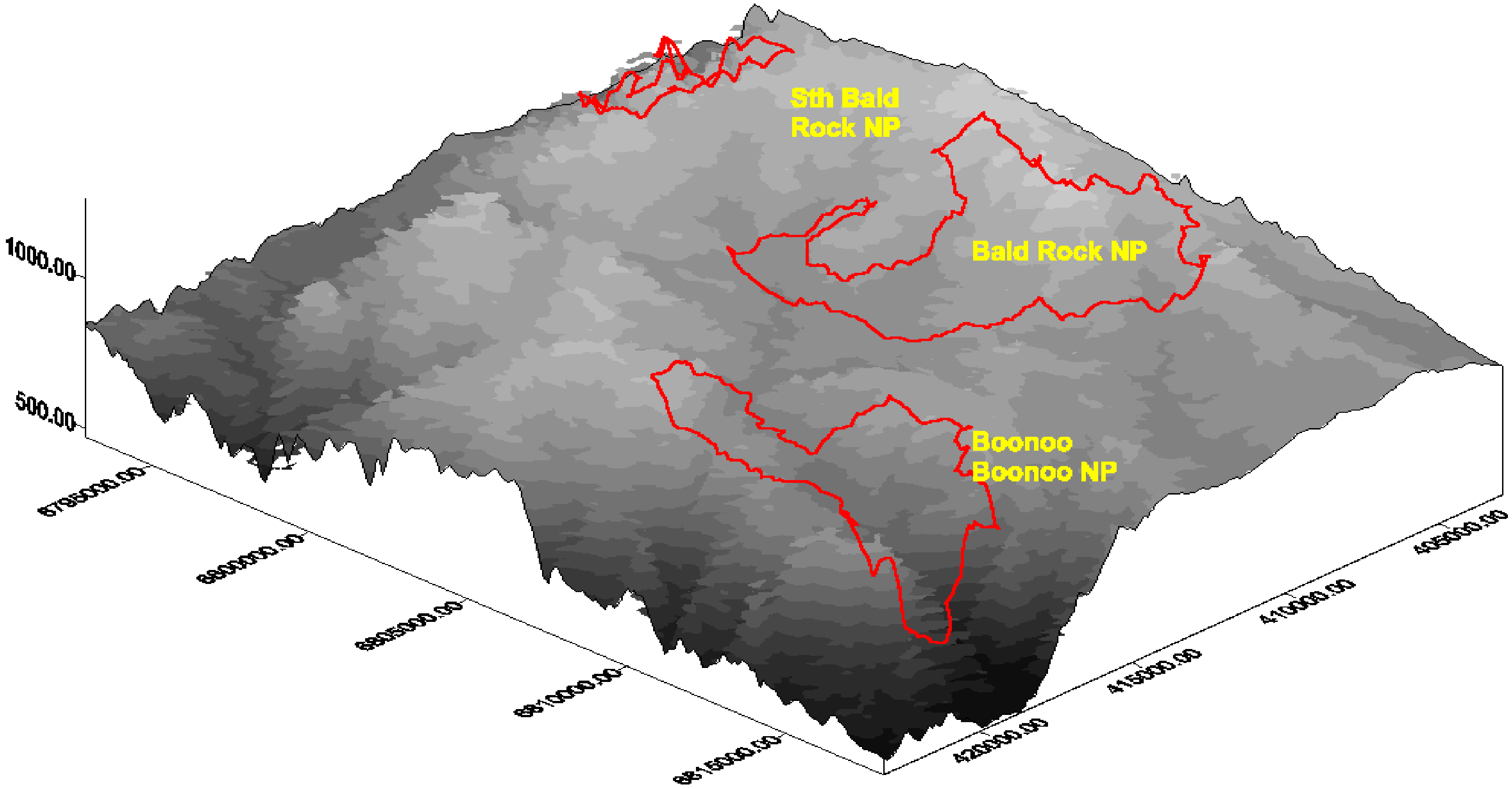


**Figure 4:** 3-D view of Landform and altitude changes with associated drainage patterns in the area containing the Bald Rock and Boonoo Boonoo National Parks; boundaries for the reserve do not include more recent additions. The red lines indicate the boundaries of this current survey.

### *1.6 Geology and geological setting*

Granitic rocks are the main component of continents. Granite is an igneous rock comprising crystals of quartz, feldspar, mica and/or hornblende or pyroxene (Myers 1997). Quartz and feldspars make up 90% of the rock and it is the proportions of these and the kinds of feldspars that are used in dividing granitic rocks into different types (Myers 1997). A complex of related granitic bodies joined at the subsurface is termed a batholith (Twidale 1982; Myers 1997).

The New England Orogen (NEO), of the New England Fold Belt (NEFB), is a belt of complex geology interpreted to be a tectonic collage of a number of terranes that amalgamated with, and accreted to the eastern margin of Gondwana during the late Paleozoic-early Mesozoic (Flood & Fergusson 1984; Flood & Aitchison 1993) (Figure 4). It is the easternmost tectonic element in the Tasman Orogenic Zone of eastern Australia, and the youngest (Schreibner 1993). It extends for 1500 km from Newcastle in the south almost to Bowen in the north (Murray 1998) (Figure 5). The setting for the assemblage of the majority of these terrains was an active continental convergent margin (Flood & Aitchison 1993) that comprised three major morphotectonic features: The western magmatic arc (an Andean style volcanic chain concealed in the southern NEO); the forearc basin; and the subduction complex or oceanic trench (Day *et al.*1978). The genesis of the NEO began in the Cambrian and extended through various phases of uplift and deformation to the Triassic, with igneous activity lasting through to the Jurassic (RACAC 1996).

With the culmination of the orogenic episode most of the granites formed from the melting of freshly deposited volcanic sediments (RACAC 1996a). These granites form the New England Batholith (Barnes *et al*. 1988). The batholith extends for 400 km in length and 110 km in width, from Stanthorpe in Queensland to Tamworth in New South Wales (Leigh 1968) (Figure 5). It formed during a major period of plutonism between 265-220 Ma ago (Barnes *et al.* 1988). These are some of the youngest granitic rocks within Australia, with those in Western Australia being around 3600 Ma (Willmott & Stephenson 1989). About 255 individual plutons form at least 20 aggregated outcrop 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 outcrops in Australia. Within the batholith is Bald Rock, 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) (Figure 5).

In northeast New South Wales, outcrops of granite have been called 'tors'. This term is ambiguous as it is used for all types of granitic landforms including single boulders to large massifs. Twidale (1982) has attempted to clarify the terminology used. This work along with a synopsis presented by Campbell (1997) and Main (1997a), describe the majority of features found in granitic landscapes. A *precis* of some of the more significant features as described within these works is briefly presented here. Reference should be made to these works for further detail or for definitions of additional terms.

- Massif: a large elevated feature formed from an orogenic belt that differs in topography and structure from the adjacent terrain.
- Inselberg: large steeply sided 'island' mountains that arise abruptly from their surroundings. They arise more abruptly than monadnocks.
- Monadnock: an isolated hill or mountain where surrounding areas are level to their limits.
- Bornhardt: is the basic inselberg feature. They are large dome-shaped monoliths, bald and steeply sided with few fractures whereas the surrounding landscape is highly fractured. This feature is further divided. 'Whalebacks' are elongated and elliptical. 'Turtlebacks' are symmetrical with steeply sloping flanks. 'Elephant rocks' are symmetrical in profile. 'Domes' have plan axes of similar length and altitude. 'Sugarloaf' is high and narrow along the plan axis. A bornhardt is the basic positive relief landform from which nubbins and kopjes are formed.
- Nubbin: a block or boulder strewn, hill-sized inselberg.
- Kopje: also known as koppie, a feature comprising angular and blocky rocks in castellated form.
- Pediment: essentially flat or gently sloping rock platform, often grooved and dimpled and slightly included away from an adjacent upland.
- Gnammas: rock basins that are circular, elliptical or irregular depressions in solid bedrock.
- Pavement: a small exposure of low and relatively plain relief.

- Fugitive outcrop: a subsurface basement, high but not yet fully exposed.

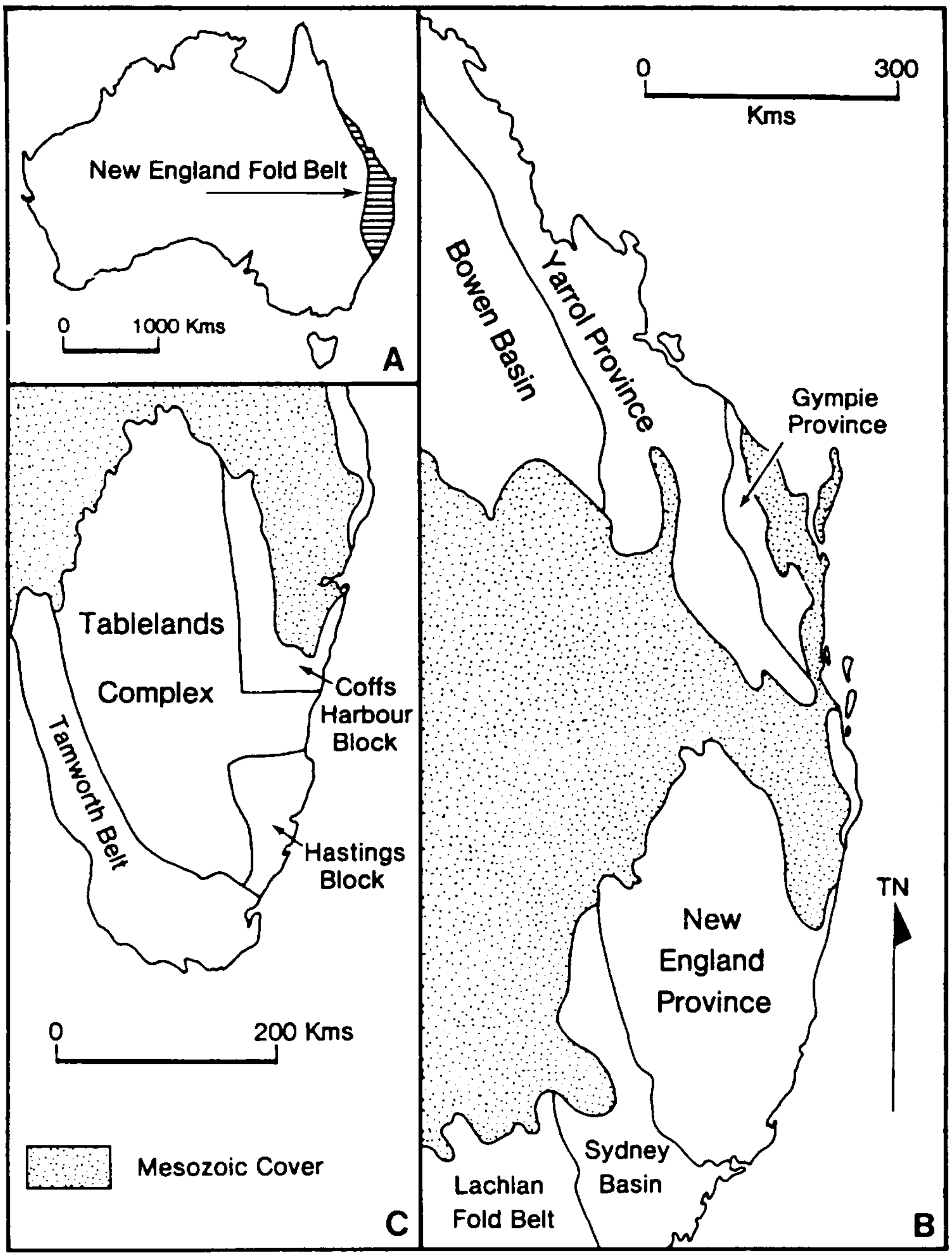


**Figure 5:** Geological setting. Taken from Flood and Fergusson (1984). A) Location of the New England Fold Belt (or Orogen). B) Subdivisions of the New England Fold Belt. C) Subdivisions of the New England Province.

## *1.7 Aboriginal landuse*

The chronology of Aboriginal prehistory in the district is poorly known. Occupation of the tablelands probably occurred around the mid-Holocene (State Forests of New South Wales 1995). A brief account of Aboriginal occupation and utilization of the north east of New South Wales is given in RACAC (1996c). The granite belt lay on a pathway from northern New South Wales to the Bunya Mountains where aborigines from many areas gathered. The area encompassing these two reserves was included within the districts of the Bundjalung and Kambu-Wul tribes.

## *1.8 European history and landuse*

The initial settlement of this region of New South Wales occurred in 1843 with a Pasture Licence being taken up by Robert Mackenzie for the Tenterfield Run. Early interests were mainly in cattle grazing (Gilmour & Helman 1993). It wasn't until the 1860's that extensive clearing began after the introduction of the Robertson Selection Acts (Pearson 1992; RACAC 1996b). By 1890 *c.* 10% of the Northern Tablelands had been ring-barked or cleared (Benson & Ashby 1996). Pasture improvement with a range of exotic species commenced in the 1920s and by the 1970s 19% of the region was sown to improved pastures (Benson & Ashby 1996).

By the late 1860s sawmills were set up in the region (e.g. Bolivia Station) and by the 1880's there were sleeper cutting operations in the Mount Spirabo area (Pearson 1992). The Forestry Commission was established in 1917 (Pearson 1992). Logging in within the reserve has been selective and has predominantly occurred within the recent new additions. In particular logging occurred within parts of Jenner State Forest in the 1990s. Parts of Boorook State Forest that are now incorporated within the Boonoo Boonoo were logged in the 1970s and also pre-1960 (SFNSW 1995). Mining occurred throughout the region and alluvial tin was found in 1864 (McDonald *et al*. 1995) however a rush did not occur until 1872 (Harmon-Price 1995). At Morgan's Gully within Boonoo Boonoo National Park there is an example of a race that was cut through the solid granite in order to lower the bed level of the creek to assist in draining the area for mining at the turn of the century (Walker 1982).

### *1.9 Past fire history and grazing*

Wildfires are a common feature of this area of New South Wales. The new additions which where under the management of the State Forests had prescribed fire frequencies of 3-5 years for plateau areas, 4-7 years for gorge country and more than 10 years wetter areas at higher altitudes. It appears that in much of the better grazing areas on the plateau leaseholders probably kept fire frequencies closer to every three years. Grazing permits existed over much of the current reserve until reserve declaration. Most leases were only lightly grazed although burning was an intrical part of grazing practices to create 'green pick' for cattle. The largest fires recorded in the area for many years occurred in late 1994 when up to 90% of Bald Rock and the neighbouring Girraween National Parks where burnt.

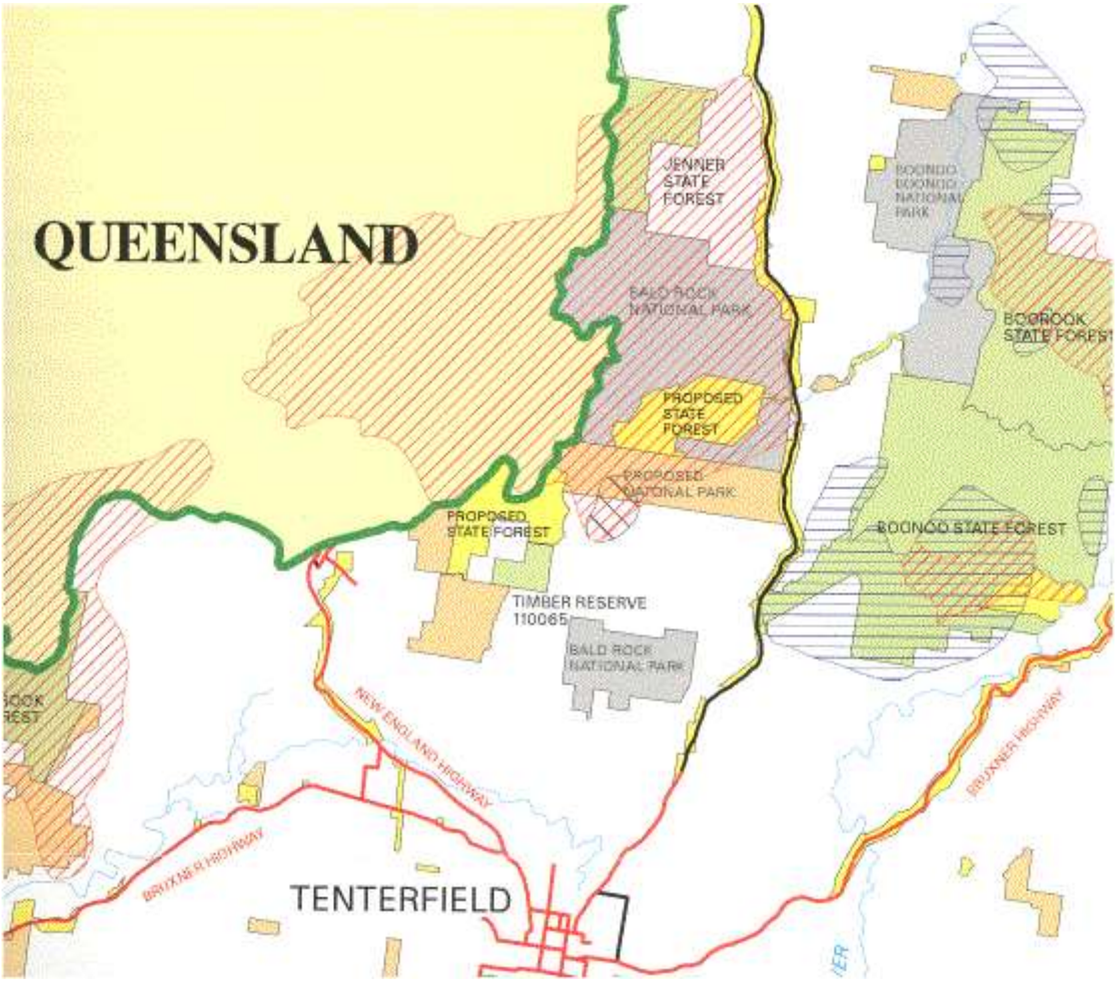


**Figure 6:** Past fire history of the region. Blue horizontal = 1988-1991. Black diagonal = 1991-1994. Red diagonal = 1994-1995. Taken from SFNSW (1995). Note the large and extensive fires of late 1995. Subsequent fires have occurred over the last 10 yrs.

### *1.10 Botanical exploration*

Alan Cunningham was a botanist and explorer who first passed through this area in 1827 in search of an inland route to Morton Bay from Sydney (Figure 7). Cunningham traveled between Bald Rock and Mount Norman (Girraween NP) on June 26$^{th}$ and stated that he saw '*large detached masses of granite of every shape towering above each other, and in many instances standing in almost tottering positions, constituted a barrier before us*'.

Some of the earliest publications on the vegetation and flora of the north east of New South Wales are those of Turner (1903; 1906). Several collecting trips were made by Botanists from the Botanic Gardens in Sydney over many decades particularly by Maiden, Boorman and Betche. Stanley Blake and Cyril White also collected in the area in the 1930s and 1940s. Many local professional and amateur botanists were also active in this and other parts of the New England namely, Rupp, Blakely, McKie and Youman to name a few.

It wasn't until the late 1950's and early 1960's that any concerted effort was made on surveying the vegetation and flora of the New England. Unfortunately due to arguments amongst those carrying out the surveys, all site data was destroyed and the only record remaining of this work is the annotated checklist published by Gray (1961). Williams (1963) described the major changes in vegetation across the eastern scarp to the western slopes. Williams made his first collected trip to the targeted parks in 1966. Williams (1995) surveyed the dynamics of sedge-heaths on the tablelands at Gibraltar Range National Park (published in Williams & Clarke (1997)). McDonald *et al*. (1995) presents the first published collective checklist of the flora of Bald Rock. It is only in the last decade that a concerted effort has been made to systematically survey the various communities and flora that occur on the New England and the escarpment.

Nearby reserves that have been surveyed systematically include the Torrington State Recreation Area (Clarke *et al.* 1998) and the Demon Nature Reserve (Hunter *et al*. 1999). A number of targeted surveys have occurred in the near or within Bald Rock and Boonoo Boonoo National Parks primarily in last ten years. Roberts (1982) surveyed sites within Bald Rock National Park as part of his thesis on granite vegetation in the New England. A student field trip from the University of New England sampled a number of sites within Boonoo Boonoo National Park in 1994 and a compilation of these efforts is presented by Clarke (1998). State Forests of New South Wales (Binns 1995) conducted a systematic survey of forestry lands (some of which is now incorporated in the current reserves) in 1994. The extensive Natural Resources Audit Council (1995) and the North East Forest Biodiversity Study (1995) surveys of the north east placed sites within and nearby the reserve and subsequently mapped the forest types by Air Photo Interpretation (API) within the two reserves (Figures 7 & 8). Gilmour (1993) surveyed rainforest communities in the Clarence Valley and placed a site within Boonoo Boonoo National Park. Hunter (1999) surveyed primarily outcrops but also forested sites within Bald Rock and Boonoo Boonoo National Parks and across the tablelands in general for a comprehensive biogeographic assessment of outcrop floras (Hunter & Clarke 1998; Hunter 1999). More recently Hunter and Bell (2007ab) have surveyed and analysed the compositional changes in montane bog communities within the New England, including those within Bald Rock and Boonoo Boonoo National Parks.

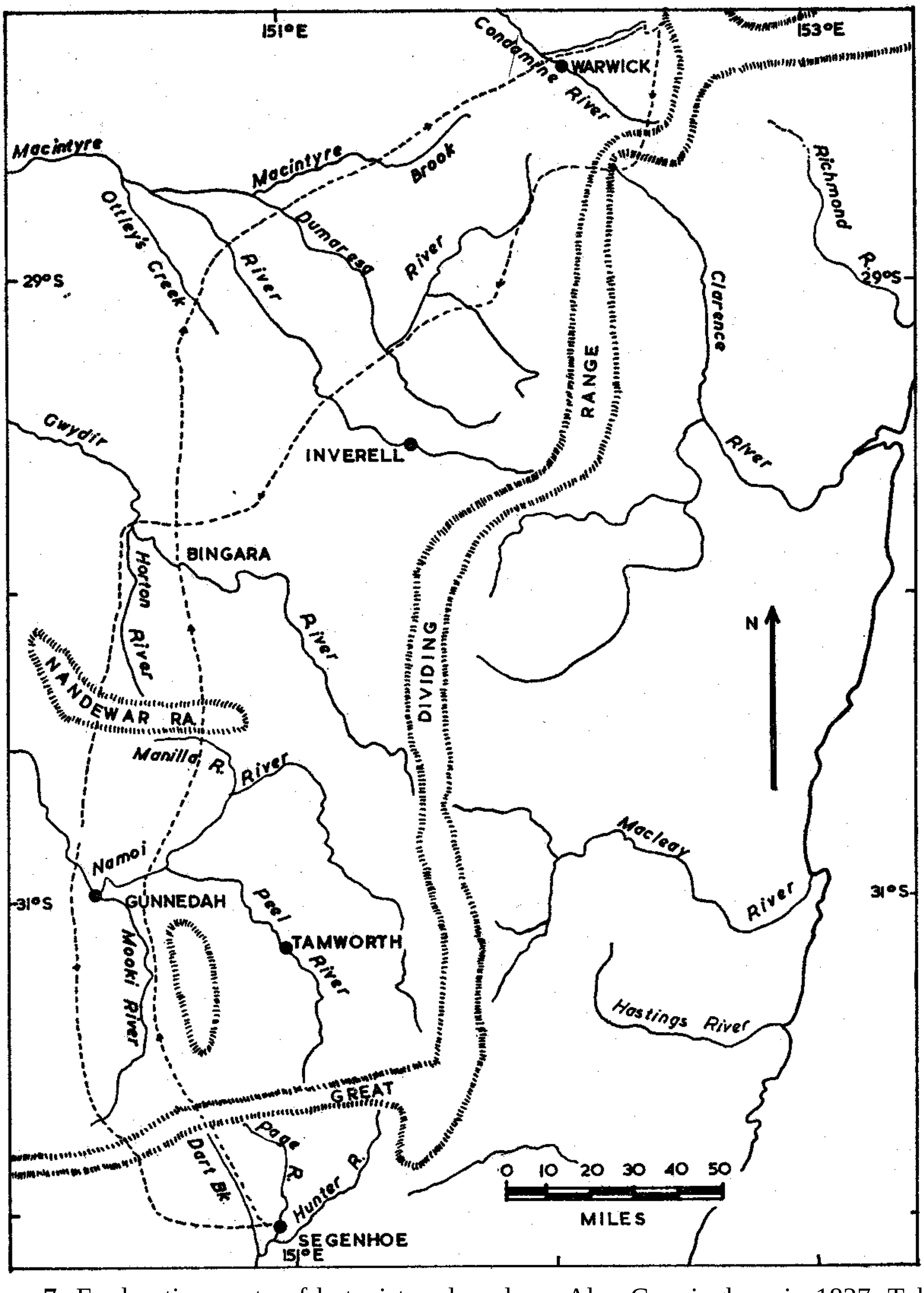


**Figure 7:** Exploration route of botanist and explorer Alan Cunningham in 1827. Taken from McMinn (1970).

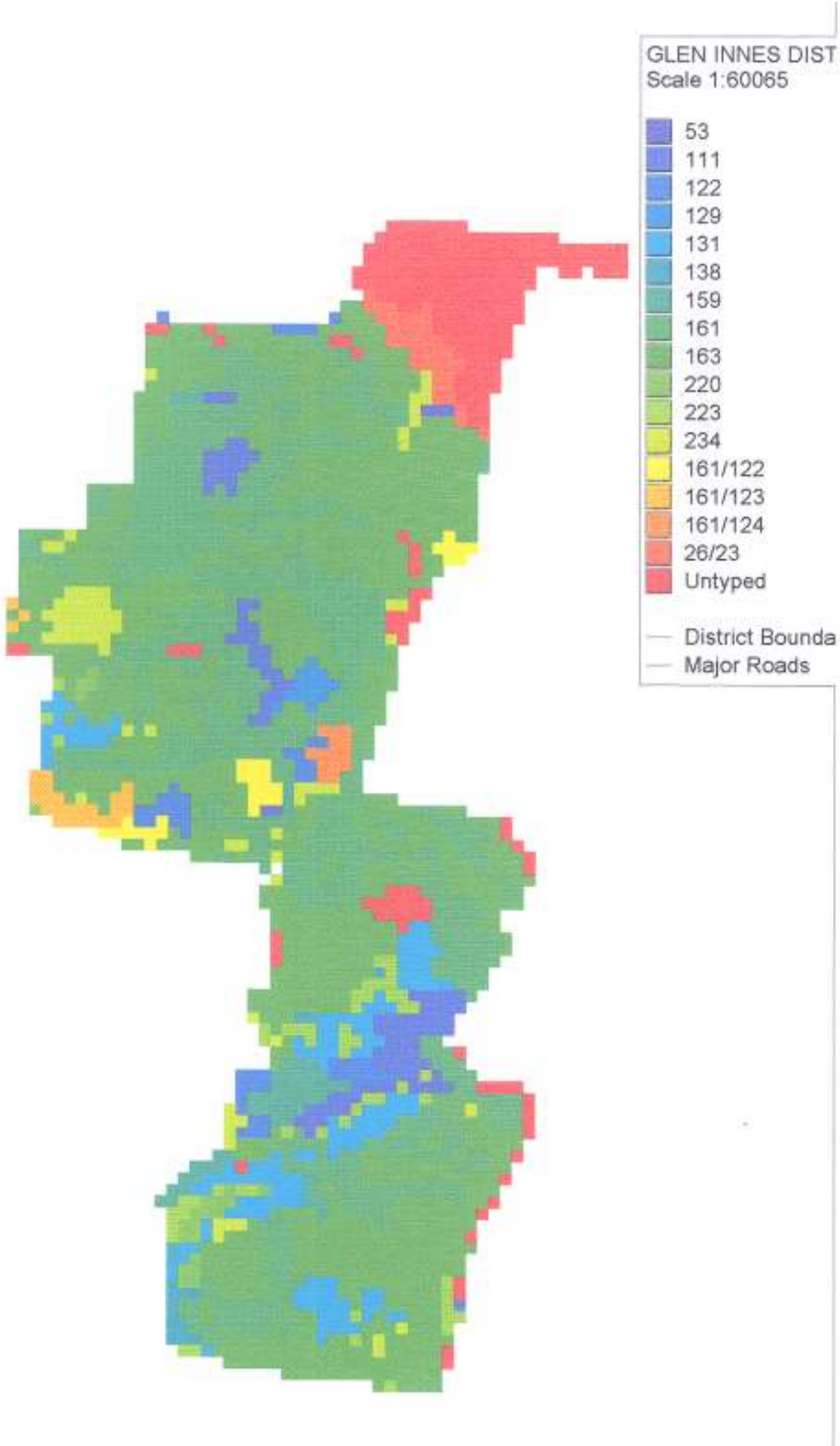


**Figure 8:** NRAC API forest type map for Boonoo Boonoo National Park. See Figure 8 for code breakdowns.

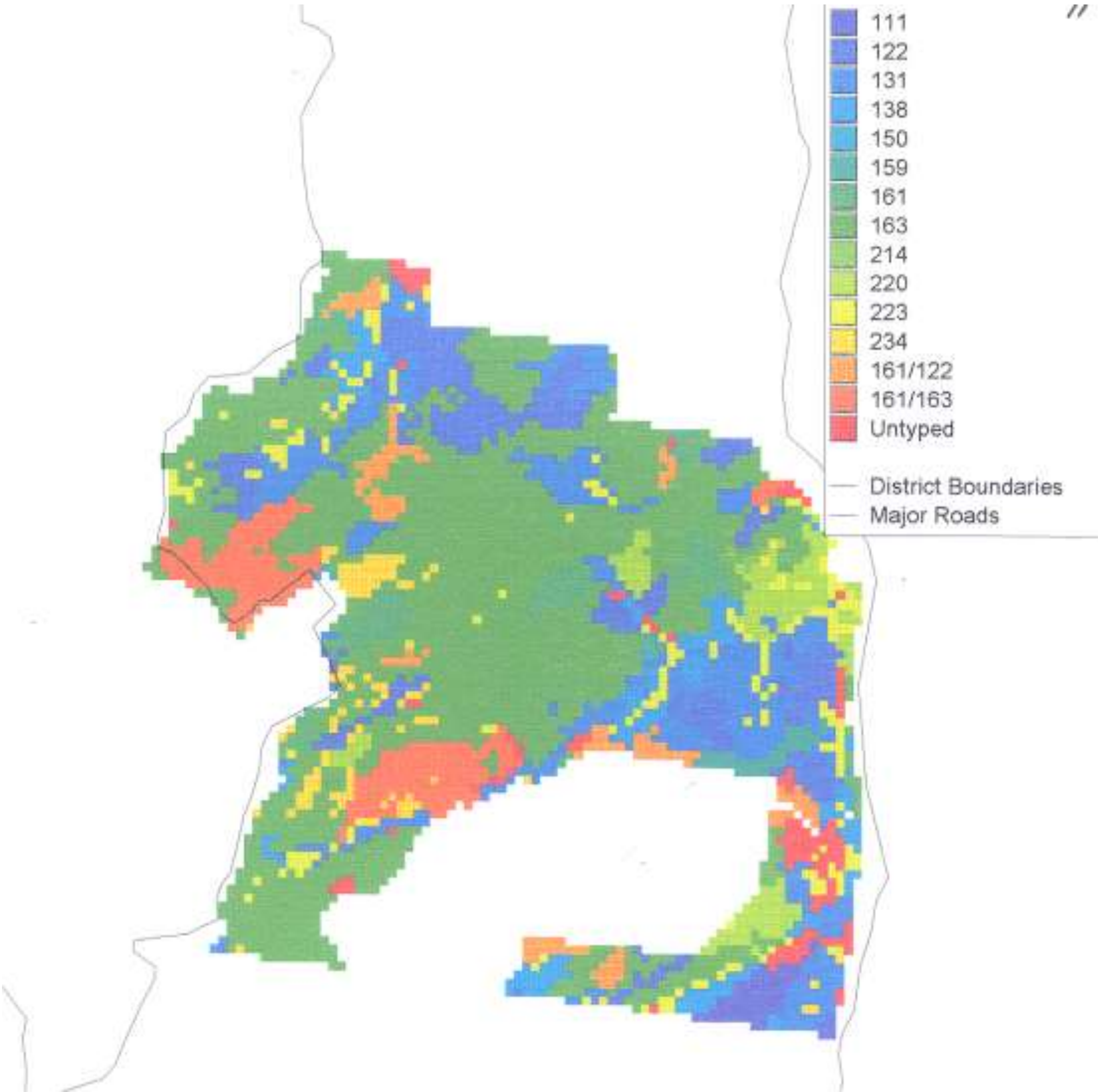


**Figure 9:** NRAC API forest type map of Bald Rock National Park. Codes for Figures 7 & 8 are: 53 = Brushbox; 111 = Stringybark – Peppermint; 122 = New England Stringybark; 129 = *Angophora floribunda*; 131 = Peppermint – Gum; 138 = Snow Gum Woodland; 150 = Messmate; 159 = Mountain Gum; 161 = Brown Gum; 163 = New England Blackbutt – New England Stringybark; 214 = Wattle; 220 = Cleared; 223 = Heathland – Sedgeland; 234 = Rock Outcrop; 26/23 = Depauperate Regrowth of Rainforest.

## *1.11 Review of literature concerning granite outcrop vegetation communities*

### 1.11.1 The outcrop environment

Inselbergs, or granitic outcrops form a major landscape component of Bald Rock and Boonoo Boonoo National Parks. Bald Rock itself is the largest granitic monolith in the southern hemisphere and is the second largest rock in Australia. A vast literature on the forested systems of eastern Australia exists and is readily available from numerous sources. However, information regarding the dynamics of communities on outcrops is scantily presented across a number of mainly overseas journals, and hence is not available generally to land managers. This is despite the fact that many of the rare and threatened flora species in north eastern New South Wales are restricted to such habitats. As such it is appropriate that a literature review concerning these environments should be collated and presented briefly within this report. This present review is taken from Hunter (1999).

Spatially, granitic outcrops frequently occur as clusters with exposures separated by a few kilometres or less, and much greater distances separating the clusters in turn from one another (Murdy 1968). This 'island-like' environment has ramifications for the distribution of plants and, potentially, the genetic divergence of their component populations. In addition outcrops, along with many other specialised systems (e.g. cliffs), are harsh and stochastic environments compared to others with the same macroclimate (Phillips 1981; Phillips 1982; Houle & Phillips 1989b; Dorrstock *et al.* 1996). In general it is not the average climate, as expressed in its many variables (e.g. mean daily temperature or yearly average rainfall), but the rarer extremes that limit plant survival. Granitic outcrops are systems in which the extremes of climate are encountered more frequently, and often with greater intensity (Dorrstock *et al.* 1996). The microclimate of granitic outcrop systems is diverse over very small distances (Hambler 1964; Uno & Collins 1987). Many extreme variations in microclimate may be persistent for extended periods (Hambler 1964; Porembski *et al.* 1996), however most occur only temporarily (Hambler 1964; Burbank & Phillips 1983). Thus there are 'stresses' that impede the establishment and persistence of plants on granite outcrops (Uno & Collins 1987). In turn, these same 'stresses' may also aid the rapid evolution of the component flora, both in terms of co-evolution of adaptive life history traits and in the divergence of individual populations.

The most noticeable feature of granitic outcrop environments is the lack of true soil development (Platt 1951). Plants often persist in a thin layer of organic dust overlain by coarse granite shingle (Gillham 1961). The skeletal soil, composed primarily of organic matter, is very acidic, commonly between pH 4 and 5 (Hambler 1964; Jones 1964; Rundel 1975; Phillips 1981; Dorrstock *et al.* 1996). Such a low pH significantly affects the availability and/or toxicity of many nutrients (Meyer *et al.* 1960). An increase in soil depth has also been correlated with a higher average pH and a greater cation exchange capacity (Shure & Ragsdale 1977). One of the most pertinent effects of poor soil development for plants, is the lack of water retention. A relatively minor increase in soil depth can dramatically prolong water retention capabilities (Burbank & Platt 1964; Houle & Phillips 1989a). These thin soils rapidly dry out after rain and have little or no moisture available for extended periods (Murdy *et al.* 1970; Chapman & Jones 1975: Uno & Collins 1987; Baskin & Baskin 1988). The low water retention of soils is accentuated by heat absorption of granite, high incident radiation and winds, little cooling from evapotranspiration and high runoff (Phillips 1981; Phillips 1982; Walters 1982; Baskin & Baskin 1988; Houle & Phillips 1989a; Ware 1990; Dorrstock *et al.* 1996). It is estimated that 45 to 47% of rainfall is shed from outcrops after individual storms and that depending on the granitic outcrop characteristics, up to 95% runoff can be expected (Walters 1982; Moran & Hopper 1983; Lawler *et al.* 1997; Wyatt 1997). Such a high incidence of runoff means that at the least, the available moisture afforded to the vegetation on outcrops is almost half that of the surrounding vegetation matrix, if not a great deal less. This also means that the vegetation immediately surrounding large outcrops may receive up to double the effective rainfall of the general vegetation of the region. Conversely on outcrops, extended waterlogged conditions often occur depending on the topography of the available soil pans. Plants often have to contend with waterlogged situations followed by times of intense drought, within a matter of days. Few species are able to cope with such alternating submergence and desiccation (McVaugh 1943).

The overall macroclimate of a region is further modified on exposed granitic surfaces in terms of temperature. Temperatures are often 8-18°C higher than that of the ambient air

(Winterringer & Vestal 1956; Shure & Ragsdale 1977). Platt (1951) recorded surface temperatures of 63°C in summer with temperatures of 55-60°C being very common for 4-5 hrs of the day (Erickson *et al.* 1973; Phillips 1982; Walters 1982; Uno & Collins 1987; Reinhard & Ware 1989; Porembski *et al.* 1995; Dorrstock *et al.* 1996; Porembski *et al.* 1996). The low temperatures are also extreme, and the diurnal variations that are met by plants on outcrops are high (Jones 1964). Mares (1997) reported air temperature changes of up to 38°C over a 24-hour period on a granitic outcrop.

Variation in microclimate can be dramatic within a single granitic outcrop, due to aspect, slope, structural vegetation type and cover and topographic and micro-topographic variation (Ashton & Webb 1977). Hambler (1964) showed that the soil temperatures on a single vegetated patch on a granitic outcrop varied from 50°C in ephemeral flush vegetation to 35°C within the adjacent *Andropogonetum* patch. Uno and Collins (1987) showed that in an open herbfield the soil temperatures could be up to 6°C cooler under herbs than on unvegetated adjacent soil. Saplings and trees tend to stabilize the microclimate and contribute to the establishment of more mesic conditions (Phillips 1982; Burbank & Phillips 1983). Compared with large outcrops, small sized rock outcrops have less pronounced variation in microclimate (Porembski *et al.* 1996). The density of vegetation and the amount of exposed granite that surrounds a vegetation patch can dramatically ameliorate, or accentuate the extremes of environmental conditions (Houle & Delwaide 1991).

The wet and, more commonly, the dry extremes accentuate the severity of living conditions for outcrop taxa (Winterringer & Vestal 1956). Evaporation is rapid and drought is common. High temperatures, winds and incident radiation accentuate this. The majority of the rainfall that does occur is lost as surface runoff. In winter, cold temperatures and winds are just as detrimental to the survival of species (Hopper 1981; Phillips 1981). Such harsh conditions are met frequently and fluctuate greatly both seasonally and diurnally. Such abrupt changes are a strain physiologically on taxa (Oosting & Anderson 1937) and constitute extremely limiting environments (Maycock & Fahselt 1992). Granitic outcrops are environments that are commonly inhospitable to mesic invaders (Fleischmann *et al.* 1996) and constitute edaphic and micro-climatic deserts (Houle & Delwaide 1991; Porembski *et al.* 1994; Gr★ger & Barthlott 1996;

Porembski *et al.* 1996), even within macro-climates of high rainfall (Dorrstock *et al.* 1996). It is believed that coping with seasonal or unpredictable drought is the most significant survival strategy faced by the granitic outcrop flora (Kirkpatrick *et al.* 1988; Houle & Phillips 1989b; Groger & Barthlott 1996; Hopper 1999).

The patterns shown by disjunct, relict and introduced species are likely to be different to those of endemics. Burgman (1987) showed that granite outcrops in Western Australia were important sites for relictual and recently evolved taxa. Some notable records are of disjunctions over 1 500 km (Porembski *et al.* 1994). Within perhumid areas, outcrops provide opportunities for disjunct occurrences of arid adapted species (Erickson *et al*. 1973; Porembski *et al.* 1994; Ibisch *et al*. 1995; Porembski *et al*. 1996). Outcrops also provide, through their diverse range of microhabitats and low competition niches, for other relictual species to persist in fluctuating environments beyond their main range (Erickson *et al.* 1973; Abbot 1984; Hopper *et al.* 1997; Main 1997a; Burke *et al.* 1998; Hopper 1999). Main (1997a) believed that outcrops provided opportunities for the maintenance of a co-operative of refugees. It has been hypothesised that within fire prone environments, such as those within Bald Rock and Boonoo Boonoo National Parks, granite outcrops also provide places for relictual taxa that have not evolved to cope with this factor (Moran & Hopper 1983; Craven & Jones 1991; Binns 1992; Fuls *et al.* 1992; Gr★ger & Barthlott 1996; Beard 1997; Hopper *et al.* 1997; Lawler *et al.* 1998).

Uno and Collins (1987) showed that many outcrop species could be found off outcrops in disturbed habitats. Hopper (*pers. comm.* 1998) has also found that some granitic outcrop endemics may become weeds in other areas when transplanted from granitic outcrops in Western Australia. Such observations led Wyatt (1997) to postulate that some 'weedy' taxa may have originally been restricted to granitic outcrops and have since spread more recently to sites disturbed by human activities.

Hopper *et al.* (1997) presented results of multivariate analyses on the distribution of orchid taxa on granitic outcrops. They remarked on the fact that closely adjacent rocks were widely separated in the classification yet some geographically separated rocks had similar orchid floras. It is evident that even the most prominent taxa exist in small isolated populations in which there is little migration (Wyatt 1984). Larger populations on outcrops are often found to be, on closer inspection, subdivided into a number of smaller stands isolated from each other by areas of sheet granite (Moran & Hopper 1983). In addition to the lack of some of the more prominent taxa, there is also the inclusion of a number of taxa with very low constance (Porembski 1995; D★rrstock *et al.* 1996).

### 1.11.2 Adaptations and lifeform traits of granitic outcrop vegetation

Species have adapted to tolerate the harsh physiological conditions on granitic outcrops in a multitude of ways. The means by which species are able to endure this environment, the success of such adaptations or whether there has been time to evolve such adaptations has implications for the potential richness and diversity of these habitats. Basic requirements of outcrop species are tolerances of high temperatures, desiccation and high light. In addition to physiological adaptations, species that are more or less restricted to outcrops exist in a mosaic of small isolated populations that may be separated by great distances, and therefore the effectiveness of cross-pollination and dispersal may be limited.

Outcrop plants often show gross morphological characters that aid drought tolerance, such as root systems that can penetrate small fissures and hoary and narrow leaves (Erickson *et al.* 1973; Uno & Collins 1987). Other common morphological characteristics include succulence (Fleischmann *et al.* 1996) and storage organs. Survival via underground storage organs is a method of drought avoidance commonly noted (Pate & Dixon 1982; Houle & Phillips 1989b; Hopper *et al.* 1997; Hopper 1999). Pate and Dixon (1982) discovered that species from granitic outcrops in Western Australia commonly had storage organs with a high nitrogen content allowing almost total desiccation during aestivation. These adaptations were thought to be unique response to the outcrop habitat.

Chapman and Jones (1975) found that even ubiquitous taxa shared by outcrops and the surrounding vegetation could be physiologically and chemically differentiated, with outcrop forms being more drought tolerant. The growth and photosynthetic rates of outcrop endemics have been shown to be maximal in high light environments (Baskin & Baskin 1988: Houle & Delwaide 1991). Research has proven implicitly that outcrop taxa have a much higher drought tolerance than species from the surrounding communities (Ashton & Webb 1977; Ware 1991).

Other plants on outcrops have evolved dormancy and germination cues that enable them to avoid drought periods rather than persist through them. Baskin and Baskin (1982) discovered that 85—90% of freshly matured *Arenaria* seeds from outcrops were innately dormant and that the 10—15% that germinated only did so at temperatures lower than those that occur in the habitat at the time of seed dispersal in summer. Similarly, Wyatt (1983) found that seeds of *Sedum* required a period of physiological after-ripening and were therefore restricted to autumn germination. Dorrstock *et al.* (1996) also found that dormancy prevented germination of many species within the last weeks of the rainy season on outcrops of the Ivory Coast. Dormancy was only broken in this system by a period of high temperatures followed by rain thereby preventing germination after sporadic rains in the wrong season. Such dormancy and germination characteristics are usually coincident with an annual life history that is the most common lifeform on outcrops (Erickson *et al.* 1973; Ornduff 1987; Uno & Collins 1987; Baskin & Baskin 1988; Porembski *et al.* 1994; Ibisch *et al.* 1995; Dorrstock *et al.* 1996; Hopper *et al.* 1997; Wyatt 1997). Long term dormancy of up to 100 years has been found in some outcrop species (Keever 1957). Avoidance of drought can also be achieved by survival during periodic drying out. Many species on rock outcrops have been termed 'resurrection' plants such as species of *Borya*, *Cheilanthes* and *Pleurosorus* on Western Australian outcrops (Pate & Dixon 1982; Hopper 1999).

Wyatt (1981; 1983) has shown plant species on granitic outcrops often demonstrate a syndrome of ant pollination. It has also been noted that a number of primarily outcrop-restricted species self-pollinate (Wyatt 1984; Ornduff 1987; Dorrstock *et al.* 1996; Hopper *et al*. 1997; Wyatt 1997; Hopper 1999). Dorrstock *et al.* (1996) found that 57% of plant species were entomophilous in the outcrop system they investigated. Hopper (1981; 1999) found that a number of granite outcrop woody perennials in Western Australian are potentially bird pollinated.

Anemochory appears to be a common diaspore dispersal method (Porembski *et al*. 1994; Porembski *et al.* 1996). Dorrstock *et al.* (1996) found that up to 75% of species on the Ivory Coast granitic outcrops where anemochorous, although 77% were polychorous. Wyatt (1997) believed that in general diaspore dispersal was highly localized and was affected primarily by wind and water. Hunter *et al.* (1998) postulated that reptiles could effect dispersal of some outcrop taxa but that this was likely to be very localized.

Species on granitic outcrops also contend with low nutrient soils of high acidity. This has led to the occurrence of a high number of carnivorous species (Dorrstock *et al.* 1996; Hopper 1999). Dorrstock *et al.* (1996) believed that the nutrient deficiencies of the soil also favoured the production of very small diaspores produced in large numbers. The fire refugial aspects of outcrops have also permitted the persistence or evolution of obligate seeder life history traits that often are contrast with features of the surrounding flora (Gillham 1961; Erickson *et al.* 1973; Ashton & Webb 1977; Fuls *et al.* 1992; Binns 1995a; Groger & Barthlott 1996; Beard 1997; Hopper *et al.* 1997; Heinze *et al.* 1998; Hunter 1998a; Lawler *et al.* 1998; Hopper 1999).

It is clear that the lifeforms characteristic to of floras of granitic outcrops are those most commonly associated with arid environments, and that many physiological and gross morphological features of these taxa are adaptations to drought. Some adaptations also pertain to the ‘island-like’ nature of the granitic outcrop systems, particularly in terms of pollination and dispersal.

### 1.11.3 Evolutionary dynamics on granitic outcrops

Granitic outcrops are ancient landscapes. They are arid environments, often in contrast to more mesic surroundings. Many of the taxa on outcrops are relicts or at their distributional limit. In addition, populations are often small, inbreeding and prone to extinction. Such conditions provide opportunities for the investigation of living collections of discrete, yet integrated, natural evolutionary experiments (Bussell & James 1997).

Many narrow endemics have evolved and species characteristic of this habitat share many common adaptations. Wyatt and Fowler (1977) proposed an island-hopping model to account for the discrepancy between the apparent antiquity of the flora and the relatively recent origin of specific outcrops. The habitat and flora are much older than the age of any one exposure. While individual outcrops have not persisted indefinitely, collectively outcrops of hard crystalline rocks have been available for occupation throughout angiosperm history (Burbank & Platt 1964; Murdy 1968; Axelrod 1972). Outcrops are exposed gradually in a patch like manner resulting in a series of discontinuous basement sites (Axelrod 1972). Main (1997a) believed that the evolution of many characteristic outcrop groups probably began in the Tertiary along with the development of sclerophylly. Outcrops have thus facilitated genetic divergence and speciation (Hopper *et al.* 1997).

Outcrops are believed to be sites with low levels of competition due to the harsh environment (McVaugh 1943; Baskin & Baskin 1988; Ware 1990; Ware & Pinion 1990; Porembski *et al.* 1994). Where species are at the edge of their range they may become saxicolous as the outcrop habitat may afford protection under unfavourable regional conditions and can offer a refuge from competition (Davis 1951; Murdy 1968; Baskin & Baskin 1988; Burke *et al.* 1998). Catastrophic selection on the marginal population could result in narrow edaphic endemics (Davis 1951; Baskin & Baskin 1988). Davis (1951), however, believed that evolution of this kind even at the species level was not progressive and that such species could do little but maintain themselves and that extinction would be inevitable.

Species that are largely or entirely restricted to granitic outcrops are prone to further selection due to having small populations existing in isolation (Murdy 1968; Chapman & Jones 1971; Axelrod 1972; Sampson *et al.* 1988; Bussell & James 1997). A few intensive genetic investigations have occurred regarding rock outcrop restricted species within Australia. Moran and Hopper (1983) showed that the genetic diversity within populations of *Eucalyptus caesia* was remarkably low. However the level of population differentiation was the highest reported for a tree species. The diversity estimates were more typical of an inbreeding annual rather than a tree species. In a study of the genetic variation within *Eucalyptus crucis*, Sampson *et al*. (1988) found that the heterozygosity of populations was low compared with other tree species. The level of population differentiation was as expected for small isolated populations undergoing genetic fixation from genetic drift. Bussell and James (1997) in summarising much of their work on *Isotoma petraea*, concluded that outcrops preserve a record of change both within single populations and across population systems. They are windows on evolutionary processes.

In contrast to the edaphic narrow endemism that has occurred on a number of granitic outcrops, research indicates that some widespread ruderals may have had their origin on granitic outcrops. These xeric sites can be regarded as perpetual pioneer areas somewhat similar to disturbed localities (Axelrod 1972; Wyatt & Fowler 1977). Outcrop endemics have occasionally been found off outcrops in disturbed habitats where there is high light and low competition. Some 'weedy' species of early successional sites may have originated on outcrops and spread more recently to sites disturbed by human activities (Porembski 1995; Porembski *et al* 1996; Hopper 1999).

# Methodology

## *2.1 Survey design*

The survey was carried out in a randomly stratified way in order to sample and replicate the major environmental changes. The compilation of 100 quadrats specified by the contract constitute the first half of the survey. The quadrats were divided proportionately between combinations of three major environmental variables. Specialised communities are often missed in stratified sampling strategies. Often this is due to the their small area of occurrence or they were not known from the area under investigation. Additional sites were placed in specialised communities that were not included in the *a priori* sampling strategy or to stratified classes that were not replicated in the sampling design.

As only 100 quadrats were available for distribution only a small number of variables could be chosen as with the addition of each variable there is a marked reduction in replication. Altitude was also chosen as an environmental variable. Two altitudinal bands were chosen above 900 m (900-1250 m) and below 900 m (450-900 m). This altitude was selected as it corresponds to the rough cut off point of the Northern Tablelands and North Coast Botanical Districts. As forest type mapping had already been done via air photo interpretation over most of the reserve these groups were used as a basis of a second environmental variable. It was thought that these broad community groups could be a defacto for other environmental variables. Landform was selected as the third environmental variable. These broad community groups were approved by the steering committee and were used here for stratification purposes (Table 1).

The area in hectares was then used to proportionately distribute the 100 quadrats across the 15 classes. The number of plots allocated to each class was directly proportional to the area it occupied. The square root of the number of hectares was used so that proportionately less effort was given to larger areas. This enabled a more equitable distribution of sites.

Were a variable had enough sites other variations in aspect were considered. The basic stratification was modified in the field when the information used was found to be inaccurate.

**Table 1:** Environmental attributes and the classes within them used for stratifying sample sites. 15 environmental sub-classes were sampled.

| Environmental Attribute | Class | Number of subclasses |
|---|---|---|
| Altitude | 450-900 m | 7 |
| | 900-1250 m | 8 |
| Total | | 15 |
| Landform | Plateau | 3 |
| | Hill Slopes | 5 |
| | Lower Slopes | 2 |
| | Creek Lines | 4 |
| | Rock Outcrops | 1 |
| Total | | 15 |
| Forest association | Moist Open Forest (MOF) | 3 |
| | Dry Open Forest (DOF) | 8 |
| | Rainforest (RF) | 1 |
| | Woodland (WO) | 3 |
| Total | | 15 |

### *2.2 Site and species information*

Topological information was also collected along with measurements of altitude, slope, aspect and horizontal elevation. Altitude was taken directly from topographic maps. Slope and horizontal elevation were measured using a ‘SUUNTO Optical Reading Clinometer’. Horizontal elevation was measured at eight compass bearings. Aspect was measured using a compass with reference to magnetic north. Information on soil, fires and other disturbances was also collected in a form amenable to the site survey data sheets supplied by the Glen Innes District of the National Parks and Wildlife Service (Appendix A). Site location was derived from a Magellan Trailblazer XL GPS with reference to topographic maps.

Vegetation structure was derived using the system developed by Walker and Hopkins (1990). This method uses growth form, height and crown cover of the dominant taxa in each of the strata layers that are identifiable. Individual taxon data for each quadrat was recorded using the species data forms supplied by the Glen Innes District of the National Parks and Wildlife Service (Appendix A). Species were scored in accordance with a modified Braun-Blanquet (1982) cover abundance six ranking scale. Cover codes are as follows:

| Cover Code | Projected Canopy Cover |
|---|---|
| 1 | <5% few individuals |
| 2 | <5% any number of individuals |
| 3 | 6-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | >75% |

These methods will enable cross comparison of species records with other major vegetation surveys carried out by the New South Wales National Parks and Wildlife Service.

### *2.3 Vouchering*

The importance of vouchering is discussed by Hosking *et al.* (1996) who conclude that without vouchers one may as well not publish results. As Hosking *et al.* (1996) state, current taxonomic knowledge is continually changing, and what was once one species may be split into ten or vise-versa. Vouchers can be checked with up to date descriptions and nomenclature changes as they are published.

It is unreasonable and impossible to collect all taxa from all sites. During this survey where possible at least one sample of each taxon was collected. All taxa that could not be identified accurately without doubt in the field were sampled from each site and labled according to the site they were taken. Opportunistic sitings of taxa were also collected if they were not found in any of the previous survey sites.

A single complete as practicle set of taxa were prepared on field cards and retained by the Glen Innes District of the New South Wales National Parks and Wildlife Service. Additional good quality material of many taxa were also retained as vouchers and sent to the Coffs Harbour Botanic Gardens Regional Herbarium then to the National Herbarium of New South Wales (NSW) as a second choice and further duplicates were sent to NCW Beadle Herbarium (NE) and other recognised herbaria if available.

### *2.4 Data management*

'Paradox 7 for Windows' (1995) a relational database, was used for data management, validation, storage and retrieval. 'Parent' tables were created with verified information that was used for data entry in 'Child' tables allowing consistency in data entry (for example the spelling of species names (Campbell 1984; McKenzie 1991; McKenzie *et al.* 1991)). Three 'parent' tables were created to store information with six 'child' tables used for referential integrity, validation and data entry. The three primary tables stored information relating to the taxa found the quadrats placed. The region number and site number were the relational fields used to link the three main tables. These three record values are unique and duplicate values were not accepted by the database. The system was designed to minimise the number of keystrokes, and allow for subsequent specimen determinations and results of analyses to be incorporated later without disruption. Field data collected during a single field trip were added either at night in the field on a 'note book' computer or immediately on the days after returning from the field on the main computer. Thus, discrepancies could be sorted out while the relevant survey sites were fresh in the mind.

Sorted data was exported to EXCEL spreadsheets prior to analysis. All site and species attributes are presented in EXCEL spreadsheets and included in the electronic form of this document that is held with the Glen Innes District of the New South Wales National Parks and Wildlife Service.

### *2.5 Multivariate Analysis*

Initial exploratory analysis of  sites was conducted using classification and ordination techniques available in PATN: Pattern Analysis Package (Belbin 1995ab). PATN was developed for manipulation, analysis and display of patterns in multivariate biological data (Belbin 1995a). Both classification and ordination were performed on data as each technique is complimentary and the use of both highlights anomalies produced by the other (Gauch 1982). Ordination will detect natural clusters if they are present and highlight overall trends clarifying relationships alluded to with classification (Belbin 1991; Belbin 1995a). However, strong discontinuities in survey data can affect the way ordination techniques display continuous variation (Faith 1991). Classification techniques will impose groups on continuous data even if they are not present (Belbin 1991; Faith 1991; Belbin 1995a). In such situations ‘chaining’ may occur whereby samples grow by accretion one by one rather than by fusion with other clusters (Goodall 1980). Even in such situations utility can be found in imposed divisions (Gauch 1982). Classification is useful in detecting outliers that may affect ordination procedures (strong discontinuity). This technique also aids in the detection of smaller groupings or trends within the data that may be difficult to see from an ordination where groupings may be less obvious (Faith 1991).

Site classification was achieved using the Kulczynski association measure that has proven to be a superior measure of association with ecological data (Faith et al. 1987; Belbin 1995b). Agglomerative hierarchical clustering using flexible UPGMA (Unweighted Pair Group arithMetic Averaging) was used for group joining, this optimises the hierarchy and not the groups. UPGMA gives equal weight to objects not groups in the fusion process thereby groups are weighted proportionally to the number of objects contained (Belbin 1995b). This method has been widely tested and is the most frequently used classification technique (Gauch 1982; Belbin 1995b) and it provides the best fit between the association measure and the distances implied from the dendrogram (Belbin 1991). Flexible UPGMA enables the value of β, which ranges from –0.1 to 1.0 to be changed, this controls the amount of space dilation during the fusion process (Belbin 1991; Belbin 1995b). A β value of –0.1 was used to enable slight dilation to occur; this has been shown to better recover known partitions (Belbin 1995b).

Semi- Strong- Hybrid Multidimensional Scaling (SSH) was used as the ordination technique. Multidimensional scaling (MDS) moves objects around in a space defined by the number of dimensions chosen and the dissimilarities among sites in terms of their composition (Faith 1991; Belbin 1991). SSH calculates the level of stress, which is the miss-match between distances between points and the best estimate of the same values (Belbin 1995b). Subsequently all points in the initial ordination are moved slightly to reduce stress, this process is iterated a specified number of times or until a minimum stress is achieved (Orloci 1978; Belbin 1995b). MDS has been shown to be a robust method (Minchin 1987; Faith 1991). SSH has the advantage of being designed to cope with unimodal responses of taxa replacing the assumption of linearity used by many other ordination procedures (see e.g. Noy-Meir & Whittaker 1978; Orloci 1978; ter Braak & Prentice 1988; Faith 1991; Belbin 1995a).

The number of groups to be recognised can be based on a number of a priori methods. The point at which a leveling of a scree plot of dissimilarity and number of fusion points occurs can be an indication of the optimal cut off point. At such a point, many clusters are formed at essentially the same linkage distance. Binns (1995b) described understorey communities using the same analyses procedures within the same area at a dissimilarity of 0.8.

'Canonical Correspondence Analysis' (CCA) via CANOCO (ter Braak 1987—1992) was used for exploration of site attributes and their affects on site ordination. CCA is a multivariate direct gradient analysis technique for the analysis of patterns of variation in community composition that can be explained by environmental variables. The technique is based on the reciprocal averaging algorithm of Correspondence Analysis (CA). In CCA the axis of the ordination is constrained to be linear combinations of the environmental variables (i.e. direct gradient analysis), which enables the analysis to handle complex environmental gradients. A major advantage of this type of analysis is it assumes a unimodal Gaussian response of taxa which is more ecologically realistic (see e.g. Gauch 1982, ter Braak 1986; Sparrow 1990; Austin 1991; Faith 1991), but it is also robust to significant departures from this (Gauch 1982; ter Braak 1986; Palmer 1993).

Forward selection of variables was used for data reduction, ranking of variable importance and significance testing (ter Braak & Verdonschot 1995). This was achieved by using the forward selection module on CANOCO. Here the variation explained by each variable is partitioned and a model of significant variables is constructed, i.e. all environmental variables are ranked based on the fit of each variable separately. The significance of the effect of each variable is tested by a Monte Carlo permutation test (in this case 99 iterations). A variable was added if its significance was at the 5% level or less. As each variable is selected, the remaining variables are reassessed based on the fit that each variable gives in conjunction with the variables already selected (ter Braak &

Verdonschot 1995). Forward selection ceases when the significance based on the Monte Carlo tests is greater than 5%. The overall significance of the CCA ordinations was tested by Monte Carlo permutation (99 iterations) of residuals of the taxa after fitting co-variables and environmental variables (ter Braak 1992).

### *2.6 Significant vascular plant taxa within the reserve*

Three main sources of information were used initially to assess the significance, in terms of rarity, of any taxa found within the reserve. The national list of rare or threatened Australian plants (ROTAP) (Briggs & Leigh 1996) along with the New South Wales Threatened Species Conservation Act 1995 (TSC Act) was used as a primary indicator of national and state significance. The regional significance of taxa was assessed with reference to the publication Significant Vascular Plants of Upper North East New South Wales (Sheringham & Westaway 1995; and 1998 unpublished update). Additionally, local botanical knowledge as expressed in the many published and unpublished survey reports and the personal experience of the author was used as a final source of information.

### *2.7 Analysis of evenness*

The distribution of abundances amongst species in communities is a basic feature that is best measured by evenness (Smith & Wilson 1996). When a species is present in equal abundance a high evenness is the result, but, if species differ widely in their abundances then the community has low evenness. Evenness is essentially one of two components of species diversity, richness being the other (Hill 1973; Pielou 1977; Smith & Wilson 1996).

A number of evenness indices have been proposed, many of which are measures aligned to diversity (Smith & Wilson 1996). Camargo (1993) proposed a measure of evenness called Evar. Smith and Wilson (1996) conducted tests on a number of evenness indices and concluded that Evar was the best index of evenness for general use. This index is independent of species richness and is symmetric to degrees of abundance. In addition Evar provides a good Molinari shape (i.e. responds well to changes in evenness) and although it has a few minor problems it is the only index with no severe problems (Smith

& Wilson 1996). Evar is based on the variance in abundance over species and is calculated by the following formula:

$$E_{\mathrm{var}} = 1 - \frac{2}{\pi} \arctan\left\{ \sum_{s=1}^{s} \left( \ell n(\chi_t) - \sum_{t=1}^{s} \ell n(\chi_t) / S \right)^2 \right\} / S$$

This variance is taken over log abundances, to examine the proportional difference, and to ensure the index is independent of the units used. The variance is then converted to a 0-1 range, with 0 being the minimum evenness and 1 the maximum (Smith & Wilson 1996).

## *2.8 Observations and experiments on fire and outcrops*

Fire responses of species found within the reserve have been determined as far as practically from records contained in previously published literature and the results of these are presented even when they are potentially contradictory.

The following experimental design is incorporated here from the work of Hunter (1999). This research has been included in this document as it was a trail that was carried out within Bald Rock National Park and at present this work is not readily available in a published format.

### 2.8.1 Opportunistic observations and qualitative autecological methodology

During the survey period many large and intensive fires occurred during November 1994 and February 1995 throughout Bald Rock National Park. This enabled fire responses to be recorded for taxa and some autecological information to be gathered. Qualitative information on changes in structure and floristics after fire was gathered at Bald Rock and Girraween National Parks. Populations of *Muehlenbeckia costata* was followed across its range for two years between 1994 and 1996. Although no quadrats were formally placed prior to fire, sites had been visited prior to wildfire in planning stratification methods and inspection of access trails, and notes were taken during these visits on dominant species on outcrops. These notes, and the changes recorded subsequently, constitute important qualitative information on changes in structure and floristics after fire.

### 2.8.2 Seed germination experiments

*Muehlenbeckia costata* (Polygonaceae) is dioecious, with stems procumbent and weakly climbing. The stems may reach up to 5 m in length radiating from a central rootstock. The leaves are ovate, oblong to almost triangular, 3-14 cm long, 1-9 cm wide with a cordate base and crenulate margins. The nuts are trigonous with a hard, black and rugose coat. The perianth is initially green, but as the nut matures it becomes orange and fleshy and elongates and swells to enclose the nut, becoming the diaspore.

Diaspores were collected from taxa in the field and each subjected to 24 separate treatments. Heat treatments were; no treatment, 60°C, 80°C, 100°C and 120°C (each for ten minutes). Other treatments included smoking with native fuel, scarification via sandpaper, fungicidal treatment with Benlate 0.5g/l, phosphate buffering (pH 4.2) and the associate controls. Germination trays were randomized in incubators. All diaspores were incubated on a 12 hr day and 12 hr night light cycle and temperature variation of 20°C at night and 30°C by day. Numbers of germinated seeds were checked once a week for 8 weeks.

*Muehlenbeckia costata* seeds were collected from mature plants with additional small amounts of seed gained from neighboring soil. A total of 25 *M. costata* seeds were placed in each treatment tray (600 seeds) with an additional 200 seeds used for viability tests.

The viability of seeds was ascertained using 1% 2,3.5-triphenyltetrazolium chloride (Tetrazolium) and confirmed using 0.05% indigocarmine. A viable embryo stains red by Tetrazolium the false positives (dead embryos) stain with indigocarmine (Kearns & Inouye 1993).

### 2.8.3 Experimental before and after fire trials

The experimental design was limited to ground vegetation as larger fires would be unmanageable and trees are only a minor component of outcrop floras. To enable direct comparisons with the surrounding flora only ground vegetation (i.e. not trees) was burnt in these communities as well. As outcrop species are thought to respond to increased light and removal of competition one of the treatments in the experimental design included removal of above ground biomass. Thereby a test is provided that will differentiate between the changes noted due to fire and those due to increased light and removal of competition.

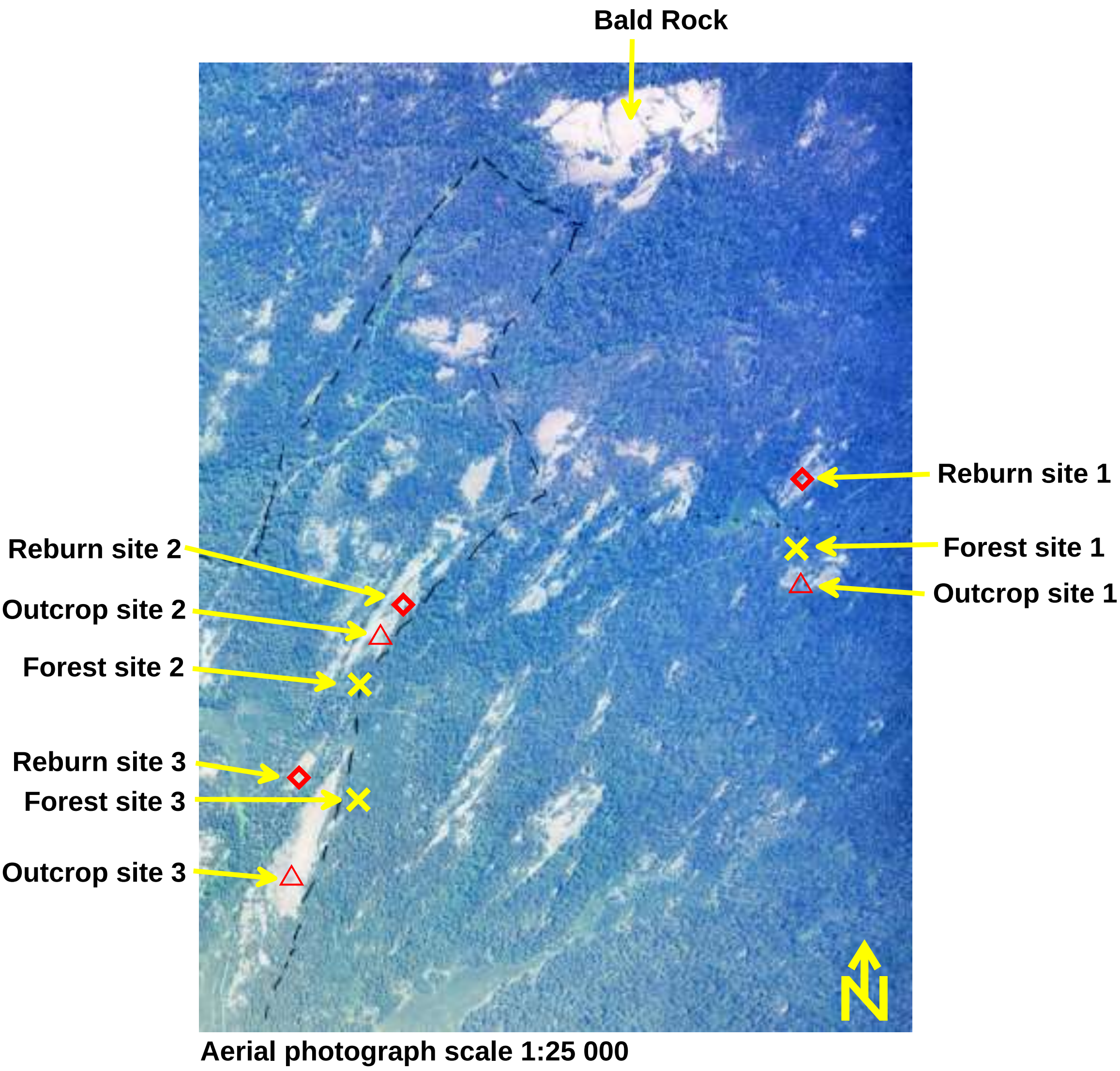


**Figure 10:** Location of fire experimental sites within Bald Rock National Park. Black dashed line represents approximate New South Wales and Queensland State border.

Three separate fire experiments were conducted between December 1995 and January 1996. Habitats chosen for investigation included granitic outcrops that had no evidence of previous fires, outcrops that had been burnt one year previously (December 1994) and adjacent areas of forest (Figure 9.1 & 9.2). Each of the fire trials incorporated a before and after control incident design (BACI) (Underwood 1992) whereby data was collected before the applied treatment and afterwards once a month for 12 months.

Experiment 1

Three separate outcrops were chosen for investigation (Figure 9). On each outcrop, six 2 m by 2 m plots were randomly placed within a vegetated patch. Three experimental treatments; clearing, burning and control were duplicated within the six plots by random selection (Figure 10). All above ground biomass was removed from the cleared sites beyond the boundaries of the plot. Plots that were to be burnt had all above ground biomass alighted by drip torches to the point where no above ground biomass was observable. Control plots were left unmodified (Figure 10).

Experiment 2

Three separate outcrops were chosen (Figure 9) that had had their standing biomass burnt during the fires of December 1994. Within each of these outcrops, 2 m by 2m plots were randomly placed and two were allocated to each of two treatments, burning and control. The same procedures as Experiment 1 were used.

Experiment 3

Three forested areas were selected in close proximity to the Experiment 1 sites (Figure 8). Within each site, four 2 m by 2 m plots were randomly placed and two were allocated to each of two treatments, burning and control. The same procedures as given in Experiment 1 were used.

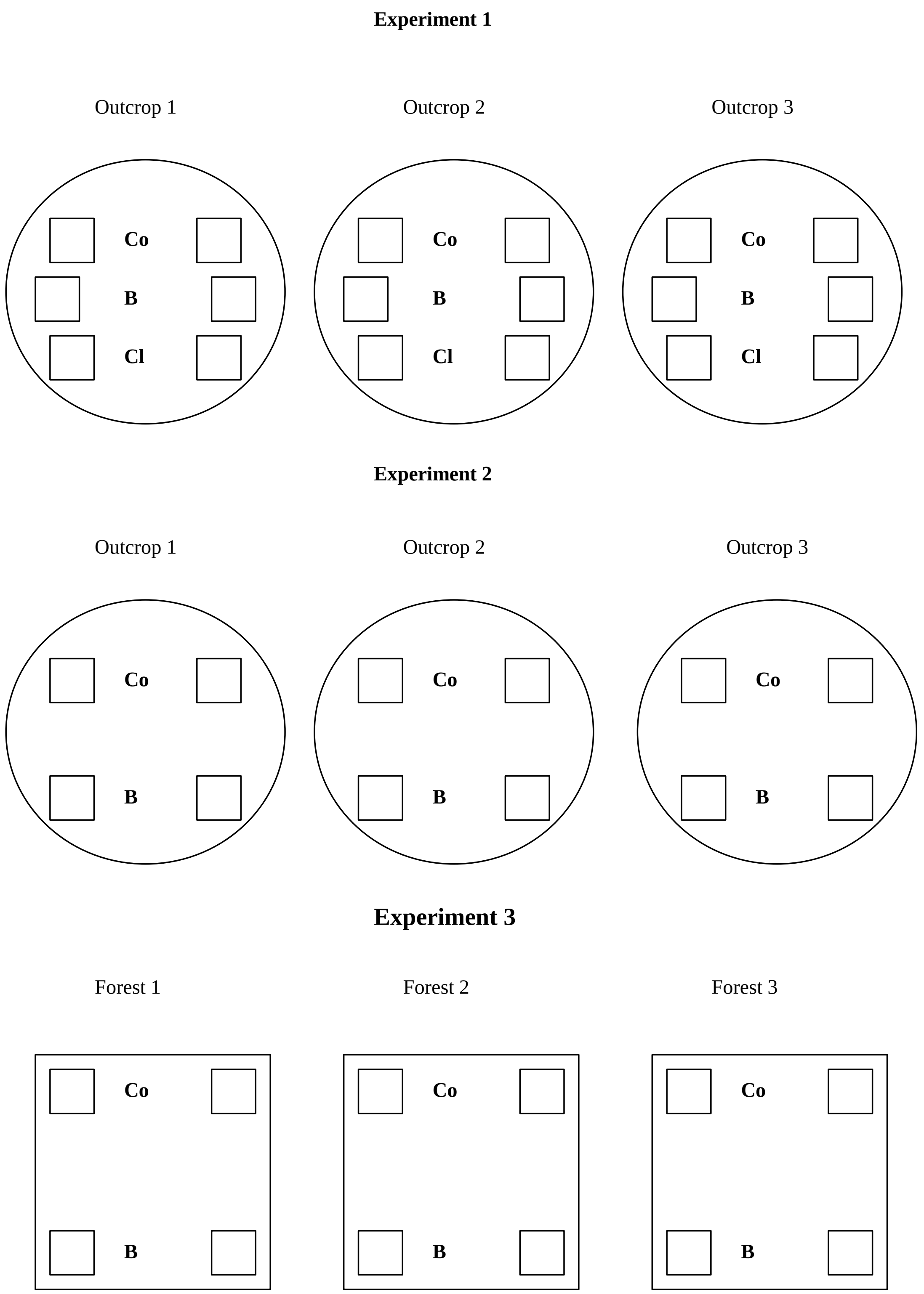


**Figure 11:** Graphic representation of experimental design. Experiment 1 includes three treatments times two on three separate unburnt granitic outcrops. Experiment 2 includes two treatments times two on three separate previously burnt outcrops. Experiment 3 includes two treatments times two within three adjacent forest patches. Co = Control treatment; B = Burning treatment; Cl = Clearing treatment.

Each of the 42 experimental plots was 2 m by 2 m in area. The corners of each plot were marked by of 1.5 m tall wooden stakes. A 2 m by 2 m 'grid' of durable cord was created, consisting of 16 squares each measuring 50 cm by 50 cm. This grid was hooked over each of the four corner posts (Figure 11) and moved, up or down, depending on the height of the plants. Every plant species present within each plot was given two scores out of sixteen: a relative abundance score, based on presence or absence of primary rooting in each of the sixteen sub-squares, and a cover score, based on presence or absence of projective foliage cover. The size of each plot enabled the whole plot to be viewed equitably with little distortion, allowing accurate scores to be recorded for each species.

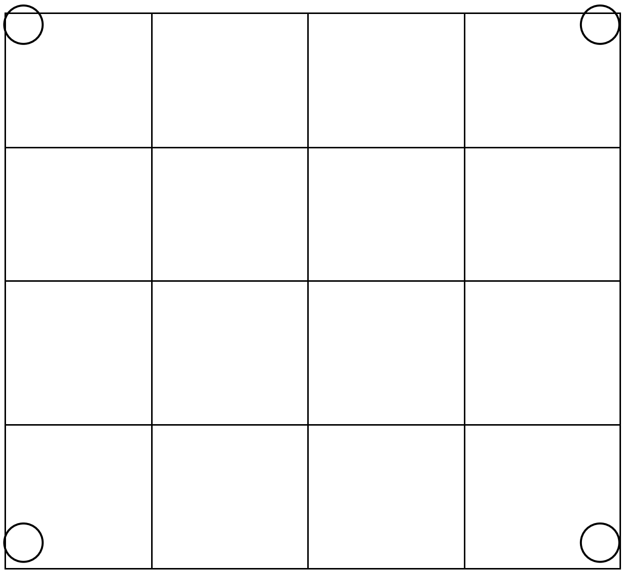

**Figure 12:** Diagram indicating Grid made to fit over corner posts of experimental plots enabling cover and frequency counts to be made for each species found.

The 42 experimental plots were surveyed once before treatments were applied and thereafter once a month, when possible, for a period of one year. During May of 1996, extensive rains and flooding occurred in the area making access impossible. In both September and November of 1996 extensive fires occurred in the general vicinity of the experiment making access to plots dangerous.

Richness and diversity were calculated for each plot (42 actual plots) at each monthly recording session (402 temporal plots in total). Richness is the number of species in each plot and diversity was measured by the Simpson diversity measure. Diversity measures differ primarily in the degree to which they emphasize species richness versus species evenness. In temporal comparisons the number of species is often of less importance, compared to, relative abundance, due to competitive displacement or extinction. When changes in relative abundance is of importance Simpson's *D* is an appropriate measure of diversity as it emphasises evenness (Huston 1994). Krebs (1985) considered that such a method summarises most of the biological information on diversity. The relative cover score out of 16 was used in all calculations as a direct substitute for abundance. Univariate analyses were conducted using ANOVA techniques and direct comparison of plotted scores. Multivariate analyses were performed using PATN and CANOCO (see previous sections for details of these procedures.

### *2.9 Coleman curves*

Coleman curves represent the means of repeated sampling of all pooled samples. The smoothed Colman curves thus represent the statistical expectation for the corresponding acummunaltion curve. Coleman curves are different from accumulation curves which record the total number of species found with addition sampling (species area curves) as they are produced by repeated resampling of the species pool at random. Sampling is done without replacement within each resampling. This repeated randomised sampling produces a smooth rarefaction curve. Here the algorithym of Incidence-Based Coverage Estimator of species richness was used (ICE) to generate the data for estimating the potential total species richness (Lee and Chao 1994). During these simulations 200 random samplings were used.

# Results

### *3.1 Site stratification*

The basic stratification as outlined in the methods was completed. Some modification was necessary as some forest types were not as suggested by the information on the E-RMS. Furthermore, certain combinations did not exist. In total, the 175 stratified sites were sampled over a period of 20 field days (Figure 12) during January and August of 1994; May, July and August of 1995, October of 1997; December of 1998; January of 1999 and January of 2000.

### *3.2 Floristics*

A total of 898 vascular plant taxa were recorded during the collation of existing site data and subsequent extra sampling (Appendix B). Approximately 6% (52) of all taxa recorded were introduced. From the survey sites 656 taxa were recorded, the remaining 242 taxa were recorded from previous surveys within the boundaries of the present reserve and were not found during this investigation. This represents 14% of the total New South Wales Flora and 28% of the flora of north eastern New South Wales. The total number of taxa found within the reserve is of significance (Table 2) as with the exception of Gibraltar Range/Washpool all other surveys with greater richness are of entire management areas of 100000s of ha. Furthermore this survey, unlike the others of greater richness was conducted over an area of a single geological rock type. This richness is likely to increase significantly after stage two is completed.

The 898 taxa occurred in 135 families and 429 genera. The families with the greatest number of taxa are Poaceae (95), Fabaceae (81), Asteraceae (70), Myrtaceae (65), Cyperaceae (40), Orchidaceae (31), Proteaceae (25), Epacridaceae (22), Rutaceae (19), Dilleniaceae (15), Euphorbiaceae (15), Apiaceae (14) and Lamiaceae (13). The richest genera are: *Eucalyptus* (32), *Acacia* (25), *Hibbertia* (15), *Senecio* (13), *Pultenaea* (10), *Austrodanthonia* (9), *Juncus* (9), *Dianella* (9), *Leptospermum* (9), *Wahlenbergia* (9), *Austrostipa* (8), *Leucopogon* (8), *Pultenaea* (8), *Brachyscome* (7), *Lomandra* (7) and *Persoonia* (7).

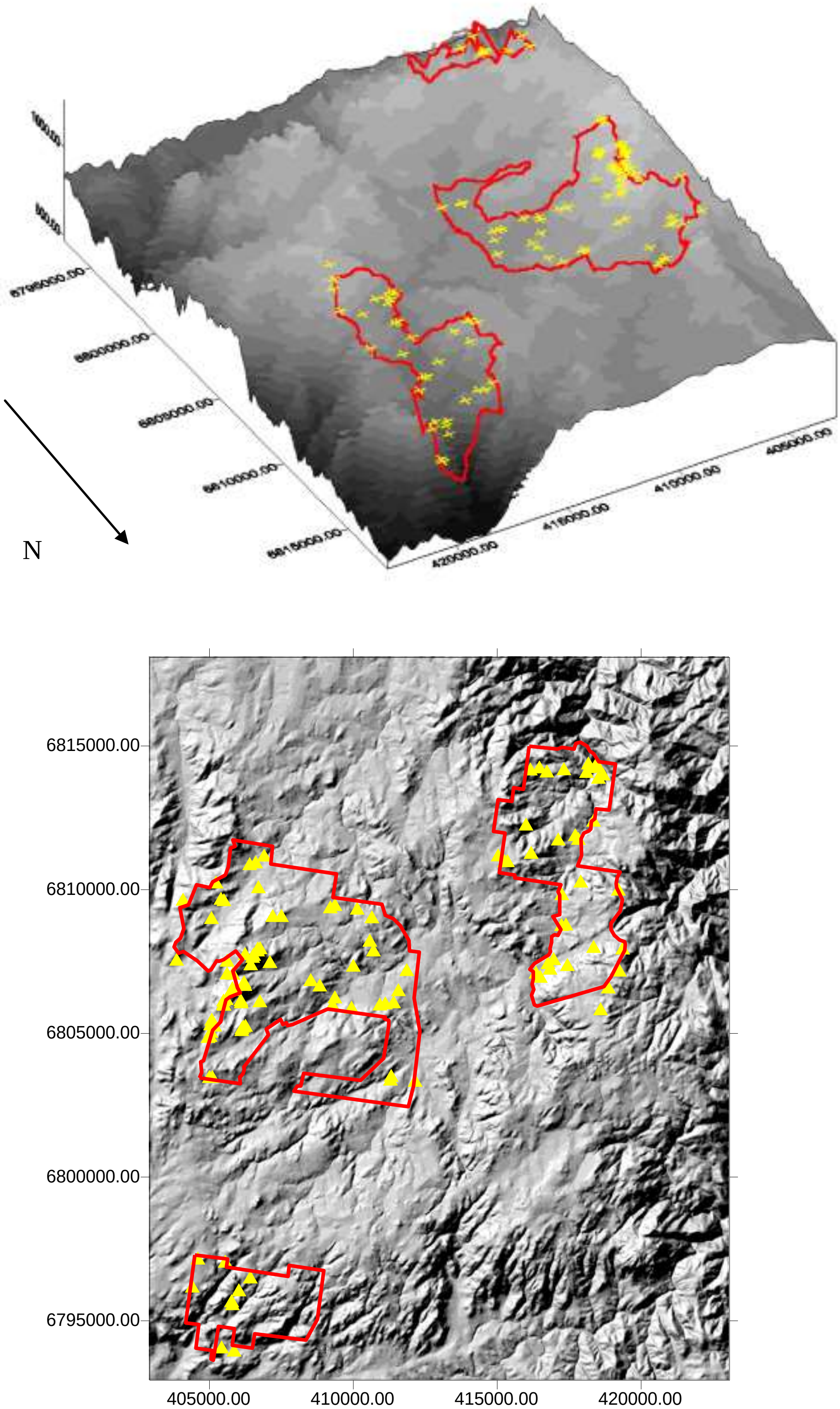


**Figure 13:** Distribution of the 114 sites surveyed during part 1 of the Bald Rock and Boonoo Boonoo National Park Vegetation Survey. The red line demarcates the boundaries of the part of relevance to part 1 of the survey. Sites are yellow triangles.

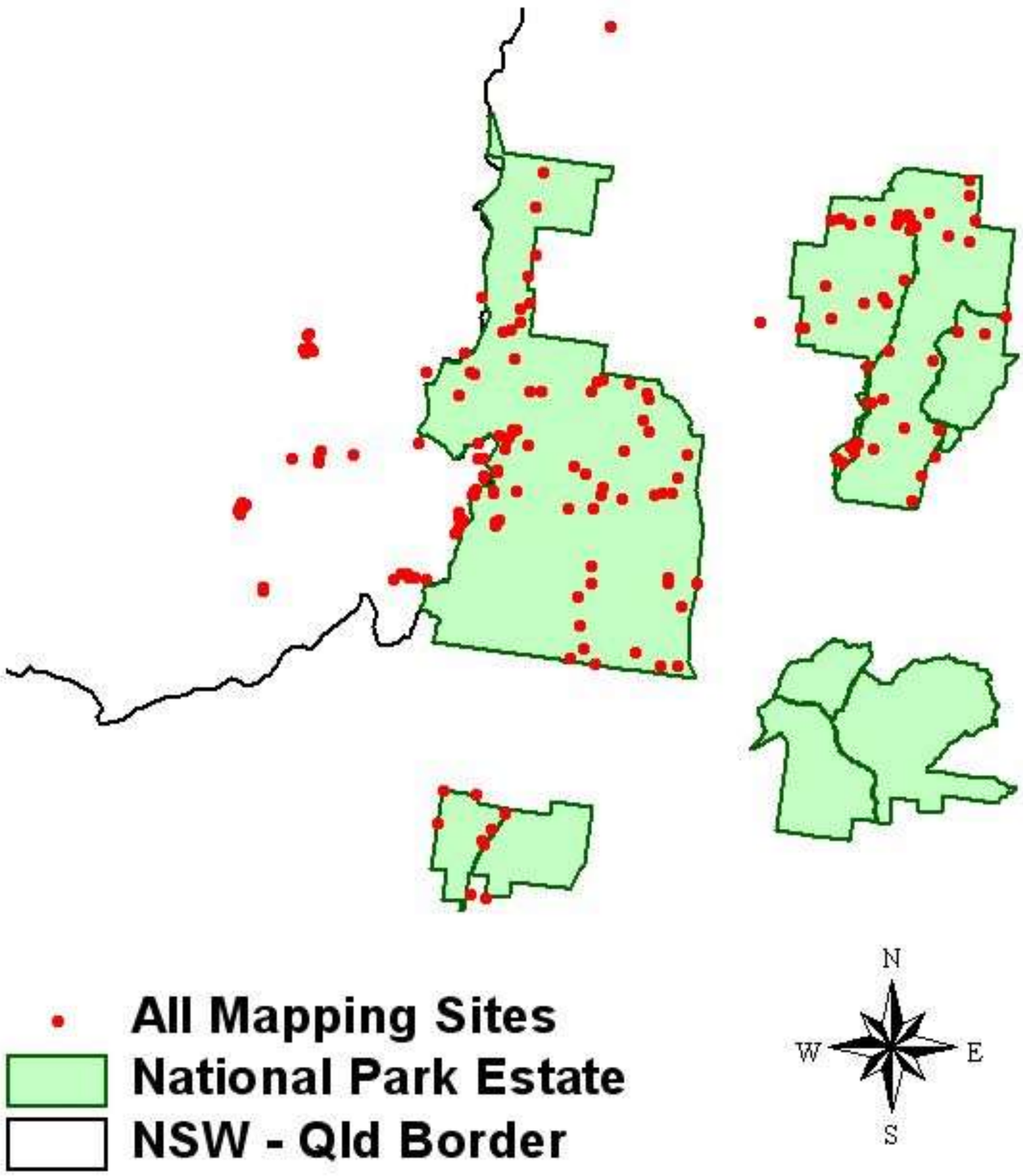


**Figure 14:** Mapped placement of all sites considered during the mapping of Bald Rock and Boonoo Boonoo National Parks. An additional 61 sites were incorporated into stage 2 mapping compared to stage 1 (previous figure).

**Table 2**. Comparison of species richness for other recently surveyed areas in the north-east of New South Wales.

| Number of Taxa | Introduced Species | Number of Sites | Mean Richness | *EPB&C – TSC –* RoTAP | Regional Diversity Index | Area Covered by Survey |
|---|---|---|---|---|---|---|
| 1069 | 10% | 151 | 52/0.1 ha | 37 | 220 | New England NP (Clarke *et al.* 2000). 151 20 x 50 m sites + extensive checklist over 30 yrs. |
| 946 | 10% | | 36/0.1 ha | 1 | 203 | Myall Lakes NP (Hunter & Alexander 2000). Compilation of 300+ survey sites. |
| 943 | 11% | 215 | ? | 35 | 207 | Werrikimbe (Hunter 2006). Formal + informal sites & checklists. |
| 926 | 6% | 264 | 42/0.1 ha | 19 | 214 | Capoompeta & Washpool Additions NPs (Hunter 2001a). |
| **896** | **5%** | **88** | **50/0.1 ha** | **26** | **208** | **Bald Rock & Boonoo Boonoo NP (*ibid.*) 20 x 50 m sites.** |
| 878 | 2% | 120 | 36/0.1 ha | 42 | 198 | Gibraltar Range & part of Washpool NP (Sheringham & Hunter 2002). 20 x 50 m sites. |
| 826 | 9% | 180 | | 21 | 184 | Nymboida NP (Benwell 2000). 20 x 50 m sites. |
| 752 | 5% | 201 | 60/0.1 ha | 34 | 168 | Torrington SP (Clarke *et al.* 1998). 0.1 ha sites. 152 species from previous records. |
| 740 | 7% | 94 | 43/0.1 ha | 17 | 193 | Mann River (Hunter 2002). |
| 666 | 5% | 101 | 40/0.1 ha | 9 | 158 | Part of Guy Fawkes National Park (Hunter & Alexander 1999b). 20 x 50 m sites |
| 507 | 31% | 87 | 38/0.04 | 8 | 143 | Warrabah NP (Hosking & James 1998). Also 20 x 20 m sites Meanders over many seasons and years. |
| 503 | 10% | 105 | 37/0.04 ha | ? | 53 | 1:100 000 Ashford Map Sheet (Le Brocque & Benson 1995). 20 x 20 m sites (290 taxa) and all additional records (213 extra taxa). |
| 502 | 11% | 69 | 40/0.04 ha | 19 | 155 | Bolivia Hill Nature Reserve (Hunter 2002d). 20 x 20 m sites. |
| 495 | 9% | 71 | 41/0.04 ha | 18 | 150 | Warra NP (Hunter 2001b). 20 x 20 m sites, and additional 32 x 32 m nested quadrats. |
| 657 | 8% | 170 | 36/0.04 ha | 11 | 144 | Mt Kaputar NP (Hunter & Alexander 2000a). 20 x 20 m sites. |
| 503 | 20% | 171 | 20/0.09 ha | | 108 | Kinchega National Park (Westbrooke *et al.* 2001). 30 x 20 m sites. |
| 503 | 10% | 105 | 37/0.04 ha | ? | 53 | 1:100 000 Ashford Map Sheet (Le Brocque & Benson 1995). 20 x 20 m sites (290 taxa) and all additional records (213 extra taxa). |
| 477 | 9% | 140 | 35/0.04 ha | 10 | 142 | Ironbark NR & *Bornhardtia* VCA (Hunter & Hunter 2003). 20 x 20 m sites. |

| Number of Taxa | Introduced Species | Number of Sites | Mean Richness | *EPB&C – TSC –* RoTAP | Regional Diversity Index | Area Covered by Survey |
|---|---|---|---|---|---|---|
| 460 | 9% | 48 | 38/0.04 ha | 17 | 130 | Severn River NR (Hunter 2000f) 20 x 20 m sites. |
| 448 | 11% | 124 | 22/0.04 ha | 2 | 105 | Narran Lake Nature Reserve (Hunter 2006). 20 x 20 m sites. |
| 450 | 11% | 164 | 25/0.04 | 5 | 101 | Dthiniia Dthinnawan Nature Reserve (Hunter 2006). 20 x 20 m sites. |
| 441 | 10% | 75 | 51/0.04 ha | 17 | 112 | Kings Plains NP (Hunter 2000h). 20 x 20 m sites. |
| 437 | 10% | 40 | 31/0.04 | 1 | 121 | Cataract NP & NR *ibid*. 20 x 20 m sites. |
| 434 | 21% | 50 | 36/0.04 ha | 9 | 123 | Arakoola NR (Hunter 2000d). 20 x 20 m sites. |
| 424 | 11% | 40 | 43/0/1 ha | 11 | 124 | Single NP (Clarke *et al.* 2000). 20 x 20 m sites. Lachlan Copeland *pers. comm.* |
| 422 | 14% | 125 | 25/0.09 ha | ? | 85 | Peery National Park (Westbrooke *et al.* 2002). 30 x 30 m sites. |
| 417 | 4% | 40 | 38/0.1 ha | 10 | 120 | Basket Swamp NP (Hunter 2002). |
| 410 | 35% | None | NA | ? | 140 | Attunga State Forest (Hosking & James 1998). Meanders over many seasons and years. |
| 407 | 17% | 101 | 40/0.04 ha | 5 | 116 | Kwiambal National Park (Hunter 1998d). 20 x 20 m sites. |
| 371 | 13% | 132 | 37/0.04 ha | ? | 80 | Goobang National Park (Porteners 1997). 20 x 20 m sites. |
| 367 | 8% | 48 | 41/0.04 ha | 7 | 113 | Bluff River NR (Hunter 2002d). 20 x 20 m sites |
| 365 | 2% | 40 | 52/0.1 ha | 5 | 124 | Demon Nature Reserve (Hunter *et al.* 1999). 32 x 32 m nested quadrats. |
| 345 | 4% | 38 | ?/0/04 ha | 1 | 103 | The Basin Nature Reserve. (Hunter & Copeland 2002, *unpublished*). 20 x 20 m plots. |
| 342 | 4% | 28 | 33/0.1 ha | 3 | 135 | Burnt Down Scrub Nature Reserve (Hunter 2000). 20 x 20 m sites. |
| 341 | 8% | 28 | ?/0.04 ha | 3 | 110 | Watson's Creek Nature Reserve (Copeland 2002, *unpublished*). 20 x 20 m sites. |
| 330 | 11% | 50 | ?/0.04 ha | 1 | | Coolah Tops NP (Binns 1997). 20 x 20 m plots |
| 324 | 8% | 36 | 33/0.4 ha | 2 | 97 | Maryland NP (Hunter 2006.). 20 x 20 m plots. |
| 320 | 12% | 77 | 34/0.4 ha | 1 | 109 | Melville Range NR (Hunter 2006) . 20 x 20 m plots. |
| 309 | 9% | 23 | ?/0.04 ha | ? | 112 | Stoney Batter Nature Reserve (Copeland 2002, *unpublished*). 20 x 20 m sites. |
| 240 | 8% | 42 | 28/0.04 ha | 1 | 51 | Culgoa National Park (Hunter 2005). 20 x 20 m sites. |

| Number of Taxa | Introduced Species | Number of Sites | Mean Richness | *EPB&C – TSC –* RoTAP | Regional Diversity Index | Area Covered by Survey |
|---|---|---|---|---|---|---|
| 237 | 10% | 21 | 34/0.04 ha | 1 | 88 | Boronga, Boomi & Boomi West Nature Reserves (Hunter 2006). 20 x 20 m sites. |
| 227 | 4% | 184 | ? | ? | 44 | Nombinnie NP & Round Hill NR (Cohn 1995). 30 x 30 m sites. |
| 211 | 13% | 15 | 37/0.04 ha | 0 | 90 | Curry's Gap NR (Hunter 2002). 20 x 20 m sites |
| 210 | 15% | 25 | 35/0.04 ha | 1 | 74 | Planchonella NR (Hunter 2006). 20 x 20 m sites. |
| 205 | 8% | 43 | 30/0.04 ha | 2 | 62 | Ngulin NR (*ibid.*). 20 x 20 m sites. |
| 203 | 20 | 20 | 38/0.04 ha | 0 | 101 | Yina Nature Reserve. (Hunter 2003). 20 x 20 m sites. |
| 200 | ? | ? | ? | ? | 47 | Macquarie Marshes Nature Reserve (NSW NPWS). |
| 199 | 11% | 45 | 21/0.04 ha | 2 | 55 | Budelah NR (Hunter 2006). 20 x 20 m sites. |
| 185 | 5% | 40 | 12/0.04 ha | 1 | 44 | Ledknapper Nature Reserve (Hunter & Fallavollita 2003). 20 x 20 m sites. |
| 181 | 11% | 22 | 35/0.04 | 1 | 74 | Imbota Nature Reserve (Hunter 2003). 20 x 20 m sites. |
| 175 | 14% | 14 | 36/0.04 ha | 1 | 85 | Gamilaroi Nature Reserve (Hunter 2006). 20 x 20 m sites. |
| 174 | 9% | 59 | 15/0.04 ha | 1 | 40 | Thilta Karra section Paroo Darling NP (Hunter & Fallavollita 2003). 20 x 20 m sites |
| 170 | 3% | 15 | 30/0.04 ha | 1 | 79 | Mt McKenzie NR (Hunter 2002). 20 x 20 m sites. |
| 161 | 12% | 15 | 25/0.04 ha | 0 | 63 | Midkin Nature Reserve (Hunter 2006). 20 x 20 m sites. |
| 155 | 17% | 22 | 37/0.1 ha | 2 | 49 | Kirramingly Nature Reserve (Clarke *et al.* 1998). 33 x 33 m nested sites. |
| 134 | 5% | 21 | 26/0.04 ha | 5 | 72 | Aberbaldie NR (Hunter 2005). 20 x 20 m sites. |
| 129 | 14% | 20 | 22/0.04 ha | 1 | 49 | Brigalow Park & Claremont Nature Reserves (Hunter 2006). 20 x 20 m sites. |
| 112 | 4% | 15 | 26/0.04 ha | 1 | 51 | Gibraltar NR (Hunter 2002). 20 x 20 m sites. |
| 107 | 8% | 15 | 25/0.04 ha | 0 | 39 | Careunga Nature Reserve (Hunter 2006). 20 x 20 m sites. |
| 90 | 2% | 7 | ? | ? | 25 | Derra Derra Ridge, Bingara (Benson *et al.* 1996). 20 x 20 m sites. |

## *3.3 Community definition*

The scree plot analysis indicates that the point of inflection lies near the 0.8 dissimilarity level thereby recognising 10 groups of species assemblages (Figure 13). This level of inference for community definition is the same as used by other investigators in the same bioregion after similar scaled investigations (e.g. Binns 1995; Hunter 1998; Hunter & Alexander 1999). The ten vegetation communities recognised are displayed in a summary dendrogram (Figure 8) that highlights three major larger groupings or floristic elements. These three larger assemblages appear to be related to an inferred moisture gradient based on the taxa associated with each. The ordination scattergram (Figure 14) with the ten classified groups displayed highlights the three major disjunctions in floristics. An eleventh community is recognised based on the stratified survey of granitic outcrops by Hunter (1999).

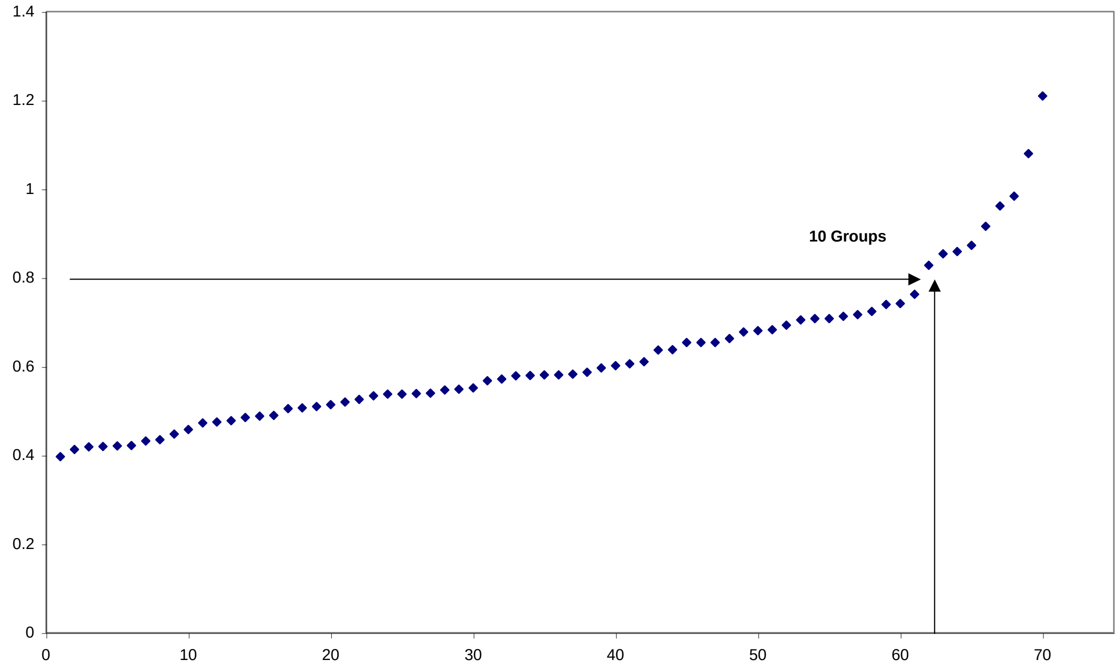


**Figure 15:** Scree plot of Kulczynski association measure and the flexible UPGMA fusion strategy results. The line of demarcation represents the cut off point for recognition of floristic groups (*c.* 0.8 dissimilarity, 9 communities). Note the groups are recognised near the point of inflection of the curve.

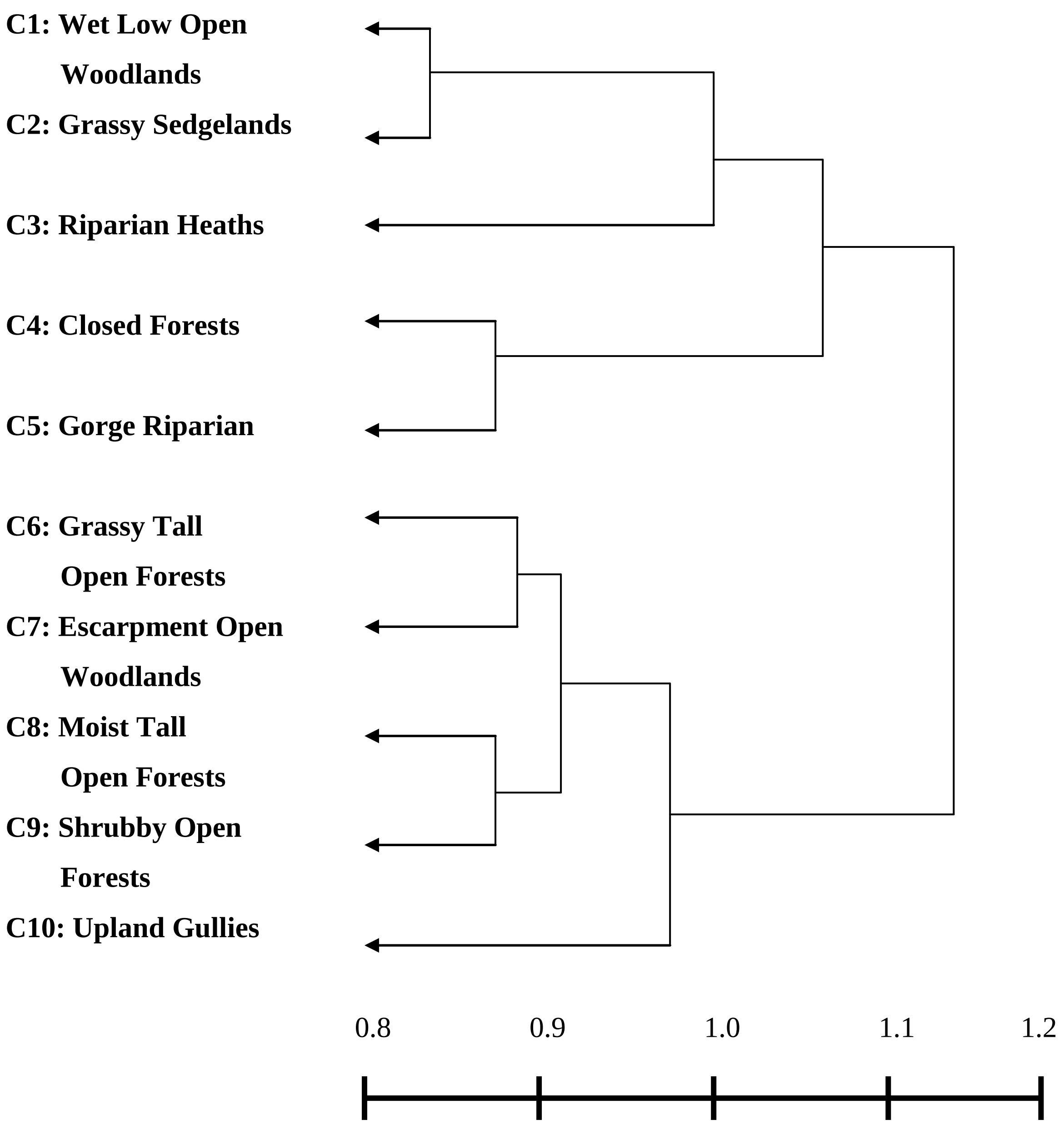


**Figure 16:** Summary dendrogram of full floristic dataset of non-outcrop of sites using the Kulczynski association and flexible UPGMA fusion strategy and a beta value of –0.1. Communities have been defined at a dissimilarity level of *c.* 0.8.

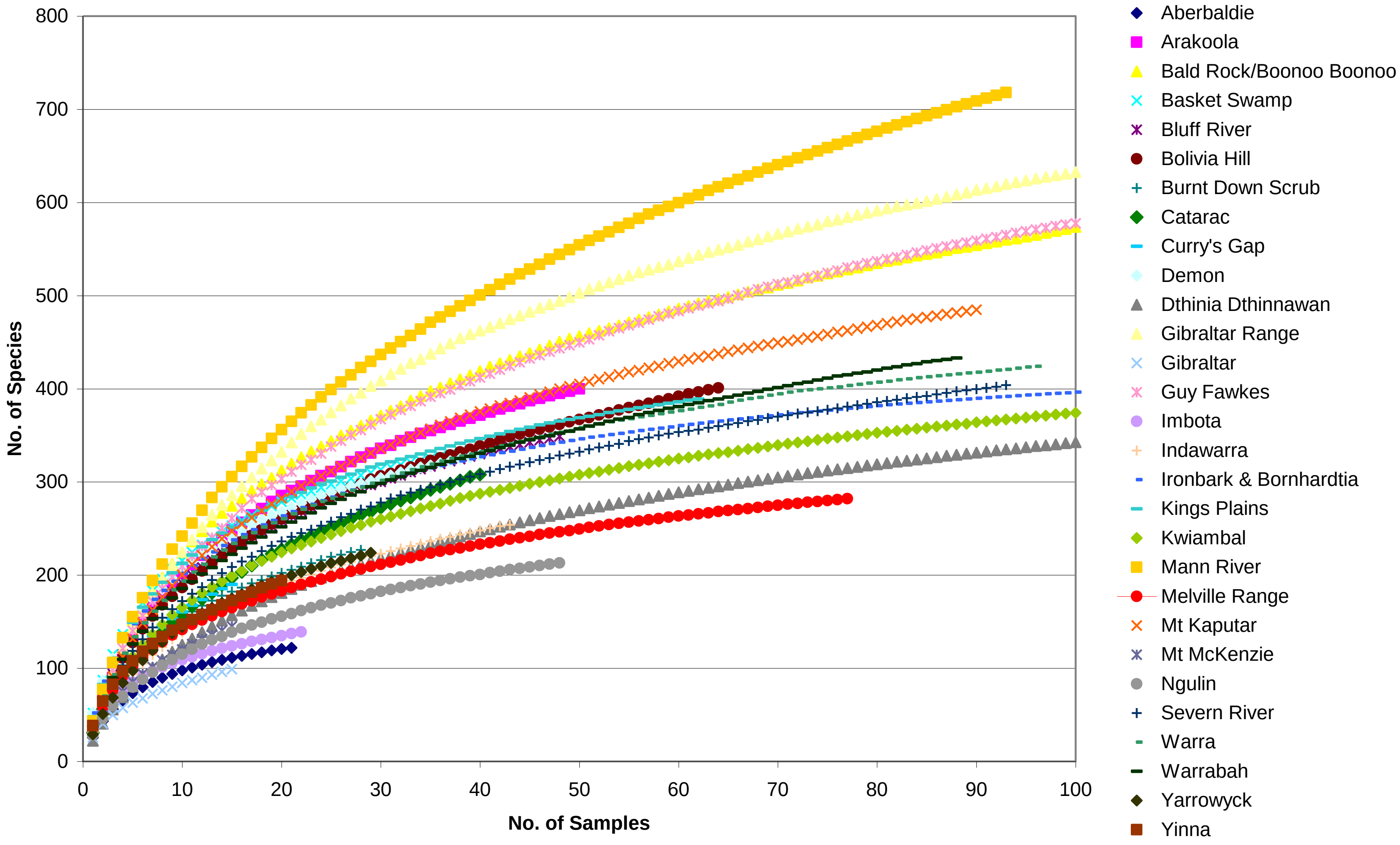


**Figure 17:** Species accumulation curves for selected sampled areas in northern New South Wales (NWS & NT).

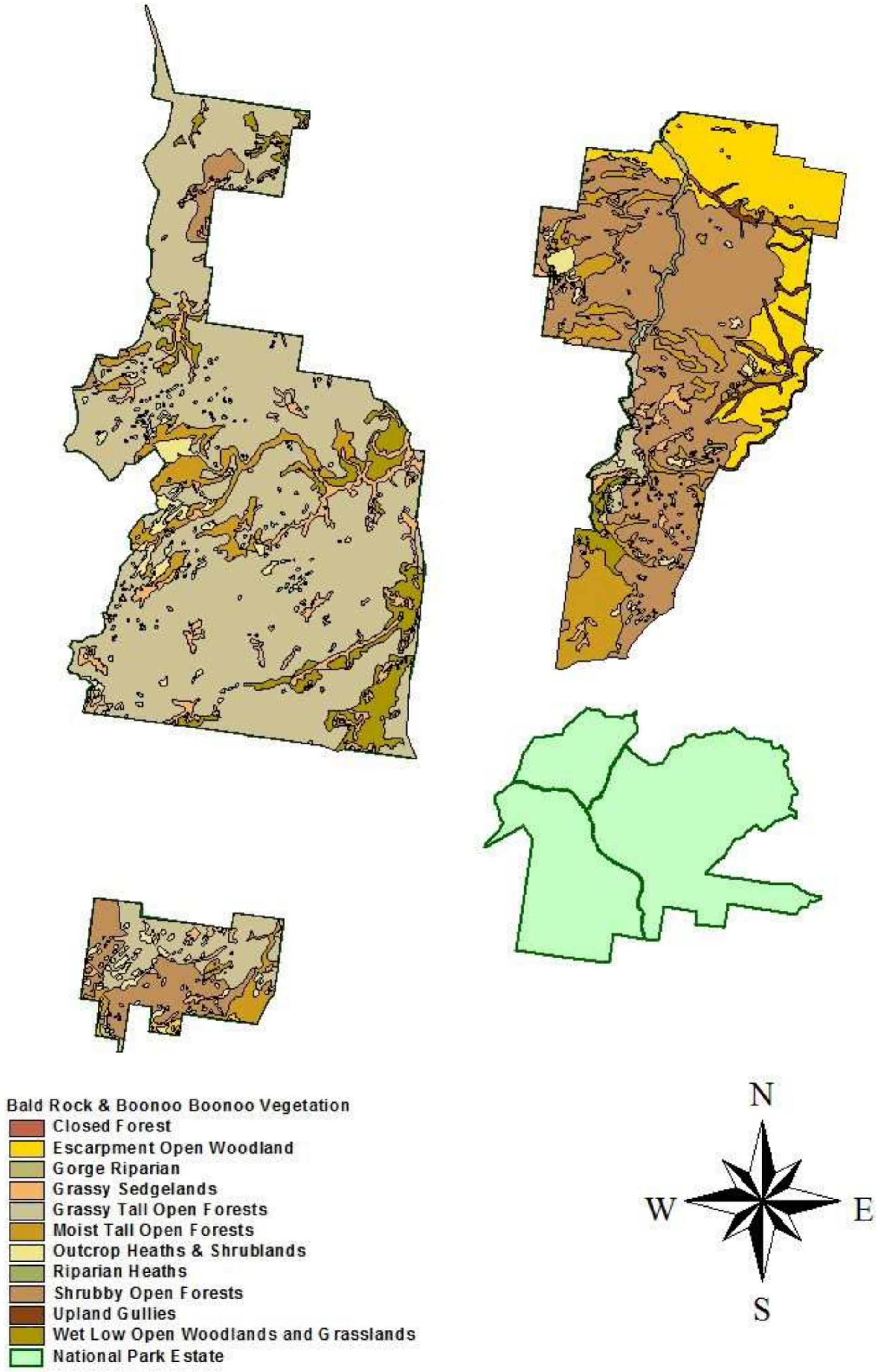


**Figure 18:** Mapped vegetation of Bald Rock and Boonoo Boonoo National Parks.

## *3.4 Description of plant communities*

Most of the communities within Bald Rock and Boonoo Boonoo National Parks are Tall Open Forests with either a predominantly shrubby or grassy understorey. Woodlands do occur but are of restricted distribution primarily within the minor occurrences of gorge and escarpment country or fringing open and poorly drained sites. Closed forests are rare and only exist at the bottom of Boonoo Boonoo Falls within the sections of the park surveyed. Sedgelands, wetter grasslands and wet heaths are common at level ground at the base of undulating hills, around the margins of creeks and rivers and occasionally in poorly drained sites high up on the plateau country. Heaths and shrublands associated with granite inselbergs are widespread, common and are at their best development within these parks. Eleven communities in total were defined and these are mapped and described below.

### 3.4.1 Community 1: Wet Low Open Woodlands

Wattle-leaved Peppermint (*Eucalyptus acaciiformis*) – White Sally (*Eucalyptus pauciflora*) Low Open Woodland.

**Sample sites (10):** 1, 2, 3, 37, 38, 89, 99, 100, 101, 106.
**Number of hectares:** 697 **Proportion of reserves:** 4.9%
**Landform:** Restricted to the margins of low-lying periodically waterlogged sites at higher altitudes.
**Distribution:** found both in Boonoo Boonoo and Bald Rock National Parks, primarily along major creeks and rivers with broad open valleys and also fringing the margins of small sedgelands.
**Structure:** Upper 1-25 m tall, 15-30% cover; middle 1-5 m tall, 30-80% cover; ground <1 m tall, 40-100% cover.
**No. of taxa:** 117 **No. of taxa per plot:** 46-64 (52 av.).
**Common natives:** Listed in decreasing order of importance (frequency and cover).
**Trees:** *Eucalyptus acaciiformis, Eucalyptus pauciflora, Eucalyptus eugenioides, Eucalyptus radiata* subsp. *sejuncta, Eucalyptus campanulata, Eucalyptus banksii, Banksia integrifolia, Allocasuarina littoralis, Eucalyptus nova-anglica.*

**Shrubs:** *Epacris microphylla* subsp. *microphylla, Callistemon pityoides, Leptospermum gregarium, Leptospermum arachnoides, Hakea microcarpa, Dillwynia phylicoides, Baeckea omissa, Leptospermum variabile, Pimelea linifolia, Leucopogon lanceolatus, Callistemon flavovirens, Bursaria spinosa* subsp. *obovata.*

**Climbers & trailers:** *Desmodium varians, Rubus parvifolius.*

**Ground cover:** *Themeda triandra, Imperata cylindrica, Oplismenus imbecillus, Gonocarpus micranthus, Entolasia marginata, Viola hederacea, Stylidium graminifolium, Sporobolus elongates, Juncus remotiflorus, Hypericum gramineum, Chrysocephalum apiculatum, Tricoryne elatior, Hydrocotyle peduncularis, Geranium solanderi* var. *grande, Euchiton sphaericus, Echinopogon caespitosus, Dichelachne parva, Austrostipa rudis* subsp. *rudis, Arthropodium milleflorum, Ajuga australis.*

**Introduced taxa:** *Hypochaeris radicata, Conyza bonariensis, Conyza albida, Taraxacum officinale, Conyza chilensis, Centaurium erythraea, Andropogon virginicus, Aira cupaniana, Paspalum dilatatum, Gnaphalium americanum, Axonopus affinis.*

**Percent of species introduced:** 9%.

**Variability:** each patch is quite divergent in terms of associated species and this probably relates to the small and isolated nature of each occurrence and past disturbance regimes. The community can be variable in structure and may contain a somewhat dense understorey of shrubs or be open and grassy and this relates primarily to the degree of waterlogging and proximity to water sources such as creek channels. However, the sites all share a very open and low woodland appearance.

**Condition:** generally poor to reasonable. This community has been the most highly effected by past disturbances such as clearing and grazing. Many trails exist that pass through this community. Many weeds exits in this community and it has the third largest incidence of weeds of all communities within these reserves and these weeds are some of the most invasive and hardest to remove.

**Taxa of conservation importance:** none apparent.

**Notes:** similar communities are described as occurring in waterlogged areas as far south as Gloucester/Chichester and Coolah Tops (Binns 1995a; Binns 1997) and Maryland National Park (Hunter 2006). However this type of association appears to be at or near their northern geographic limit within these reserves. Binns (1995b) considered that there were two forms of *E. dalrympleana* subsp. *heptantha* on the Northern Tablelands but these were probably ecotypes of no true taxonomic status. Binns believed there was a 'swamp form' of this taxon that occurred in areas of impeded drainage often with *E.*

*pauciflora*. Such a situation occurs within these reserves. Communities containing *E. pauciflora* are varied across the Northern Tablelands and it appears this taxon may link many somewhat distinct assemblages. Beadle (1981) describes the distribution of *E. pauciflora* as following valleys where cold air drainage and frosts occur; the soils are not waterlogged but are perennially wet. It appears that *E. pauciflora* is restricted to the slopes of valleys where cold air may collect but is replaced in waterlogged soils by *E. acaciiformis* and on drier hillsides by other species. Clarke (1998) describes a community with a similar association as being constrained to well drained valley slopes and alluvial flats at altitudes less than 1000 m within Boonoo Boonoo National Park. This however cannot be reconciled with the findings of this survey and the literature (e.g. Beadle 1981) that shows clearly in classification, canonical ordination and distribution that these assemblages are restricted to poorly drained sites at altitudes primarily above 1000 m.

**Conservation status:** assemblages such as these are isolated and small throughout the whole Northern Tablelands and are hence there is great variability between sites with many species of low constance. As such each occurrence is likely to be of conservation significance. Communities based on the overstorey dominants of *E. pauciflora* and *E. dalrympleana* are considered poorly conserved. Occurrences of similar assemblages are known to be reserved in the Western Washpool National Park (Hunter 1999), Basket Swamp National Park, Bolivia Hill Nature Reserve and the Demon Nature Reserve. Therefore, although these areas are restricted within the reserve they are of high conservation significance. *Eucalyptus nova-anglica* and *E. pauciflora* communities on sediments are listed as **endangered**.

**Management considerations:** only a small area of this community occurs within the reserve and subsequently active management may be more appropriate. Of particular concern is that most of the trail networks throughout the reserve pass through this fringing community and hence disturbance is constant. Weed invasion will thus always be an issue in this association as introductions from vehicles will be constant. Trails must always be kept to a high standard and not be allowed to deteriorate, particularly in the more waterlogged situations. Invasive weeds are an issue in this community and these will need constant management. Damage from stray cattle is still occuring in some areas. Pig rutting is a major cause of disturbance and weed introduction within this community and as such pig trapping and shooting will need to be a constant management practice.

**Figure 19:** Photographs of Community 1. Above = Site 44, below = Site 56 both from Bald Rock.

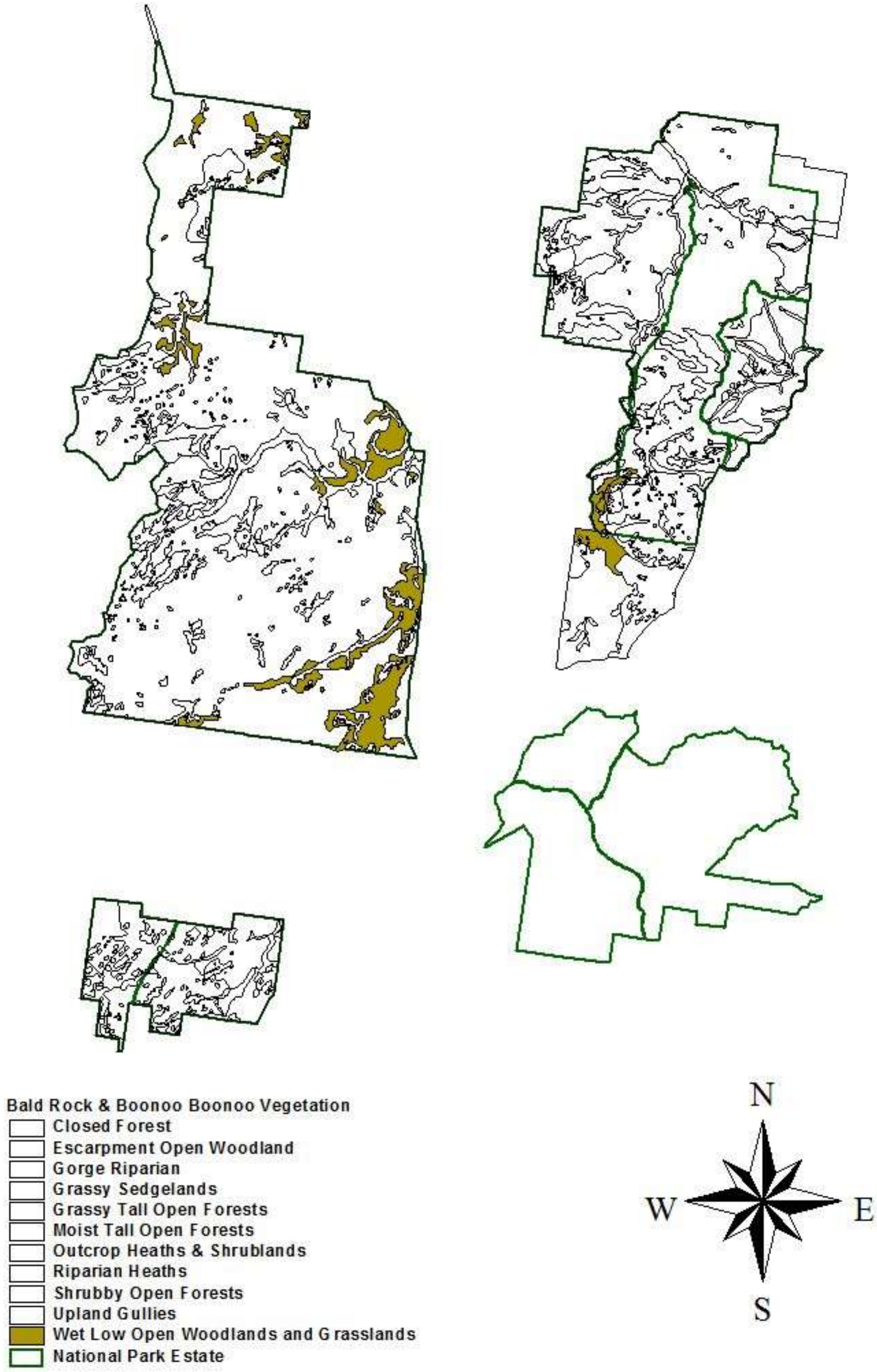


**Figure 20:** Mapped distribution of Community 1.

### 3.4.2 Community 2: Grassy Sedgelands

Kangaroo Grass (*Themeda triandra*) – Narrow Cord Rush (*Baloskion stenocoleum*) Grassy Sedgelands

**Sample sites (8):** 17, 19, 21, 29, 49, 86, 87, 108.

**Number of hectares:** 706 **Proportion of reserves:** 5%

**Landform:** restricted to low lying periodically or permanently waterlogged sites at higher altitudes.

**Distribution:** found throughout both reserves as small isolated patches at sites of impeded drainage within the upper catchments of creeks or as elongated occurrences along broad open valleys following drainage lines and their major tributaries.

**Structure:** Upper not always present 10-20 m tall, 10% cover; ground <1 m tall, 100% cover.

**No. of taxa:** 87 **No. of taxa per plot:** 29-38 (33 av.).

**Common natives:** Listed in decreasing order of importance (frequency and cover).

**Trees:** *Eucalyptus dalrympleana* subsp. *heptantha*, *Eucalyptus pauciflora, Eucalyptus brunnea, Allocasuarina littoralis.*

**Shrubs:** *Epacris microphylla* subsp. *microphylla, Pimelea linifolia, Hakea microcarpa, Baeckea omissa, Callistemon pityoides, Leptospermum arachnoides, Hibbertia acicularis, Boronia parviflora, Epacris obtusifolia, Banksia cunninghamii* subsp. *neo-anglica, Leptospermum gregarium, Grevillea juniperinum.*

**Climbers & trailers:** None apparent.

**Ground cover:** *Themeda triandra, Xyris complanata, Baloskion stenocoleum, Goodenia bellidifolia* subsp. *bellidifolia, Gonocarpus micranthus, Entolasia stricta, Hypericum gramineum, Thelionema grande, Selaginella uliginosa, Haemodorum planifolium, Geranium solanderi* subsp. *grande, Ranunculus lappaceus, Philothrix deusta, Lomandra longifolia, Drosera binata, Austrostipa rudis* subsp. *rudis, Viola hederacea, Viola betonicifolia, Poa sieberiana, Craspedia canens, Baloskion fimbriatum*.

**Introduced taxa:** *Andropogon virginicus, Conyza albida.*

**Percent of species introduced:** 2%.

**Variability:** this community had a number of species with high constance and many that were poorly associated. These communities are isolated, small and generally of limited distribution and as such although a number of species will almost always be present and dominant the other associated taxa are likely to be highly variable. The community as defined here may be visually separated into grass and cyperoid dominated areas. This internal variability within individual occurrences and this is primarily due to the proximity to water sources and therefore the effective period of inundation. Clarke (1998) further subdivided this association into four zones that were banded based on proximity to creek channels within Boonoo Boonoo National Park. This community intergrades with Community 1 along its margins. Described as Community 1: *Epacris microphylla – Leptospermum arachnoides/Themeda triandra – Gonocarpus micranthus* and Community 3: *Baeckea omissa – Epacris microphylla/Lepidosperma limicola – Baloskion stenocoleum* (the former occurring in drier areas and the latter in wetter locations) by Hunter & Bell (2007) in their region wide analysis of montane bogs. These bogs are the most northerly occurring Australian bogs and are at their climatic and distributional limit and are highly significant in these terms. These communities would conform to the , montane peatlands and swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and the Australian Alps bioregions have been listed as an **endangered** ecological community (TSC 1995; 17 December 2004).

**Condition:** across the two reserves this assemblage is generally considered to be in very good condition. However, some sites are particularly disturbed by pig rutting and by stray cattle, the signs of which were commonly noted. Furthermore, in areas of past habitation and grazing such as around the Boonoo Boonoo hut and down to the river and also in the upper reaches of Boonoo Boonoo River within Bald Rock National Park this community has a high incidence of invasive weedy taxa.

**Taxa of conservation importance:** *Thelionema grande*.

**Notes:** few completely comparable examples of this assemblage can be found within the literature. Similar associations are restricted to higher altitudes on the tablelands particularly on the eastern margin of the divide generally restricted to eastern flowing catchments from here south to the Sara River south east of Glen Innes (Hunter & Bell 2007).

**Conservation status:** communities such as these are usually highly divergent across relatively small distances and as such most occurrences are somewhat unique. Hunter & Bell (2007) in their region wide analysis have shown that this assemblage can be found within Capoompeta NP, Western Washpool NP, Mann River NR and Warra NP. Similar small isolated occurrences are likely to occur within most reserves on the escarpment and associated tablelands areas such down to Barrington Tops.

**Management considerations:** this community is prone to disturbance particularly from stray cattle and rutting from pigs. Service trails pass along side and across many examples of this community type. Most occurrences of this community within Bald Rock National Park have an associated trail running alongside them. Closure or at least minimal use of some of these trials may need to be considered. Such trails will need to be kept at a high standard and the effects of runoff in terms of erosion and weed invasion. Disturbances and weed invasion are likely to be greater after fires. Control of weeds and introduced pests will be a constant management issues. This community is also threatened by influxes of nutrients and climate change.

**Figure 21:** Photographs of Community 2. Above = Site 29 within Boonoo Boonoo, below = Site 49 within Bald Rock.

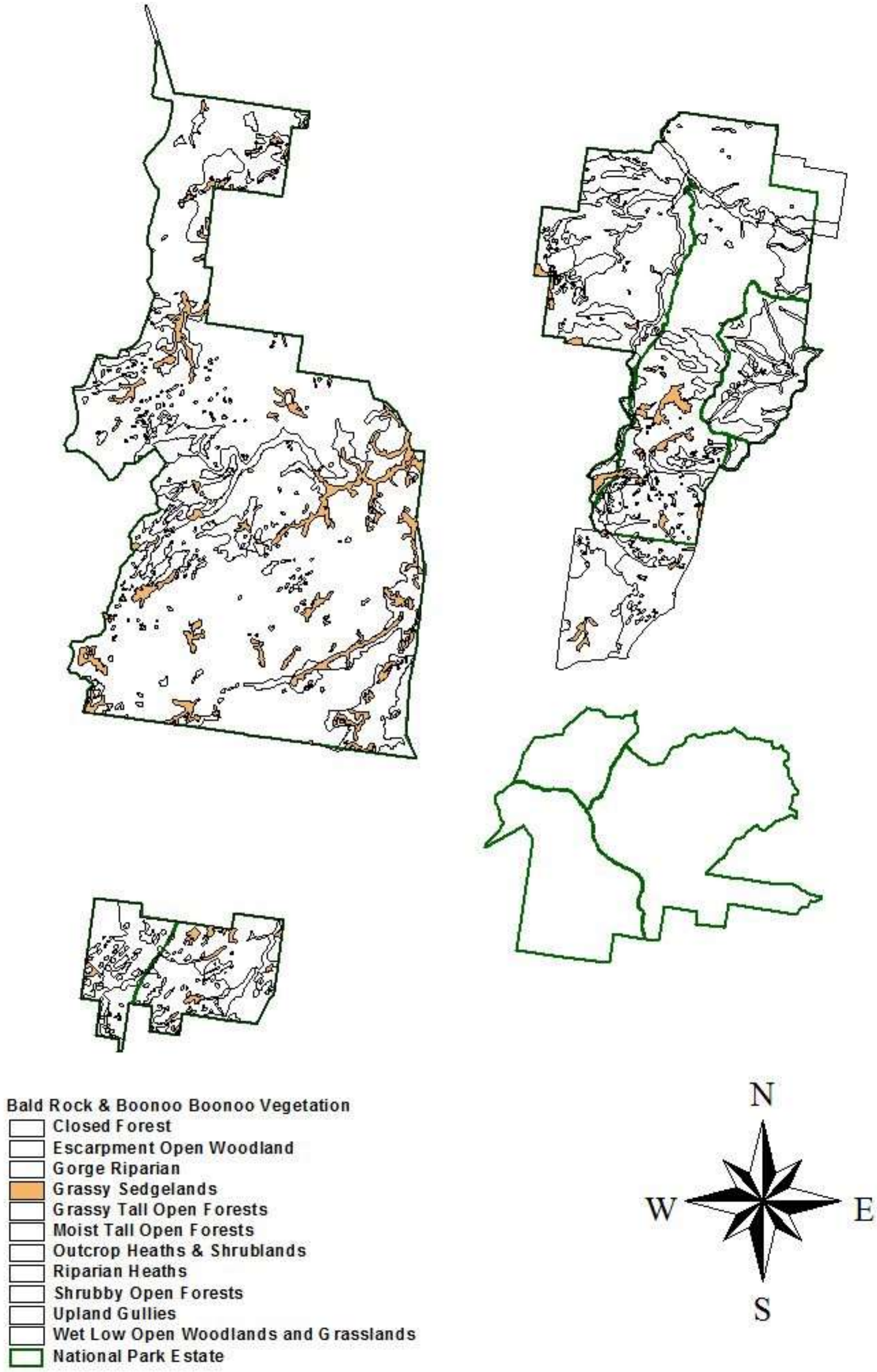


**Figure 22:** Mapped distribution of Community 2.

### 3.4.3 Community 3: Riparian Heaths

Burgan (*Kunzea parvifolia*) – Lemon Bottlebrush (*Callistemon pallidus*) – Rock Oak (*Allocasuarina rupicola*) Riparian Heath.

**Sample sites (2):** 12, 28.

**Number of hectares:** 60 **Proportion of reserves:** 0.4%

**Landform:** the open rocky banks of Boonoo Boonoo River.

**Distribution:** this community type only occurs along the rocky margins of the Boonoo Boonoo River at higher altitudes.

**Structure:** upper layer 5-8 m tall, *c.* 10% cover; middle layer 1-3 m tall, 20-40% cover; ground layer <0.5 m tall, *c.* 20% cover.

**No. of taxa:** 119 **No. of taxa per plot:** 62-78 (70 av.).

**Common natives:** Listed in decreasing order of importance (frequency and cover).

**Trees:** *Callitris endlicheri*.

**Shrubs:** *Kunzea parvifolia, Callistemon pallidus, Allocasuarina rupicola, Leptospermum polygalifolium* subsp. *montanum, Leptospermum gregarium, Calytrix tetragona, Prostanthera nivea, Philotheca myoporoides* subsp. *epilosum*, *Notelaea linearis, Mirbelia confertiflora, Leucopogon neoanglicus, Leptospermum variabile, Leptospermum novae-angliae, Homoranthus lunatus, Boronia anemonifolia*, *Baeckea omissa*.

**Climbers & trailers:** none apparent.

**Ground cover:** *Lomandra longifolia, Schoenus melanostachys, Entolasia stricta, Schoenus apogon, Digitaria ramularis, Dichelachne sieberiana, Actinotus gibbonsii, Trachymene incisa, Themeda triandra, Rhynchospora brownii, Philydrium lanuginosum, Panicum simile, Mitrasacme paludosa, Lobelia gibbosa, Lepyrodia anarthria, Lepidosperma gunnii, Laxmannia compacta, Hypericum gramineum, Gonocarpus oreophilus, Gonocarpus micranthus, Gleichenia dicarpa, Entolasia marginata, Drosera spatulata, Dichelachne crinita, Cyperus gracilis, Cheilanthes sieberi, Carex lobolepis, Brachyscome stuartii, Agrostis avenacea, Actinotus helianthi.*

**Introduced taxa:** *Conyza albida, Juncus bufonius, Taraxacum officinale, Hypochaeris radicata, Gnaphalium americanum, Aira cupaniana.*

**Percent of species introduced:** 4%.

**Variability:** This assemblage is highly stochastic and most species will have a low constance. The structure also is variable and in places will be densely shrubby and in others shrubs are only a minor component.

**Condition:** Generally very good. This community highly disturbed in some sites due to the popular use of the river by visitors. Some banks are eroded.

**Taxa of conservation importance:** *Allocasuarina rupicola, Homoranthus lunatus, Actinotus gibbonsii, Prostanthera petraea*, *Callitris oblonga* subsp. *parva*.

**Notes:** the community intergrades in some places with community 11 due to the outcrop nature of some of the riverbanks. It also intergrades with Community 9 where the rocky substratum becomes less prominent and the riverbed widens out and has patches with deeper soils.

**Conservation status:** this community as circumscribed here is likely to be limited to Boonoo Boonoo National Park though similar communities do occur within Basket Swamp NP and Warra NP. Due to its restricted occurrence and the limited distribution of a number of its associated taxa this community is vulnerable and of considerable conservation significance.

**Management considerations:** this community has a very high edge to area ratio and as such will be prone to disturbances of all kinds, particularly from fire. Many drivable access points to small campsites exist along the river. These trails should be closed and easy access to the river should be minimised. A high number of restricted and threatened species are associated with this community. This in itself presents significant management problems. Of particularly note is the picnic area at Morgans Gully, within a hundred meters of this site several TSC Act and RoTAP species populations exist. Damage to plants within this area will need monitoring as many of these threatened species are prone to death due to trampling. A number of these threatened species are fire avoiders and even small fires escaping from the picnic area may threaten the survival of some populations. Weed invasion while not significant at present, probably due to the rocky nature of the substrate, may become an issue in the future and thus will need periodic monitoring.

**Figure 23:** Photographs of Community 3. Above = Site 12 (Morgans Gully), below = Site 28, both from the Boonoo Boonoo River within Boonoo Boonoo.

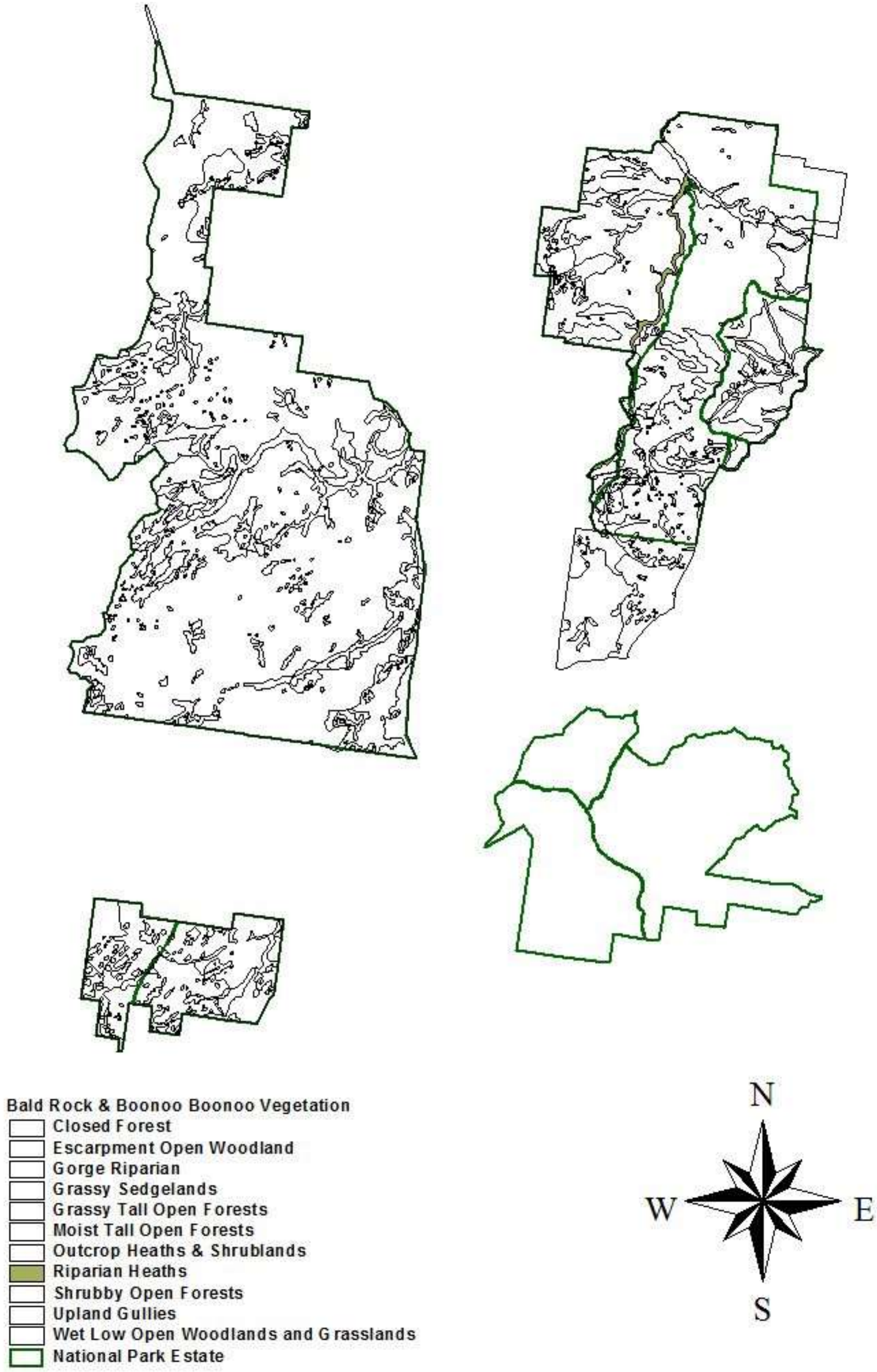


**Figure 24:** Mapped distribution of Community 3.

### 3.4.4 Community 4: Closed Forests

Brush Box (*Lophostemon confertus*) – Creek Sandpaper Fig (*Ficus coronata*) Closed Forest.

**Sample sites (1):** 7.

**Number of hectares:** 7 **Proportion of reserves:** <0.1%

**Landform:** Deeply incised gullies.

**Distribution:** Restricted to one site at the base of Boonoo Boonoo Falls.

**Structure:** No distinct layering however some broad groupings can be distinguished. Upper layer 20-25 m, 30% cover; middle layer 8-12 m tall, 80% cover.

**No. of taxa:** 36 **No. of taxa per plot:** 36.

**Common natives:** Listed in decreasing order of importance (frequency and cover).

**Trees:** *Lophostemon confertus, Ficus coronata, Diospyros australis, Cryptocarya rigida, Pennantia cunninghamii, Pararchidendron pruinosum, Ficus obliqua, Alectryon subdentatus, Alectryon subcinereus, Rhodamnia argentea.*

**Shrubs:** *Neolitsea australiensis, Citriobatus pauciflorus, Omalanthus populifolius*.

**Climbers & trailers:** *Stephania japonica* subsp. *discolor, Smilax australis, Sarcopetalum harveyanum, Parsonsia velutina, Parsonsia straminea, Parsonsia purpurascens, Morinda jasminoides, Grammitis billardieri, Tinospora smilacina, Geitonoplesium cymosum, Dictymia brownii, Cissus antarctica*.

**Ground cover:** *Calochlaena dubia, Blechnum cartilagineum, Asplenium australasicum, Pellaea falcata* var. *nana, Gymnostachys anceps, Davallia pyxidata, Cordyline petiolaris, Adiantum hispidulum, Adiantum aethiopicum.*

**Introduced taxa:** *Ageratina adenophora*.

**Percent of species introduced:** 3%.

**Variability:** only one site was sampled in this community and hence the natural variability of this association cannot be assessed based on the results presented here.

**Condition:** good, little disturbance appears to have occurred however some is associated with tracks and trails associated with visitors climbing to the bottom of the Falls. The more open areas have bad infestations of Crofton Weed.

**Taxa of conservation importance:** *Acronychia laevis*.

**Notes:** this community was considered by Gilmour (1993) to be floristically a dry rainforest but with an unusual combination of species that made it difficult to place within Floyds (1991) rainforest associations of New South Wales. Gilmour (1993) tentatively placed this community within the *Drypetes-Araucaria* Alliance and potentially within the *Ficus-Streblus-Dendrocnide-Cassine* Sub-alliance. This alliance is commonly restricted to sites protected from fire with a marked spring or summer drought (Floyd 1990).

**Conservation status:** the patch size is only a little over 1 ha in size and contains an unusual combination of species (Gilmour 1993). It is likely that this assemblage is rather unique and of considerable conservation significant.

**Management considerations:** Braiding of trails has occurred due to visitors using different paths to the bottom of the Boonoo Boonoo Falls. While a distinct trail may increase visitor usage it may also reduce damage associated with people using many different paths to the bottom. The service may wish to consider the construction of a defined trail.

**Figure 25:** Photograph of Community 4.

**Figure 26:** Photographs of Community 4. Both = Site 7. Bottom of Boonoo Boonoo Falls, Boonoo Boonoo.

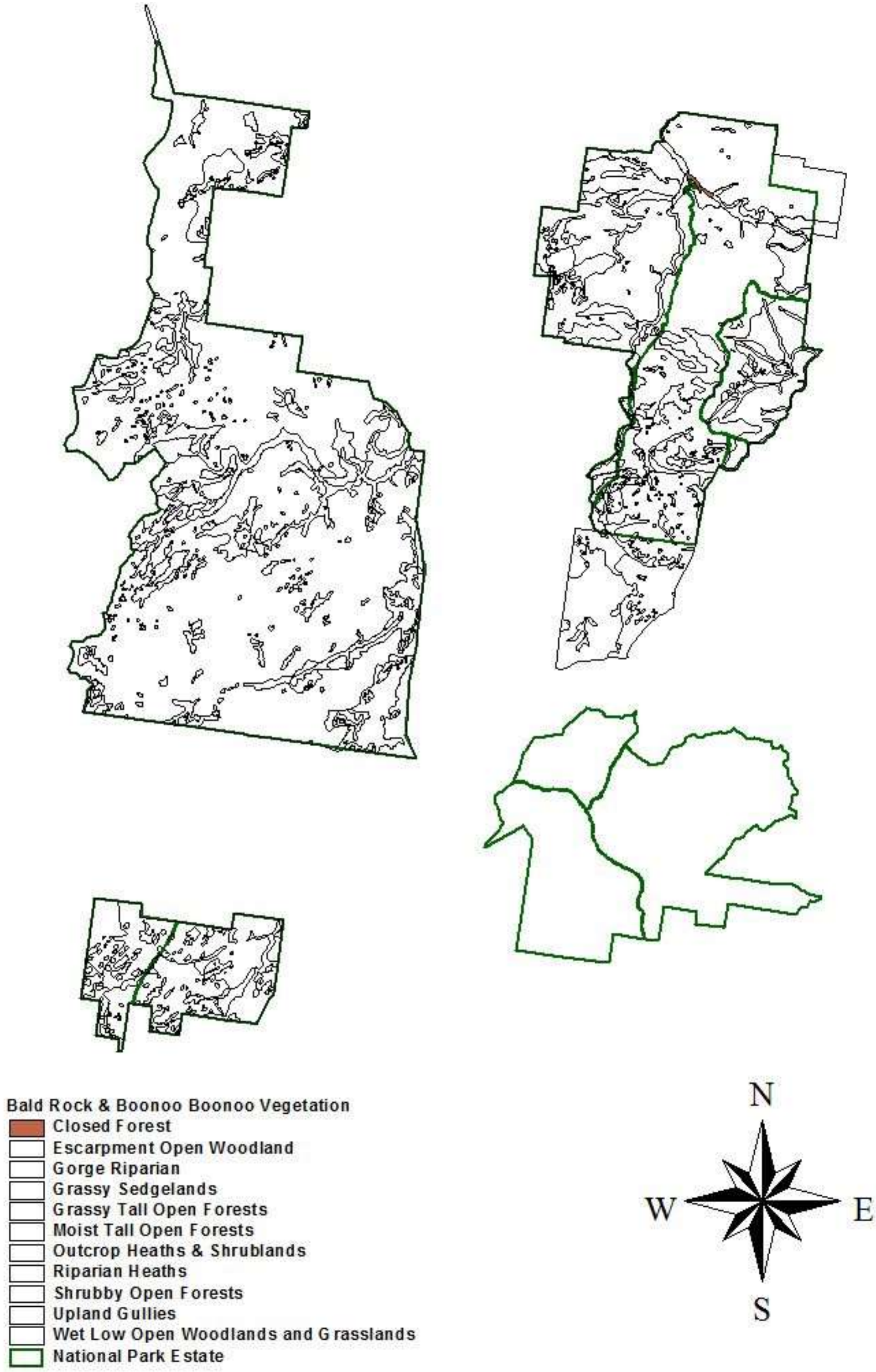


**Figure 27:** Mapped distribution of Community 4.

### 3.4.5 Community 5: Gully Riparian

Tea-tree (*Leptospermum brachyandrum*) Gully Riparian.

**Sample sites (1):** 8.

**Number of hectares:** 16 **Proportion of reserves:** <0.1%

**Landform:** River sides at the base of the gorge.

**Distribution:** Restricted to the margins of the Boonoo Boonoo River at the base of the falls.

**Structure:** Upper layer 80-10 m, 5% cover; middle layer 2-4 m, 15% cover; ground layer <1 m tall, *c.* 15% cover.

**No. of taxa:** 49 **No. of taxa per plot:** 49.

**Common natives:** Listed in decreasing order of importance (frequency and cover).

**Trees:** *Angophora subvelutina, Toona ciliata, Lophostemon confertus, Ficus rubiginosa, Ficus coronata, Alectryon subdentatus, Alangium villosum, Casuarina cunninghamii.*

**Shrubs:** *Leptospermum brachyandrum, Calytrix tetragona, Callistemon viminalis, Leucopogon neoanglicus, Alchornea ilicifolia, Acacia floribunda.*

**Climbers & trailers:** *Pyrrosia rupestris, Geitonoplesium cymosum, Stephania japonica, Parsonsia straminea, Dendrobium linguiforme.*

**Ground cover:** *Lomandra longifolia, Psilotum nudum, Plectranthus graveolens, Oplismenus undulatifolius, Juncus usitatus, Entolasia stricta, Austrodanthonia fulva, Wahlenbergia stricta, Vernonia cinerea, Sporobolus creber, Rumex brownii, Opercularia aspera, Lepidosperma laterale, Euchiton involucratus, Echinopogon caespitosus, Doodia aspera, Digitaria breviglumis, Dianella caerulea* var. *producta, Cyperus imbecillis, Arthropodium milleflorum, Aristida vagans, Aristida ramosa, Aristida jerichoensis, Ajuga australis, Adiantum hispidulum.*

**Introduced taxa:** *Ageratina adenophora, Hypochaeris radicata, Gnaphalium americanum, Conyza albida, Andropogon virginicus.*

**Percent of species introduced:** 12%.

**Variability:** only one site was sampled in this community and hence the natural variability of this association cannot be assessed based on the results presented here. However, based on its limited occurrence and riparian nature this community is likely to be highly variable. The presence of dry closed forest species is dependent on the protection afforded by the site, more exposed areas had a reduction in these taxa but still had a number of vine species. Just below this site *Casuarina cunninghamii* become prominent.

**Condition:** Good.

**Taxa of conservation importance:**

**Notes:** although riverine communities such as these are known throughout the north-east they are likely to be rather divergent from this assemblage as species are usually of low constance.

**Conservation status:** although *Casuarina cunninghamii* communities are considered to be well reserved within the east, those within gorge country on granite of limited distribution. This along with the unique assemblage shown here would indicate that this assemblage is of conservation significance and of very limited distribution.

**Management considerations:** these areas are relatively inaccessible and likely to be little disturbed in the future. However, weed invasion is likely to be a problem in the future and the level of weeds is considered to be high at present.

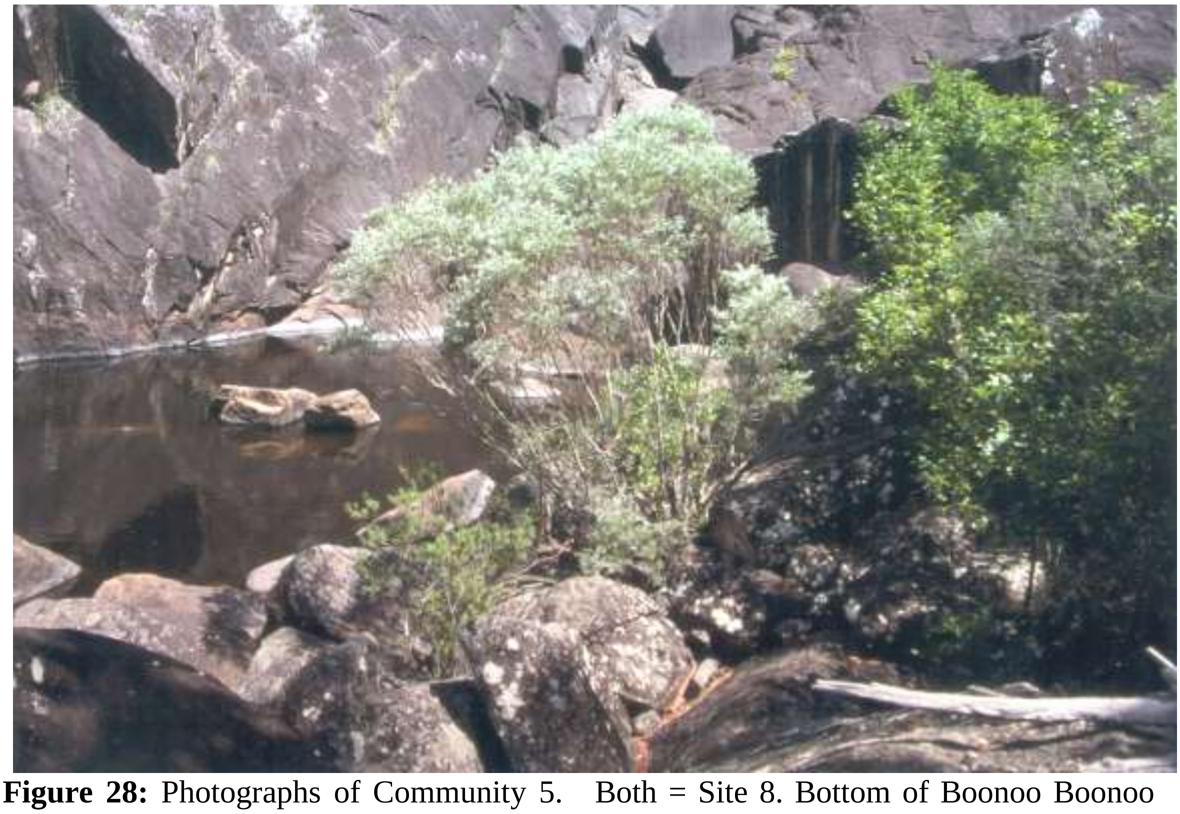

**Figure 28:** Photographs of Community 5. Both = Site 8. Bottom of Boonoo Boonoo Falls, Boonoo Boonoo.

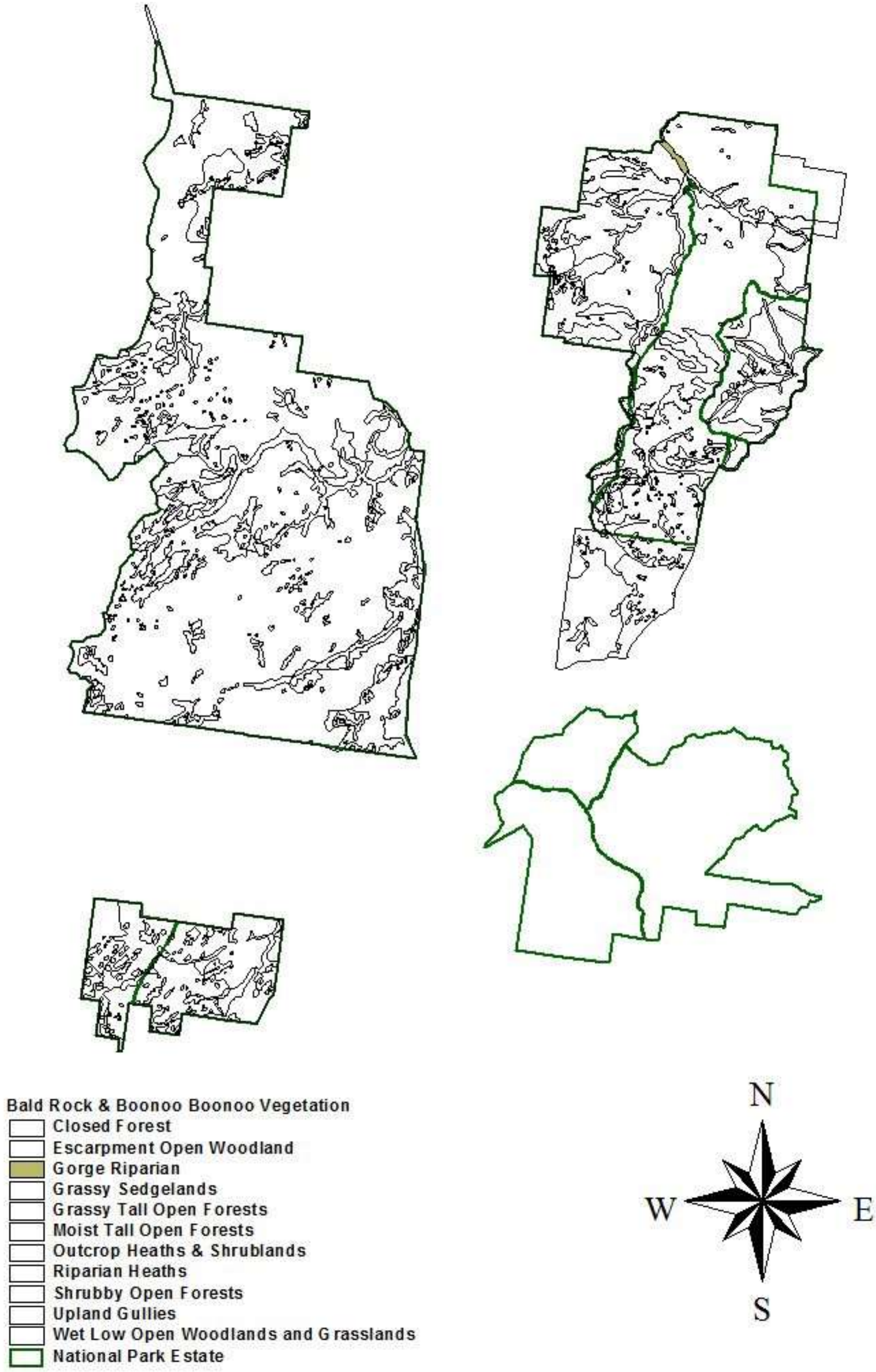


**Figure 29:** Mapped distribution of Community 5.

### 3.4.6 Community 6: Grassy Tall Open Forests

New England Blackbutt (*Eucalyptus campanulata*) – Mountain Gum (*Eucalyptus brunnea*) Grassy Tall Open Forest.

**Sample sites (38):** 4, 9, 11, 14, 25, 26, 35, 36, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50, 51, 53, 56, 57, 58, 59, 62, 88, 103, 104, 105, 109, 110, 112, 113, 114, 117, 118, 119.

**Number of hectares:** 6,417 **Proportion of reserves:** 45%

**Landform:** On undulating to hilly country within plateau areas generally above 800 m but more common above 900 m altitude on deeper less rocky soils.

**Distribution:** Found throughout both reserves but primarily restricted to nearby the Boonoo Boonoo River in Boonoo Boonoo National Park yet more widespread in Bald Rock National Park.

**Structure:** Upper layer 20-40 m tall, 20-50% cover; middle layer 5-15 m tall, 10-60% cover (not always present); lower middle layer 1-4 m tall, 20-60% cover (usually not present if previous layer is present); ground layer <1 m, 60-100% cover.

**No. of taxa:** 273 **No. of taxa per plot:** 37-71 (53 av.).

**Common natives:** Listed in decreasing order of importance (frequency and cover).

**Trees:** *Eucalyptus campanulata, Banksia integrifolia, Eucalyptus brunnea, Allocasuarina littoralis, Eucalyptus eugenioides, Eucalyptus radiata* subsp. *sejuncta, Eucalyptus pauciflora, Eucalyptus dalrympleana* subsp. *sejuncta, Eucalyptus acaciiformis, Eucalyptus tindaliae, Angophora subvelutina, Eucalyptus dorrigoensis, Eucalyptus saligna, Eucalyptus propinqua.*

**Shrubs:** *Hibbertia obtusifolia, Leucopogon lanceolatus, Monotoca scoparia, Melichrus procumbens, Dillwynia phylicoides, Persoonia tenuifolia, Acacia irrorata, Lomatia silaifolia, Platysace ericoides.*

**Climbers & trailers:** *Hardenbergia violacea, Desmodium varians, Rubus parvifolius, Glycine clandestina, Glycine tabacina, Eustrephus latifolius, Smilax australis, Desmodium rhytidophyllum, Clematis glycinoides, Tylophora woollsii*.

**Ground cover:** *Sorghum leiocladum, Themeda triandra, Imperata cylindrica, Pteridium esculentum, Stylidium graminifolium, Poranthera microphylla, Dianella caerulea* var. *caerulea, Goodenia bellidifolia* subsp. *bellidifolia, Poa sieberiana, Opercularia aspera, Brachyscome nova-anglica, Viola betonicifolia, Pratia purpurascens, Vernonia cinerea* subsp. *cinerea, Microlaena stipoides, Hypericum gramineum, Gonocarpus tetragynus, Geranium solanderi* subsp. *solanderi, Dichelachne crinita, Trachymene incisa, Senecio diaschides, Entolasia stricta, Echinopogon caespitosus* var. *caespitosus, Dichelachne micrantha, Lomandra multiflora, Chrysocephalum apiculatum, Tricoryne elatior.*

**Introduced taxa:** *Hypochaeris radicata, Conyza albida, Taraxacum officinale, Conyza bonariensis, Sonchus oleraceus, Medicago arabica, Gomphocarpus fruticosus, Centaurium erythraea, Aira cupaniana, Verbena bonariensis, Secale cereale, Conyza chilensis, Cirsium vulgare.*

**Percent of species introduced:** 5%.

**Variability:** this community is widespread yet usually has a distinct suite of species that are often associated. Often the community is very open with a sparse understorey. *Allocasuarina* is common as a low tree layer and shrubs are usually scattered and often primarily include *Leucopogon lanceolatus*. *Poa*, *Imperata*, *Lomandra* and Pteridium dominate the herb layer. Sometimes the shrub component may be more prominent and include legumes such as *Daviesia* or *Acacia* that have germinated on mass due to recent fires that heated the soil sufficiently to germinate seeds.

**Condition:** generally good. Many areas have been affected by a high regularity of fires. Signs of recent cattle grazing were common.

**Taxa of conservation importance:** *Eucalytpus dorrigoensis, Tylophora woollsii*.

**Notes:** Clarke (1998) describes a somewhat similar community for Boonoo Boonoo National Park and lists it as occurring on well drained slopes and ridges at altitudes less than 1000 m. The observations made during this survey would indicate that this community is more widespread and occurs commonly at higher altitudes up to 1100 and is not restricted to well drained slopes or ridges. Binns (1995d) describes a very synonymous community in Maryland State Forest where it extensive on granite in low relief drainage lines and lower slopes. Divergent but a somewhat floristically similar community is described by Elsol (1991) as occurring as far north as Toowoomba. In the surveys of State Forests conducted in the north east of New South Wales (King 1985; Binns 1991; Binns 1992; Moore & Floyd 1994; Binns 1995b, Binns 1995d; Chapman & Binns 1995) somewhat synonymous communities have been described as occurring from the Kempsey and Wauchope areas north to Tenterfield, Urbenville and Grafton. The NSW NPWS (1996b) describe Unit 75 which seems similar to Community 6 and its occurrence is mapped as extensive between Forest Lands State Forest south to the upper Sara River. Binns (1992) and Binns (1995b) describe similar communities as being common in the Tenterfield and Glen Innes districts on lower slopes and along gullies in undulating topography particularly around 900 m altitude. Moore & Floyd (1994) describe overstorey communities such as this but with a mesomorphic closed forest understorey or in re-invasion areas of once cleared closed forest in the Grafton Forestry District. Beadle (1981) also describes how the understorey of similar communities is dramatically changed by fire. Closed forest taxa are eliminated by fire and are replaced by *Acacia irrorata* and *Allocasuarina torulosa*. If fires are repeated in close succession only an understorey of grasses dominated by *Imperata* and *Themeda* remains which is how the community occurs within these reserves. These comments are corroborated by Binns (1995b) who observed the replaced of mesomorphic closed forest taxa with an understorey of grasses. Fire has been frequent within this association in the reserve.

**Conservation status:** based on overstorey dominants this community can be fitted within a range of other communities and forest types within the literature. In general these types of associations were considered to be poorly conserved across their range but since the many recent additions these associations are probably now well conserved across their range. Similar assemblages are or are likely to be reserved within Basket Swamp National Park, Demon Nature Reserve, Mann River Nature Reserve, Forest Lands National Park, Washpool National Park Western Additions and Guy Fawkes River National Park. The association as it occurs here is probably widespread from Glen Innes to nearly Toowoomba.

**Management considerations:** this community is extensive and occurs throughout both reserves. It has a minimal weed component and therefore does not warrant much active weed management. The community is probably most affected by frequent fires that are likely to come from neighbouring properties.

**Figure 30:** Photographs of Community 6. Above = Site 53, below = Site 58. Both within Bald Rock.

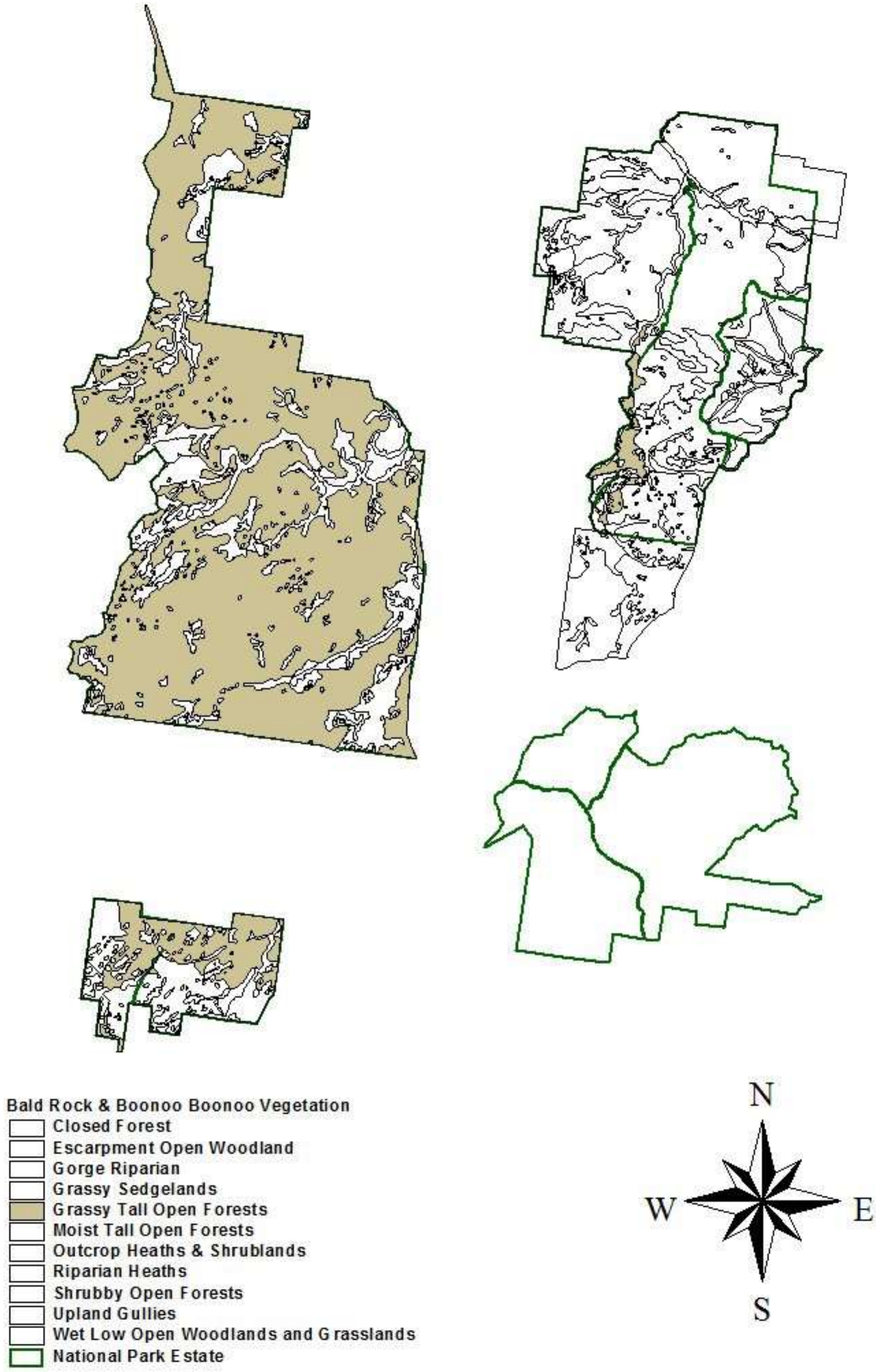


**Figure 31:** Mapped distribution of Community 6.

### 3.4.7 Community 7: Escarpment Open Woodlands

Broad-leaved Apple (*Angophora subvelutina*) – Grey Gum (*Eucalyptus biturbinata*) Open Woodland.

**Sample sites (9):** 10, 27, 34, 68, 90, 93, 94, 96, 98.

**Number of hectares:** 1,218 **Proportion of reserves:** 8.5%

**Landform:** Steep slopes within the gorge country.

**Distribution:** This community is mainly restricted to the steep gorge country below 800 m altitude around Boonoo Boonoo Falls. However, there is also a disjunct occurrence not associated with gorge country in the far south western portion of the Sth Bald Rock National Park section. This locality however is associated with a deep gully and westerly exposed dry position which seems to mirror the environmental attributes of the gorge country within Boonoo Boonoo.

**Structure:** Upper layer 20-25 m, 30-40% cover; upper middle layer not always present 5-14 m tall, 10-20% cover, lower middle layer 1-5 m tall, 30-70% cover; ground layer <1 m tall, 30-90% cover.

**No. of taxa:** 119 **No. of taxa per plot:** 42-53 (49 av.).

**Common natives:** Listed in decreasing order of importance (frequency and cover).

**Trees:** *Angophora subvelutina, Eucalyptus biturbinata, Banksia integrifolia, Eucalyptus tindaliae, Eucalyptus radiata* subsp. *sejuncta, Eucalyptus eugenioides, Allocasuarina torulosa, Eucalyptus tereticornis, Eucalyptus prava, Eucalyptus campanulata, Corymbia gummifera, Allocasuarina littoralis, Lophostemon confertus.*

**Shrubs:** *Daviesia elliptica, Acrotriche aggregata, Lomatia silaifolia, Leptospermum polygalifolium* subsp. *transmontanum, Desmodium brachypodum, Trochocarpa laurina, Myoporum montanum, Leucopogon melaleucoides, Jacksonia scoparia, Hibbertia obtusifolia, Acacia macnuttiana, Acacia betchei.*

**Climbers & trailers:** *Desmodium rhytidophyllum, Rubus parvifolius, Glycine clandestina, Desmodium varians, Hardenbergia violacea, Cissus hypoglauca.*

**Ground cover:** *Imperata cylindrica, Sorghum leiocladum, Themeda triandra, Pteridium esculentum, Cymbopogon refractus, Poa sieberiana, Dichelachne micrantha, Vernonia cinerea* var. *cinerea, Echinopogon caespitosus* var. *caespitosus, Chrysocephalum apiculatum, viola betonicifolia, Schoenus apogon, Pomax umbellata, Lomandra* *filiformis, Lepidosperma laterale, Gonocarpus tetragynus, Austrodanthonia monticola, Trachymene incisa, Thysanotus tuberosus, Stylidium graminifolium, Senecio diaschides, Lomandra longifolia, Goodenia hederacea, Gahnia aspera, Dianella caerulea* var. *caerulea, Cheilanthes sieberi.*

**Introduced taxa:** *Hypochaeris radicata, Conyza albida, Taraxacum officinale, Sigesbeckia orientalis* var. *orientalis*.

**Percent of species introduced:** 3%.

**Variability:** the major disjunction in species is between the gorge country sites of Boonoo Boonoo National Park and the lower valley sites in the southern section of Bald Rock National Park. However, as indicated by the classification many elements are shared and this is primarily due to the very well drained and dry nature of both areas. Within the gorge country of Boonoo Boonoo National Park much of the variation is due to altitudinal changes and the associated merging with Community 7 at higher altitudes and Community 6 at the base of the gorge or due to the steepness of slope and how shallow and rocky the soils may be. *Allocasuarina torulosa* in more protected sites can become dominant and form a very dense layer.

**Condition:** generally good. Stray cattle appear to use the gorge country at Boonoo Boonoo National Park frequently and have caused disturbance and weed introductions to a number of areas. Within the southern section of Bald Rock National Park some clearing near the bottom of the park has occurred. Furthermore, in this section a fire trial has recently been put in (1998) that has caused some major disturbance and weed introductions to this limited community.

**Taxa of conservation importance:** *Acacia macnuttiana, Acacia betchei.*

**Notes:** a community described in Gilgurry State Forest (Binns 1995b) near the Queensland Border and a community described for Bowman State Forest near the Barrington Tops (Binns 1995a) are almost directly synonymous. It is likely that somewhat synonymous communities to Community 7 are found as far north as Beenleigh in Queensland (McDonald & Whiteman 1979) as far south as the eastern and western slopes of Barrington Tops (Binns 1995a; NSW NPWS 1996b). This and synonymous communities are probably the most extensive vegetation type on steep precipitous slopes at mid altitudes around 500-900 m in the north east of New South Wales. All similarly described communities are simple in structure with a tree layer around 30 m tall, a grass layer and a conspicuous and ubiquitous *Allocasuarina torulosa* sub-canopy. Binns (1992) speculates that a long history of burning by graziers has maintained the consistent grassy understorey.

**Conservation status:** similar communities as circumscribed here have been considered very poorly conserved to inadequately conserved across their range. However with the recent additions to the reserve network these assemblages may no be considered adequately conserved across north eastern New South Wales. Directly comparable communities from gorge areas are known to be reserved within the Demon Nature Reserve (Hunter *et al.* 1999), Mann River Nature Reserve, Guy Fawkes River National Park (Hunter & Alexander 1999) and in the Washpool National Park Western Additions (Hunter 1998). The dry lower valley of south Bald Rock National Park also shows some affinities to regions such as Torrington (Clarke *et al.* 1998) and similar assemblages may also be reserved in the southern parts of Girraween National Park and also Sundown National Park in Queensland. Despite the apparent adequate reservation status of this community it is of limited extent within both reserves and further additions of this type of community may be worthwhile as these occurrences here are near the northern limit of their distribution.

**Management considerations:** the fire trial within the southern section of Bald Rock National Park should either be allowed to regenerate or should be upgraded in order to prevent erosion and further disturbance to the lower creek areas of the reserve. The trail as it exists follows within close proximity to a creek most its length in the bottom half of the reserve. Stray cattle will need removal whenever they are noted. Weed invasion is generally low but may increase significantly if the south Bald Rock fire trail is used with any frequency.

**Figure 32:** Photographs of Community 7. Above = Site 34, below = Site 35. Both within Boonoo Boonoo.

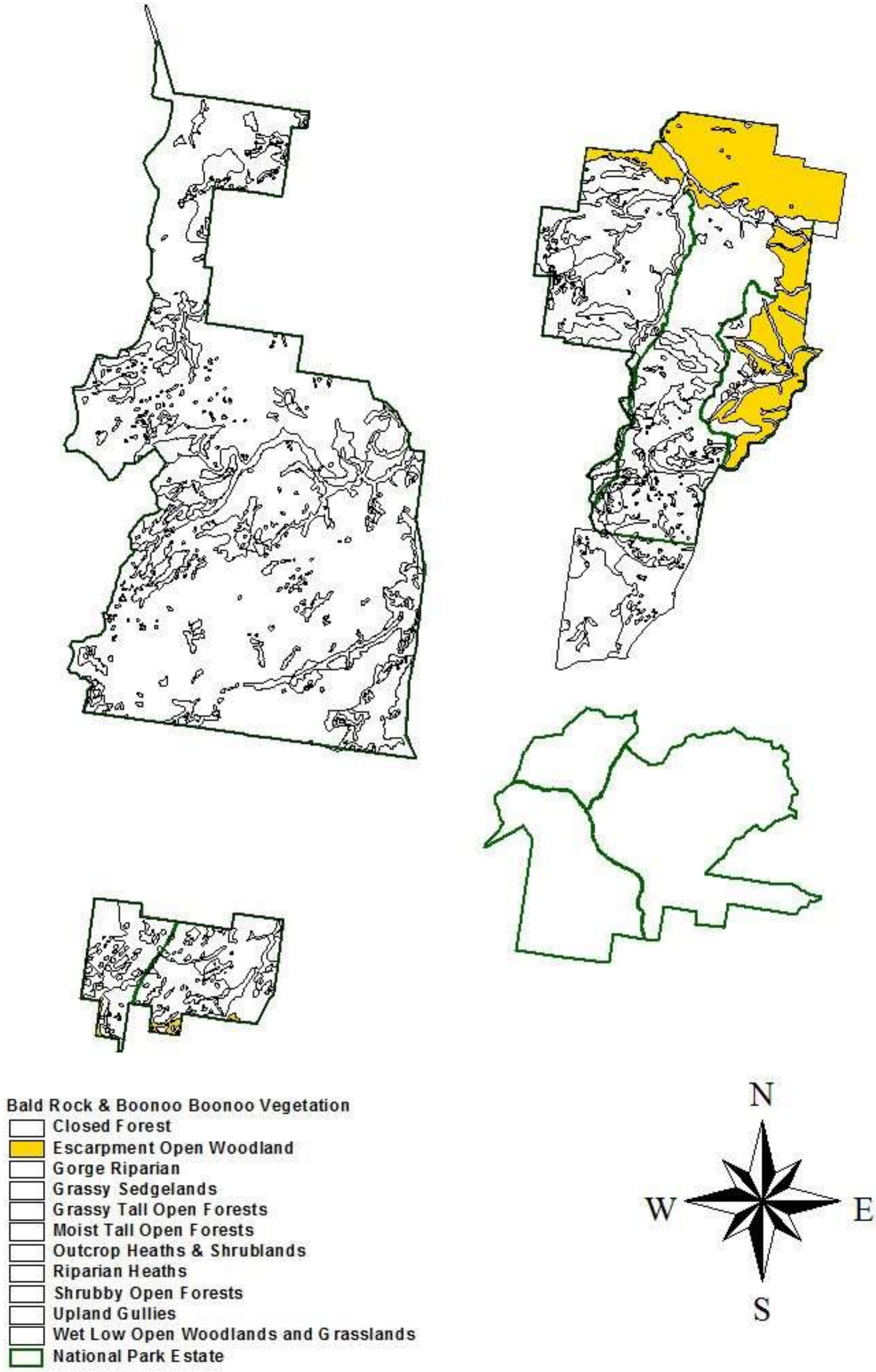


**Figure 33:** Mapped distribution of Community 7.

### 3.4.8 Community 8: Moist Tall Open Forests

New England Blackbutt (*Eucalyptus campanulata*) – Mountain Gum (*Eucalyptus brunnea*) – Messmate (*Eucalyptus obliqua*) Tall Open Forest.

**Sample sites (9):** 5, 6, 13, 24, 30, 55, 66, 69, 107.

**Number of hectares:** 1,361 **Proportion of reserves:** 9.5%

**Landform:** Protected creeks and gullies and the base of larger bornhardts.

**Distribution:** Found within both reserves but generally associated with protected gullies in upland sites (above 1000 m) or associated with the margins of larger outcrops where sites are protected and afforded extra runoff.

**Structure:** Upper layer 25-40 m tall, 40-80% cover; upper middle layer 6-20 m tall, 10-70% cover; lower middle layer 1-5 m tall, 20-50% cover; ground layer >1 m tall, 60-100% cover.

**No. of taxa:** 203 **No. of taxa per plot:** 41-73 (55 av.).

**Common natives:** Listed in decreasing order of importance (frequency and cover).

**Trees:** *Eucalyptus campanulata, Eucalyptus brunnea, Allocasuarina littoralis, Banksia integrifolia, Eucalyptus obliqua, Eucalyptus radiata* subsp. *sejuncta, Lophostemon confertus, Eucalyptus notabilis, Eucalyptus dorrigoensis.*

**Shrubs:** *Leucopogon lanceolatus, Maytenus silvestris, Acacia irrorata, Acacia falciformis, Platysace ericoides, Lomatia silaifolia, Acrotriche aggregata, Pultenaea linophylla, Podolobium ilicifolium, Elaeocarpus reticulatus, Persoonia oleoides, Hibbertia obtusifolia, Hakea eriantha, Amperea xiphoclada* subsp. *xiphoclada, Acacia penninervis*.

**Climbers & trailers:** *Desmodium varians, Smilax australis, Eustrephus latifolius, Trochocarpa laurina, Glycine clandestina, Rubus parvifolius, Hardenbergia violacea, Kennedia rubicunda, Hibbertia scandens, Billardiera scandens, Polyscias sambucifolius, Hibbertia aspera,*

**Ground cover:** *Poa sieberiana, Gonocarpus oreophilus, Entolasia stricta, Themeda triandra, Pteridium esculentum, Lomandra longifolia, Echinopogon caespitosus* var. *caespitosus, Dianella caerulea* var. *caerulea, Calochlaena dubia, Viola betonicifolia, Microlaena stipoides, Entolasia marginata, Senecio diaschides, Imperata cylindrica, Schoenus melanostachys, Pratia purpurascens, Lepidosperma laterale, Dichondra* *repens, Blechnum cartilagineum, Oxalis chnoodes, Geranium solanderi* var. *solanderi, Deyeuxia parviseta, Poranthera microphylla,*

**Introduced taxa:** *Hypochaeris radicata, Conyza albida, Aira cupaniana, Gomphocarpus fruiticosus, Cirsium vulgare.*

**Percent of species introduced:** 3%.

**Variability:** the variability within this community is largely based on time since fire incursions and the amount of water available. It is best developed in the deeper upland gullies and directly below the larger rock outcrops. However its large edge to area ratio in both situations means that fire can and does regularly incur change the more mesic understorey to a more sclerophyllous type of assemblage. Often tree ferns or Soft Ground Ferns may be dense and prevalent, at times if a hot fire incursion has occurred a dense cohort of legumes may be found or when best developed closed forest taxa occur in the understorey.

**Condition:** good to fair. Many occurrences of this community type have been severely affected by the large fires in recent decades and the integrity of this community will largely be based on the future fires.

**Taxa of conservation importance:** *Eucalyptus dorrigoensis, Tylophora woollsii.*

**Notes:** Community 8 is closely allied to Beadles' (1981) *E. campanulata* Alliance that is described as occurring at higher altitudes from just over the Queensland border to the Barrington Tops area. The extent of similar assemblages based on currently described vegetation communities in the literature, reinforces Beadles (1981) perception of the extent of this Alliance. McDonald & Whiteman (1979) describe an *E. campanulata* community that varies from a tall forest with a partial closed forest understorey to a shorter forest with a shrubbier understorey. McDonald and Whiteman (1979) map a disjunct occurrence of this community in small areas just over the Queensland border from Canangra Creek near the Darlington Range to Tallebundgera Mountain near Lamington. Flora surveys conducted by the State Forests of New South Wales in their management areas (Binns & Chapman 1993; Binns 1995a, b) describe similar assemblages. These are found from the Tenterfield region south to the Carrai Plateau and to Barrington Tops. All described occurrences are at high altitudes above 900 m. Binns (1995b) considered this association as possibly the most widespread community in the Tenterfield area above 900 m on all geological substrates. Clarke *et al* (1998) describe a slightly divergent but very similar community as occurring on the Metasediment pendant in the Torrington area to the west of the region. The NSW NPWS (1996b) describe at least three Units similar to Community 5 and map their distribution from the Forest Lands State Forest south to Yarrowitch. Hunter (1998) and Hunter and Alexander (1998) have mapped similar assemblages within the Washpool National Park Western Additions and the Guy Fawkes River National Park.

**Conservation status:** of particular note is forest type 152 dominated by *E. obliqua* and *E. brunnea* that was considered a priority for reservation within the region and was surveyed for by Richards (1996). This forest type is most commonly found within Community 9. Richards (1996) describe this forest type as occurring in high rainfall, elevated and cool situations with moist soils. It was estimated that 4194 ha of this community existed. However, Hunter (1998) found extensive areas of this forest type within Washpool National Park Western Additions and by Hunter and Alexander for the Guy Fawkes River National Park. With the addition of this forest type Bald Rock and Boonoo Boonoo it appears that this forest type is more widespread and that the reservation status of this forest type has increased considerably. This assemblage is well reserved across the escarpment areas of north eastern New South Wales and is known to occur within the Demon Nature Reserve, Gibraltar Range National Park, Spirabo National Park, Washpool National Park Western Additions and Guy Fawkes River National Park. Despite this the community is of limited extent within Bald Rock and Boonoo Boonoo National Parks and is threatened by too frequent fire regimes. Furthermore this community type is near the northern limit of its distribution.

**Management considerations:** this community is of limited extent throughout the reserves and is surrounded by more highly flammable vegetation. The occurrence of this community is largely associated within the larger granite monoliths. Thus this community further protects the larger outcrops (acting as a buffer) from incursions of fire. However, they are usually only a few hundred meters wide and are likely to be overcome by larger fires from the surrounding drier communities. Fires will need to be excluded from these areas in the foreseeable future. Some trails pass through this community type particularly around Bald Rock itself and these cause an opening of the understorey canopy thus increasing the introduction of weeds. Trials would be best placed outside of this assemblages particularly around their margins and could aid in fire prevention.

**Figure 34:** Photographs of Community 8. Below = Site 13. Above Bald Rock, below on the banks of Boonoo Boonoo.

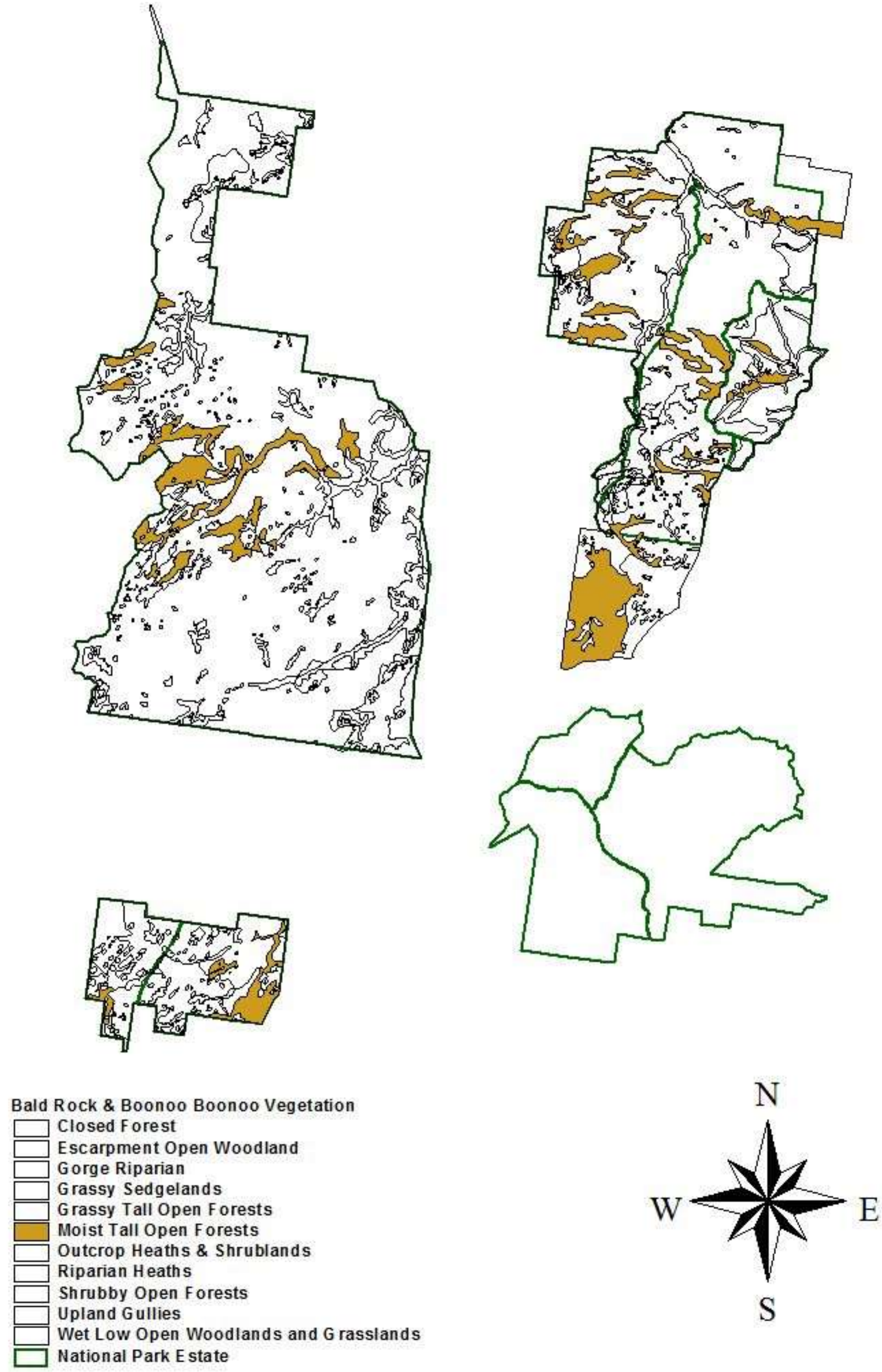


**Figure 35:** Mapped distribution of Community 8.

### 3.4.9 Community 9: Shrubby Open Forests

New England Blackbutt (*Eucalyptus campanulata* & *E. andrewsii*) – Large-fruited Stringybark (*Eucalyptus williamsiana*) Shrubby Open Forest.

**Sample sites (23):** 15, 16, 18, 20, 22, 23, 31, 23, 33, 52, 54, 60, 61, 63, 64, 65, 67, 70, 71, 97, 98, 115, 116.

**Number of hectares:** 3,120 **Proportion of reserves:** 21.9%

**Landform:** Primarily higher altitudes with coarser and or shallower soils in hilly to undulating terrain, often interspersed with boulders.

**Distribution:** Found throughout both reserves but is particularly developed within Boonoo Boonoo National Park and the southern section of Bald Rock National Park at higher altitudes.

**Structure:** Upper layer 20-40 m tall, 40-60% cover; Tall middle layer not always present 5-15 m tall, 20-60% cover; lower middle layer usually present 1-5 m tall, 10-70% cover; ground layer <1 m tall, 50-100% cover.

**No. of taxa:** 221 **No. of taxa per plot:** 38-70 (50 av.).

**Common natives:** Listed in decreasing order of importance (frequency and cover).

**Trees:** *Eucalyptus campanulata, Allocasuarina littoralis, Eucalyptus williamsiana, Banksia integrifolia, Eucalyptus andrewsii, Eucalyptus notabilis, Eucalypts brunnea, Eucalytpus radiata* subsp. *sejuncta, Eucalyptus cameronii, Corymbia gummifera.*

**Shrubs:** *Petrophile canescens, Platysace ericoides, Lomatia silaifolia, Leptospermum trinervium, Monotoca scoparia, Hibbertia obtusifolia, Amperea xiphoclada* var. *xiphoclada, Phyllanthus hirtellus, Leucopogon lanceolatus* var. *lanceolatus, Dillwynia phylicoides, Acacia falciformis, Persoonia tenuifolia, Dampiera stricta, Banksia cunninghamii* subsp. *neo-anglica, Podolobium ilicifolium, Melichrus procumbens, Persoonia cornifolia, Maytenus silvestris, Bossiaea neo-anglica, Phyllota phylicoides, Leucopogon melaleucoides, Elaeocarpus reticulatus, Acrotriche aggregata, Daviesia latifolia, Acacia penninervis.*

**Climbers & trailers:** *Hardenbergia violacea, Smilax australis, Billardiera scandens, Kennedia rubicunda, Glycine clandestina, Eustrephus latifolius, Cassytha pubescens, Desmodium varians, Clematis aristata.*

**Ground cover:** *Themeda triandra, Pteridium esculentum, Entolasia stricta, Dianella caerulea* var. *caerulea, Patersonia sericea, Goodenia bellidifolia* subsp. *bellidifolia, Goodenia hederacea, Imperata cylindrica, Pomax umbellata, Patersonia glabrata, Gonocarpus tetragynus, Stylidium graminifolium, Lepidosperma laterale, Agrostis avenacea, Gonocarpus oreophilus, Poa sieberiana, Lomandra multiflora, Trachymene incisa, Microlaena stipoides, Dichelachne micrantha, Poranthera microphylla, Brachyscome nova-anglica, Viola betonicifolia, Tricoryne elatior, Thysanotus tuberosus, Brunoniella australis, Austrostipa rudis* subsp. *rudis, Austrostipa ramosissima.*

**Introduced taxa:** *Hypochaeris radicata*.

**Percent of species introduced:** 0.01%.

**Variability:** two major subcomponents are found within this community and these are based solely on occurrence within Boonoo Boonoo or Bald Rock National Park. The occurrences within Bald Rock National Park are within the southern section of the reserve and have a more 'western influence' within the inclusion of species such as *Hibbertia* sp. B, *Acacia betchei* and *Eucalyptus andrewsii* which are commonly associated with communities on the western side of the New England.

**Condition:** overall very good. The occurrences within Boonoo Boonoo National Park have been burnt with more regularity than may have been normal.

**Taxa of conservation importance:** *Acacia betchei, Hibbertia* sp. B.

**Notes:** this community type as described within Boonoo Boonoo National Park is exclusive to coarse grained granite substrates and are probably largely restricted to this region in the north and south to Spirabo National Park. Binns (1995b) was unclear why in some places similar country is dominated by grassy forests and yet others have a heathy understorey (as is seen within these two reserves), but presumed that the differences may be in a lower clay content, shallower soils and a lowered fire frequency may account for these heathy forests. As such the distribution of this community and that of community 6 may be dynamic in nature. Community 9 as it is found in Bald Rock National Park may have more western affinities and similar assemblages as these are probably restricted to areas as far north as this and extend as far west as Torrington.

**Conservation status:** this community type is further conserved within Basket Swamp National Park, the Demon Nature Reserve, Western Washpool National Park, Girraween National Park and Torrington State Recreation Area. As such this assemblage is probably adequately conserved across its range and extensive areas occur within these reserves.

**Management considerations:** The main management goal within this community type is an appropriate fire regime. Few other management options will need to be considered at this stage.

**Figure 36:** Photographs of Community 9. Above = Site 16, below = Site 61. Above within Boonoo Boonoo and below within Bald Rock southern section.

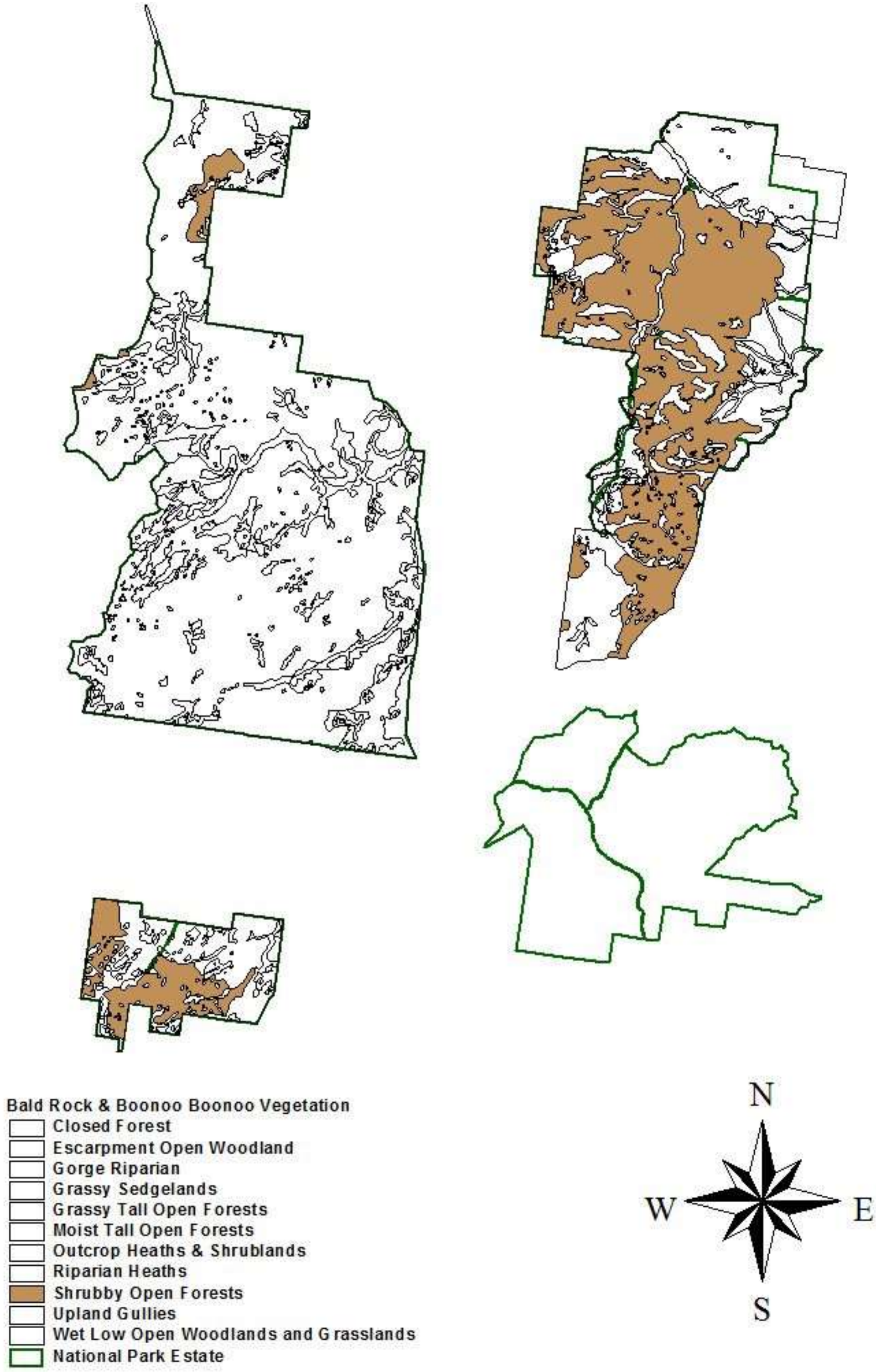


**Figure 37:** Mapped distribution of Community 9.

### 3.4.10 Community 10: Upland Gullies

New England Blackbutt (*Eucalyptus campanulata*) – Mountain Gum (*Eucalyptus brunnea*) – Sydney Blue Gum (*Eucalyptus saligna*) Tall Open Forest.

**Sample sites (4):** 91, 92, 95, 97.

**Number of hectares:** 128 **Proportion of reserves:** 0.9%

**Landform:** restricted to protected gullies and lower slopes associated with gullies on the eastern escarpment.

**Distribution:** found only in the eastern parts of Boonoo Boonoo National Park.

**Structure:** Upper layer 20-40 m tall, 40-60% cover; Tall middle layer not always present 5-15 m tall, 20-60% cover; lower middle layer usually present 1-5 m tall, 10-70% cover; ground layer <1 m tall, 50-100% cover.

**No. of taxa:** 99 **No. of taxa per plot:** - ( av.).

**Common natives:** Listed in decreasing order of importance (frequency and cover).

**Trees:** *Eucalyptus campanulata, Eucalytpus brunnea, Eucalyptus saligna, Eucalyptus caliginosa, Lophostemon confertus, Banksia integrifolia.*

**Shrubs:** *Acacia falciformis, Podolobium ilicifolium, Leucopogon lanceolatus, Trochocarpa laurina, Persoonia oleoides, Melichrus adpressus, Allocasuarina littoralis, Allocasuarina torulosa, Acacia irrorata.*

**Climbers & trailers:** *Hardenbergia violacea, Rubus parvifolius, Hibbertia scandens, Desmodium varians, Kennedia rubicunda, Glycine clandestina, Smilax australis, Pandorea pandorana, Clematis aristata.*

**Ground cover:** *Poa sieberiana, Sorghum leiocladum, Lomandra longifolia, Geranium solanderi, Calochlaena dubia, Gonocarpus oreophilus, Echinopogon caespitosus, Dichondra repens, Dianella caerulea, Themeda triandra, Pteridium esculentum, Brachyscome spathulata, Ranunculus lappaceus, Poranthera microphylla, Oplismenus imbecillus, Lepidosperma laterale, Hydrocotyle laxiflora, Austrostipa rudis, Arthropodium milleflorum, Vernonia cinerea, Senecio prenanthoides, Pratia purpurascens, Plectranthus suaveolens, Platysace ericoides, Plantago varia, Patersonia sericea, Lagenifera stipitata, Hydrocotyle peduncularis, Goodenia bellidifolia, Entolasia stricta, Chrysocephalum apiculatum, Blechnum cartilagineum, Austrodanthonia racemosa, Austrodanthonia monticola, Asperula converta.*

**Introduced taxa:** *Hypochaeris radicata, Cirsium vulgare, Taraxacum officinale.*

**Percent of species introduced:** 3%.

**Variability:** this assemblage was highly variable structurally and floristically due to its linear nature and the impact of past fires which have affected different areas with more or less frequency and/or intensity.

**Condition:** generally good, though fires may be too frequent.

**Taxa of conservation importance:** none apparent.

**Notes:** close to Community 8 which shares much of the same structure and however this community contains more mesic elements particularly with the inclusion of *Lophostemon confertus* and an abundance of vines and twiners. This community is likely to be similar to many upland creek areas along the eastern escarpment as is described for Western Washpool. Synonymous assemblages are likely to occur from south of the Queensland border to the east of Walcha.

**Conservation status:** currently should be considered reasonably well reserved throughout its range with many of the more recent additions to the eastern escarpment reserve network. .

**Management considerations:** no major works or attention needs to be paid currently, though a reduction in the frequency of fire may be of importance.

**Figure 38:** Photographs of Community 10.

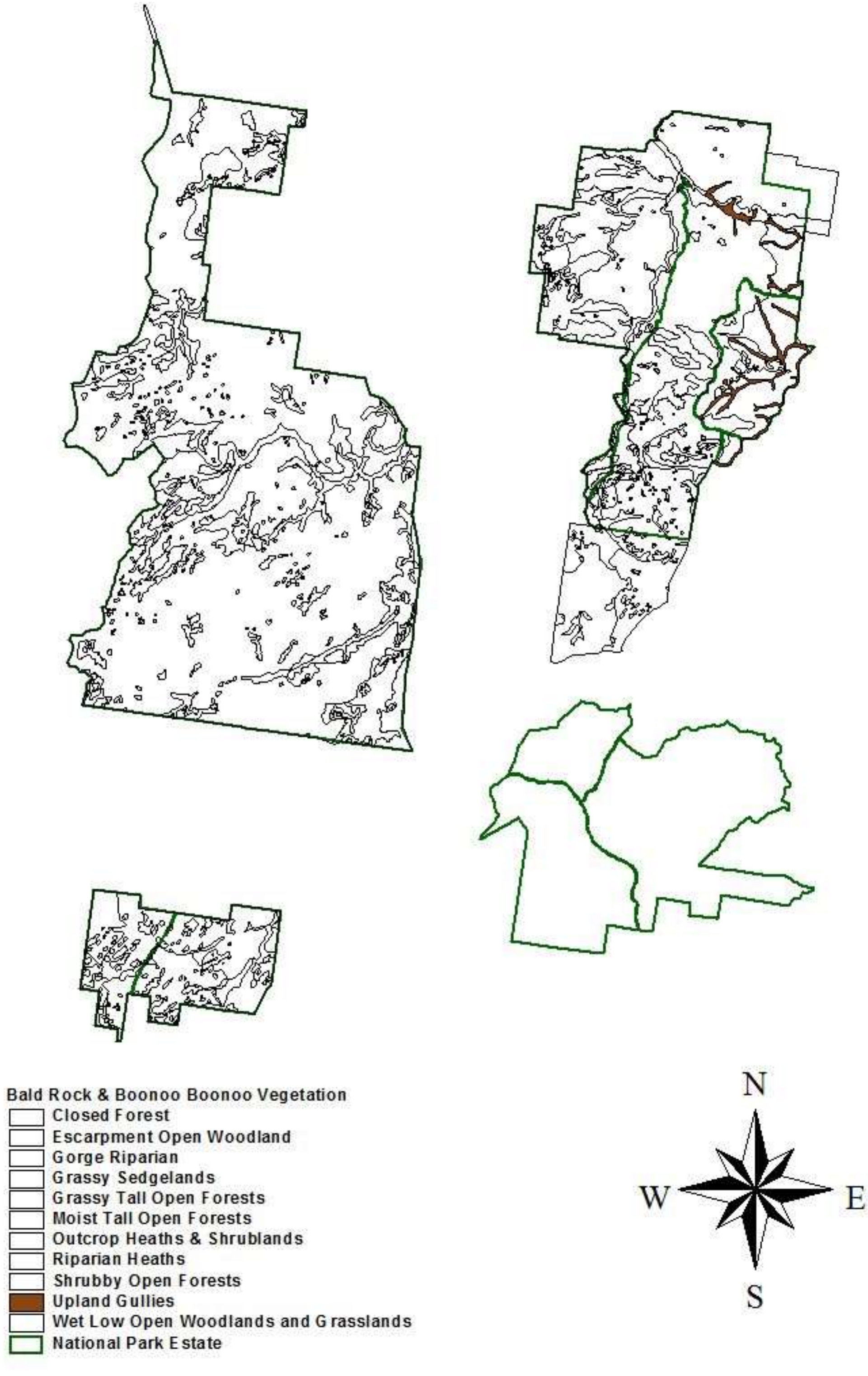


**Figure 39:** Mapped distribution of Community 10.

### 3.4.11 Community 11: Outcrop Heaths & Shrublands

Granite Kunzea (*Kunzea bracteolata*) – New England Tea-tree (*Leptospermum novae-angliae*) Heaths & Shrublands.

**Sample sites (36):** see Hunter & Clarke (1998).

**Number of hectares:** 530 **Proportion of reserves:** 4%

**Landform:** Wholly restricted to exposed granite surfaces.

**Distribution:** Scattered throughout both reserves on all outcrops.

**Structure:** Closed heaths to open shrublands 1-4 m tall with fringing herbfields and lichen mats.

**No. of taxa:** 172 **No. of taxa per plot:** 10-42 (24 av.).

**Common natives:** Listed in decreasing order of importance (frequency and cover).

**Trees:** *Eucalyptus campanulata, Eucalyptus andrewsii, Eucalyptus prava, Eucalyptus dealbata, Eucalyptus notabilis, Callitris endlicheri, Allocasuarina littoralis, Eucalyptus banksii, Eucalyptus scoparia, Lophostemon confertus.*

**Shrubs:** *Kunzea bracteolata, Philotheca epilosum, Leptospermum novae-angliae, Leucopogon neoanglicus, Dodonaea viscosa, Acacia latisepala, Leucopogon melaleucoides, Pimelea linifolia, Leptospermum polygalifolium* subsp. *transmontanum, Acacia adunca, Leionema ambiens, Acrotriche aggregata, Callistemon pallidus, Acacia viscidula, Persoonia cornifolia, Leionema rotundifolium, Acacia venulosa, Homoranthus lunatus, Allocasuarina rupicola, Callistemon* sp. Big Red, *Callitris rhomboidea, Exocarpus cupressiformis, Callitris monticola, Prostanthera petraea, Plectranthus suaveolens, Mirbelia speciosa* subsp. *speciosa.*

**Climbers & trailers:** *Muehlenbeckia costata, Pyrrosia rupestris,*

**Ground cover:** *Lomandra longifolia, Trachymene incisa, Entolasia stricta, Lepidosperma laterale, Gonocarpus oreophilus, Brachyscome stuartii, Austrodanthonia bipartita, Stypandra glauca, Crassula sieberiana, Stylidium laricifolium, Schoenus apogon, Calandrinia pickeringii, Cheilanthes sieberi, Bulbostylis densa, Actinotus helianthi, Pomax umbellata, Dianella revoluta, Tripogon loliiformis, Paspalidium constrictum, Laxmannia compacta, Isotoma anethifolia, Gonocarpus teucrioides, Thelionema grande, Digitaria breviglumis, .Austrodanthonia racemosa, Gahnia sieberiana.*

**Introduced taxa:** *Hypochaeris radicata, Conyza bonariensis, Gnaphalium americanum, Sonchus asper, Setaria verticillata, Phytolacca octandra, Verbena bonariensis, Stellaria media, Sonchus oleraceus.*

**Percent of species introduced:** 5%.

**Variability:** This community type is highly variable within and between outcrops and few species have a high constance. They are however consistently shrublands or heathlands but do occasionally have herbfields associated with shallower soil pans or the fringes of the shrublands.

**Condition:**

**Taxa of conservation importance:** *Kunzea bracteolata, Philotheca myoporoides* subsp. *epilosum, Acacia latisepala, Muehlenbeckia costata, Acacia adunca, Leionema ambiens, Leionema rotundifolium, Callitris rhomboidea, Thelionema grande, Prostanthera petraea, Homoranthus prolixus, Allocasuarina rupicola, Eucalyptus scoparia, Mirbelia confertiflora, Callitris monticola, Plectranthus suaveolens,*

**Notes:** Hunter & Clarke (1998) when describing this community circumscribed it as the New England Escarpment Shrubby Open Scrubs and Heaths and the occurrences of this element that occurred within Bald Rock and Boonoo Boonoo National Park were further divided it into three assemblages. However, due to the inability to recognise these on aerial photographs and the similar management considerations for all they have been included as one community in this investigation. The three sub-associations described by Hunter (1999) were a *Leptospermum novae-angliae – Acacia latisepala* Heath, a *Leptospermum novae-angliae – Dodonaea viscosa* Heath and a *Kunzea bracteolata – Leucopogon melaleucoides* Heath. This community type is wholly restricted to the region between Stanthorpe to the Malara Plateau. In a broader sense the element as described by Hunter & Clarke (1998) occurs as far south as Cathedral Rocks National Park.

**Conservation status:** the community as described here is reserved within Girraween National Park and to a minor extent the Demon Nature Reserve. It may be considered adequately reserved, however the actual true extent of the community is only a percentage of the area of exposed granite surfaces and is thus very small. Furthermore, Hunter (2002; 2003; 2004) has shown that due to the dynamic nature of these communities any rock is likely to of conservation significance and that maximising the number of granite outcrops is likely to be of importance.

**Management considerations:** an appropriate fire regime is the most important consideration for these assemblages. They will require fire frequencies that are in terms of decades to hundreds of years. Of importance also is the likely damage caused by visitors. It has been shown that plants on outcrops are often of substantial age and in low numbers and that lichen and moss mats are equally aged. Trampling can cause significant irreversible damage to these communities. The nutrient status of these communities is very poor and any addition of nutrients from organic rubbish is likely to increase the chances of weed invasion and exclusion of outcrop endemics. Therefore the management of people visiting these systems will need to be considered carefully and access potentially limited to a few major areas. For example it may not be appropriate to create a walking path to Mt Prentice to discourage regular visitation to the bornhardt, thus only those few adventurous visitors who do not need trails.

**Figure 40:** Photographs of Community 11. This community can be highly variable and may include small herbfields and moss and lichen mats.

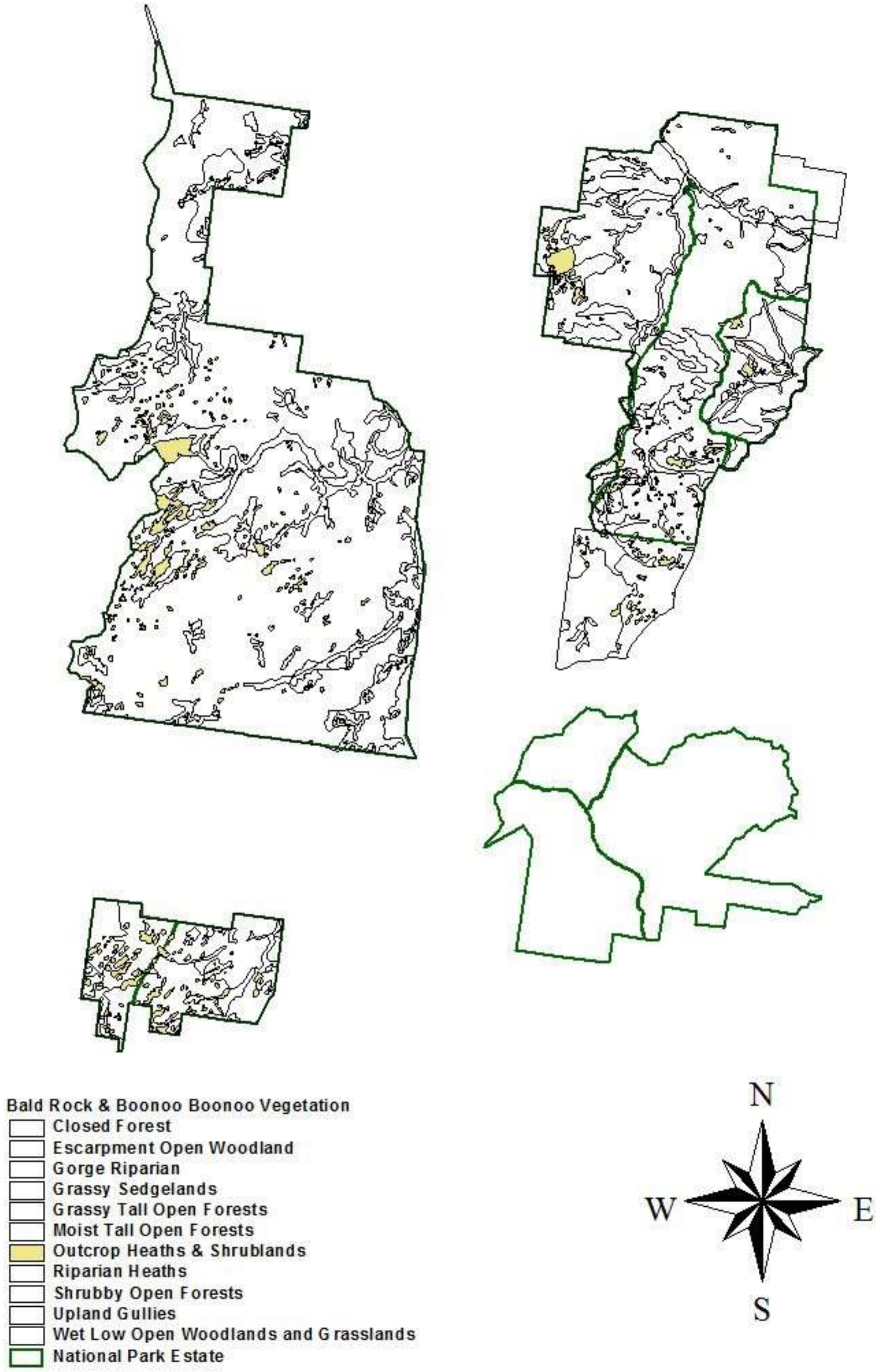


**Figure 41:** Mapped distribution of Community 11.

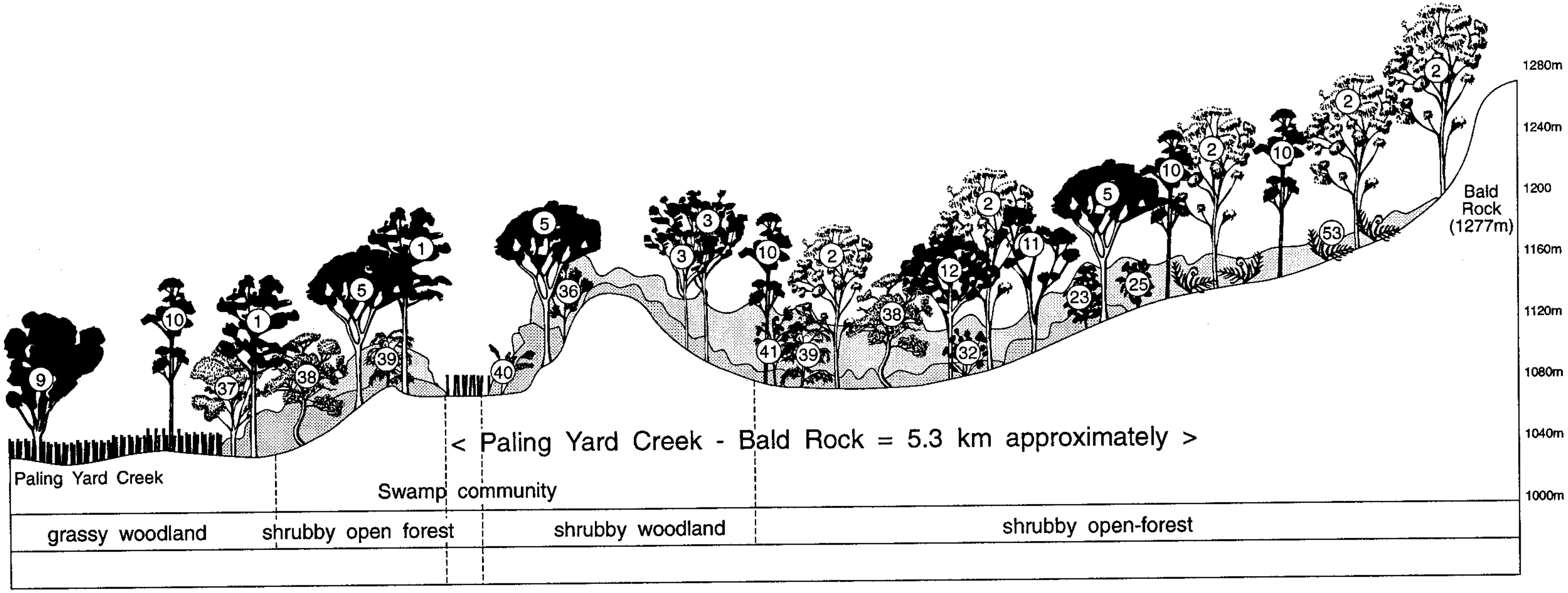


**Figure 42:** Vegetation patterns of Bald Rock National Park. 1 = *E. brunnea*; 2 = *E. campanulata*; 3 = *E. andrewsii*; 5 = *Eucalyptus caliginosa*; 9 = *E. nova-anglica*; 10 = *E. dalrympleana* subsp. *heptantha*; *E. banksii*; 23 = *Elaeocarpus reticulatus*; 25 = *Leucopogon lanceolatus*; 32 = *Persoonia cornifolia*; 36 = *Acacia adunca*; 37 = *Acacia filicifolia*; 38 = *Banksia integrifolia*; 39 = *Allocasuarina littoralis*; 40 = *Daviesia latifolia*; 41 =*Acacia falciformis*; 53 = *Pteridium esculentum*. Taken from McDonald *et al.* (1995).

### *3.5 Description of taxa of conservation significance*

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**3.5.1 *Acacia latisepala* Pedley (3RC-).**

**Taxonomy**

**Type:** *ca.* 1 mile west of Joll's Falls, 5 miles N of Stanthorpe, Oct. 1963, *Pedley 1538* (BRI).

**Reference:** *Proceedings of the Royal Society of Queensland* 75: 31..

**Family:** Fabaceae.

**Affinities:** .

**Synonymy:** *Racosperma latisepala* (Pedley) Pedley.

**Derivation of name:** Meaning wide sepals.

**Common name:** None apparent.

**Changes in conservation status:** 3RC- (Briggs & Leigh 1996), unchanged since.

**Life history**

**Growth form:** Shrub to 8 m tall.

**Vegetative spread:** None.

**Longevity:** Unknown but germinates en-mass yet older individuals are usually only as isolated plants. It is likely that this species has a high juvenile to middle age mortality but based on time since fire and the few very tall specimens this species may live for up to 50 years.

**Primary juvenile period:** 3 years.

**Flowers:** Spring to late summer.

**Fruit/seed:** May mature as early as December but may continue to early autumn.

**Dispersal, establishment & growth:** Via seed. Requires a disturbance such as fire for germination, however fires may need to occur within the right season or dormancy may not be broken. Seed banks are long lived and survive for over 50 years.

**Fire response:** Obligate seeder but requires dormancy period before germination, which is often on mass if fire temperatures are high enough (Hunter 1999).

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs, Northern Tablelands, North Western Slopes.

**General distribution:** Found in a band from Torrington in the west and through the Granite Belt to Bald Rock.

**Distribution within the BRBB:** Found only along the western margin of Bald Rock, particularly near the Border Trail.

### Habitat

**Habitat:** Primarily restricted to granite outcrops.

**Altitude:** 900-1285.

**Annual Rainfall:** 700-1000.

**Abundance:** Found in very large numbers in a few localities on granite outcrops after the 1994 fires, but otherwise found in small isolated populations, often as individuals.

**BRBB community:** Restricted to Community 11.

**Substrate:** Wholly granite outcrops.

**Exposure:** Fully exposed sites.

### Management

**Population size:** Probably at present under 500 individuals within the park. Numbers are likely to fluctuate greater over decades due to various firing.

**Reserved:** Found within the Torrington State Recreation Area, Girraween National Park and Bald Rock National Park.

**Threats:** Inappropriate fire regimes. Goat grazing.

**Management considerations:** It would be appropriate to follow the changes in population size in areas where the species germinated 1994. If fires subsequent fires are known to occur on granite outcrops these should be checked the following year for new populations. Although considered as only rare, this species may be less abundant than currently thought due to the very small populations and the fluctuating populations sizes.

**Figure 43:** Photograph of *Acacia latisepala*.

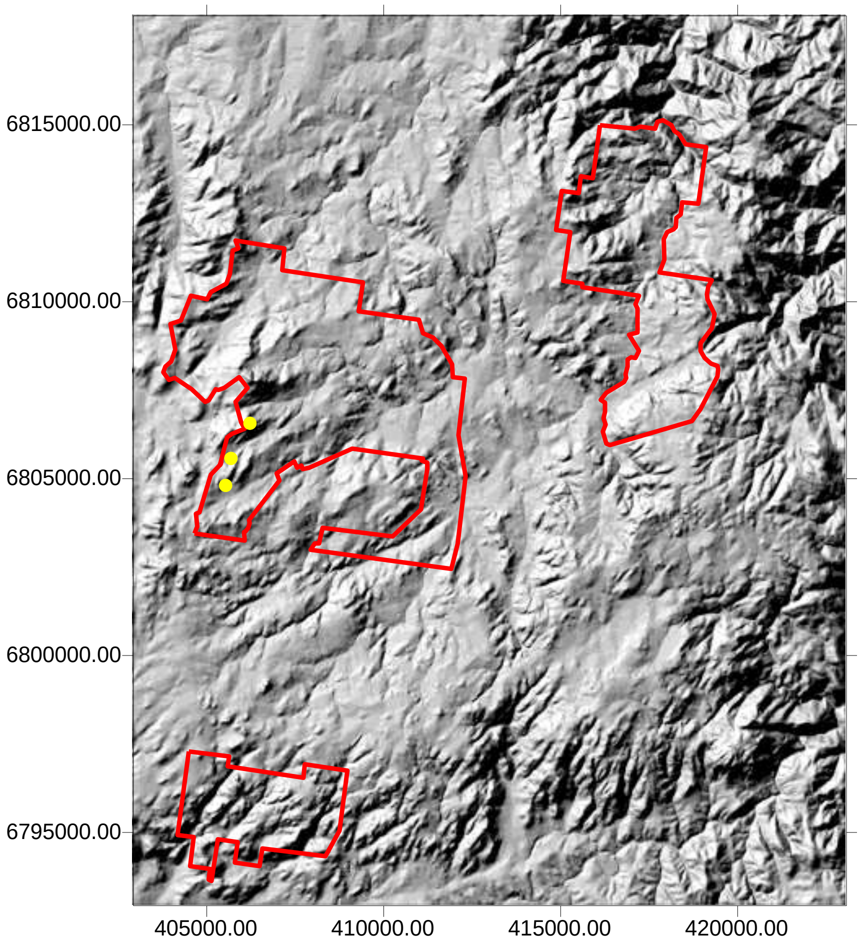


**Figure 44:** Distribution of *Acacia latisepala*.

### 3.5.2 *Acacia macnuttiana* Maiden & Blakely (3RC-: TSC Endangered)

**Taxonomy**

**Type:** New South Wales: North Western Slopes: Bismuth, near Deepwater, *A. McNutt s.n.*, August 1913 (*holo*: NSW).

**Reference:** *Journal and Proceedings of the Royal Society of New South Wales* 60: 176 (1926).

**Family:** Fabaceae

**Affinities:** *A. macnuttiana* forms a complex of closely related narrow leafed wattles that include *A. betchei*, *A. floydii*, *A. neriifolia*, *A. adunca* and *A. ingramii*. *Acacia macnuttiana* can be separated from these species by the combination of a single gland at the base of the phyllode, curved mucro at the apex, pubescent sepals and peduncle.

**Synonymy:** None.

**Derivation of name:** Named in honour of the collector of the type material.

**Common name:** McNutt's Wattle.

**Changes in conservation status:** 2KC-; 2VC- (Quinn *et al.* 1995); 2VCi (Briggs & Leigh 1996); TSC Act (1995) Endangered; 2KC- (Sheringham & Westaway 1998 *update*).

**Life history**

**Growth form:** Tall shrub usually to 3 m but sometimes to 5 m tall.

**Vegetative spread:** None.

**Longevity:** Unknown but at least 15 years.

**Primary juvenile period:** 3-4 years

**Flowers:** July to September.

**Fruit/seed:** Late summer.

**Dispersal, establishment & growth:** Via seed probably localised.

**Fire response:** Obligate seeder. Germinates readily after the passage of fire.

**Interactions with other organisms:** None known.

**Distribution**

**Botanical sub-regions:** North Coast, Northern Tablelands and North Western Slopes.

**General distribution:** Mainly restricted to watercourses from the Pindari Dam on the Severn River through the Torrington State Recreation Area and the Eagle Creek area to Boonoo Boonoo Falls. An unnamed and closely related entity is common in the eastern gorge country of Western Washpool NP and Mann River.

**Distribution within the BRBB:** Found only at the escarpment above Boonoo Boonoo Falls.

**Habitat**

**Habitat:** Usually along creeks on granite

**Altitude:** 500-1140 m.

**Annual Rainfall:** 600-900 mm.

**Abundance:** Found on the escarpment edge above Boonoo Boonoo Falls.

**BRBB community:** Grassy Tall Open Forests.

**Substrate:** Granite.

**Exposure:** Exposed.

**Management**

**Population size:** Only a few isolated patches were found however further searches along the escarpment and riverbanks may find additional populations, however it is assumed that the population size within the reserve is rather small.

**Reserved:** Bald Rock National Park (single record), Boonoo Boonoo National Park, Torrington State Recreation Area, Washpool National Park Western Additions. A record given by Quinn *et al*. (1995) and Sheringham & Westaway (1998) of '33 km along Poverty Point Rd, *J.B.Williams* 10.12.1986' has since been re-determined as *Acacia floydii* by the author. A large number of plants were known from the shores of Pindari Dam before the recent enlargement, all of the hundreds of plants found there have since been inundated, this population however may have been *Acacia acrionastes*. None have been rediscovered in the area, however there is potential for new populations to be found in the Severn River Nature Reserve.

**Threats:** Inappropriate fire regimes (high frequency). Grazing by stock and goats will eliminate this taxon.

**Management considerations:** Under threat due to small and disjunct population size. Other likely areas of occurrence along the major watercourses and along the escarpment should be checked and the size of the currently known population size should be established. Too high a frequency of fire is likely to eliminate this species along with long absences of fire. An inter-fire period, long enough to enable seed bank development, probably at least 10 years. Goats and wild stock should be removed from these areas.

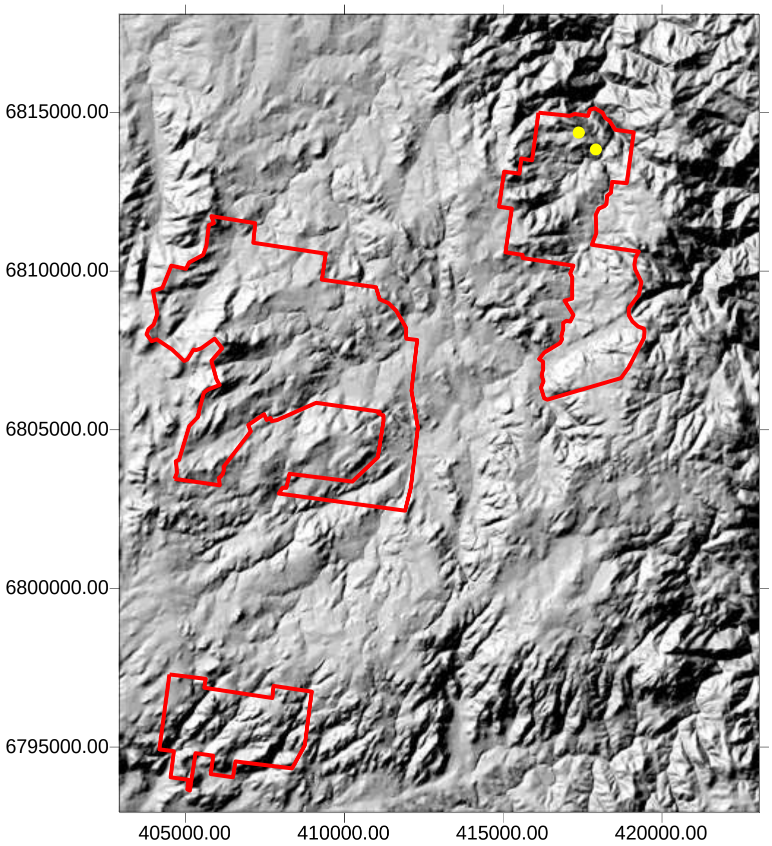


**Figure 45:** Distribution of *Acacia macnuttiana*.

**Figure 46:** Photograph of *Acacia macnuttiana*.

### 3.5.3 *Allocasuarina rupicola* L.A.S. Johnson (2RC-).

**Taxonomy**

**Type:** 6.4 km on Boonoo Boonoo Falls rd from Boonoo Boonoo, N.S.W., 25 March 1981, *L.A.S.Johnson 8539* (holo: NSW; iso: BRI, CANB, K, MO).

**Reference:** *Flora of Australia* 3: 199.

**Family:** Casuarinaceae.

**Affinities:** Closely related to *Allocasuarina rigida* but differs in teeth not spreading when fresh.

**Synonymy:** None.

**Derivation of name:** *rupis* meaning rock and *cola* meaning dweller, hence rock dweller.

**Common name:** None apparent.

**Changes in conservation status:** 2RC- (Briggs & Leigh 1996) unchanged since.

**Life history**

**Growth form:** Shrub to 3 m tall.

**Vegetative spread:** No.

**Longevity:** Unknown but possibly long lived.

**Primary juvenile period:** Unknown.

**Flowers:** Mainly spring and summer.

**Fruit/seed:** Summer to autumn.

**Dispersal, establishment & growth:** Via seed.

**Fire response:** Unkown, but based on its occurrences on rocky banks of the Boonoo Boonoo River and the larger outcrops of the region this species is likely to be an obligate seeder and one that avoids at least frequent fires.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs, Northern Tablelands.

**General distribution:** From Wyberba in Queensland to Boonoo Boonoo.

**Distribution within the BRBB:** Restricted to the rocky banks of the Boonoo Boonoo River and on the larger granite outcrops such as Mount Prentice.

**Habitat**

**Habitat:** Restricted to the clefts in granite outcrops on bornhardts and along rocky creeks.

**Altitude:** 800-1200.

**Annual Rainfall:** 800-1200.

**Abundance:** Fairly common along the Boonoo Boonoo River but otherwise scarce in New South Wales.

**BRBB community:** Community 4 and Community 11.

**Substrate:** Exposed granite surfaces.

**Exposure:** Fully exposed sites.

**Management**

**Population size:** Probably a maximum of 1000 individuals throughout the reserves.

**Reserved:** Girraween and Boonoo Boonoo National Parks.

**Threats:** Inappropriate fire regimes, disturbance by visitors along the riverbank.

**Management considerations:** Reducing the impact of visitors to parts of the riverbank. One population at Morgan's Gully was almost completely devastated by what appeared to be human activity.

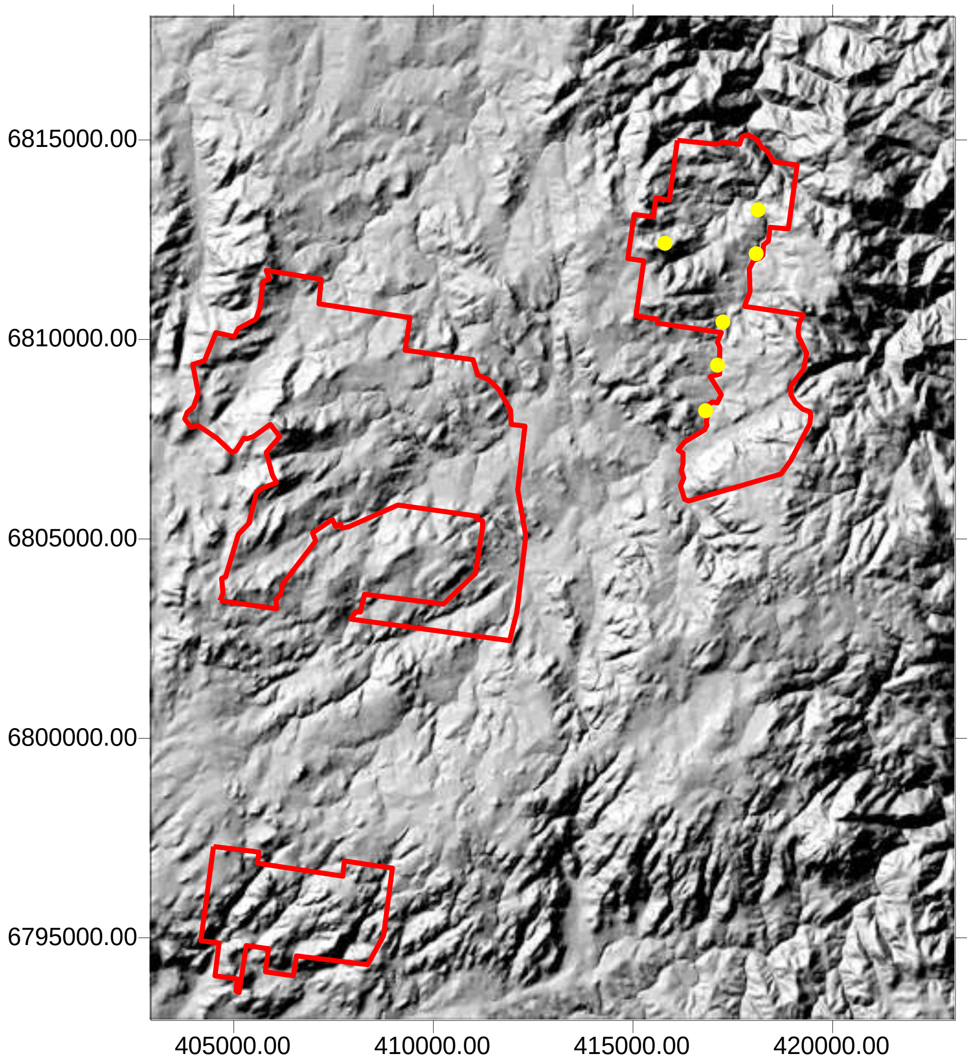


**Figure 47** Distribution of *Allocasuarina rupicola*.

### 3.5.4 *Callistemon flavo-virens* (Cheel) Cheel (3RC-).

**Taxonomy**

**Type:** None chosen.

**Reference:** *Royal Society of New South Wales* 50: 263.

**Family:** Myrtaceae.

**Affinities:** Not apparent.

**Synonymy:** *Callistemon rugulosus* var. *flavo-virens*.

**Derivation of name:** *flavo* meaning yellow and *veriens* meaning green, in reference to the yellow green flowers.

**Common name:** Green Bottlebrush.

**Changes in conservation status:** 3RC- (Briggs & Leigh 1996), unchanged since.

**Life history**

**Growth form:** Shrub to 3 m tall.

**Vegetative spread:** No.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown but likely to be 3-5 yrs.

**Flowers:** Mainly spring to summer.

**Fruit/seed:** Not stated.

**Dispersal, establishment & growth:** Via seed.

**Fire response:** Unknown.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs, Northern Tablelands.

**General distribution:** From Torrington through Stanthorpe and Wallangara to Boonoo Boonoo with a disjunct occurrence at Gibraltar Range.

**Distribution within the BRBB:** Restricted to the banks of the Boonoo Boonoo River.

**Habitat**

**Habitat:** Granite country along creek banks.

**Altitude:** 800-900 m.

**Annual Rainfall:** 800-1400 mm.

**Abundance:** Isolated and restricted populations occur within close proximity to the rocky banks of major waterways.

**BRBB community:** Community 4.

**Substrate:** Exposed granite.

**Exposure:** Fully exposed.

**Management**

**Population size:** Unknown but probably of limited numbers within a few hundred.

**Reserved:** Within Girraween National Park, Boonoo Boonoo National Park, Bluff River Nature Reserve and Gibraltar Range National Park. Potentially in the Torrington State Recreation Area depending on if the variant there, which is taller is part of this complex.

**Threats:** Disturbance to creek banks, inappropriate fire regimes.

**Management considerations:** Minimising disturbance to the rocky creek banks of the Boonoo Boonoo River.

**Figure 48:** Photograph of *Callistemon flavo-virens*.

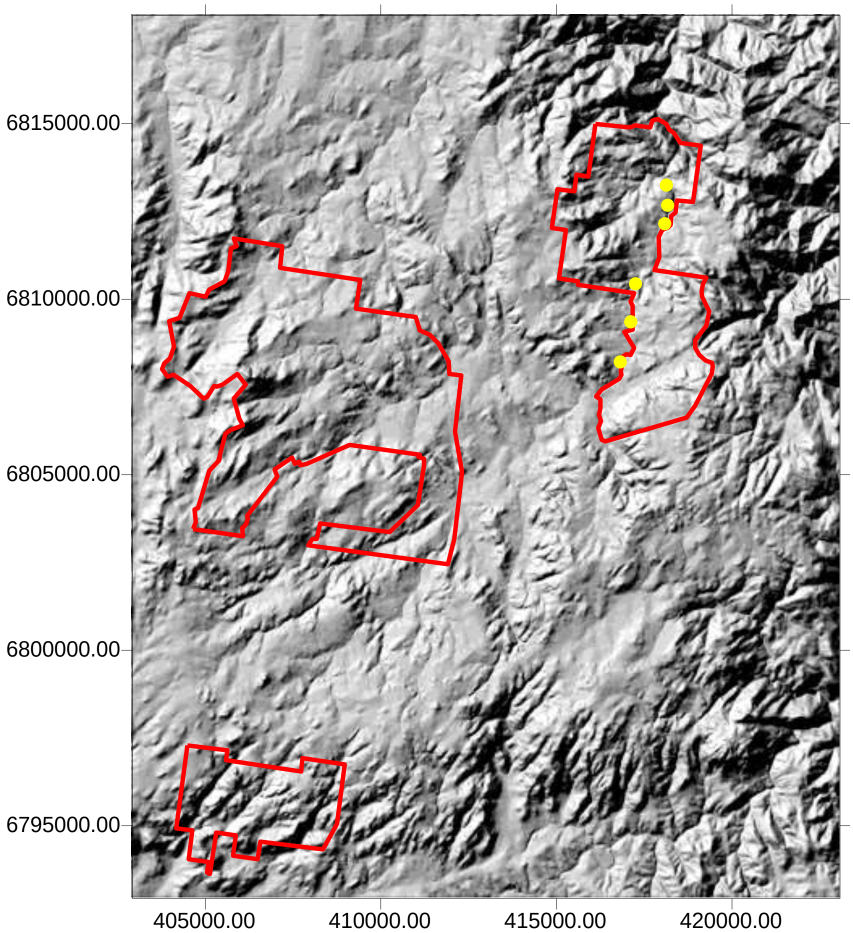


**Figure 49:** Distribution of *Callistemon flavo-virens*.

### 3.5.5 *Callitris monticola* J.Garden (3RC-).

**Taxonomy**

**Type:** Wallangarra, Queensland, *W. de Beuzeville*, 4.1941 (holo: NSW).

**Reference:** *Contributions from the New South Wales National Herbarium* 2: 385.

**Family:** Cupressaceae.

**Affinities:** Not apparent but possibly close to *Callitris rhomboidea* and *C. oblonga*.

**Synonymy:** None.

**Derivation of name:** In reference to the mountain habitat.

**Common name:** Cypress Pine.

**Changes in conservation status:** 3RC- (Briggs & Leigh 1996), unchanged since.

**Life history**

**Growth form:** Shrub to 2.5 m tall.

**Vegetative spread:** None.

**Longevity:** Like other *Callitris* this species is probably long lived.

**Primary juvenile period:** If like its co-geners it may require a few decades before seed sets.

**Flowers:** Not applicable.

**Fruit/seed:** Not applicable.

**Dispersal, establishment & growth:** Via seed or cone dispersal.

**Fire response:** Obligate seed that probably has a short lived seed bank but requires a long juvenile period.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Found in the Darling Downs, Moreton, North Coast and Northern Tablelands divisions.

**General distribution:** From Restricted to the Granite Belt and across the border ranges in northern New South Wales and Southern Queensland with a disjunct population in Gibraltar Range.

**Distribution within the BRBB:** Apparently restricted to the most western parts of Bald Rock National Park near the Border Trail.

**Habitat**

**Habitat:** Restricted to shallow, sandy soils on rocky sandstone, granite or rhyolite outcrops.

**Altitude:** ?800-1400 m.

**Annual Rainfall:** ?800-1800.

**Abundance:** Found usually as only isolated individuals or in very small populations that are usually very disjunct.

**BRBB community:** Community 11.

**Substrate:** Variable but restricted to outcrops.

**Exposure:** Fully exposed.

**Management**

**Population size:** Only a handful of individuals have been seen and the population within the reserves is probably less than ten at this stage.

**Reserved:** Within Girraween National Park, Bald Rock National Park, Main Range National Park, Lamington National Park, Mount Barney National Park, Gibraltar Range National Park, Waihou Flora Reserve.

**Threats:** Fire is the main threat to these populations.

**Management considerations:** Further searches may recover additional sightings and exclusion of fire from sites containing this taxon is the main consideration at this stage.

**Figure 50:** Photograph of *Callitris monticola*.

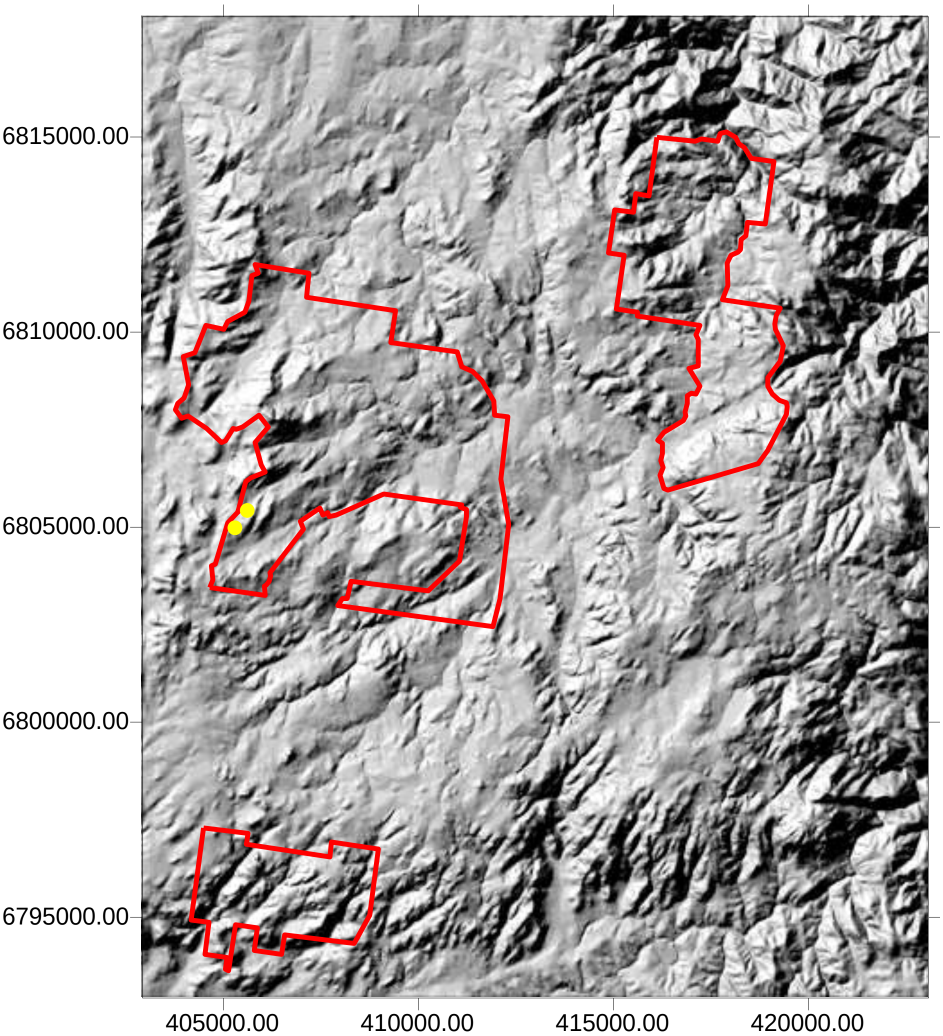


**Figure 51:** Distribution of *Callitris monticola*.

### 3.5.6 *Callitris oblonga* subsp. *parva* Hill (3VCa; Schedule 2, Vulnerable *TSC* Act)

**Taxonomy**

**Type:** Backwater, NSW, 9 Mar. 1995, *K.D.Hill 4765 & L.Stanberg* (holo: NSW; iso: BRI, CANB, HO, MEL).

**Reference:** *Flora of Australia* 48: 717: (1998).

**Family:** Proteaceae.

**Affinities:** *Callitris oblonga* subsp. *oblonga* and *C. oblonga* subsp. *caragensis*.

**Synonymy:** none.

**Derivation of name:** *parvus* meaning small, in reference to the smaller cones and leaf segments as compared to the type subspecies.

**Common name:** Pygmy Cypress Pine.

**Published conservation status:** 3VCi (Briggs & Leigh 1988); 3VCa (Nadolny & Benson 1993; Briggs & Leigh 1996); Schedule 2, Vulnerable *TSC* Act; unchanged since.

**Life history**

**Growth form:** small tree or tall shrub to 7 m tall.

**Vegetative spread:** none.

**Longevity:** fast growing plants known to survive to 28 yrs.

**Primary juvenile period:** unknown.

**Fruit/seed:** fruit held on branches until branch dies, then seeds released.

**Dispersal, establishment & growth:** seeds released from cones when branch dies often after floods or fire, such disturbance decreases competition.

**Fire response:** obligate seeder.

**Interactions with other organisms:** none apparent.

**Distribution**

**Botanical sub-regions:** Northern Tablelands.

**General distribution:** found sporadically from Backwater to Boonoo Boonoo.

**Habitat**

**Habitat:** in sandy soils over granite around creeks and swamps.

**Altitude:** 900-1100 m.

**Annual rainfall:** 800-1200 mm.

**Abundance:** sporadically distributed taxon.

**BRB community:** Community 3.

**Substrate:** alluvial soils overlying granite.

**Exposure:** exposed to partially protected sites.

**Management**

**Population size:** scattered individuals along the Boonoo Boonoo River.

**Reserved:** Warra NP, Basket Swamp NP, Boonoo Boonoo NP.

**Threats:** frequent fire regimes, it is generally restricted to sites that are relatively protected from fire (Nadolny & Benson 1993). Rabbit grazing of young shoots, particularly after fires. Trail bikes and other constant disturbance around the banks of the Sara River near the falls. Wild pig rutting. Competition from blackberry.

**Figure 52:** Photographs of *Callitris oblonga* subsp. *parva.*

### 3.5.7 *Cryptandra lanosiflora* F.Muell. (3RCa)

**Taxonomy**

**Type:** In rupibus tempestati expositis montium Novae Angliae apud flumen Severn; C.St. In regionibus montis Mitchell excelsioribus flumen Clarence versus; Dr. H. Beckler (no type chosen).

**Reference:** *Fragmenta Phytographiae Australiae* 3: 65.

**Family:** Rhamnaceae.

**Affinities:** Uncertain.

**Synonymy:** None.

**Derivation of name:** *Lano* meaning woolly, in reference to the woolly flowers.

**Common name:** Woolly Cryptandra.

**Changes in conservation status:** 3RCa (Briggs & Leigh 1996), unchanged since.

**Life history**

**Growth form:** Branched shrub to 30 cm tall.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown.

**Flowers:** Spring to summer.

**Fruit/seed:** Late summer to autumn.

**Dispersal, establishment & growth:** Via seed.

**Fire response:** Unknown but may be an obligate seeder.

**Interactions with other organisms:** Pollinated by generalist insects, primarily flies.

**Distribution**

**Botanical sub-regions:** Darling Downs, Northern Tablelands, North Coast, North Western Slopes.

**General distribution:** From the Severn River across the Granite Belt and down the eastern escarpment of New South Wales to Werrikimbe.

**Distribution within the BRBB:** Found within the drier regions of Boonoo Boonoo National Park and the north west portion of the southern section of Bald Rock National Park.

**Habitat**

**Habitat:** Usually in heath and heathy forests in exposed sites with shallow sandy or rocky soils.

**Altitude:** ?700- 1200 m.

**Annual Rainfall:** ?700-1400 mm.

**Abundance:** Found usually as small clumped populations, scattered throughout the region.

**BRBB community:** Community 10.

**Substrate:** Granite and rhyolitic shallow soils.

**Exposure:** Fully exposed.

**Management**

**Population size:** Only found as a couple of small populations and may only be around 500 individuals within both reserves.

**Reserved:** Girraween National Park, Bald Rock National Park, Boonoo Boonoo National Park, Gibraltar Range National Park, New England National Park, Werrikimbe National Park, Butterleaf National Park, Mann River Nature Reserve, Western Washpool NP, Warra National Park, Bolivia Hill Nature Reserve and the Torrington State Recreation Area.

**Threats:** Fires that are too frequent?.

**Management considerations:** Searches of the dryer heathy forests may highlight further populations.

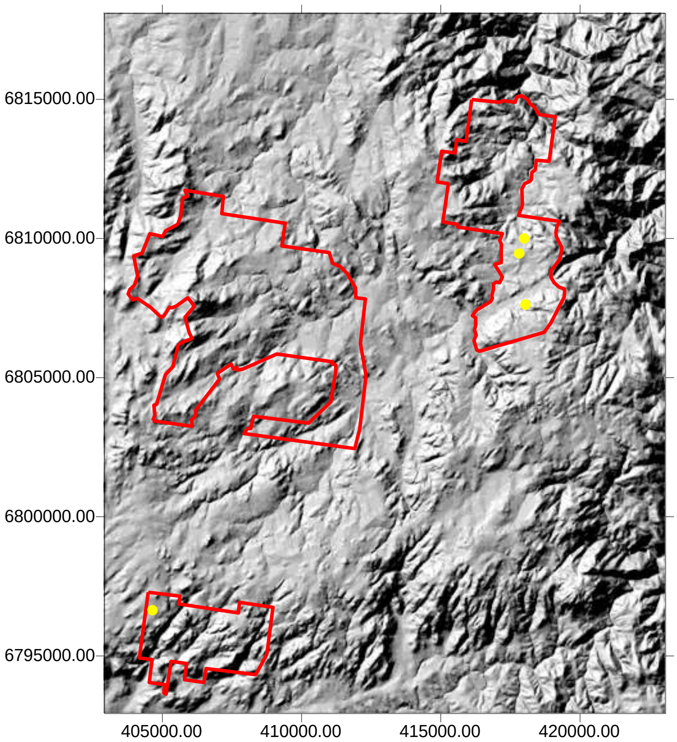


**Figure 53:** Distribution of *Cryptandra lanosiflora*.

### 3.7.8 *Daviesia elliptica* Crisp (3RC-).

**Taxonomy**

**Reference:** *Australian Systematic Botany* 4: ?.

**Family:** Fabaceae.

**Affinities:** *Daviesia latifolia*.

**Synonymy:** Unknown.

**Derivation of name:** In reference to the shape of the leaves.

**Common name:** None apparent.

**Changes in conservation status:** 3RC- (Briggs & Leigh 1996), unchanged since.

**Life history**

**Growth form:** Shrub to 1.5 m tall.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown but probably 3 years.

**Flowers:** September to November.

**Fruit/seed:** ? late summer to autumn.

**Dispersal, establishment & growth:** Via seed.

**Fire response:** Known to germinate prolifically to fires of the right temperature. Probably an obligate seeder and has responses similar to many other legumes.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs and the Northern Tablelands.

**General distribution:** North of the Oban River.

**Distribution within the BRBB:** Found in Boonoo Boonoo National Park particularly within close proximity to the Boonoo Boonoo River and the falls area and also in the old Jenner State Forest section of Bald Rock National Park.

**Habitat**

**Habitat:** In dry forests on sandy soils.

**Altitude:** 800-1000 m.

**Annual Rainfall:** 1000-12000 mm.

**Abundance:** Found in very large numbers in scattered localites. Each population appears to be a cohort that has germinated after single wildfire events.

**BRBB community:** Community 8 and Community 11.

**Substrate:** Usually deeper sandy soils on granite.

**Exposure:** Partially shaded.

**Management**

**Population size:** The population size is likely to be highly variable over decades and will relate to the frequency and temperature of local fires. At present the population within Boonoo Boonoo is likely to be several thousand.

**Reserved:** Boonoo Boonoo National Park, Basket Swamp NP, Western Washpool NP, Gibraltar Range NP, Bolivia Hill NR and Mann River NR.

**Threats:** Fires at an incorrect frequency or temperature.

**Management considerations:** No hands on management is required at this time, however periodic monitoring of populations for an understanding of their long term dynamics would be beneficial.

**Figure 54:** Photograph of *Daviesia elliptica*.

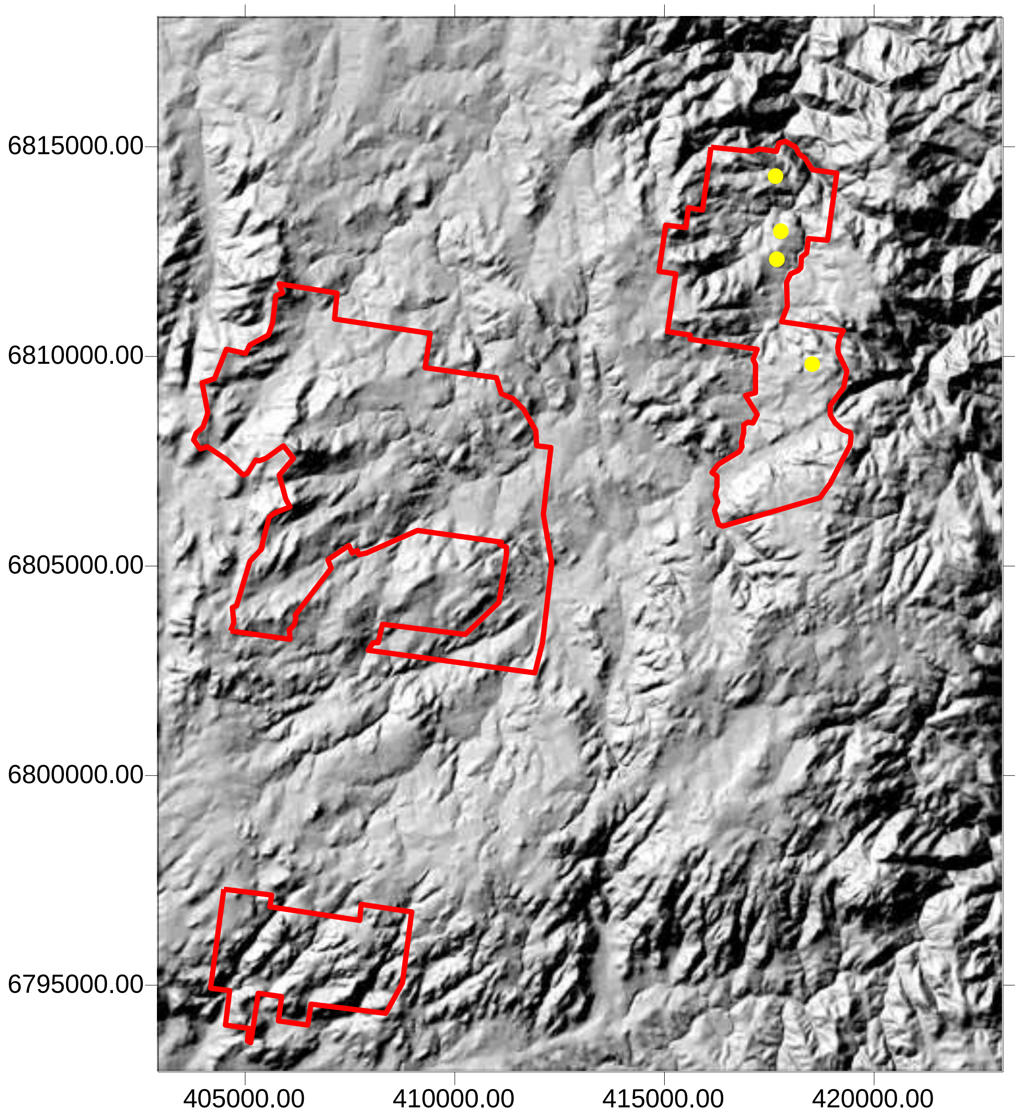


**Figure 55:** Distribution of *Daviesia elliptica*.

### 3.5.9 *Dodonaea hirsuta* (Maiden & Betche) Maiden & Betche (3RC-).

**Taxonomy**

**Type:** Jennings N.S.W., *J.L. Boorman,* October 1901 (holo: NSW).

**Reference:** *Proceedings of the Linnean Society of New South Wales* 38: 245.

**Family:** Sapindaceae.

**Affinities:** Not apparent.

**Synonymy:** *Dodonaea peduncularis* var. *hirsuta*.

**Derivation of name:** In reference to the hairy leaves.

**Common name:** Hairy Hop Bush.

**Changes in conservation status:** .3RC- (Briggs & Leigh 1996), unchanged since.

**Life history**

**Growth form:** Shrub to 1.5 m tall.

**Vegetative spread:** None.

**Longevity:** Not known.

**Primary juvenile period:** Unknown but probably 3-5 yrs.

**Flowers:** Within spring to summer.

**Fruit/seed:** Summer.

**Dispersal, establishment & growth:** Via fruit, wind dispersed.

**Fire response:** Obligate seeder. Apparently recruits readily post fire.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs, Northern Tablelands and North Western Slopes.

**General distribution:** From Torrington to Wallangara and to Grafton.

**Distribution within the BRBB:** The southern section of Boonoo Boonoo in heathy forests.

**Habitat**

**Habitat:** Shrubby forests and heathlands on outcrops.

**Altitude:** 800-1200 m.

**Annual Rainfall:** 700-1400 m.

**Abundance:** Often found abundantly but with a disjunct distribution.

**BRBB community:** Community 11.

**Substrate:** Sandstone and granite.

**Exposure:** Usually partially shaded to fully exposed sites.

**Management**

**Population size:** Probably only a few hundred within the reserve.

**Reserved:** Banyabba Nature Reserve, Girraween National Park, Fortis Creek National Park, Torrington State Recreation Area and Kings Plains National Park.

**Threats:** Inappropriate fire regimes.

**Management considerations:** Populations are fairly stable and probably do not require hands on management. Further work into the fire responses of this species is warranted.

### 3.5.10 *Endiandra hayesii* Kosterm. (3VC-; TSC Act Shedule 2, Vulnerable).

**Taxonomy**

**Type:** In valley below Minyon Falls (*ca.* 8 miles SW of Mullumbimby, N. Coast, alt. 130 m, Oct. Buds, *Hoogland & Hayes 8498* (holo: BO; iso: A, BRI, K, L, MEL, NSW).

**Reference:** *Reinwardtia* 8: 81.

**Family:** Lauraceae.

**Affinities:** Not apparent.

**Synonymy:** None.

**Derivation of name:** Named after botanist Hayes.

**Common name:** Rusty Rose Walnut.

**Changes in conservation status:** 3VC- (Briggs & Leigh 1996), unchanged since.

**Life history**

**Growth form:** Small to medium sized tree.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown.

**Flowers:** Summer.

**Fruit/seed:** Not known.

**Dispersal, establishment & growth:** Via fruit.

**Fire response:** Unknown.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Moreton, North Coast.

**General distribution:** North of the Clarence River to just over the Queensland Border.

**Distribution within the BRBB:** Restricted to the bottom of the Boonoo Boonoo Falls.

**Habitat**

**Habitat:** In subtropical lowland closed forests on sedimentary of alluvial soils in shetered valleys.

**Altitude:** 10-500 m.

**Annual Rainfall:** 1400 mm +.

**Abundance:** Locally abundant when it is found.

**BRBB community:** Community 4.

**Substrate:** Alluvial or sedimentary soils.

**Exposure:** Protected sites usually within gullies.

**Management**

**Population size:** Only a handful of plants were seen and the total population within the reserve may be under 50.

**Reserved:** Burleigh Heads National Park, Warrie National Park, Big Scrub Flora Reserve, Nightcap National Park, Snows Gully Nature Reserve, Boonoo Boonoo National Park.

**Threats:** Fire and rock slides.

**Management considerations:** A survey of total population size at the base of the Boonoo Boonoo Falls is appropriate.

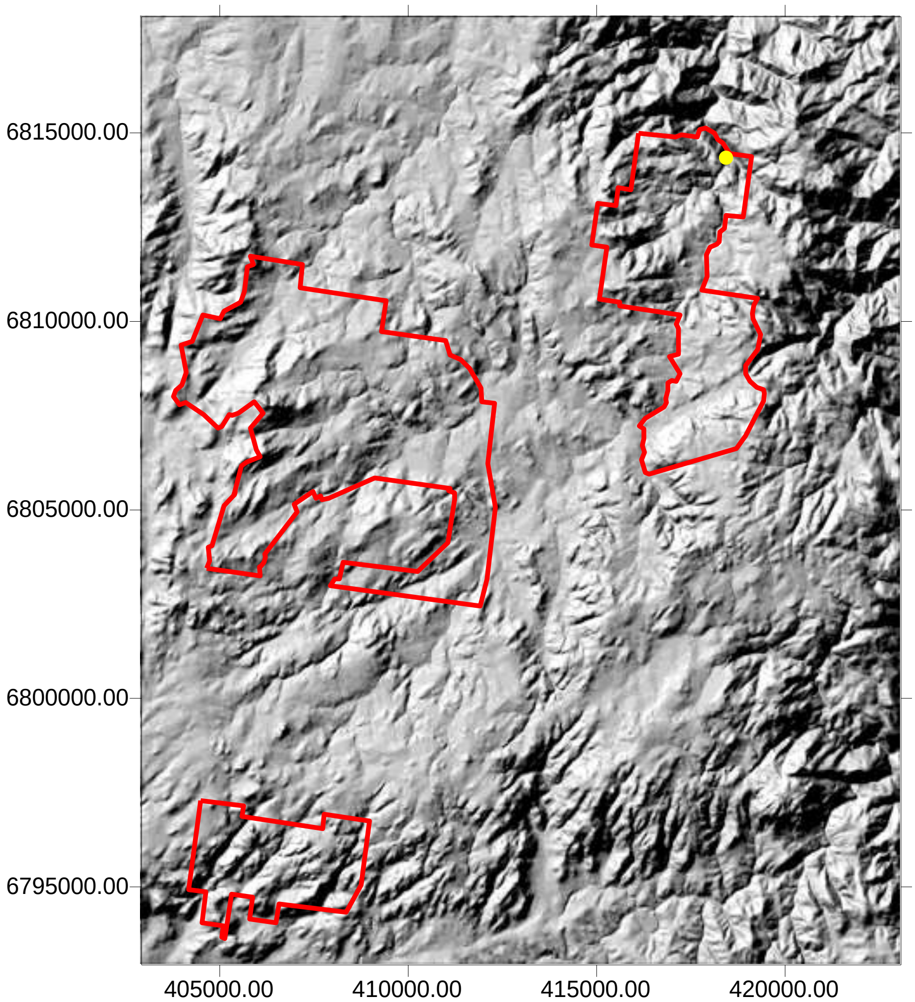


**Figure 56:** Distribution of *Endiandra hayesii*.

### 3.5.11 *Eucalyptus dorrigoensis* (Blakely) L.A.S.Johnson & K.D.Hill (3KC-)

**Taxonomy**

**Type:** New South Wales: Northern Tablelands: Wild Cattle Creek, Dorrigo, *W.A.W. Beuzeville* Sept. 1931 (*lecto*: NSW).

**Reference:** *Telopea* 4: 63 (1990).

**Family:** Myrtaceae.

**Affinities:** Possibly related to *E. benthamii* but differs in the structure of the outer calyptra.

**Synonymy:** *Eucalyptus benthamii* subsp. *dorrigoensis* Blakely.

**Derivation of name:** Named after region of type locality.

**Common name:** Dorrigo White Gum.

**Changes in conservation status:** Not considered to be at risk (Johnson & Hill 1990); 2RCa (Binns 1992); 2KC- (Sheringham & Westaway 1995; Quinn *et al.* 1996); 3KC- (Sheringham & Westaway 1998, update).

**Life history**

**Growth form:** Smooth barked tree to 40 m tall.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown.

**Flowers:** Unknown.

**Fruit/seed:** Several seasons held on one individual and gradually released.

**Dispersal, establishment & growth:** Seed dispersed, regenerates well after logging (Chapman & Binns 1995).

**Fire response:** Long term frequent burning may deplete populations.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** North Coast and Northern Tablelands.

**General distribution:** From south-east of Tenterfield along the eastern escarpment to the Macleay River.

**Distribution within BRBB:** Scarce at the higher altitudes in most situations but in particular along most upland creeks and some upland drier slopes.

**Habitat**

**Habitat:** Along creeks and drainage depressions on undulating plateau landforms but sometimes on steep slopes (Binns 1992; Hunter 1998). Deep soils in valleys (Chapman & Binns 1995). Found occasionally along creek lines and dry steep slopes within the reserve.

**Altitude:** 700-1200 m.

**Abundance:** Widespread and locally dominant in the Glen Innes District (Binns 1992).

**BRBB additions community:** Community 7 and 9.

**Substrate:** Metasediments, Acid Volcanics and Granite.

**Exposure:** Fully exposed to slightly protected sites.

**Management**

**Population size:** Small populations are common throughout the reserves especially along creeks although along some ridges this species may form small monospecific stands.

**Reserved:** Boonoo Boonoo National Park, Demon Nature Reserve, Dorrigo National Park, Guy Fawkes National Park, Guy Fawkes River National Park, Washpool National Park Western Additions and Dorrigo White Gum Flora Reserve.

**Threats:** Regular grazing and burning may inhibit long-term recruitment (Chapman & Binns 1995).

**Management considerations:** This species is very common throughout the reserve and many age classes can be found, therefore active management is not considered necessary for this taxon. It is likely that the widespread nature of this species that is obvious from recent surveys should preclude this species from being a ROTAP or at least it should only be given a 3RCa coding.

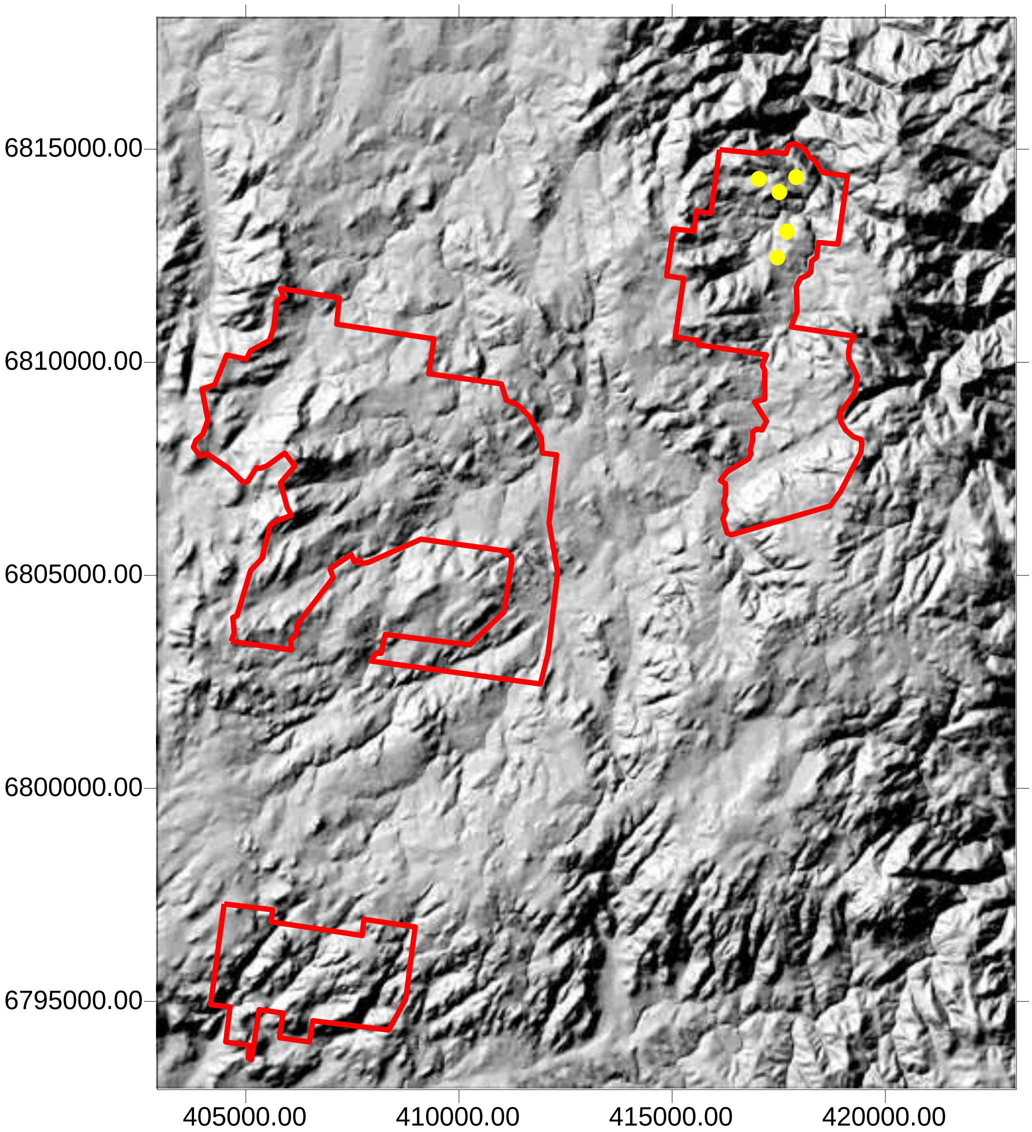


**Figure 57:** Distribution of *Eucalyptus dorrigoensis*.

### 3.5.12 *Eucalyptus scoparia* Maiden (2VCi).

**Taxonomy**

**Type:** On the tops of the highest hills in fissures of granite rocks around Wallangarra, occurring on both sides of the New South Wales-Queensland Border, *J.L. Boorman*, July, 1904 (holo: NSW).

**Reference:** *Proceedings of the Linnean Society of New South Wales* 29: 777.

**Family:** Myrtaceae.

**Affinities:** Not apparent.

**Synonymy:** None.

**Derivation of name:** *Scopulus* meaning pointed rock, cleft or crag, in reference to the habitat.

**Common name:** Wallangarra White Gum.

**Changes in conservation status:** 2VCi (Briggs & Leigh 1996), unchanged since. Only a few individuals are known from New South Wales and as such this species may warrant TSC Act Listing.

**Life history**

**Growth form:** Tree to 20 m tall.

**Vegetative spread:** None.

**Longevity:** Unknown but based on habitat may be long lived, in the order of hundreds of years.

**Primary juvenile period:** Unknown but likely to be 5 yrs +.

**Flowers:** Summer.

**Fruit/seed:** Throughout the year.

**Dispersal, establishment & growth:** Seed.

**Fire response:** Not known but likely to be readily killed by fires and have a poor resprouting response.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs and the Northern Tablelands.

**General distribution:** Restricted to the Wallangarra area, once thought to occur in the Malara area but this is now thought to be an erroneous locality.

**Distribution within the BRBB:** Restricted to the larger granite outcrops near the Queensland Border within Bald Rock National Park.

### Habitat

**Habitat:** Clefts within exposed granite slopes.

**Altitude:** 900-1300 m.

**Annual Rainfall:** 800-1200 mm.

**Abundance:** Found frequently within Girraween National Park but very uncommon in New South Wales.

**BRBB community:** Community 11.

**Substrate:** Granite outcrops.

**Exposure:** Fully exposed sites.

### Management

**Population size:** Within the reserves the population may only be in the order of tens of individuals or less.

**Reserved:** Within Girraween and Bald Rock National Parks.

**Threats:** Fires.

**Management considerations:** Too frequent fires are the greatest threat to this species.

**Figure 58:** Photograph of *Eucalyptus scoparia*.

### 3.5.13 *Euphrasia orthocheilia* subsp. *peraspera* W.R.Barker (3RC-).

**Taxonomy**

**Type:** Clarence River, *Wilcox,* xi. 1875 (holo: MEL).

**Reference:** *Journal of the Adelaide Botanic Gardens* 5: 280.

**Family:** Scrophulariaceae.

**Affinities:** Not certain.

**Synonymy:** None.

**Derivation of name:** *Ortho* meaning strait, *cheilia* meaning lip and *para* meaning throughout. Presumably meaning straight lip on the flower throughout.

**Common name:** None apparent.

**Changes in conservation status:** 3RC- (Briggs & Leigh 1996), unchanged since. Currently being considered for inclusion on the TSC Act as vulnerable (John Westaway *pers. comm.*).

**Life history**

**Growth form:** Annual herb to 60 cm tall.

**Vegetative spread:** None apparent.

**Longevity:** Annual.

**Primary juvenile period:** < 1 yr.

**Flowers:** Spring to summer.

**Fruit/seed:** Summer.

**Dispersal, establishment & growth:** Seed.

**Fire response:** Unknown but may be stimulated to flower and seed after fire.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs, North Coast and Northern Tablelands.

**General distribution:** From north of Dorrigo to Torrington.

**Distribution within the BRBB:** Not found during this survey, but previously found within Boonoo Boonoo.

**Habitat**

**Habitat:** In moist open situations.

**Altitude:** ?800-1200 m.

**Annual Rainfall:** 900-1800 mm.

**Abundance:** Not known but probably very infrequent.

**BRBB community:** Not known but likely to be within Community 7.

**Substrate:** Various.

**Exposure:** Open but not fully exposed sites.

**Management**

**Population size:** Not known as not found during the current survey. Populations may fluctuate widely depending on seasonal quality and may be missed due to its annual habit.

**Reserved:** Guy Fawkes National Park, Torrington State Recreation Area, Boonoo Boonoo National Park, Girraween National Park.

**Threats:** Unknown.

**Management considerations:** Until populations are found no direct management procedures are required apart from potential searches in appropriate habitat and seasons.

### 3.5.14 *Hibbertia* sp. B (2KC-).

**Taxonomy**

**Type:** Not yet formally described.

**Reference:** NA.

**Family:** Dilleniaceae.

**Affinities:** *Hibbertia obtusifolia* complex.

**Synonymy:** *Hibbertia obtusifolia*.

**Derivation of name:** NA.

**Common name:** Guinea Flower.

**Changes in conservation status:** 2K (Briggs & Leigh 1996), unchanged since. Clarke and Fullon (1999) state that the taxon requires TSC Act vulnerable listing. However the size of populations within Torrington SRA and Severn River would probably preclude this and the species probably warrants a 3RCa classification.

**Life history**

**Growth form:** Erect shrub to 80 cm tall.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown but probably 2-3 years.

**Flowers:** Summer.

**Fruit/seed:** Late summer to autumn.

**Dispersal, establishment & growth:** Via seed, ant dispersed.

**Fire response:** Killed by fire, obligate seeder. Post fire seedlings noted by germination experiments by Clarke and Fullon (1999) failed to germinate seeds. Probably has specialised dormancy cues and a long lived seed bank.

**Interactions with other organisms:** Secondary dispersal by ants.

**Distribution**

**Botanical sub-regions:** Northern Tablelands and the North Western Slopes.

**General distribution:** From the Severn River to southern Bald Rock National Park.

**Distribution within the BRBB:** Restricted to the southern section of Bald Rock National Park.

**Habitat**

**Habitat:** Found only granite outcrops or within the surrounding boulder fields.

**Altitude:** 700-1100 m.

**Annual Rainfall:** 700-1000 mm.

**Abundance:** Found commonly on and around granite boulders in the Severn River and Torrington areas.

**BRBB community:** Community 10.

**Substrate:** Granite and rhyolite.

**Exposure:** Fully exposed sites.

**Management**

**Population size:** Within the reserve only a handful of plants were seen, the total population may only be in the lower hundreds.

**Reserved:** Severn River Nature Reserve, Torrington State Recreation Area and now Bald Rock National Park.

**Threats:** Inappropriate fire regimes and cattle and goat grazing.

**Management considerations:** A survey of the total population size and distribution would be beneficial.

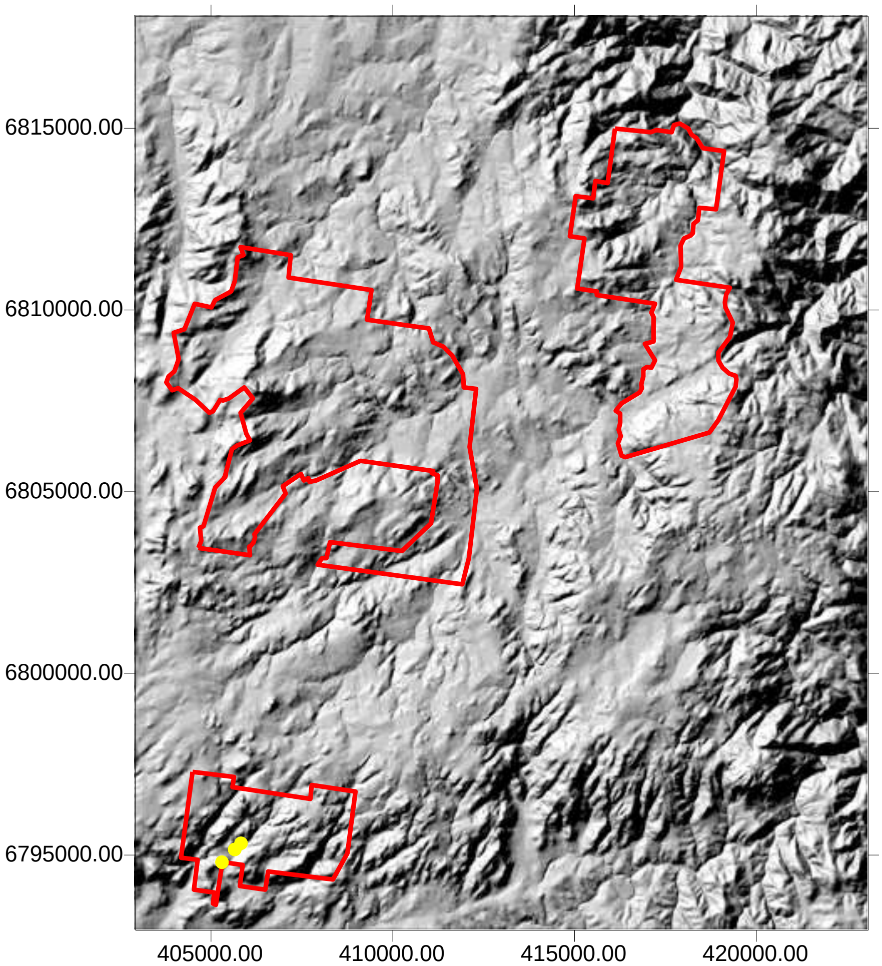


**Figure 59:** Distribution of *Hibbertia* sp. B.

### 3.5.15 *Homoranthus lunatus* Craven & S.R.Jones

**Taxonomy**

**Type:** Boonoo Boonoo National Park, Cypress Rest Area, 10 m from the bank of the Boonoo Boonoo River, 28.ix. 1990, *Jones 19* (holo: CANB; iso: A, AD, K, L, MEL, NSW).

**Reference:** *Australian Systematic Botany* 4: 522.

**Family:** Myrtaceae.

**Affinities:** Part of the *H. biflorus* complex and closely related to *Homoranthus papillatus*.

**Synonymy:** None.

**Derivation of name:** In reference to the lunar shape of the leaves.

**Common name:** None apparent.

**Changes in conservation status:** 2RC-t (Briggs & Leigh 1996). Elevated to 2VC- by Hunter 1997.

**Life history**

**Growth form:** Low spreading shrub to only 30 cm tall.

**Vegetative spread:** None.

**Longevity:** Unknown but probably long lived.

**Primary juvenile period:** Unknown.

**Flowers:** July to November.

**Fruit/seed:** December to February.

**Dispersal, establishment & growth:** Via fruit. Dispersal is generally immediately below the adult.

**Fire response:** Obligate seeder.

**Interactions with other organisms:** Not apparent.

**Distribution**

**Botanical sub-regions:** Northern Tablelands.

**General distribution:** Found in Boonoo Boonoo and Basket Swamp National Parks and a single population at Torrington.

**Distribution within the BRBB:** Restricted to the rocky banks of the Boonoo Boonoo River and Mount Prentice.

**Habitat**

**Habitat:** Exposed granite surfaces in heath.

**Altitude:** 900-1200 m.

**Annual Rainfall:** 900-1200 mm.

**Abundance:** Locally abundant.

**BRBB community:** Community 4 and 11.

**Substrate:** Granite sheeting.

**Exposure:** Fully exposed sites.

## Management

**Population size:** The population size of this and other *Homoranthus* species across the tablelands suffered incredible declines in 1997-1998. These deaths have devastated the populations of *H. lunatus* within the reserve with around 60% of individuals dying both on Mount Prentice and at Morgan's Gully. The current extant population size may be less than 1000 individuals.

**Reserved:** Only at Boonoo Boonoo and Basket Swamp National Parks. The population at Torrington is within a private holding.

**Threats:** Fire and trampling from visitors. Long-term climatic cycles?

**Management considerations:** Trampling of plants at accessible locations may be an issue, particularly around Morgan's Gully and the Cypress Pine Rest Area. Exclusion of fire for the near future may be appropriate.

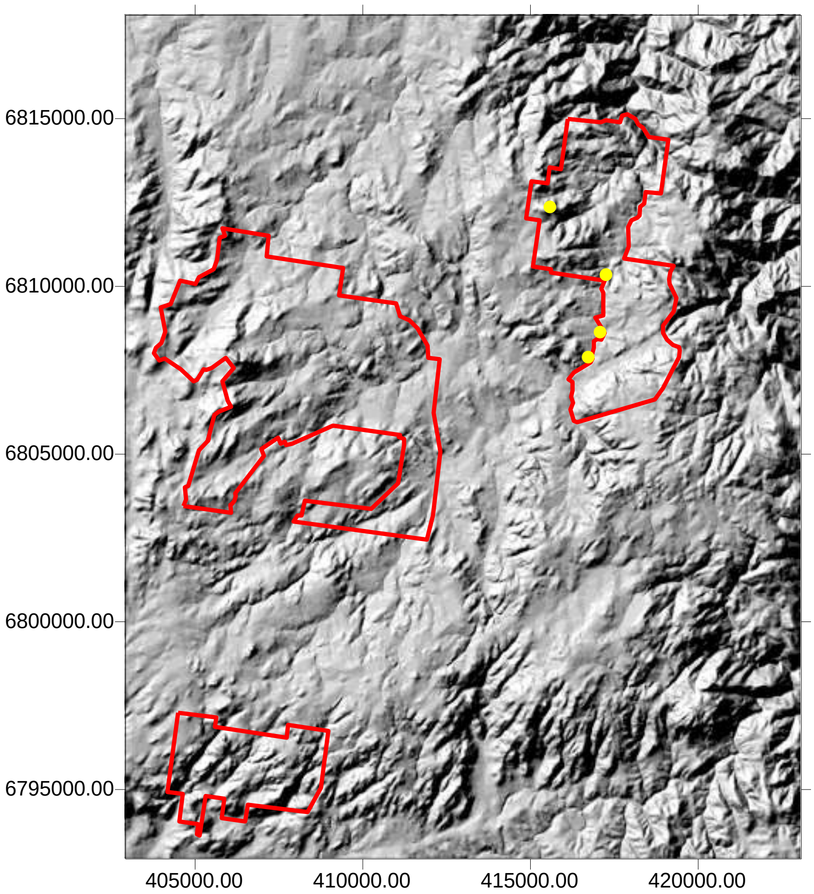


**Figure 60:** Distribution of *Homoranthus lunatus*.

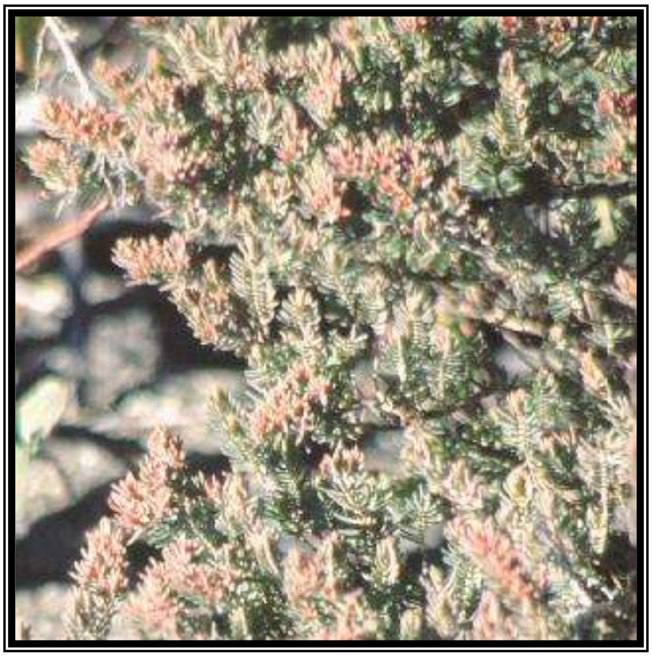

**Figure 61:** Photograph of *Homoranthus lunatus*.

### 3.5.16 *Kunzea bracteolata* Maiden & Betche (3RC-).

**Taxonomy**

**Type:** New South Wales?: Northern Tablelands?: Wallangara, *J.L. Boorman* Nov. 1904 (*holo*: NSW).

**Reference:** *Proceedings of the Linnean Society of New South Wales* 30: 363 (1905).

**Family:** Myrtaceae.

**Affinities:** Unknown but can easily be distinguished by the prominent bracts at the base of the flowers.

**Synonymy:** None.

**Derivation of name:** In reference to the prominent bracts around the inflorescences.

**Common name:** Granite Kunzea.

**Changes in conservation status:** 3RC- (Briggs & Leigh 1988) unchanged since, reservation status however is probably adequate.

**Life history**

**Growth form:** Dense and diveracate shrub to 3 m tall.

**Vegetative spread:** None.

**Longevity:** Unknown but some populations are likely to be many decades old (50 yrs + or much more).

**Primary juvenile period:** At least 4 years.

**Flowers:** Spring to Summer.

**Fruit/seed:** Late Summer to Autumn.

**Dispersal, establishment & growth:** Via capsule or seed. Establishment cues not known.

**Fire response:** Obligate seeder but may resprout if fire intensity is low. Clarke and Fullon (1999) state that there is no soil stored seed bank. However replacement of post fire communities eventually with *Kunzea bracteolata* would suggest that soil stored seed is available for some years after the passage of fire.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Northern Tablelands within New South Wales and the Darling Downs within Queensland.

**General distribution:** From Mount Chaelundi in New South Wales to Girraween National Park within Queensland.

**Distribution within BRBB:** Restricted to granite outcrops.

**Habitat**

**Habitat:** Exposed rock outcrops at high altitudes.

**Altitude:** 800-1350.

**Annual Rainfall:** 740-1400.

**Abundance:** Usually as scattered very small populations.

**BRBB community:** Community 11.

**Substrate:** Mainly Granite but also Acid Volcanics.

**Exposure:** Fully exposed situations at high altitudes.

**Management**

**Population size:** Found in small but numerous populations throughout both reserves.

**Reserved:** Bald Rock National Park, Boonoo Boonoo National Park, Gibraltar Range National Park, Guy Fawkes River National Park, Limpinwood Nature Reserve and Torrington State Recreation Area, Washpool National Park Western Additions, Warra National Park, Butterleaf National Park, Bolivia Hill Nature Reserve, Warra NP within New South Wales and Girraween National Park in Queensland.

**Threats:** Small population size at any given locality. Frequent fires, this species can be totally removed after the passage of fire (Hunter, *unpublished data*).

**Management considerations:** Such a small and isolated population is vulnerable to local extinction by inappropriate

**Figure 62:** Photograph of *Kunzea bracteolata*.

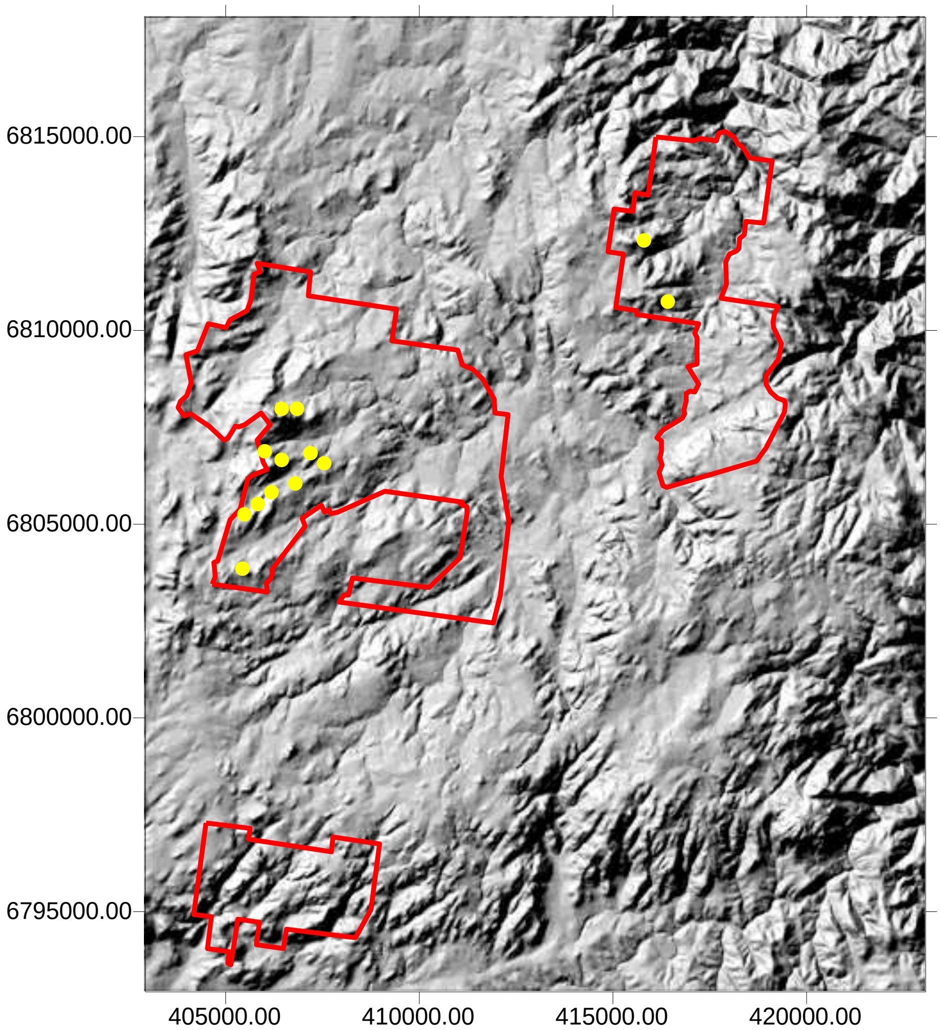


**Figure 63:** Distribution of *Kunzea bracteolata*.

### 3.5.17 *Leionema ambiens* (F.Muell.) Paul G.Wilson (3VC-).

**Taxonomy**

**Type:** near Timbarra, New South Wales, *C. Stuart 570* (*lecto*: MEL).

**Reference:** *Nuytsia* 12: 271.

**Family:** Rutaceae.

**Affinities:** Uncertain.

**Synonymy:** *Eriostemon ambiens* and *Phebalium ambiens*.

**Derivation of name:** *ambien* meaning going around, in reference to the leaf bases that surround the stem.

**Common name:** None apparent.

**Changes in conservation status:** 3RC- (Briggs & Leigh 1996). Upgraded to 3VC- by Copeland and Hunter (1999).

**Life history**

**Growth form:** Shrub to 2.5 m tall.

**Vegetative spread:** None.

**Longevity:** Unknown but likely to be very long lived.

**Primary juvenile period:** Unknown but likely to be 3-5 years.

**Flowers:** Spring to summer.

**Fruit/seed:** Summer.

**Dispersal, establishment & growth:** Via seed.

**Fire response:** Obligate seeder. Some post fire recruitment has been noted (Hunter 1999).

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs, Northern Tablelands.

**General distribution:** From Torrington to the Malara Plateau.

**Distribution within the BRBB:** Restricted to around Mount Prentice in Boonoo Boonoo and to the larger granite outcrops within Bald Rock.

**Habitat**

**Habitat:** Restricted to heaths on exposed granite outcrops.

**Altitude:** 900-1300 m.

**Annual Rainfall:** 900-1200 mm.

**Abundance:** May be locally abundant but very disjunct and scattered in distribution.

**BRBB community:** Community 11.

**Substrate:** Sheet granite.

**Exposure:** Fully exposed sites.

### Management

**Population size:** The population within both reserves is likely to be under 1000 individuals and may be under 500.

**Reserved:** Within Torrington State Recreation Area, Girraween National Park, Bald Rock National Park, Boonoo Boonoo National Park, Warra National Park, Gibraltar Range National Park and the Demon Nature Reserve.

**Threats:** Inappropriate fire regimes and trampling of soil and roots.

**Management considerations:** Observations suggest that this species is prone to death by soil compaction from trampling. Fires are also a threat.

**Figure 64:** Photograph of *Leionema ambiens*.

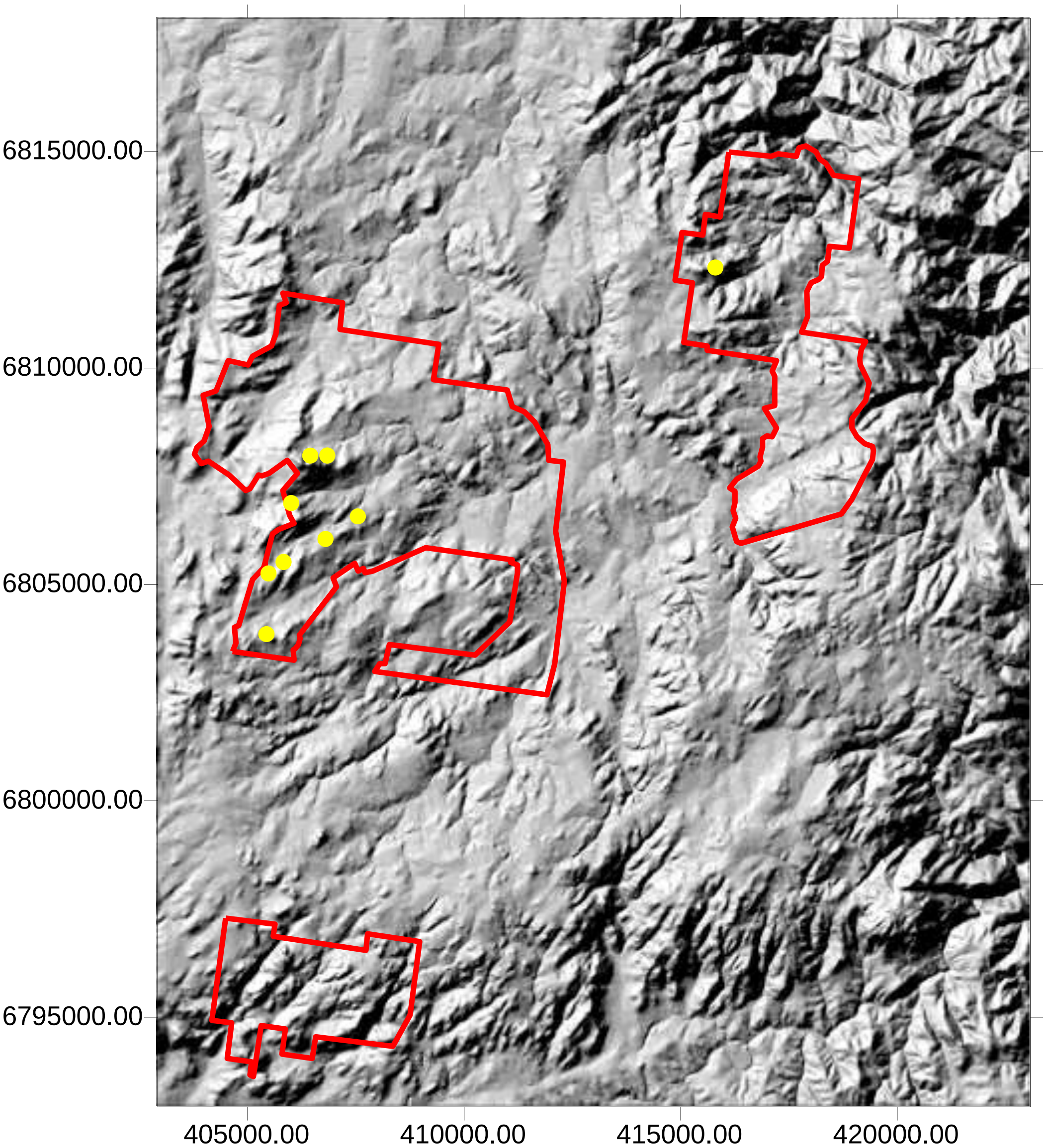


**Figure 65:** Distribution of *Leionema ambiens*.

### 3.5.18 *Muehlenbeckia costata* m.s. (3VCa; TSC Act Schedule 2, Vulnerable).

**Taxonomy**

**Type:** Not formally described.

**Reference:** NA.

**Family:** Polygonaceae

**Affinities:** *M. rhyticarya*.

**Synonymy:** None, but informally known as *M.* sp. Mt Norman.

**Derivation of name:** *Costatus* meaning having more than one primary midrib, presumably in reference to the ribbed stems.

**Common name:** None apparent.

**Changes in conservation status:** 3KC- (Briggs and Leigh 1996). Listed as Vulnerable on the TSC Act. Raised to 3VCa by Hunter *et al.* (1998).

**Life history**

**Growth form:** Trailing to weakly erect herb to 5 m.

**Vegetative spread:** None.

**Longevity:** 1 to possibly 3 years.

**Primary juvenile period:** 2 months.

**Flowers:** Continuous for the life span of the individual.

**Fruit/seed:** Continuous for the life span of the individual.

**Dispersal, establishment & growth:** Via fruit covered by fleshy sweet calyx. Possibly dispersed by lizards or birds. Seed banks are extremely long lived and fresh seed probably has a dormancy period. Seeds survive temperatures of 120°C for over 10 minutes and subsequently germinate.

**Fire response:** Fire ephemeral with explosive population growth after fires and quick declines.

**Interactions with other organisms:** All populations appear to become infested by a rust fungus at around 1 yr of age. The species probably has a low resistance to pathogens due to its increased efforts in reproduction.

**Distribution**

**Botanical sub-regions:** Darling Downs, Northern Tablelands and Central Tablelands.

**General distribution:** From Mount Kaputar to Bald Rock and a disjunct distribution in the Blue Mountains.

**Distribution within the BRBB:** Restricted to Bald Rock and other large bornhardts near the Queensland Border.

**Habitat**

**Habitat:** Wholly restricted to the post fire environment on exposed granite surfaces.

**Altitude:** 1100-1400 m.

**Annual Rainfall:** 1000-1400 mm.

**Abundance:** Boom and bust population strategy.

**BRBB community:** Community 11.

**Substrate:** Sheet granite.

**Exposure:** Fully exposed sites.

**Management**

**Population size:** Estimated to be around 600 individuals within Bald Rock National Park post fire and to be around 10 two years post fire (Hunter *et al*. 1998).

**Reserved:** Mt Kaputar National Park, Girraween National Park, Bald Rock National Park, Butterleaf National Park, Warra National Park and the Blue Mountains National Park.

**Threats:** Inappropriate fire regimes.

**Management considerations:** Appropriate fire regimes is the only management criteria at this stage.

**Figure 66:** Photograph of *Muehlenbeckia costata*.

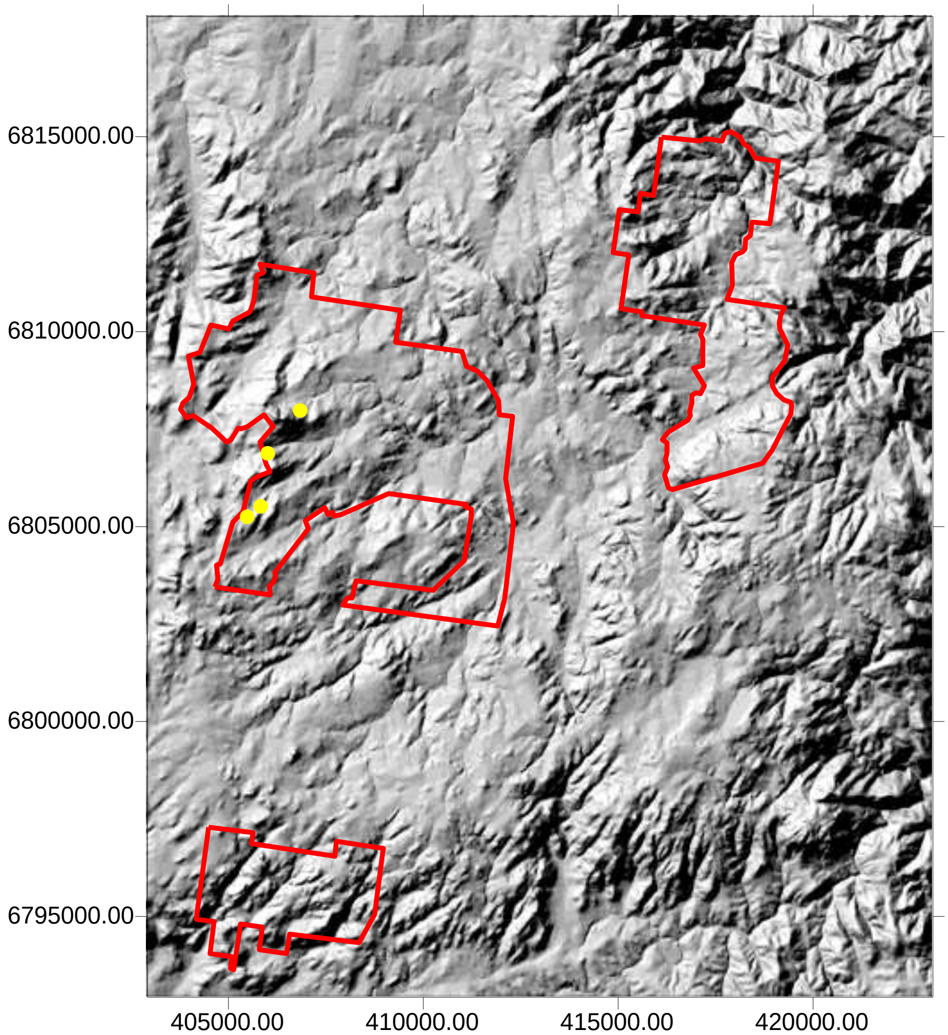


**Figure 67:** Distribution of *Muehlenbeckia costata*.

### 3.5.19 *Olearia gravis* (F.Muell.) F.Muell. ex Benth. (3KC-).

**Taxonomy**

**Type:** Near Tenterfield, New England, *C. Stuart s.n.* (?MEL).

**Family:** Asteraceae.

**Affinities:** Uncertain possibly *O. stellutlata*.

**Synonymy:** *Aster gravis* F.Muell., *Olearia gravis* S.T.Blake.

**Derivation of name:** Meaning heavy.

**Common name:** Daisy Bush.

**Changes in conservation status:** 3RC (Thomas & McDonald 1989; McDonald *et al.* 1995); 3KC- (Briggs & Leigh 1996).

**Life history**

**Growth form:** Densely hairy shrub to 1.6 m tall.

**Vegetative spread:** No.

**Longevity:** Not known, but at least 5 years.

**Primary juvenile period:** Known to flower in the second year.

**Flowers:** October to December.

**Fruit/seed:** November to January.

**Dispersal, establishment & growth:** Dispersed by seed via wind. The species is known to germinate after soil disturbance such as on the side of roads or after road grading (Hunter, *pers. obs.*).

**Fire response:** Known to germinate after fire, known to resprout.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Northern Tablelands and the North Western Slopes of New South Wales. Darling Downs and Burnett in Queensland.

**General distribution:** A disjunct and sporadic distribution occurs from Murgon to Girraween National Park in Queensland to Torrington and Kwiambal and also at Gibraltar Range National Park.

**Distribution within BRBB:** Found during previous surveys within Boonoo Boonoo National Park but also likely to occur in the southern section of Bald Rock National Park.

**Habitat**

**Habitat:** Usually restricted to granite outcrops or rocky granite ridges.

**Altitude:** 300-1100.

**Annual Rainfall:** 650-1200 mm.

**Abundance:** This species often has a clumped distribution with many plants growing in close proximity.

**Kwiambal community:** Community 10.

**Substrate:** Granite.

**Exposure:** Fully exposed positions.

**Management**

**Population size:** Probably very low as not recorded during this survey.

**Reserved:** Torrington State Recreation Area, Boonoo Boonoo National Park, Gibraltar Range National Park, Kwiambal NP, Bolivia Hill NR, Severn River NR, King Plains NP in New South Wales. The western portion of Girraween National Park and also Sundown National Park in Queensland.

**Threats:** Goats have been known to brouse this species.

**Management considerations:** Basic information on the biology and population size of this species is needed. Accurate estimations of the population size of this species within the park are needed.

**Figure 68:** Photograph of *Olearia gravis*.

### 3.5.20 *Persoonia daphnoides* A.Cunn. ex R.Br. (3RC-).

**Taxonomy**

**Type:** near Hunter's River, 1827. *A. Cunningham*.

**Reference:** *Prodromus Florae Novae Hollandiae – Suppl. 1: Proteaceas Novas* 15.

**Family:** Proteaceae

**Affinities:** Unknown but probably close to *P. procumbens*.

**Synonymy:** None.

**Derivation of name:** Not known but may relate to a resemblance to *Daphne* or its odour.

**Common name:** Geebung.

**Changes in conservation status:** 3RC- (Briggs & Leigh 1996), unchanged since.

**Life history**

**Growth form:** Prostrate shrub.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown but probably 2 years.

**Flowers:** December to January.

**Fruit/seed:** Autumn.

**Dispersal, establishment & growth:** Via fruit.

**Fire response:** Resprouter.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** .

**General distribution:** From Stanthorpe and Tenterfield area.

**Distribution within the BRBB:** Found in open grassy forests and woodlands in Bald Rock and Boonoo Boonoo.

**Habitat**

**Habitat:** In grassy forests and open woodlands.

**Altitude:** 950-1200 m.

**Annual Rainfall:** 900-1400 mm.

**Abundance:** Found usually as isolated individuals with low specific abundances.

**BRBB community:** Community 1 and 7.

**Substrate:** Coarse granite soils.

**Exposure:** Semi shade to exposed sites.

**Management**

**Population size:** The species is widespread but in low numbers and the total population size is likely to under 1000 within both reserves.

**Reserved:** Girraween National Park, Bald Rock National Park, Boonoo Boonoo National Park and Western Washpool National Park.

**Threats:** Grazing.

**Management considerations:** Stray cattle and pigs need to be kept under control.

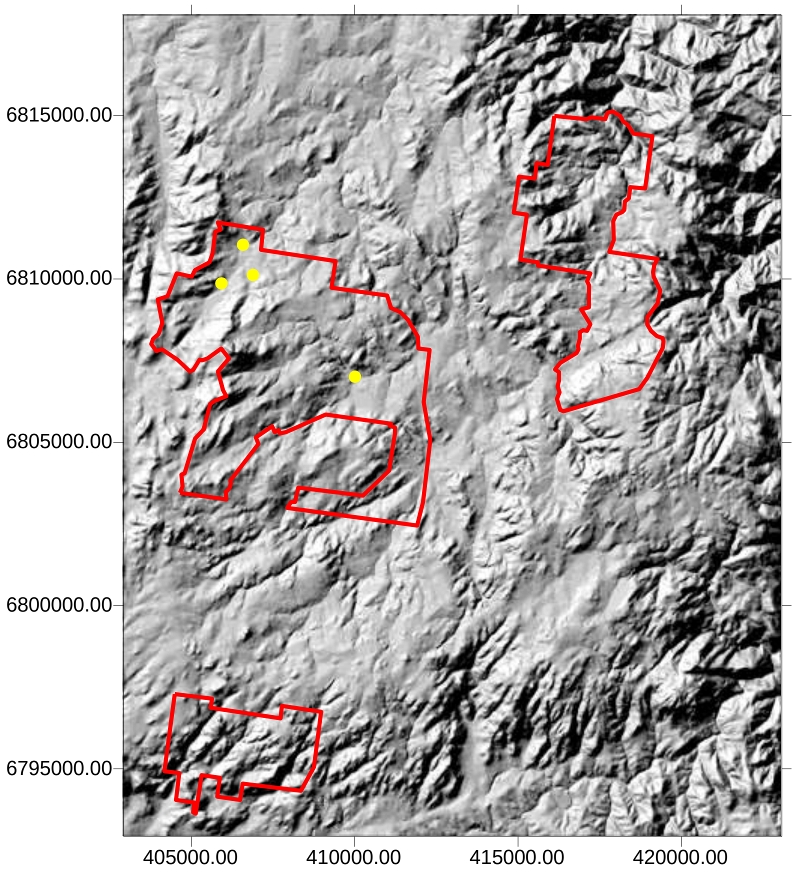


**Figure 69:** Distribution of *Persoonia daphnoides*.

**Figure 70:** Photograph of *Persoonia daphnoides*.

### 3.5.21 *Philotheca epilosa* (Paul G. Wilson) P.I.Forst.

**Taxonomy**

**Type:** Wallangarra, Queensland. *J.L. Boorman,* Nov. 1906 (holo: NSW).

**Reference:** *Muelleria* 11: 120.

**Family:** Rutaceae.

**Affinities:** Part of the *P. myoporoides* complex.

**Synonymy:** *Eriostemon myoporoides* subsp. *epilosus*.

**Derivation of name:** Meaning lacking hairs, in reference to the flowers.

**Common name:** None apparent.

**Changes in conservation status:** 3RC- (Briggs & Leigh 1996). Downgraded to 3RCa by Richards & Hunter (1997).

**Life history**

**Growth form:** Shrub to 1 m tall, spreading.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown but probably 2-3 yrs.

**Flowers:** Spring to autumn.

**Fruit/seed:** Autumn to winter.

**Dispersal, establishment & growth:** Via seed.

**Fire response:** Obligate seeder. Killed outright by fire but post fire germinations noted.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs, Northern Tablelands, North Coast.

**General distribution:** From north of Glen Innes to just over the border in Queensland.

**Distribution within the BRBB:** In Bald Rock and Boonoo Boonoo on exposed granite surfaces.

**Habitat**

**Habitat:** Found in heaths on granite outcrops.

**Altitude:** 1000-1300 m.

**Annual Rainfall:** 1000-1600 mm.

**Abundance:** Found in small and scattered disjunct populations.

**BRBB community:** Community 11.

**Substrate:** Sheet granite.

**Exposure:** Fully exposed.

**Management**

**Population size:** Probably under 1000 individuals within both parks.

**Reserved:** Found in Girraween National Park, Bald Rock National Park, Boonoo Boonoo National Park, Butterleaf National Park, Demon Nature Reserve, Bolivia Hill Nature Reserve and the Torrington State Recreation Area.

**Threats:** Inappropriate fire regimes and trampling.

**Management considerations:** Trampling is likely to kill this species and frequent fires are likely to devastate populations.

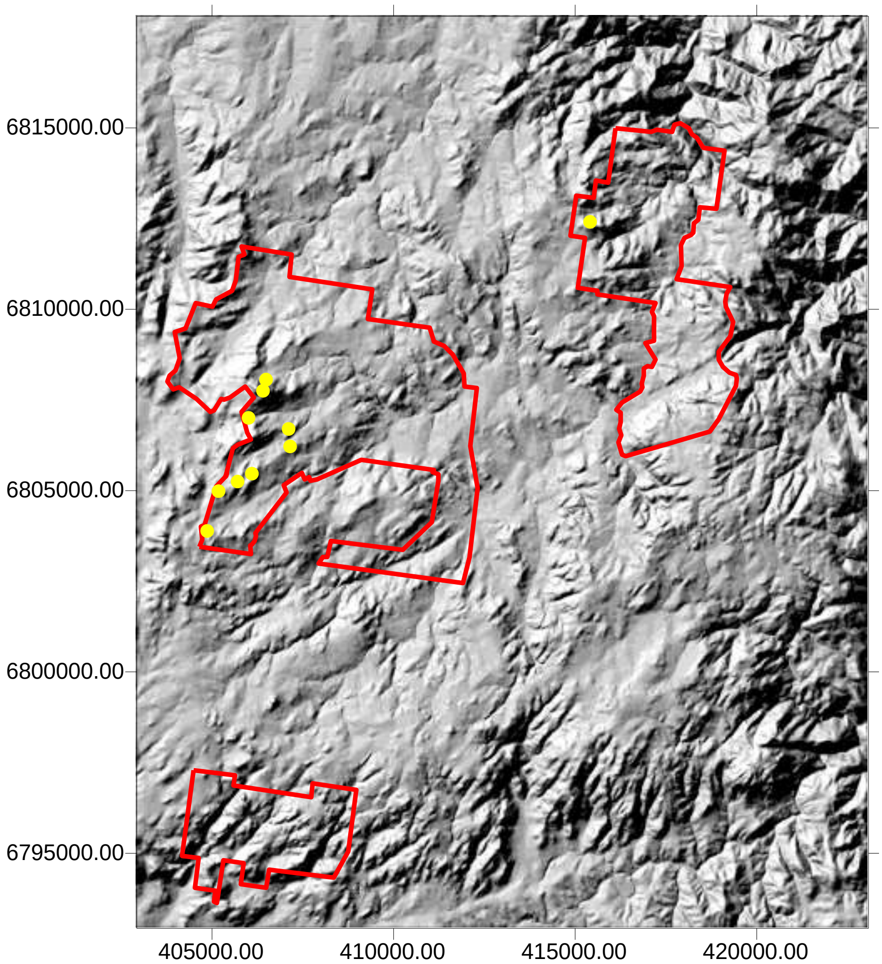


**Figure 71:** Distribution of *Philotheca epilosa*.

### 3.5.22 *Plectranthus nitidus* P.I.Forster (2KCi; TSC Act Schedule 1, Endagered).

**Taxonomy**

**Type:** Cultivated at Byron Bay from plant collected at upper Terania Creek, Nightcap Range, 20 May 1991, *P. Hardwick* (holo: BRI).

**Reference:** *Austrobaileya* 3: 736.

**Family:** Lamiaceae.

**Affinities:** Shows affinities to *P. apreptus*.

**Synonymy:** None.

**Derivation of name:** *Nitidus* meaning shining.

**Common name:** None apparent.

**Changes in conservation status:** 2EC (Forster 1992). Changed to 2KCi (Briggs & Leigh 1996), unchanged since. Listed as Endangered on the TSC Act.

**Life history**

**Growth form:** Herb to 40 cm tall.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown.

**Flowers:** Spring to summer.

**Fruit/seed:** Summer to autumn.

**Dispersal, establishment & growth:** Seed.

**Fire response:** Unknown.

**Interactions with other organisms:** Unknown.

**Distribution**

**Botanical sub-regions:** Moreton and the North Coast.

**General distribution:** From Horton's Creek to just over the Queensland Border.

**Distribution within the BRBB:** Known from the moisture sites within Boonoo Boonoo.

**Habitat**

**Habitat:** Rock outcrops in association with wetter forests and closed forests.

**Altitude:** ?.

**Annual Rainfall:** ?1000-1600.

**Abundance:** Only isolated individuals.

**BRBB community:** Community 6 and 8.

**Substrate:** Granite and rhyolite.

**Exposure:** Protected sites.

**Management**

**Population size:** Only a handful of individuals were seen.

**Reserved:** Border Ranges National Park, Horton's Creek Flora Reserve, Lamington and Nightcap National Park.

**Threats:** Not known but probably inappropriate fire regimes.

**Management considerations:** Further searches for populations may be warranted.

### 3.5.23 *Plectranthus suaveolens* S.T.Blake (3KC-).

**Taxonomy**

**Type:** Queensland: Moreton: Queen Mary's Falls *prope* Killarney in Queensland a Gresty lecta in Brisbane culta, *Blake 20506* (*holo*: BRI).

**Reference:** *Contributions from the Queensland Herbarium* 9: 30 (1971).

**Family:** Lamiaceae.

**Affinities:** Close to *P. parviflorus* and *P. graveolens* of which some hybrids are found. Often the distinction between *P. parviflorus* and *P. suaveolens* is not clear. This species can be distinguished by the distribution and orientation of its indumentum and its odour.

**Synonymy:** None.

**Derivation of name:** Meaning sweet scented.

**Common name:** Mint Bush.

**Changes in conservation status:** 3RC- (Thomas & McDonald 1989); 3KC- (Quinn *et al.* 1995) unchanged since this time.

**Life history**

**Growth form:** Aromatic shrub to 80 cm tall.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown.

**Flowers:** Spring to Summer.

**Fruit/seed:** Summer.

**Dispersal, establishment & growth:** Via seed. Freely colonizes disturbed areas, and often becomes weedy when cultivated (Binns 1995).

**Fire response:** Probably vegetative as a small tuber is often present.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** North Coast and Northern Tablelands of New South Wales and the Darling Downs and Moreton districts of Queensland.

**General distribution:** From south-east Queensland and north-east New South Wales.

**Distribution within BRBB:** Relatively common but scattered on rocky outcrop sites usually in the escarpment and gorge areas.

**Habitat**

**Habitat:** Usually in rocky or shallow soil sites in exposed situations.

**Altitude:** 900-1300 m.

**Annual rainfall:** 800-1100 mm.

**Abundance:** Populations are widespread but usually with a low number of individuals.

**BRBB additions community:** Community 8.

**Substrate:** Mixed but usually Granite, but also Metasediments and Acid Volcanics.

**Exposure:** Usually fully exposed sites on outcrops.

**Management**

**Population size:** Very isolated and small populations are found throughout the reserve making assessments of population sizes difficult.

**Reserved:** Nymboida National Park, Gibraltar Range National Park, Guy Fawkes National Park, Chaelundi National Park, Mann River Nature Reserve, Numinbah Nature Reserve, Banyabba Nature Reserve, Washpool National Park Western Additions, Guy Fawkes River National Park and the Demon Nature Reserve within New South Wales and Girraween National Park and Queen Mary Falls National Park in Queensland.

**Threats:** Goat browsing has been seen to occur and mechanical damage from goat camps and trails has occurred in a number of sites.

**Management considerations:** Eradication of goats in areas with this taxon is of primary concern.

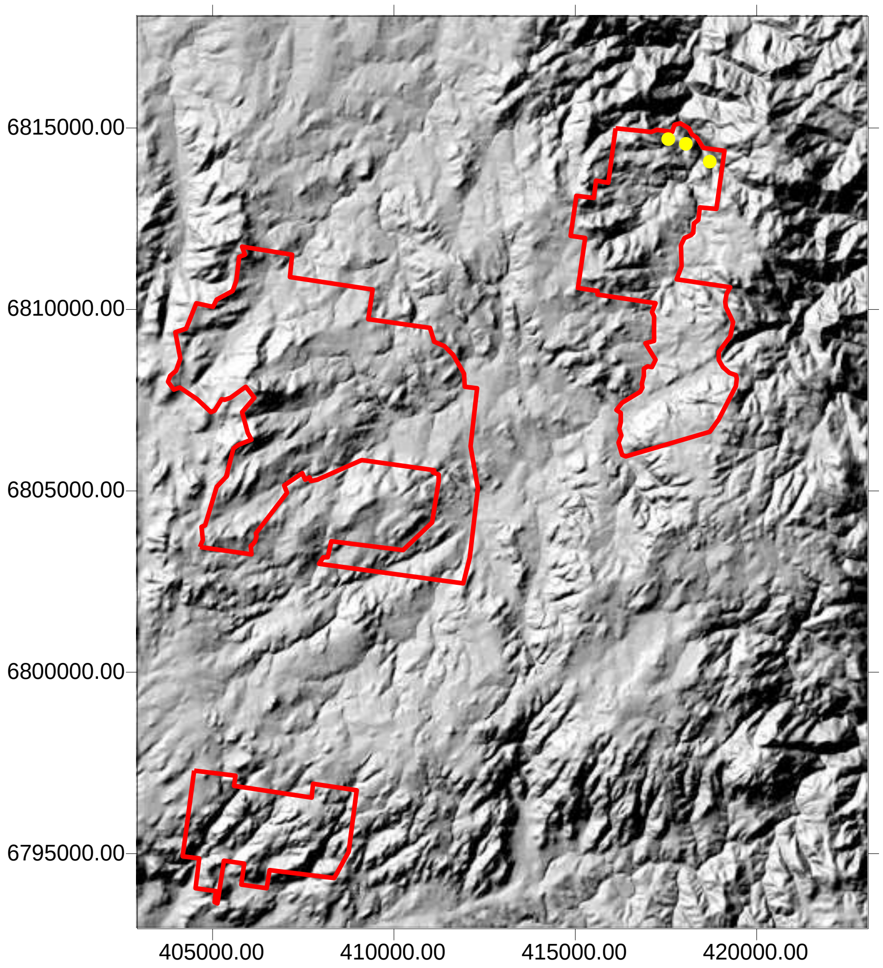


**Figure 72:** Distribution of *Plectranthus suaveolens*.

### 3.5.24 ***Prostanthera petraea*** **B.J.Conn (2RC-).**

**Taxonomy**

**Type:** Bald Rock National Park: Bungoona Walking Track, *B.J.Conn 3668 & E.A.Brown*, 11 Oct 1992 (holo: NSW).

**Reference:** *Telopea* 11: 252 (2006).

**Family:** Lamiaceae

**Affinities:** Uncertain.

**Synonymy:** NA.

**Derivation of name:** NA.

**Common name:** None apparent.

**Changes in conservation status:** 2RC- (Briggs & Leigh 1996), unchanged since.

**Life history**

**Growth form:** Shrub to 3 m tall.

**Vegetative spread:** None.

**Longevity:** Not known but probably long lived.

**Primary juvenile period:** Unknown but probably 3-5 yrs.

**Flowers:** Spring to summer.

**Fruit/seed:** Summer to autumn.

**Dispersal, establishment & growth:** Via seed, potentially a long lived seed bank.

**Fire response:** Obligate seeder. Post fire recruitment noted.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs and Northern Tablelands.

**General distribution:** From Stanthorpe to Malara.

**Distribution within the BRBB:** Found on the larger granite outcrops within Bald Rock and Boonoo Boonoo and also along creek and rivers in Boonoo Boonoo.

**Habitat**

**Habitat:** Exposed granite sheets and creek margins.

**Altitude:** 900-1300 m.

**Annual Rainfall:** 900-1200 mm.

**Abundance:** Found as very small, scattered populations.

**BRBB community:** Community 4, 9 and 11.

**Substrate:** Sheet granite and alluvial soils.

**Exposure:** Fully exposed sites and some protected sites.

## Management

**Population size:** In total the population within the two parks is probably below 1000 individuals and likely to be below 500.

**Reserved:** Girraween National Park, Boonoo Boonoo National Park and Demon Nature Reserve.

**Threats:** Fire.

**Management considerations:** High fire frequencies is likely to eradicate this species.

**Figure 73:** Photograph of *Prostanthera petraea*.

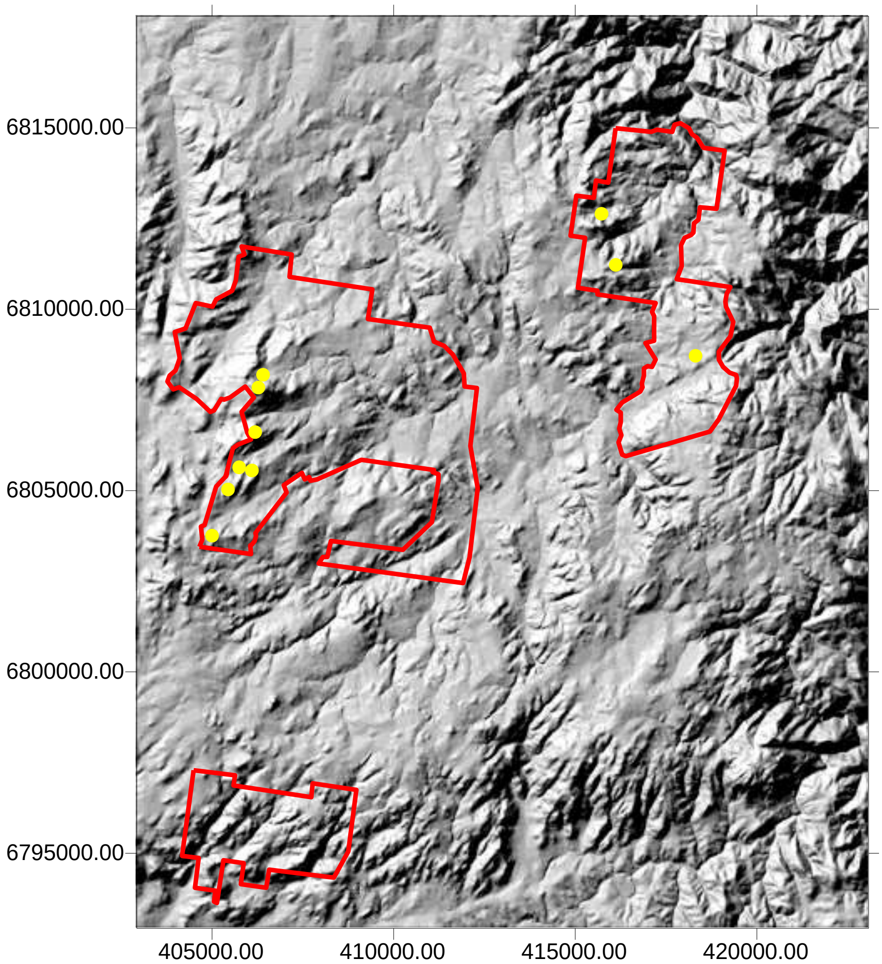


**Figure 74:** Distribution of *Prostanthera petraea*.

### 3.5.25 *Pultenaea pycnocephala* Benth. (3RCa).

**Taxonomy**

**Type:** Bluff Mountain, New England *C.Stuart*.

**Reference:** *Flora Australiensis* 2: 114.

**Family:** Fabaceae.

**Affinities:** Uncertain.

**Synonymy:** None.

**Derivation of name:**.

**Common name:** None apparent.

**Changes in conservation status:** 3RCa (Briggs & Leigh 1996), unchanged since.

**Life history**

**Growth form:** Shrub to 1.5 m tall.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown.

**Flowers:** Spring to summer.

**Fruit/seed:** Summer to autumn.

**Dispersal, establishment & growth:** Seed.

**Fire response:** Unknown probably a resprouter.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Darling Downs, Northern Tablelands.

**General distribution:** Found from Werrikimbe to just over the Queensland Border.

**Distribution within the BRBB:** Found within the shrubby forests in Boonoo Boonoo and the southern section of Bald Rock National Park.

**Habitat**

**Habitat:** Found in shrubby forests on granite soils.

**Altitude:** 900-1300 m.

**Annual Rainfall:** ?900-1600 mm.

**Abundance:** Found commonly in heathy forests.

**BRBB community:** Community 10.

**Substrate:** Granite.

**Exposure:** Exposed to partial shade.

**Management**

**Population size:** Unknown but the plants were common in shrubbier forests and may be in the order of 1000 + individuals.

**Reserved:** Girraween National Park, Bald Rock National Park, Boonoo Boonoo National Park, Lamington National Park, Gibraltar Range National Park, Guy Fawkes National Park, Chaelundi National Park, Mann River Nature Reserve, and the Demon Nature Reserve.

**Threats:** Unknown.

**Management considerations:** Possible fire regimes may be an issue.

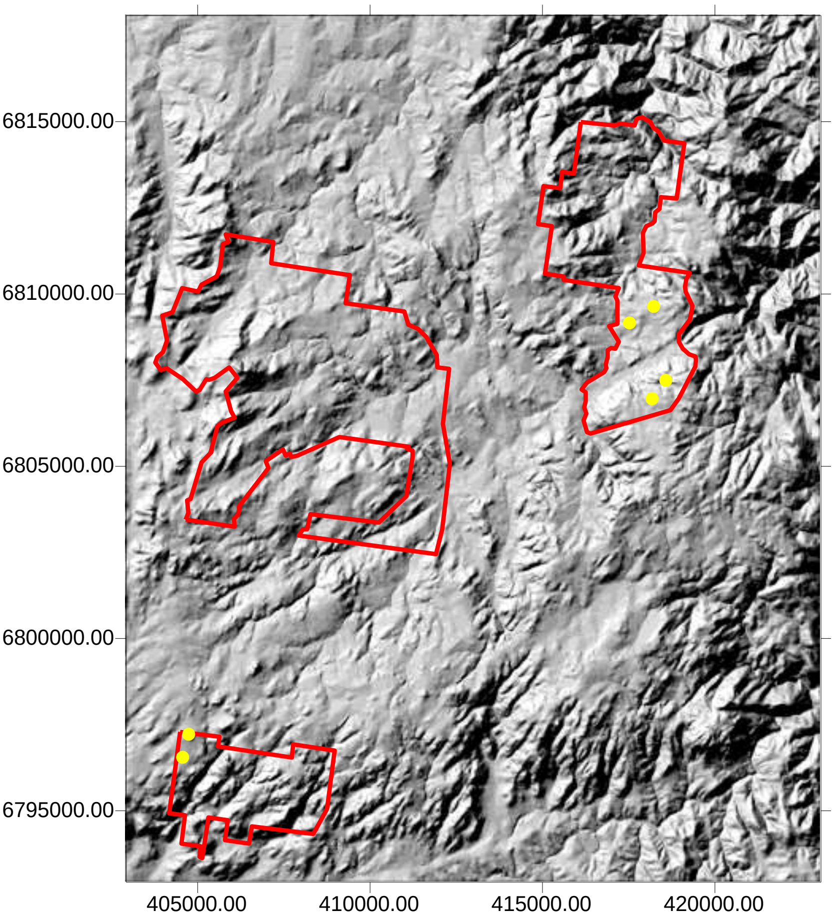


**Figure 75:** Distribution of *Pultenaea pycnocephala*.

### 3.5.26 *Thelionema grande* (C.T.White) R.Henderson (3RCa).

**Taxonomy**

**Type:** Mt Norman, Queensland, Nov. 1944, *M.S. Clemens* (holo: BRI).

**Reference:** *Austrobaileya* 2: 110.

**Family:** Phormiaceae.

**Affinities:** *Thelionema caespitosa*.

**Synonymy:** *Stypandra grandis*.

**Derivation of name:** In reference to the large size, grand.

**Common name:** Granite Lily.

**Changes in conservation status:** 3RC- (Briggs & Leigh 1996). Downgraded to 3RCa by Copeland and Hunter (1999).

**Life history**

**Growth form:** Herb to 1.3 cm tall.

**Vegetative spread:** Potentially?

**Longevity:** Unknown.

**Primary juvenile period:** Unknown.

**Flowers:** Spring to summer.

**Fruit/seed:** Summer.

**Dispersal, establishment & growth:** Via seed.

**Fire response:** Resprouter.

**Interactions with other organisms:** Known to hybridise with *T. caespitosa*.

**Distribution**

**Botanical sub-regions:** Darling Downs, Northern Tablelands and North Western Slopes.

**General distribution:** From Bundarra to just over the Queensland border.

**Distribution within the BRBB:** Found within sedgeland and on granite outcrops within both reserves.

**Habitat**

**Habitat:** Two distinct habitats, within sedgeland near creek channels or where soils are waterlogged and on exposed granite outcrops.

**Altitude:** 800-1300 m.

**Annual Rainfall:** 700-1400 mm.

**Abundance:** Common within either of the two distinct habitats within the area.

**BRBB community:** Community 2, 4 and 11.

**Substrate:** Granite.

**Exposure:** Fully exposed positions.

## Management

**Population size:** Probably over 1000 individuals within the reserves.

**Reserved:** Girraween National Park, Mt Barney National Park, Bald Rock National Park, Boonoo Boonoo National Park, Gibraltar Range National Park, Ironbark Nature Reserve, Werrikimbe National Park, Torrington State Recreation Area, Bolivia Hill Nature Reserve and Warra National Park.

**Threats:** Unknown.

**Management considerations:** Seemingly secure.

**Figure 76:** Photograph of *Thelionema grande*.

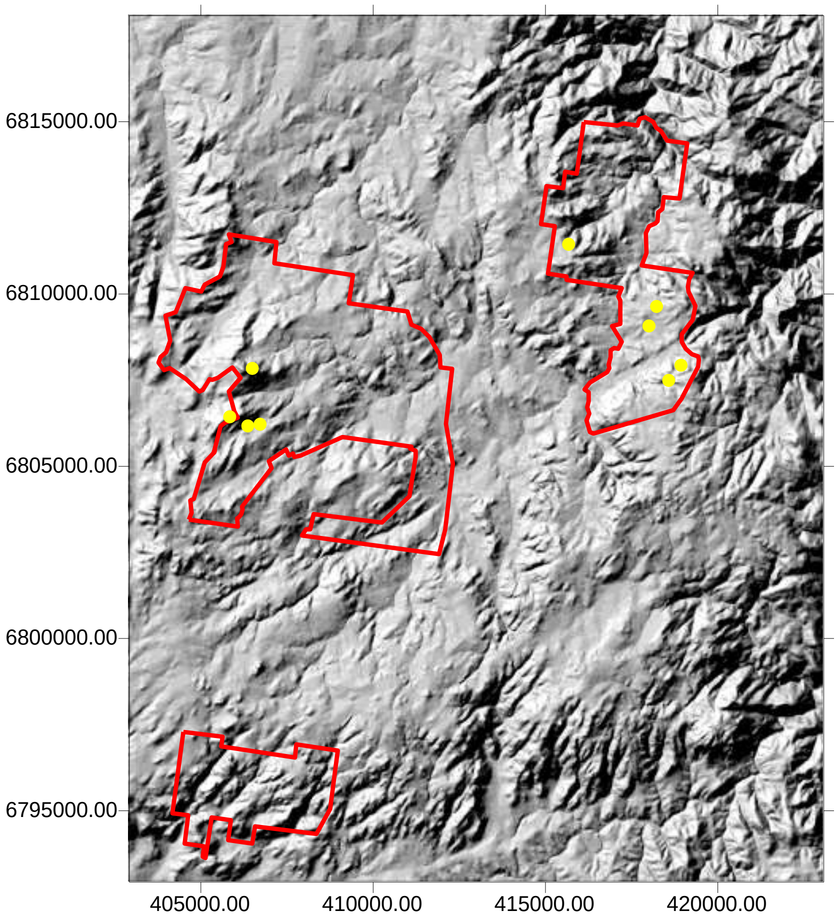


**Figure 77:** Distribution of *Thelionema grande*.

### 3.5.28 *Tylophora woollsii* Benth. (2E; TSC Act Schedule 1, Endangered).

**Taxonomy**

**Type:** Parramatta, N.S.W., *Woolls* (holo: K; iso: MEL).

**Reference:** *Flora Australiensis* 4: 335.

**Family:** Asclepiadaceae.

**Affinities:** Probably *Tylophora barbata*.

**Synonymy:** None.

**Derivation of name:** Named in honour of William Woolls amateur botanist of Parramatta.

**Common name:** Cryptic Forest Twiner.

**Changes in conservation status:** 2E (Briggs & Leigh 1996), unchanged since. TSC Act listed as Endangered.

**Life history**

**Growth form:** Vine.

**Vegetative spread:** None.

**Longevity:** Unknown.

**Primary juvenile period:** Unknown.

**Flowers:** May skip a flowering season and may retain undeveloped buds.

**Fruit/seed:** Fruits fully developed between April and July.

**Dispersal, establishment & growth:** Seed.

**Fire response:** Unknown, probably obligate seeder.

**Interactions with other organisms:** None apparent.

**Distribution**

**Botanical sub-regions:** Central Coast, North Coast and Northern Tablelands.

**General distribution:** Extinct in the central coast and occurs from Dorrigo to Bald Rock.

**Distribution within the BRBB:** Found only within the gorge country at Boonoo Boonoo and at the base of Bald Rock within Bald Rock.

**Habitat**

**Habitat:** Rainforest and wetter sclerophyll forests.

**Altitude:** ?500-1200 m.

**Annual Rainfall:** ?.

**Abundance:** Very scarce only few individuals usually found.

**BRBB community:** Community 6 and 9.

**Substrate:** Variable.

**Exposure:** Very protected sites.

**Management**

**Population size:** Possibly around 100 in total.

**Reserved:** Bald Rock National Park, Boonoo Boonoo National Park, Gibraltar Range National Park, Barrington Tops National Park and Girraween National Park.

**Threats:** Low population numbers, grazing, inappropriate fire regimes, roadworks and fire trail maintenance, feral animals such as pigs.

**Management considerations:** Eradication of feral animals and stray domestic stock. Exclusion of fire from sites containing this species. Care taken in fire trail maintenance and weed control in areas likely to contain this species.

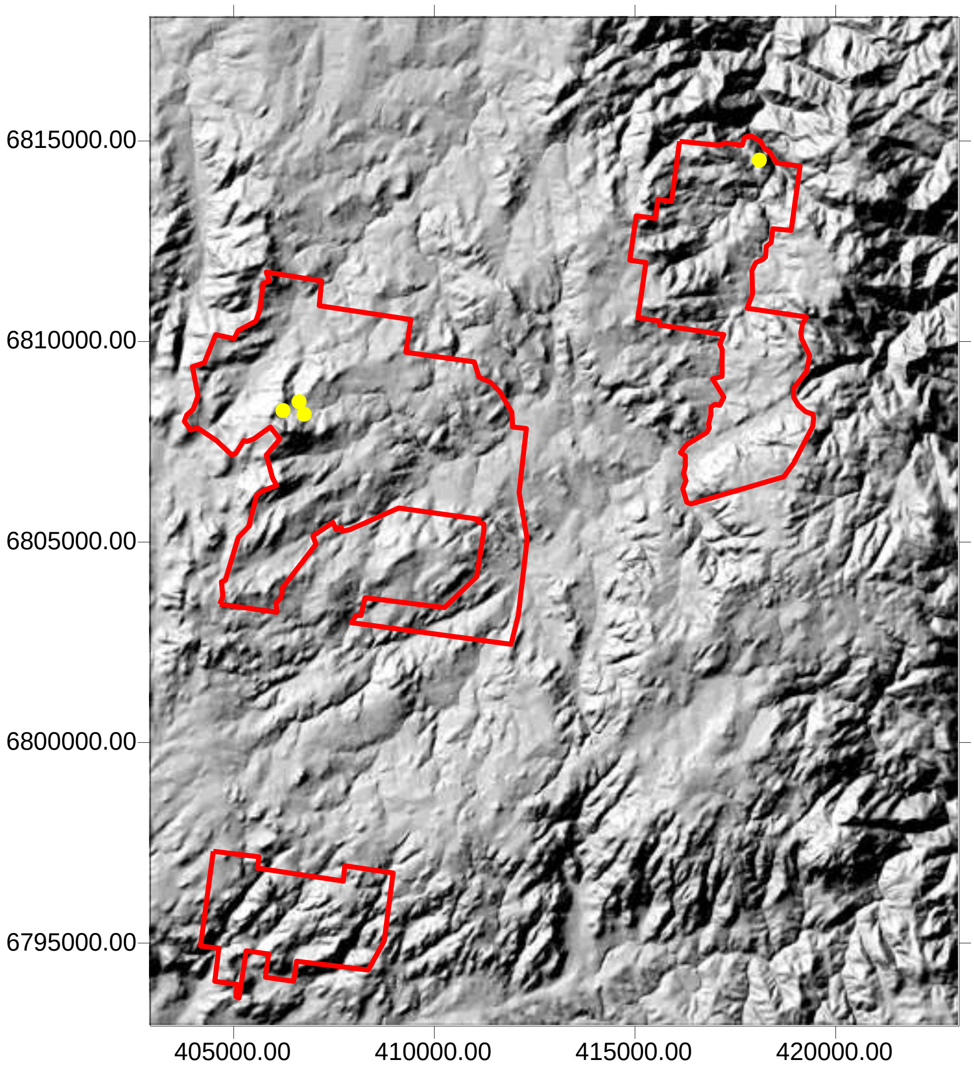


**Figure 78:** Distribution of *Tylophora woollsii*.

### 3.5.28 Other taxa of conservation significance: Regionally significant taxa

*Acacia leucoclada* subsp. *argentifolia* is a tree to 18 m tall. This taxon is considered as possibly regionally uncommon with a possible disjunct distribution within the north-east of New South Wales. It is primarily distributed along the western slopes of New South Wales and has minor occurrences on the North Coast. On the North Coast this taxon has been found primarily north-east of Tenterfield near the Queensland border with one historical collection from south of Maclean.

*Acaena agnipila* is potentially a regionally uncommon herb. It has been found near Ebor, and near the Bluff River Bridge. It was found during a previous survey in Boonoo Boonoo National Park and the occurrence here is of regional significance.

*Acronychia laevis* is a closed forest tree that has its southern distributional limit at the base of Boonoo Boonoo Falls and of conservation significance.

*Actinotus gibbonsii* is a prostrate and spreading herb that is considered to be regionally uncommon in the north-east of New South Wales but common elsewhere in the state. The species has been found sporadically throughout mainly higher parts of the north-east. The species is probably more common than collections indicate. This taxon is often found on rock outcrops particularly after recent fires. Hunter (in prep.) has found this taxon to become almost dominant on many granitic and other outcrops after fire and that population numbers decline gradually as time since fire increases. Many of these areas had not had fires in recent years and the seed bank of this species is probably long lived. The ephemeral nature of this species and its restricted habitat requirements have probably led to the infrequent number of collections made. This taxon may not be a significant species in the north-east.

*Aristida acuta* is a small grass that is considered to be uncommon and at its distribution limit within the north-east of New South Wales. I was found within Boonoo Boonoo National Park.

*Aristida jerichoensis* subsp. *subspinulifera* is a small grass considered regionally uncommon. This taxon should be considered as a significant species within the reserve.

*Austrodanthonia monticola* is a regionally uncommon grass that has its northern distributional limit within Boonoo Boonoo National Park. This species is probably more widespread than collections indicate and it is commonly associated with rocky terrain. However the species is at is distributional limit in this area and as such is regionally significant.

*Austrodanthonia penicellata* is possibly a regionally uncommon grass it has previously only been surveyed in the Ebor to Guyra area. Only a few sites where found with this taxon. It is likely that this species is regionally uncommon and of conservation significance within the reserves.

*Austrostipa setacea* is a grass considered to be regionally uncommon. It It has previously been found near Guyra and within Guy Fawkes National Park and Boonoo State Forest. This grass was found within Boonoo Boonoo and Bald Rock National Parks.

*Boerhavia dominii* is a prostrate herb that is thought to be regionally uncommon. This taxon can be found throughout the state but has been found only near Urbenville, Gilgury, Bald Rock, the Washpool Western Additions and the Demon Nature Reserve. The occurrence of this species within the reserve is of significance.

*Bossiaea obcordata* is a shrub that may be regionally uncommon. It has previously been found at Mann River Nature Reserve, Washpool National Park Western Additions, along the Sara River and at Boonoo Boonoo National Park. Its occurrence within Boonoo Boonoo may be of regional conservation significance.

*Brachyscome tenuiscapa* is a disjunct herb. It has previously been found within Warra National Park, Paddys Land Nature Reserve and Boonoo Boonoo National Park. Its occurrence within Boonoo Boonoo is of conservation significance.

*Cassinia uncata* is a tall shrub and is considered a regionally uncommon taxon. Populations of this species are known from the Backwater area and the Long Point near Guyra. Small populations of this taxon were found within the reserve and this should not change the significant status of this species within the north-east.

*Craspedia canens* is an annual herb that is thought to be uncommon in the north-east but common elsewhere. This species has been previously recorded from Boonoo Boonoo National Park, the Washpool Western Additions and the Demon Nature Reserve where it was common. The occurrence of this taxon in the reserve is of significance.

*Crassula colorata* is potentially a regionally uncommon herb. It has previously been found within Limpinwood Nature Reserve, Mount Lindsey Forest Reserve, Guy Fawkes National Park. This species was found in Bald Rock during a previous survey and may be of regional conservation significance.

*Daviesia nova-anglica* is a shrub that has its northern distributional limit just west of Wilsons Downfall. The occurrence of this species at Boonoo Boonoo National Park is near the species northern distributional limit and thus of regional conservation signi ficance.

*Deyeuxia quadriseta* is a grass considered to be regionally uncommon and at its northern limit within Boonoo State Forest. As such the occurrence of this species within Boonoo Boonoo National Park is of conservation significance.

*Echinopogon mckiei* is a grass that has its northern limit within Boonoo Boonoo National Park and thus of conservation significance within the reserve.

*Enneapogon nigricans* is a regionally uncommon grass that has only previouslybeen recorded in the north east at Rivertree and Ewingar. This species was not found during this survey but was found to be reasonably common during a previous survey. It is possibly that these changes are climatically based.

*Epilobium gunnianum* is a herb that is regionally uncommon and at its northern limit at London Bridge south east of Glen Innes. This is a new occurrence for this uncommon taxon, is at a new northern limit, and is therefore of conservation significance.

*Epilobium hirtigerum* is a herb which is regionally uncommon being only known from Deepwater, Thulimbah, Chandlers Peak and Jenner State Forest in the north-east. The occurrence within the reserve is of conservation significance.

*Eragrostis lacunaria* is a regionally uncommon grass. It ahs previously been found at Woolongbar and within Boonoo Boonoo National Park. The occurrence within Boonoo Boonoo is of conservation significance.

*Eragrostis molybdea* is a grass that is considered regionally uncommon. This species is known from the Richmond Range State Forest in the north-east and the Washpool National Park Western Additions. This new record within the reserve is of conservation significance.

*Eragrostis trachycarpa* may be a regionally uncommon grass. It has previsouly been found at Amosfield, on the Mount Lindsey Highway north of Tenterfield, Glen Elgin, Ebor and within Boonoo Boonoo National Park. This species may be of conservation significance.

*Eucalyptus acaciiformis* is a low tree whose northern distributional limit is north of Tenterfield. The size of the populations of this species at its northern limit are of conservation significance.

*Galium binifolium* is a herb whose northern distribution limit is within Boonoo Boonoo National Park.

*Goodenia bellidifolia* subsp. *bellidifolia* is a herb with its northern distributional limit within the Tenterfield district. It was found to be reasonably common in both Bald Rock and Boonoo Boonoo National Park.

*Hovea beckleri* is a shrub that is that is both regionally rare and thought to have its distributional limit at within Spirabo National Park. This species has previously been collected at Backwater, Dorrigo, Wedding Bells State Forest, Coaldale, Gibraltar Range National Park and Mt Jondol. Many collections in the NE herbarium labeled as this species were of other species. It is possible that this taxon is rarer than herbarium collections indicate. The occurrence within the southern section of Bald Rock National Park is a new northern limit for the distribution of this species and of regional conservation significance both in terms of distributional limits and uncommon distribution.

*Indigofera adesmiifolia* is a shrub that is both disjunct and regionally uncommon. It has only previously been found north and east of Guyra in the Backwater area. This species was found in a previous survey of their reserves and none was found during this survey. The occurrence of this species within the reserve, if verified, is of regional conservation significant.

*Isotoma fluviatilis* subsp. *borealis* is a regionally uncommon herb. It has previously been recorded from Copmanhurst, Armidale, Marengo State Forest, Backwater, Ebor and at Cathedral Rocks National Park. The occurrence of this species within the reserve is of conservation significance.

*Lasiopetalum ferrugineum* var. *ferrugineum* is a shrub that is possibly uncommon in the north-east. This taxon has been previously found within Sherwood Nature Reserve, the Demon Nature Reserve, Waihou Forest Reserve, Conglomerate State Forest, Wombat Creek, Hayards Crossings and the Orara Valley. Only a single juvenile specimen was discovered in a frequently burnt area of the reserve. The occurrence of this species is probably on regional significance.

*Lepidosperma neesii* is a herb that is thought to be disjunct with a northern limit at Evans Head. This species was found only as isolated populations within Booonoo Boonoo National Park and this record represents a new northern distribution on the Tablelands.

*Leptorhynchos squamatus* subsp. A is a may potentially have be a regionally uncommon species. It has its northern limit within Boonoo Boonoo National Park and is thus of conservation significance.

*Lobelia dentata* is a herb that reaches its northern distribution limit within Boonoo Boonoo National Park and thus of conservation significance.

*Melichrus adpressus* is a shrub that has a disjunct occurrence within Boonoo Boonoo National Park that is also at its southern limit of distribution. This occurrence is of regional conservation significance.

*Olearia ramulosa* is a shrub that is regionally uncommon within north eastern New South Wales. It has previously been found at Round Mountain and Pheasant Mountain. The occurrence within Bald Rock National Park is of regional conservation significance.

*Ozothamnus* sp. nov., a potential new species was found during this survey lining a creek at the base of Mount Norman in Boonoo Boonoo National Park. This entity may be equivalent to a potential new taxon at Basket Swamp National Park. The taxonomic status of this species and its relationship to the entity at basket swamp needs clarification. However, at present the entity is likely to be highly restricted and may warrant a vulnerable listing. This population is of conservation significance.

*Patersonia fragilis* is a herb mainly restricted to swampy sites. This species is considered to be disjunct within northern New South Wales. Populations are known from Bundjalung National Park, New England National Park and the Demon Nature Reserve. This species was found in swampy situations within Boonoo Boonoo National Park.

*Podolepis hieracioides* is a herb that is possibly regionally uncommon and potentially has its northern limited at Limpinwood Nature Reserve but is a disjunct taxon. This species was found to be uncommon but scattered throughout Bald Rock and Boonoo Boonoo.

*Pomaderris vellea* is a shrub that is regionally uncommon and possibly disjunct in distribution. Records of this taxon have come from areas such as Surveyors Creek, Mann River Nature Reserve, Nymboida River, Buccarumbi and to Boonoo Boonoo National Park. No plants were seen in the reserve during this survey.

*Prostanthera caerulea* is a regionally uncommon shrub with its northern distributional limit north of Tenterfield. It has been found previously in both Bald Rock and Boonoo Boonoo National Parks. It is of regional conservation significance.

*Pterostylis daintreana* is a herb that is thought to be regionally uncommon in the North East of New South Wales. It has previously been found within the Koonym Range, Minyon Falls Forest Reserve, Whain Whian State Forest sand Chaelundi National Park. This species was found during a previous survey in Bald Rock National Park but was not found during this present investigation.

*Pultenaea altissima* is a regionally uncommon shrub that has its northern distribution limit in the north east. It has previously been found at Backwater within Warra National Park and along the Henry River within the Guy Fawkes River National Park. The occurrence of this species within Boonoo Boonoo represents a new northern limit of this regionally uncommon species and of conservation significance.

*Pultenaea dentata* is a regionally uncommon shrub that has previously been found within Basket Swamp National Park and Boonoo Boonoo National Park. The occurrence within Boonoo Boonoo is regionally significant.

*Pultenaea polifolia* is a shrub within its northern distributional limit at Bald Rock National Park. This species has been found within Bald Rock and Boonoo Boonoo and of regional significance.

*Trachymene anisocarpa* is a herb that is regionally uncommon with its northern limit at Tweed Heads. This genus warrants revision and further taxa may be described from these complexes. The occurrence of this regionally uncommon species within Bald Rock National Park is of conservation significance.

*Velleia montana* is a regionally rare herb with its northern distributional limit north east of Boonoo Boonoo National Park. It has previously been found at Round Mountain and also within Warra State Forest. This species responds to a post fire environment and is not long lived. It is possible that the lack of records is a reflection of an ephemeral habit. Either way this species is of regional conservation significant being at the northern distributional limit. The species was found within Bald Rock and Boonoo Boonoo National Parks.

*Wahlenbergia littoricola* is an uncommon and disjunct herb within the north-east of New South Wales. It has only been found at Boonoo Boonoo National Park and the Washpool National Park Western Additions in the north east which is disjunct from its populations on the Central Tablelands of New South Wales.

*Wahlenbergia ceracea* is a disjunct herb and may the occurrence of this species within the reserves may be of significance.

*Wahlenbergia graniticola* is a herb that is regionally uncommon. It has previously been found within Boonoo Boonoo National Park within the region. This occurrence is of regional conservation signficance.

*Wahlenbergia luteola* is a herb whose northern limit was thought to be south of Glen Innes and is uncommon in the north-east. The localities of this taxon within the reserve represent a new northern limit for the taxon and additional localities for this regionally uncommon species. The occurrences within the reserve should be considered regionally significant.

*Xyris gracilis* subsp. *gracilis* is a herb of swampy ground that has its northern limit on the tablelands at Bald Rock National Park. This species has been found both within Bald Rock and Boonoo Boonoo and is of significance being at the northern limit of distribution.

### 3.5.29 Significant species recorded within close proximity to the reserves

Nine regionally and nationally significant taxa occur in the general vicinity of the reserve. These taxa may potentially be found within Bald Rock and Boonoo Boonoo after further investigations. The following species are therefore worthy of comment.

*Bertya* sp. A is known from Girraween National Park and may potentially be found in Bald Rock National Park particularly in the southern section after further searching.

*Boronia granitica* is a widespread species on granite outcrops predominantly on the western side of the New England. The species occurs within Girraween National Park and potentially may occur in Bald Rock, particularly in the southern section.

*Boronia repanda* is a species restricted to granite outcrops near Stanthorpe. The species at one point was thought to occur within Jenner State Forest, currently a new edition to Bald Rock National Park, but this is considered to be an erroneous record. Further searches of outcrops in Bald Rock and Boonoo Boonoo it may be found

*Derwentia arenaria* is an annual herb that is nationally rare. It has been found within Girraween National Park and may be found in either reserve.

*Eucalyptus codonocarpa* is a mallee eucalypt restricted to outcrops and is nationally rare. It has been found in several disjunct locations along the eastern escarpment of north eastern New South Wales and is common in Girraween National Park and may be found within Bald Rock National Park.

*Homoranthus montanus* is a species restricted to granite outcrops near Stanthorpe. Further searches of outcrops in Bald Rock and Boonoo Boonoo it may be found.

*Homoranthus papillatus* is a species restricted to granite outcrops within Girraween National Park. Populations of this species occur on Mount Norman and it is conceivable that with further searches of outcrops in Bald Rock and Boonoo Boonoo it may be found.

*Leucopogon cicatricatus* is a rare shrub that has a disjunct occurrence on granite and acid volcanic outcrops of south eastern Queensland and northern New South Wales. A single population exists on South Bald Rock within Queensland within only a few hundred meters of Bald Rock National Park. This species may yet be discovered in Bald Rock or Boonoo Boonoo National Parks.

*Phebalium rotundifolium* is a nationally rare species with an occurrence from Copeton Dam to Girraween. It may be found in along the border trail within Bald Rock National Park or in the southern section of Bald Rock National Park with further searches.

### *3.6 Introduced taxa*

A total of 44 taxa (5%) found during all surveys of Bald Rock and Boonoo Boonoo National Parks were introduced. This is a relatively low number compared to some reserves on the coast or along the western slopes (e.g. Kwiambal 17%). However, this appears to be similar to that found for other reserves along the escarpment with Guy Fawkes also having only 5% of its flora introduced and the Washpool National Park Western Additions with 6%. Several of these taxa were only surveyed once; others however, were very common and at times could be considered ubiquitous for most communities. The most frequent introduced taxa, in terms of abundance and frequency are in decreasing order *Hypochaeris radicata, Conyza albida, Taraxacum officionale, Conyza bonariensis, Aira cupaniana, Andropogon virginicus, Gnaphalium americanum* and *Setaria verticillata.* Almost all of these are the same abundant weeds found in both the Western Washpool and Guy Fawkes River Surveys. Life history, control and distribution information for each of the introduced taxa is given in Appendix C.

### *3.7 Evenness of communities*

The evenness scores for each community are very high. In particular Communities 3, 4 and 5, and to a lesser extent 2, all show extremely high evenness. Communities 3-5 are almost perfectly even, indicating that most species are equally abundant. These communities are all associated with riparian or wet adjacent wet environments. This trend was also noted in Guy Fawkes River National Park (Hunter & Alexander 1999). Of lower evenness are the communities associated with forests and woodlands. The lowest evenness was achieved by Community 11 (rock outcrops), potentially indicating that a few species become very dominant in these habitats with a large number of species being of low abundance.

**Table 3:** Measured evenness for the eleven defined communities at Bald Rock and Boonoo Boonoo National Parks.

| Community | Evenness |
|---|---|
| **Community 1** | 0.95 |
| **Community 2** | 0.96 |
| **Community 3** | 0.98 |
| **Community 4** | 0.98 |
| **Community 5** | 0.99 |
| **Community 6** | 0.80 |
| **Community 7** | 0.94 |
| **Community 8** | 0.90 |
| **Community 9** | 0.82 |
| **Community 10** | 0.93 |
| **Community 11** (Hunter 1999) | 0.70 |

## *3.8 Fire responses of individual taxa*

### 3.8.1 Known fire responses of species

The following represents a review of the current literature on the fire responses of individual taxa.

**Table 4:** Known fire responses and traits of taxa found in the Bald Rock and Boonoo Boonoo. NPFR refers to National Fire Register. Fire responses are based on published information, some of which is contradictory. Possible reasons for these contradictions are discussed in section 4.3.

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Acacia adunca* | Obligate Seeder | Soil stored seedbank, main stimulation fire, heavy germination after medium to high intensity fire | Seed | In thickets within 1 yr of fire | | | | pers. obs. | |
| *Acacia binervata* | Obligate Seeder | Soil stored seedbank | Seed | | | | | Killed. Initial coloniser following fire, matures quickly. Viable seed virtually absent from site unburnt 30 yrs, present site burnt 14yrs. | Benson & McDougall (1996), Floyd (1966), Floyd (1976). |
| *Acacia blakei* | Variable | | Seed | | | | | | Williams (1998). |
| *Acacia brownii* | Resprouter | | Seed | | | | | Stems killed, resprouts from base | Benson (1981), Benson & McDougall (1996). |
| *Acacia buxifolia* | Resprouter | | Seed | | | | | Regrowth and suckers from | Purdie (1977), Benson & McDougall (1996). |

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| | | | | | | | | rootstocks and lateral roots, seedlings recorded less than 1 yr after fire. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Acacia falciformis* | Obligate Seeder | Soil stored seedbank, after medium intensity fire much germination | Seed | | | | | pers. obs. Perennial. Facultative resprouter. | NPFR, Williams (1998). |
| *Acacia filicifolia* | Resprouter | Soil stored seedbank | Seed | Will germinate after fires | | | | Probably resprouts from root suckers | Benson & McDougall (1996). |
| *Acacia floribunda* | Obligate seeder | | Seed | | | <3 yr | | Old plants killed young plants resprout from base after high intensity fire | Benson & McDougall (1996), Benson (1981). |
| *Acacia gunnii* | Obligate Seeder | | Seed | | | | | | Gill (1975). |
| *Acacia implexa* | Resprouter | Reproduction by sexual means, reproducing by seed propagation between 1-5 years. | Seed | Dispersed by expulsion | | | | Stems killed, resprout from base or root suckers. Prominent in soil seedbank in gaps. Present throughout gaps in unburnt Rf communities. Root bud suckers. 20-60% stems killed low intesity fire all killed by high. No protected vegetative buds. | Benson & McDougall (1996), Melick & Ashton (1991), Clarke (1989), Morrison & Renwick (2000). |
| *Acacia irrorata* | | Can't germinate from | Seed | | | | | | Floyd (1976). |

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|---|---|---|---|---|---|---|---|---|---|
| | | depths >5cm. Unheated 5% germ., heated 70 degrees C, 70% germination. | | | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Acacia latisepala* | Obligate Seeder | Soil stored seedbank, germinates in large numbers after fire | Seed | Will establish in a thick sward | 2 yrs | | | pers. obs. | Hunter (1995). |
| *Acacia leucoclada* | | | Seed | | | | | | |
| *Acacia longifolia* | Obligate Seeder | Soil stored seedbank. | Seed | | 2 yrs | | | Killed, flowering within 2 yrs of high intensity fire | Benson & McDougall (1996), Auld & O'Connell (1991), Floyd (1976), NPFR. |
| *Acacia macnuttiana* | Obligate Seeder | Main stimulation is the passage of fire | Seed | | | | | pers. obs. | |
| *Acacia maidenii* | Obligate Seeder | Best germination after 45 days 3-6cm depth. Viable seed at 9-12cm. | Seed | | | | | Killed. Site unburnt 30yrs had slightly more viable seed than that burnt 14yrs ago. 100% scorch kills. | Benson & McDougall (1996), Floyd (1976), Fox (1988), NPFR. |
| *Acacia melanoxylon* | Variable | Fire stimulated and also opening of canopy. Requires disturbance. | Hard-coated seed, may survive up to 500 years | Humus or soil stored seed, rapid early growth | | | <50 | Facultative resprouter. Obligative Seeder from soil stored seed or plant stored seed. | Barker (1990), Hill (1982), Hill & Read (1984), Jordan et al. (1992), Melick & Ashton (1991), Benson & McDougall (1996). |
| *Acacia myrtifolia* | Variable | Mainly after fire | Seed | | <3 yr | | | Will germinate after high intensity fire. Obligate Seeder and facultative resprouter. Soil stored seed. 100% scorch killed. | Benson & McDougall (1996), Auld & O'Connell (1991), Floyd (1976), Keith (1996), Siddiqi et al. (1976), Bradfield (1981), NPFR. |

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| | | | | | | | | Min. temp to break seed dormancy 60-80 degrees C. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Acacia obtusifolia* | Obligate Seeder | May germinate after fire | Seed | | | | | Resprouts from base and root suckers. Seedlings may establish on disturbed sites. | NPFR, Benson & McDougall (1996). |
| *Acacia penninervis* | Resprouter | | Seed | | | | | | Williams (1998). |
| *Acacia rubida* | Resprouter | | Seed | | | | | From root suckers | Benson & McDougall (1996). |
| *Acacia stricta* | Obligate Seeder | | Seed | | | | | Probably killed. | Benson & McDougall (1996). |
| *Acacia ulicifolia* | Variable | No germination at 60 degrees. Optimum 70 deg. C. Variable with population. | Seed | | <3 yr | | | Variable. Killed by fire. Resprouts and root suckers in some populations. Most seedlings flowering within 2.5 years of high intensity fire. | Fox (1988), Benson & McDougall (1996). |
| *Acacia venulosa* | Obligate Seeder | | Seed | | | | | | |
| *Acacia viscidula* | Resprouter | | Seed | | | | | | |
| *Acaena agnipila* | | | Fruit | Dispersed by attachment to animal fur, clothing etc | | | | | Benson & McDougall (2000). |
| *Acaena novae-zelandiae* | Resprouter | | Fruit | Dispersed by attachment to animal fur, clothing etc | | | | First recorded 3m after fire in wet forest, 4m after fire in grassy forest. Regeneration | Dickinson & Kirkpatrick (1987), Benson & McDougall (2000). |

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| | | | | | | | | greater 16-24m than 0-16m after fire. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Acetosella vulgaris* | Resprouter | | | | | | | | |
| *Acianthus exsertus* | Resprouter | | Seed, winged. | | | | Indefinite. | | NPFR, Benson & McDougall (2005). |
| *Acmena smithii* | Variable | 70% fresh seed germinates without treatment 24-120 days, viable < 6 months, dried at room temp > 1y | Fleshy fruit with single large seed | Probably bird-dispersed, adapted for vertebrate dispersal; no soil-stored seedbank, seedlings shade tolerant, found under adult plants but possibly short-lived, no lignotuber on seedlings but produced later, quick growth rate, coloniser | 5 years | | 100-200 years | Some killed by high intensity fire, most resprout from basal and epicormic shoots, < 10% mortality after wildfire | Chesterfield et al. (1991), Melick & Ashton (1991), NPFR, Benson & McDougall (1998), Clarke (1989). |
| *Acrotriche aggregata* | Resprouter | | | | | | | pers. obs. Facultative resprouter. | NPFR |
| *Actinotus gibbonsii* | Obligate Seeder | Germinates in large numbers following high intensity fires-seeds persist for many years: pers obs | | Vigorous growth and may dominate within months after fire: pers obs | < 1yr | | | Probably killed, (flowering and fruiting within months of high intensity fires: pers obs) | NPFR, Benson & Mcdougall (1993). |
| *Actinotus helianthi* | Obligate Seeder | Fire promotes germination of seed | | Seeds dispersed by wind. | | | | Killed and re-established from soil-stored seed. Old plants of 'headland' form | Bradstock et al. (1997), Benson (1985), Conroy (1996), Fox & Fox (1986), Clemens & Franklin (1980), Siddiqi et al. |

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| | | | | | | | | with thick stems (1cm) may be unaffected. | (1976), NPFR, Benson & McDougall (1993), Clarke (1989). |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Adiantum aethiopicum* | Resprouter | | | Diaspore: spores dispersed by wind. Probably no dormancy mechanism. | | | | Fire sensitive in open situations but tolerant if rhizomes amongst rocks. Resprouts at ground level. | NPFR, Benson & McDougall (1993). |
| *Adiantum formosum* | Resprouter | | | | | | | Facultative resprouter. | Benson & McDougall (1993), NPFR. |
| *Adiantum hispidulum* | Resprouter | | | | | | | Flush of growth from rhizome after fire | Benson & McDougall (1993), NPFR. |
| *Agiortia cicatricata* | Obligate Seeder | | Fruit | | | | | | |
| *Aira cupaniana* | Obligate Seeder | 1yr after fire | Fruit (indehiscent 1 seeded) | Adhesive to animals & wind dispersed. | <1 | | | Seedlings in burnt and unburnt sites 1yr after fire - not noted before fire. | Lunt (1990), Purdie (1977), NPFR, Benson & McDougall (2005). |
| *Ajuga australis* | Resprouter | | Fruit (indehiscent 1 seeded) | Erect flowering stems become horizontal at maturity, allowing short distance gravity dispersal of se | | | | Grows rapidly after fire. | Benson & McDougall (1997), Lazarides & Hince (1993). |
| *Alangium villosum* | Resprouter | | | | | | | | Williams (1998) |
| *Alchornea ilicifolia* | Resprouter | | | | | | | Stems killed, resprouts from base or roots. | Benson & McDougall (1995). |
| *Alectryon subcinereus* | Resprouter | Germinates readily after removal of the aril. | Fruit. | Seeds dispersed by vertebrates. Tertiary sand coloniser, by seed | | | 30+ | | Clarke (1989), Benson & McDougall (2001). |

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| | | | | propagation. No vegetative spread. | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Alectryon subdentatus* | Resprouter | | | | | | | | Williams (1998). |
| *Allocasuarina littoralis* | Variable | 90% seed release within 1 week of fire | | Will germinate without fire after long periods ie 13-23 yrs. Seeds dispersed by wind. | | 3 yrs | 30+ | Generally killed, larger plants killed high intensity fire, smaller resprout stem, dominates long unburnt areas. No protected stem buds, no insulating bark. | Auld (1996), Keith (1996), NPFR, Benson & McDougall (1995), Clarke (1989), Morrison & Renwick (2000). |
| *Allocasuarina rigida* | Reprouter | | | | | | | | |
| *Allocasuarina rupicola* | Reprouter | | | | | | | | |
| *Allocasuarina torulosa* | Resprouter, epicormic, basal | | | Survive 100% scorch - basal sprouts, seeds release after fire, will establish in absence of fire. | | | | Will resprout slowly from base after high intensity fire. Stems survive 100% scorch, producing more stems/shoot after high intens. fire than low. | Auld (1996), Kellman (1986), NPFR, Benson & McDougall (1995), Morrison & Redwick (2000). |
| *Alphitonia excelsa* | Resprouter | Very slow, 8 months for 70% germ. Fracturing hard coat reduces dormancy. 30-70% viable after 15-20 y | Fruit (Dry indehiscent 1 seeded) | Diaspore: fruit. Coloniser species, although seen on edges can also occur as mature specimens in gully rainforest. | | | | Facultative resprouter. Survive 100% scorch - basal sprouts. | NPFR, Benson & McDougall (2000). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Alyxia ruscifolia* | Obligate Seeder | | | | 3-May | | | | Williams (1998). |
| *Ammobium alatum* | | | | | <1 | | | | |
| *Amperea xiphoclada* | Resprouter | | | | | < 1yr | | Stems killed, resprout from base. Flowering & fruiting within 1yr of high intensity fire. | Benson (1981), Benson & McDougall (1995). |
| *Amphipogon strictus* | | Resprouter | Fruit (Dry indehiscent 1 seeded) | | | | | | Benson & McDougall (2005). |
| *Amyema cambagei* | Obligate Seeder | | | | 4-Aug | | | | Williams (1998). |
| *Amyema miquelii* | Obligate Seeder | Germination occurs only if fruit coat is removed, the embryo is green, & can begin to grow in dark. | | Diaspore: fleshy fruit, bird-dispersed mainly by Mistletoe bird, transportation only about 45km. | | | | Killed by high intensity fire. | Reid (1997), Benson & McDougall (1997). |
| *Amyema pendulum* | Obligate Seeder | | | Food plant (crimson rosella, brushtail & ringtail possums, koala, blue butterfly), Host plant (beetl | | | | Killed by canopy scorch/ high intensity fire. | Reid (1997), NPFR, Mallick et al (1997). |
| *Andropogon virginicus* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Long distance wind dispersal. Invades burnt or bare aeas. | 1 | <1 | | not in slash & burn area, but recorded in tractor disturbed area, up to 1 yr later. | Floyd (1966), Benson & McDougall (2005). |
| *Angophora floribunda* | Resprouter | No dormancy mechanism, germinates without special treatment. Growth rate slow. Coloniser, open sites | Seed | No special morphology. Probably wind-dispersed locally ie 20m. | | | 100+ | Resprouts from epicormic shoots. | Benson & McDougall (1998), Clarke (1989). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Angophora subvelutina* | Resprouter | | Seed | | | | | Facultative resprouter. Resprouts from epicormic shoots. | Benson & McDougall (1998), Williams (1998). |
| *Anthoxanthum odoratum* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | | | | | | Benson & McDougall (2005). |
| *Aotus subglauca* | Resprouter | | | | | | | pers. obs. | |
| *Aristida acuta* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive fruit, animal dispersed. | | | | | |
| *Aristida jerichoensis* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive fruit, animal dispersed. | | | | Suggestion that prescribed burning may encourage less desirable and more fire tolerant grasses like A. jerichoensis | Gill (1981), Benson & McDougall (2005). |
| *Aristida ramosa* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive fruit, animal dispersed. | | | | Facultative root resprouter - fire resistant decreaser. | Purdie & Slatyer (1976). |
| *Aristida vagans* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive fruit, animal dispersed. | | <1 | | Fruiting within 6 m of high intensity fire. | Benson & McDougall (2005). |
| *Aristida warburgii* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive fruit, animal dispersed. | | <1 | | Recruitment mainly after fire. Fruit within 4 m of high intensity fire. | Benson & McDougall (2005). |
| *Arthropodium milleflorum* | Resprouter | | | | | | | First recorded 1m after fire in grassy & wet forests. Cover value | Dickson & Kirkpatrick (1987). |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | similar in areas burnt by high & low intensity fires. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Arthropodium minus* | Resprouter | | | | | | | | |
| *Asperula conferta* | Resprouter | | Fruit | No particular mechanism for dispersal. Rhizomatous vegetative spread. | | | | | Lunt (1990), Benson & McDougall (2000). |
| *Asplenium australasicum* | Obligate Seeder | | | | 3-May | | | Probably killed by fire | NPFR, Benson & McDougall (1993). |
| *Asplenium flavellifolium* | Resprouter | | | Diaspore: spores, wind-dispersed. Probably no dormancy mechanism. | 1 | | | | Williams (1998). |
| *Asplenium polyodon* | Resprouter | | | | | | | | Williams (1998). |
| *Asterolasia correifolia* | | | Seed, ballistically released. | Seed flap may function as ant-attracting food body. | | | | | Benson & McDougall (2001). |
| *Astrotricha longifolia* | Resprouter | | | | | | | At ground level. Facultative resprouter. Survive 100% scorch - basal sprouts. 100% scorch kills - soil stored seed. | Benson & McDougall (1993), NPFR. |
| *Austrodanthonia bipartita* | Resprouter | Optimum germination >20C, although rainfall is important particularly if seed is over 6 m old to | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed & wind dispersed. | | | | | Benson & McDougall (2005). |

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| | | overcome dormancy. | | | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Austrodanthonia caespitosa* | Variable | Prolific recruitment, optimal germination at 15C for seed more than 6 m old to overcome dormancy. Germination approx. 26 days. | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed & wind dispersed. | | | | Survive 100% scorch - basal sprouts. Significantly more abundant in burnt areas. | Lunt (1990), NPFR, Benson & McDougall (2005). |
| *Austrodanthonia fulva* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed & wind dispersed. | | | | | |
| *Austrodanthonia monticola* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed & wind dispersed. | | | | | Benson & McDougall (2005). |
| *Austrodanthonia penicillata* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed & wind dispersed. | | | | | Benson & McDougall (2005). |
| *Austrodanthonia pilosa* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed & wind dispersed. | | | | Root resprouter. Fire resistant decrease. | Purdie & Slatyer (1976), NPFR. |
| *Austrodanthonia racemosa* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed & wind dispersed. | | | | | |
| *Austrodanthonia setacea* | Resprouter | Total germination 24 days. | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed & wind dispersed. | | | | Flowers in response to rain. | Benson & McDougall (2005). |
| *Austrodanthonia tenuior* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed & wind dispersed. | | <1 | | Fruiting within 6 m of high intensity fire. | Benson & McDougall (2005). |
| *Austrostipa aristiglumis* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed. | | | | | Benson & McDougall (2005). |
| *Austrostipa pubescens* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed. | | | | | Benson & McDougall (2005). |
| *Austrostipa* | Resprouter | | Fruit (Dry | Adhesive, animal | | | | | |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *racemosa* | | | indehiscent 1 seeded) | dispersed. | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Austrostipa ramosissima* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed. | | | Indefinite | | Williams (1998), Benson & McDougall (2005). |
| *Austrostipa rudis* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed. | | | | | |
| *Austrostipa rudis* | Resprouter | Total germination 98 days. | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed. Possible coloniser of bare sites. | | | | | Lunt (1990), NPFR, Benson & McDougall (2005). |
| *Austrostipa scabra* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed. | | | | | |
| *Austrostipa setacea* | Resprouter | Total germination 50 days. | Fruit (Dry indehiscent 1 seeded) | Adhesive, animal dispersed. | | | | | Lunt (1990), Benson & McDougall (2005). |
| *Axonopus affinis* | Resprouter | | Fruit (Dry indehiscent 1 seeded) | Dispersed in mud on cars. | 1 | | Indefinite | | Williams (1998), Benson & McDougall (2005). |
| *Babingtonia densifolia* | Resprouter | | Seed | | | | | | |
| *Backhousia myrtifolia* | Resprouter | No seed dormancy. | Indihiscent dry capsule. | Recruitment immediate, death under mature plants. Growth rate slow. | | | >100 yrs | Resprouter from base, but observed resprouting from trunk after high intensity fire. | Benson & McDougall (1998). |
| *Baeckea omissa* | Resprouter | | Seed | | | | | | |
| *Baloghia inophylla* | Resprouter | | | | | | | | Williams (1998). |
| *Baloskion fimbriatum* | Resprouter | | Fruit (capsule) | Wind | | | Indefinite | Seed maturation 6-8 months. | Benson & McDougall (2005). |
| *Baloskion stenocoleum* | Resprouter | | Fruit (capsule) | Wind | | | Indefinite | | |
| *Banksia* | | | Seed | | | | | Lignotuber. | Harden (1991). |

| *cunninghamii* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Banksia integrifolia* | Variable | | Seed | Gravity. Seeds released on maturity. | | | | Obligate seeder: retains seed on plant, released as soon as follicles mature. Facultative resprouter from epicormic buds. | Fox (1988), Whelan et al. (1982), NPFR, Benson & McDougall (2000). |
| *Banksia marginata* | Variable | | Seed | Gravity or short distance wind. | 5 yrs | | | 100% scorch kills and canopy stored seed. Facultative resprouter. Non-lignotuberous Sydney form killed by fire. | Kirkpatrick (1984), Gill (1981), NPFR, Benson & McDougall (2000). |
| *Banksia spinulosa* | Resprouter | | Seed | Better recruitement, better survival post autumn than spring fires. Wind and gravity dispersal. | 3+ | | | Facultative resprouter. survive 100% scorch - basal sprouts. lignotuberous. Decrease in density 1yr post fire. | Beadle (1940), Hamilton et al. (1991), Clark (1988), Harden (1991), NPFR, Benson & McDougall (2000). |
| *Baumea rubiginosa* | Resprouter | | | | | | | Facultative resprouter. Flower abundantly only after fire. Obligate pyrogenic flowering. | Keith (1991), NPFR. |
| *Bertya glandulosa* | Obligate Seeder | | | | | | | | |
| *Bidens pilosa* | Resprouter | | | Diaspore: fruit, animal dispersed (eg. on human | 18wks | | 1yr | Probably killed, vigorous recruitment from | Benson & McDougall (1994). |

| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | clothing). | | | | seed after high-intensity fire, most likely from soil-stored seed. Mature fruit within 18wks of high intensity fire. | |
| *Billardiera longiflora* | Resprouter | | | | | | | | |
| *Billardiera scandens* | Resprouter | | | | | 1.9yr | | Resprouts at base or below from surviving rootstocks, seedlings recorded <!yr after fire. | Fox (1988), Purdie (1977), Benson & McDougall (1999). |
| *Blechnum cartilagineum* | Resprouter | | | veg. repro- root stocks & coppice (rhizomes). | | < 1yr | | Vigorously resprouts from rhizome after high intensity fire, fertile fronds in 5 months from fire | Benson & McDougall (1993), Floyd (1966), NPFR. |
| *Blechnum nudum* | Resprouter | Recruitment mainly after fire. | | Diaspore: spores, wind-dispersed. Probably no dormancy mechanism. | | < 1yr | | Resprout from short burnt rhizome trunks | NPFR, Duncan & Isaac (1986), Benson & McDougall (1993). |
| *Blechnum wattsii* | Resprouter | | | | | < 1yr | | Flush of new fronds after fire | Benson & McDougall (1993). |
| *Boerhavia dominii* | Obligate Seeder | | | | 1-Feb | | | | Williams (1998). |
| *Boronia amabilis* | Resprouter | | | | | | | | |
| *Boronia anemonifolia* | Obligate Seeder | | | | | | | | |
| *Boronia anethifolia* | Obligate seeder? | | Seed | Seed dispersed ballistically from dehiscent 4-lobed | | | | | Benson & McDougall (2001). |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | fruit. | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Boronia microphylla* | Resprouter | | Seed | Seed dispersed ballistically from dehiscent 4-lobed fruit. | | | | Stems killed, resprouts from base. | Benson & McDougall (2001). |
| *Boronia parviflora* | Resprouter | | Seed | Seed dispersed ballistically from dehiscent 4-lobed fruit. Also myrmecochorous. Recruitment mainly after fire. | >5y | 1y | 25-60y | Facultative resprouter. | NPFR |
| *Boronia pinnata* | Resprouter | | Seed | Seed dispersed ballistically from dehiscent 4-lobed fruit. Also myrmecochorous. Soil stored seedbank. | | | | Resprouts from base. | Benson & McDougall (2001). |
| *Boronia polygalifolia* | Resprouter? | | Seed | Seed dispersed ballistically from dehiscent 4-lobed fruit. | | | | May be apparent after fire, presumably from resprouts. | Benson & McDougall (2001). |
| *Bossiaea neo-anglica* | Resprouter | | Seed | Soil-stored seedbank. | | | | pers. obs. | |
| *Bossiaea obcordata* | Resprouter | | Seed | Soil-stored seedbank. | | <2 yr | | At ground level or below | Benson & McDougall (1996). |
| *Bossiaea rhombifolia* | Resprouter | | Seed | Soil-stored seedbank. | | | | From base | Benson (1981), Benson & McDougall (1996). |
| *Bossiaea rhombifolia* | Resprouter | Seed viability: 100%. Non-dormant fraction 7%. | Seed | Soil-stored seedbank. | | | | Resprouts from base. | Benson (1981), Benson & McDougall (1996). |
| *Bossiaea scortechinii* | Resprouter | | Seed | Soil-stored seedbank. | | | | pers. obs. | |
| *Bothriochloa macra* | Resprouter | | Fruit (Dry indehiscent 1 | Adhesive, by animals. Wind & | | | | Flowers when competition from | Lunt (1990), Benson & McDougall (2005). |

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|---|---|---|---|---|---|---|---|---|---|
| | | | seeded) | mud on cars. | | | | other vegetation is reomved by burning , graing or mowing. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Brachychiton discolor* | Resprouter | | | | | | | | Williams (1998). |
| *Brachychiton populneus* | Resprouter | | | | | | | | Williams (1998). |
| *Brachyloma daphnoides* | Resprouter | | | Within 1 yr of fire | | 1 yr | | From ground level or below | Fox (1988), Hunter (1991), Benson & McDougall (1995). |
| *Brachyscome angustifolia* | Resprouter | | | | | | | | |
| *Brachyscome microcarpa* | Resprouter | | | | | | | | |
| *Brachyscome nova-anglica* | Resprouter | | | | | | | | |
| *Brachyscome scapigera* | Resprouter | | | | | | | | |
| *Brachyscome spathulata* | Resprouter | | | | | | | | |
| *Brachyscome stuartii* | Resprouter | | | | | | | | |
| *Brachyscome tenuiscapa* | Resprouter | | | | | | | | |
| *Breynia cernua* | Resprouter | Soil stored seedbank, germinates easily, 1-7wks, and grows quickly. Reprod. sexual, by seed 1-5yrs. | Fruit (Fleshy Red) | Probably bird dispersed; seed, ant-dispersed. | | < 1yr | | From ground level suckering. Mature fruit within 1yr of high intensity fire. Resprouts below ground. | Fox (1988), Benson & Howell (1994), Benson & McDougall (1995), Clarke (1989). |
| *Briza minor* | Obligate Seeder | | Fruit (Dry indehiscent 1 seeded) | Diaspore adhesive, animal, wind & water dispersed. | | | | Significantly more abundant in burnt areas. | Lunt (1990). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Brunoniella australis* | Resprouter | | | | | < 1yr | | At ground level, flower within 1 month of fire, probably fire dependent on removal from competition | Benson & McDougall (1993). |
| *Bulbophyllum elisae* | Obligate Seeder | | Seed | | | | Indefinite | | Williams (1998), Benson & McDougall (2005). |
| *Bulbostylis barbata* | Obligate Seeder | | | | | | | 100% scorch kills - soil stored seed. | NPFR. |
| *Bulbostylis densa* | Obligate Seeder | | | | | | | | |
| *Bursaria spinosa* | Resprouter | | | | | 16m | | Adults resprouted from base. Susceptibility of seedlings unknown. | Benson & McDougall (1999). |
| *Caladenia carnea* | Resprouter | | Seeds, winged | | | | Indefinite | | |
| *Caladenia fuscata* | Resprouter | | Seeds, winged | | | | Indefinite | | Benson & McDougall (2005). |
| *Calandrinia eremaea* | Obligate Seeder | | | | | | | | |
| *Calandrinia pickeringii* | Obligate Seeder | | | | | | | Prolific seedlings in depressions on rock platform after high intensity fire. | Benson & McDougall (1999). |
| *Caldcluvia paniculosa* | Obligate Seeder | | | | 5-Aug | | | Killed | Benson & McDougall (1995), Williams (1998). |
| *Callicoma serratifolia* | Resprouter | Viable seed present at 9-12cm, most in top 6cm. low soil temp <75 deg C. | | | | | | Resprout from base after high intensity fire, also germinates after fire from soil stored seed bank | Benson & McDougall (1995), Floyd (1976). |

| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
|---|---|---|---|---|---|---|---|---|---|
| *Callistemon flavovirens* | Obligate Seeder | | | | | | | | |
| *Callistemon pallidus* | Resprouter | | | | | | | | |
| *Callistemon pityoides* | Resprouter | Germinates without treatement, viability 10%, may have some innate dormancy. | Seed | Dispersed localy, no dormancy. | | | | | Benson & McDougall (1998). |
| *Callistemon sieberi* | Resprouter | Germinates without treatment. No soil-stored seedbank. Probably needs open conditions to germinate. | Seed. | | | | | Survives 100% scorch - basal sprouts. | NPFR. Benson & McDougall (1998). |
| *Callistemon viminalis* | Resprouter | | | | | | | | |
| *Callitris endlicheri* | Obligate Seeder | No soil-stored seedbank. 100% mortality when stem cut at ground level. | Winged seed | Probably no dormancy mechanism. | | | | 100% scorch will kill. Killed by fire (100% scorch). | Benson & McDougall (1993). |
| *Callitris monticola* | Obligate Seeder | | | | | | | | |
| *Callitris rhomboidea* | Obligate Seeder | | | | | | | Probably killed | Benson & McDougall (1993). |
| *Calochilus campestris* | Resprouter | | Seed, winged | | | 1 | Indefinite | Self pollinating | Benson & McDougall (2005). |
| *Calochilus gracillimus* | Resprouter | | Seed, winged | | | 1 | Indefinite | | Williams (1998). |
| *Calochilus robertsonii* | Resprouter | | Seed, winged | | | 1 | Indefinite | Self pollinating | Benson & McDougall (2005). |
| *Calochlaena dubia* | Resprouter | | Seed, winged | | | < 1yr | Indefinite | Shoot within 1 month after fire, no spread after high intensity burn but may dominate after low intensity fire may indicate | Benson & McDougall (1993), Benson (1985), NPFR. |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | frequent low intensity fires | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Calotis cuneifolia* | Obligate Seeder | | | | | | | Probably killed | Benson & McDougall (1994). |
| *Calotis dentex* | Obligate Seeder | | | | | | | | |
| *Calytrix tetragona* | Variable | Soil-stored seedbank. | Fruit | Wind-dispersed locally, or gravity dispersed. | | 3.75 | | Resprouts. Killed after high intensity fire. | Benwell (1998), Myerscough et al (1995), Benson & McDougall (1998) |
| *Carduus tenuiflorus* | Obligate Seeder | | | | | | | | |
| *Carex appressa* | Resprouter | | | | | | | | Williams (1998). |
| *Carex breviculmis* | Resprouter | | | | | | | First recorded 1m after fire in grassy forest. Fluctuating regeneration response. | Dickinson & Kirkpatrick (1987). |
| *Carex gaudichaudiana* | Resprouter | | | | | | | | |
| *Carex inversa* | Resprouter | | | | | | | | Lunt (1990). |
| *Carex lobolepis* | Resprouter | | | | | | | | |
| *Carex polyantha* | Resprouter | | | | | | | | |
| *Cassine australis* | Resprouter | Germination difficult and slow. 20-30% in 7-26 months. | Fruit (fleshy) | Vertebrate adapted dispersal. | | | >100 | Resprouts from base. | Benson & McDougall (1995). |
| *Cassinia aculeata* | Obligate Seeder | | Fruit (plumose) | Probably wind-dispersed. | | | | Killed by high intensity fire, no seedlings 1 yr after fire | Benson & McDougall (1994). |
| *Cassinia laevis* | Obligate Seeder | | Fruit (plumose) | Probably wind-dispersed. | | | | | Williams (1998) |
| *Cassinia quinquefaria* | Obligate Seeder | | Fruit (plumose) | Probably wind-dispersed. | | | | | |
| *Cassytha pubescens* | Obligate Seeder | Reproduction sexual and vegetative, by seed | Fruit (fleshy) | By animals. | | | | | Clarke (1989). |

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| | | propagation between 1-5yrs. | | | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Casuarina cunninghamiana* | Obligate Seeder | | Seed (winged) | | | | | Killed by fire | Benson & McDougall (1995). |
| *Caustis flexuosa* | Obligate Seeder | | | | | | | | |
| *Cayratia clematidea* | Resprouter | Reproduction sexual, reproducing by seed propagation between 1-5yrs. | | Seeds dispersed by animals. | | | | | Clarke (1989), Williams (1998). |
| *Celastrus subspicata* | Obligate Seeder | | | | 2-Jun | | | | Williams (1998). |
| *Cenchrus caliculatus* | Obligate Seeder | | Fruit (1 seeded indihiscent) | Burrs attach to animals, clothing, bags & float on water. | 1 | | | | Benson & McDougall (2005). |
| *Centaurium erythraea* | Obligate Seeder | | | Diaspore: mobile seed, possibly animal and water dispersed. | 1 | | | | Williams (1998). |
| *Centaurium tenuiflorum* | Obligate Seeder | | | Diaspore: mobile. | <1 | | <1 | Regenerate from seed. | Lunt (1990). |
| *Cheilanthes distans* | Resprouter | | | | | | | Facultative resprouter. | NPFR, Williams (1998). |
| *Cheilanthes sieberi* | Resprouter | | | Diaspore: spores, wind-dispersed. Probably no dormancy mechanism. | 1-Feb | | | Facultative resprouter. | NPFR, Benson & McDougall (1993). |
| *Chenopodium melanocarpum* | Obligate Seeder | | | | | | | | |
| *Chenopodium pumilio* | Obligate Seeder | | | | | | | | |
| *Chiloglottis diphylla* | Resprouter | | Seed, winged | | | 1 | Indefinite | | Benson & McDougall (2005). |
| *Chloanthes* | Obligate Seeder | In high numbers after fire | Seed | | < 1yr | | | pers. obs. | |

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|---|---|---|---|---|---|---|---|---|---|
| *parviflora* | | even after long periods of absence | | | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Choretrum candollei* | Resprouter | | Fruit. | Hemi-parasite on roots of other plants. | | <4y | | Survives high intensity fire, resprouts from base. | Benson & McDougall (2001). |
| *Chrysocephalum apiculatum* | Variable | Germination promoted by light, strong after ripening requirement (dormancy). | | Dormancy broken by high temperature but not cold-stratification or gibberellic acid. | | | | Resprouter. Minor Obligate seeder regeneration. 100% scorch kills. Soil stored seed. | Lunt (1990), Lunt (1994), NPFR. |
| *Chrysocephalum semipapposum* | Resprouter | | | | 1 | | | Resprouts from rootstock suckers and lateral roots, no seedlings 1 yr after fire | Purdie & Slatyer (1976), Purdie (1977), NPFR. Benson & McDougall (1994). |
| *Cirsium vulgare* | Obligate Seeder | Seedlings in burnt and unburnt sites 1yr after fire. Appears after disturbance, probably soil-stored | | Seed dispersed by wind. Diaspore: fruit, wind-dispersed. Also animal and water dispersed. | 1 | | 2 | Post burn seed coloniser. Obligate seed regenerator - therophyte. Possibly resprouted after high intensity fire, flower buds within 26 wks. Seedlings recorded <1yr after fire, prob. post-fire dispersa | Floyd (1966), Purdier & Slatyer (1976), Chesterfield et al. (1991), Dickinson & Kirkpatrick (1987), Bill (1981), NPFR, Purdie (1977). |
| *Cissus antarctica* | Obligate Seeder | | | Seeds dispersed by birds or wind. | | | | Perennial. Not recorded in tractor cleared areas to 1yr later. | Floyd (1966), Williams (1998). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Cissus hypoglauca* | Resprouter | Reproduction sexual, reproduction by seed propagation between 1-5 yrs. | | Seeds dispersed by animals. | | | | Survives 100% scorch - basal sprouts. | NPFR, Clarke (1989), Williams (1998). |
| *Citriobatus pauciflorus* | Resprouter | | | | | | | | Williams (1998). |
| *Claoxylon australe* | Obligate Seeder | | | | 3-May | | | | |
| *Clematis aristata* | Variable | | Fruit (achene) | Wind dispersed. | | 38w | | Obligate seeder. Resprouted after high intensity fire. Survives 100% scorch - rootsuckers. | NPFR, Benson & McDougall (2000). |
| *Clematis glycinoides* | Obligate Seeder | | Fruit (achene) | | | | | | |
| *Clerodendrum tomentosum* | Resprouter | | | | | | | | Williams (1998). |
| *Comesperma ericinum* | Resprouter | | | | | | | Probably killed after high intensity fire. | Benson & McDougall (1999). |
| *Comesperma sphaerocarpum* | Resprouter | | | | | <5m | | Resprouts from base after high intensity fire. | Benson & McDougall (1999). |
| *Comesperma sylvestre* | Resprouter | | | | | | | | |
| *Comesperma volubile* | Variable | | | | | | | Obligate seeder and facultative and obligate resprouter. Absent from plots burnt in autumn. | Hamilton et al. (1991), Clark (1988), NPFR. |
| *Commelina cyanea* | Resprouter | Reproduction both sexual and vegetative means, reproducing by seed propagation in first year. | | Seeds dispersed by expulsion. | | | <5 | Obligate seeder and basal resprouter. Survives 100% | NPFR, Williams (1998). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | leaf scorch. | |
| *Conospermum taxifolium* | Obligate Seeder | Seeds with 100% dormancy, persistent seed bank, half life 2 yrs. | | Diaspore a nut shed a maturity. Recruits mainly after fire. Vigorous coloniser. | 4 | | -60 | Soil stored. Fire sensitive.Vigorous resprouter but also killed by fire and reistablishes by seed ?dependent of fire intensity. | Bradstock et al. (1997), Benson (1985), Benson & McDougall (2000). |
| *Conyza albida* | Obligate Seeder | | | Diaspore: fruit. Wind-dispersed locally & wide-spread, readily colonising disturbed sites. | <1 | | 1-Feb | Killed. Seedlings recorded <1yr after fire, probably recruiting from wind-blown seed. | Purdie (1977), Benson & McDougall (1994). |
| *Conyza bonariensis* | Obligate seeder | Coloniser of disturbed sites. | | Diaspore: fruit, wind-dispersed locally and probably long distance. | <1 | | 1 | 100% scorch kills - no seed stored in burnt area. Probably killed, fruit within 15wks of high intensity fire. Possibly resprouts after low intensity fire. | Benson & McDougall (1994). |
| *Conyza canadensis* | Resprouter | | | Diaspore: fruit, wind-dispersed. | <1 | | 1 | Resprouts at ground level or below. | Benson & McDougall (1994). |
| *Coprosma quadrifida* | Resprouter | | | Fleshy fruit. | | | | | Barker (1990), Benson & McDougall (2000). |
| *Correa reflexa* | Obligate seeder | | Seed | Ballistically from dehiscent 1-4 lobed fruits. Also myrmecochorous. No vegetative spread. Soil stored seedbank. | | | | | Benson & McDougall (2001). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Corymbia gummifera* | Resprouter | | Seed | Locally dispersed by gravity. | | 3 | | Resprouts from epicormic buds or lignotuber. | Williams (1998). |
| *Corymbia intermedia* | Resprouter | | Seed | | | | | | |
| *Craspedia variabilis* | Obligate Seeder | | | Diaspore: fruit, probably wind-dispersed. | | | | Maximum recruitment may take place if burning occurs very frequently, ie., every 1-2yrs. | Lunt (1994). |
| *Crassula sieberiana* | Obligate Seeder | Seedlings in burnt and unburnt areas 1yr after fire. | | Diaspore: seed, mobile. Growing in winter. | < 1yr | | | Probably killed, seedlings recorded <1yr after fire, flowering within 7m after high intensity fire. | Purdie (1977), NPFR, Purdie (1977), Benson & McDougall (1995). |
| *Croton verreauxii* | | Germination sporadic, variable, 5-20 weeks. | | Diaspore: seeds, dispersed explosively. | | | 30+ | Killed. | Benson & McDougall (1995). |
| *Crowea exalata* | | | Seed | Seed dispersed ballistically from dehiscent 1-5 lobed fruits. | | | | | Benson & McDougall (2001). |
| *Cryptandra amara* | Resprouter | | | Diaspore: seed with food body ant-adapted for dispersal. | | | | Stems killed, resprouts from base. | Benson & McDougall (2000). |
| *Cryptandra lanosiflora* | Obligate Seeder | | | | | | | | |
| *Cryptandra scortechinii* | Obligate Seeder | | | | 3-May | | | | Williams (1998). |
| *Cryptocarya rigida* | | Fresh seed after flesh removed. Short viability germination 4-8 wks. | | | | | | Very rare in Sydney. | Benson & McDougall (1997). |

| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
|---|---|---|---|---|---|---|---|---|---|
| *Cryptostylis subulata* | Resprouter | | Seed, winged | | | 2 | Indefinite | | Benson & McDougall (2005). |
| *Cyathea australis* | Resprouter | Soil stored spores. | | | | | | Resprouts from apex. basal sprouts, and outgrowth of large apical bud. Substantial recruitment between 28-48yrs post fire in a regenerating SE Aust. forest. | Benson & McDougall (1993), Hamilton et al. (1991), Keith (1996), Gill (1981), NPFR. |
| *Cymbopogon refractus* | Resprouter | | Fruit (dry indihiscent 1 seeded) | Diaspore adhesive , animal dispersed & wind. | 1 | <1 | | Fruiting within 7 m of high intensity fire. | Williams (1998), Benson & McDougall (2005). |
| *Cynodon dactylon* | Resprouter | Reproduction sexual and vegetative. Reproducing by seed propagation between 1-5yrs. | Fruit (dry indihiscent 1 seeded) | Dispersed by wind & mud on cars, animal, water & vegetatively. | 1 | | Indefinite | | Clarke (1989), Williams (1998), Benson & McDougall (2005). |
| *Cyperus gracilis* | Obligate Seeder | | | | | | | | |
| *Cyperus imbecillis* | Resprouter | | | | | | | | |
| *Dampiera purpurea* | Resprouter | | | | | | | Resprouts from base, stems killed. | Benson & McDougall (1997). |
| *Dampiera stricta* | Obligate Resprouter | Reproduction sexual, by seed propagation between 1-5yrs. | | Seeds dispersed by expulsion. | | | | Significantly less abundant in multiple burn areas. | Bradstock et al. (1997), Clark (1988), Hamilton et al. (1991), Benwell (1998), Benson & McDougall (1997), Clarke (1989). |
| *Daucus glochidiatus* | Obligate Seeder | | | | <1 yr | | | Seedlings recorded < 1yr after fire | Benson & McDougall (1993), Purdie & Slayter (1976), Purdie (1977), NPFR. |
| *Davallia solida* | Obligate Seeder | | | | 4-Aug | | | Probably killed | Benson & McDougall (1993). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Daviesia latifolia* | Variable | Soil stored seedbank | | Within 2 yrs of fire | | >2 yr | | (Killed by high intensity fire: pers. obs.) Resprouts from base | Floyd (1976), NPFR, Benson & McDougall (1996). |
| *Daviesia umbellulata* | Obligate Seeder | Soil stored seedbank | | | | | | pers. obs. | |
| *Denhamia celastroides* | Resprouter | | | | | | | | Williams (1998). |
| *Derwentia arcuata* | Resprouter | | | | | | | | |
| *Desmodium brachypodum* | Resprouter | Soil stored seedbank | | | | | | pers. obs. | |
| *Desmodium rhytidophyllum* | Variable | Soil stored seedbank. | | | | <1 yr | | Killed or respouting and flowering and fruiting within 13 wks of high intensity fire | Fox (1988), Benson & McDougall (1996), NPFR. |
| *Desmodium varians* | Resprouter | Probably soil-stored seedbank. | | Diaspore: 1-seeded segments, shed at maturity. Adhesive. | | <1 yr | | Flowering within 11 wks of high intensity fire. Resprouted. | Lunt (1990), NPFR, Benson & McDougall (1996). |
| *Deyeuxia decipiens* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | <1 | Indefinite | Flowers abundantly only after fire. | Keith (1991), Keith (1996), NPFR, Benson & McDougall (2005). |
| *Deyeuxia gunniana* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | Benson & McDougall (2005). |
| *Deyeuxia imbricata* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | Benson & McDougall (2005). |
| *Deyeuxia parviseta* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | |
| *Deyeuxia* | Resprouter | Total germination approx. | Fruit (dry | | | <1 | | Recruitment | Lunt (1990), Benson & |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *quadriseta* | | 36 days. | indihiscent 1 seeded) | | | | | mainly after fire. Some fruiting 44 weeds after high intensity fire. | McDougall (2005). |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Deyeuxia reflexa* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | |
| *Dianella caerulea* | Resprouter | | Fruit (Blue Berry) | Vertebrates. Only 20% of flowers produced fruit. | | | | | Roche et al. (1997), Benson & McDougall (2005). |
| *Dianella caerulea* | Resprouter | | Fruit (White to Blue Berry) | Vertebrates. | | | | | Roche et al. (1997), Benson & McDougall (2005). |
| *Dianella caerulea* | Resprouter | Germination triggered by seasonal temperature & humidity. Requiers no pre-treatment but is slow to terminate. | Fruit (Blue Berry) | Birds for fruit & seeds for ants. | | 1 | | Flowers 10-12 m after high intensity fire. | Roche et al. (1997), Benson & McDougall (2005). |
| *Dianella longifolia* | Resprouter | | Fruit (White to Blue Berry) | Vertebrates | | | Indefinite | | Benson & McDougall (2005). |
| *Dianella longifolia* | Resprouter | Germination takes 4 m, germinates well without fermentation. | Fruit (White to Blue Berry) | Vertebrates | | | | | Roche et al. (1997), Benson & McDougall (2005). |
| *Dianella nervosa* | Resprouter | | Fruit (Blue Berry) | Vertebrates | | | | | |
| *Dianella revoluta* | Resprouter | | Fruit (Blue Berry) | Vertebrates | | | | | |
| *Dianella revoluta* | Resprouter | Germination takes approx. 2 yrs. Seeds should be smoked for 1 hr. Viability of fresh seed 80%. | Fruit (Blue Berry) | Vertebrates | | 2 | | | Benson & McDougall (2005). |
| *Dianella tasmanica* | Resprouter | Germination takes approx. 83 days, germinates without fermentation. | Fruit (Blue Berry) | Vertebrates | | | | Appeared 1st month after fire in wet forest. Initially good | Dickinson & Kirkpatrick (1987), Roche et al. (1997), Benson & McDougall (2005). |

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| | | | | | | | | grwoth rate, then declines. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Dichelachne crinita* | Resprouter | Total germination 34 days. | Fruit (dry indihiscent 1 seeded) | Seeds dispersed by wind. | | <1 | <5 | Regenerates after crown fire and partial burn by resprouting below ground. Resprouting within 11 m after high intensity fire. | Lunt (1990), NPFR, Clarke (1989), Benson & McDougall (2005). |
| *Dichelachne inaequiglumis* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | Benson & McDougall (2005). |
| *Dichelachne micrantha* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | 1 | | | | NPFR, Williams (1998), Benson & McDougall (2005). |
| *Dichelachne parva* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | Benson & McDougall (2005). |
| *Dichelachne rara* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | <1 | | Flowering within 10 m of high intensity fire. | NPFR, Benson & McDougall (2005). |
| *Dichelachne sieberiana* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | <5 | | Benson & McDougall (2005). |
| *Dichondra repens* | Variable | Reproduction both sexual and vegetative means. Reproducing by seed propagation in the first year. | | Stolons. Diaspore: seed, no special dispersal morphology. Dispersed in mud on cars. | 1 | | <5 | Resprouter (7091), Obligate Seeder (NPFR). Did not flower within 9m of intense autumn fire. Probably resprouts from stolons. | Lunt (1990), NPFR, Benson & McDougall (1995), Clarke (1989). |
| *Dichondra sp. A* | Resprouter | | | | 1 | | | | |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Dichopogon fimbriatus* | Resprouter | | | | | | | | |
| *Dictymia brownii* | Obligate Seeder | | | | | | | Probably killed | Benson & McDougall (1993), NPFR. |
| *Digitaria breviglumis* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | |
| *Digitaria diffusa* | Resprouter | | Fruit (dry indihiscent 1 seeded) | Diaspore adhesive, animal dispersed. | | | Indefinite | | Benson & McDougall (2005). |
| *Digitaria ramularis* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | Benson & McDougall (2005). |
| *Dillwynia phylicoides* | Obligate Seeder | | | | | | | Killed | Fox (1988), Benson & McDougall (1996). |
| *Dillwynia retorta* | Obligate Seeder | | | Within 1 yr of fire | | | | Killed. Fire sensitive. Above-ground abundance declined with time since fire. | Benson & McDougall (1996), Morrison et al. (1995), Auld (1996), Benson (1985). |
| *Dillwynia sericea* | Obligate Seeder | | | Only from seeds after fire. | | | | | Russell & Parsons (1978). |
| *Dillwynia sieberi* | Obligate Seeder | Soil stored seedbank | | | | | | Killed | Benson & McDougall (1996). |
| *Diospyros australis* | Resprouter | | | | | | | | Williams (1998). |
| *Dipodium punctatum* | Resprouter | | Seed | | | 2 | Indefinite | | Williams (1998), Benson & McDougall (2005). |
| *Dipodium variegatum* | Resprouter | | Seed | | | 1 | Indefinite | | Benson & McDougall (2005). |
| *Diuris abbreviata* | Resprouter | | Seed, winged | | | | Indefinite | | Williams (1998). |
| *Diuris punctata* | Resprouter | | Seed, winged | | | | Indefinite | | |
| *Diuris punctata* | Resprouter | | Seed, winged | | | | Indefinite | | Benson & McDougall (2005). |
| *Diuris tricolor* | Resprouter | | Seed | | | | Indefinite | | |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Dockrillia linguiformis* | Obligate Seeder | | Seed | | | | Indefinite | May resprout if only lightly scorched. | Williams (1998), Benson & McDougall (2005). |
| *Dockrillia pugioniformis* | Obligate Seeder | | Seed | | | | Indefinite | | Benson & McDougall (2005). |
| *Dodonaea hirsuta* | Obligate Seeder | | | | | | | | |
| *Dodonaea triquetra* | Obligate Seeder | Reproduction sexual, reproducing by seed propagation between 1-5yrs. | | Seeds dispersed by wind. | | | <5 | Regeneration from seed in soil. | Clarke (1989). |
| *Dodonaea viscosa* | Resprouter | Fire not obligatory. Recruitment promoted by fire. | | | | | | Facultative resprouter. Adults moderately high mortality after fire. | Hodgkinson (1979), Hodgkinson & Griffen (1982), Hodgkinson & Oxley (1990), Gill (1981), NPFR. |
| *Doodia aspera* | Resprouter | | | | | | | 24.6kg/ha dry wt. 1yr after slash burn - not recorded up to 1yr after tractor cleared. | Floyd (1966). |
| *Drosera auriculata* | Resprouter | Germination in 14 days without special treatment. | | Diaspore: seed. | | < 1yr | | May flower within 2 m of fire and may be enhanced | Juniper et al. (1989), Benson & McDougall (1995). |
| *Drosera binata* | Resprouter | | | | | < 1yr | | Stems killed resprout from base, fire needed to induce vigorous growth and flowering, flower in absence but sparsely. Flowering 1 m after high | Gill (1981), Benson & McDougall (1995), Keith (1996), NPFR, Keith (1991). |

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| | | | | | | | | intensity fire | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Drosera burmannii* | | Seedling recruitment not fire related. | | Diaspore: seed. | | | 3-6m | Probably killed. | Benson & McDougall (1995). |
| *Drosera peltata* | Resprouter | Germinate in 14 days without special treatment. Coloniser. | | Diaspore: seed. No special dispersal morphology. | | 1-2yr | | Resprouts, secondary juvenile period 2 years. Flowered March-April after January fire. | Benson & McDougall (1995). |
| *Drosera spatulata* | Resprouter | | | | | 1 yr | | Facultative resprouter. 100% scorch kills. Soil stored seed. | Benson & McDougall (1995), NPFR. |
| *Echinopogon caespitosus* | Resprouter | | Fruit (dry indihiscent 1 seeded) | Diaspore adhesive. | 1 | <1 | | Found after high intensity fire. | Williams (1998), Benson & McDougall (2005). |
| *Echinopogon mckiei* | Resprouter | | Fruit (dry indihiscent 1 seeded) | Diaspore adhesive, animal dispersed. | | | | | |
| *Echinopogon ovatus* | Resprouter | | Fruit (dry indihiscent 1 seeded) | Diaspore adhesive, animal dispersed. | | | | Survive 100% scorch. Root suckers. | NPFR, Benson & McDougall (2005). |
| *Einadia hastata* | Obligate Seeder | | | | 1 | | | | Williams (1998). |
| *Elaeocarpus holopetalus* | Obligate Seeder | May take years | | | | | | Probably killed | Benson & McDougall (1995). |
| *Elaeocarpus obovatus* | Resprouter | Slow and difficult to germinate, can take 1-18 months. | | Diaspore: fruit. Bird dispersed. | | | 100+ | Possibly killed. | Benson & McDougall (1995), Williams (1998). |
| *Elaeocarpus reticulatus* | Resprouter | | | | | | | After high intensity fire but seedlings may be killed | Benson & McDougall (1995), Chesterfield et al. (1991), NPFR. |
| *Eleocharis sphacelata* | Resprouter | | | | | | | | |
| *Elymus scaber* | Resprouter | | | | | | | | Lunt (1990). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Empodisma minus* | Resprouter | | | No special dispersal mechanism. | | 1 | Indefinite | Recruitment mainly after fire. | Benson & McDougall (2005). |
| *Enneapogon nigricans* | Resprouter | Total germination approx. 8 days. | Fruit (dry indihiscent 1 seeded) | | | | | Flowers in response to rain. | Benson & McDougall (2005). |
| *Entolasia marginata* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | Indefinite | Fruit produced within 7 m of high intensity fire. | Benson & McDougall (2005). |
| *Entolasia stricta* | Resprouter | | Fruit (dry indihiscent 1 seeded) | Vigorous growth after fire. No special dispersal mechanism. | | < 1yr | Indefinite | Survives 100% scorch - root suckers & basal shoots. Soil stored seed and clonal increaser. Recruitment mainly after fire. Fruit within 5 m of high intensity fire. | Bradsotck et al. (1997), Lumley & Spencer (1990), Clark (1988), NPFR, Benson & McDougall (2005). |
| *Epacris microphylla* | Variable | From soil stored seed | | | 2 yr | | | Seedlings after high intensity fire. Obligate Seeder (I, KE). Facultative resprouter (BG), basal sprouts. Survives 100% scorch. | Benson & McDougall (1995), Keith (1996), Clemens & Franklin (1980), NPFR. |
| *Epacris obtusifolia* | Obligate Seeder | From soil stored seed | | | | | | Seedlings within 10 ms of high intensity fire | Benson & McDougall (1995). |
| *Epacris pulchella* | | | | | | | | Fire sensitive. | Benson (1985). |
| *Epilobium billardierianum* | Variable | | | | | <3m | | Obligate seeder (NPFR-P). | NPFR, Benson & McDougall (1999). |

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| | | | | | | | | Resprouted after high intensity fire (P.Kubiak pers.comm) | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Eragrostis curvula* | Resprouter | | Fruit (dry indihiscent 1 seeded) | In mud on cars. No particular mechanism for dispersal. | | | | Seedling sgrow rapidly after summer rain. Spring burning promotes rapid growth to full maturity in early summer. | Benson & McDougall (2005). |
| *Eragrostis lacunaria* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | |
| *Eragrostis leptostachya* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | Flowering within 2 m of high intensity fire. | Benson & McDougall (2005). |
| *Eragrostis molybdea* | Resprouter | | Fruit (dry indihiscent 1 seeded) | No paricular mechanism for dispersal. Possible coloniser of bare sites. | | | | Reprouts from base. | Benson & McDougall (2005). |
| *Eragrostis parviflora* | Obligate Seeder | | Fruit (dry indihiscent 1 seeded) | No particular mechanism for dispersal. In mud on cars. | <1 | | <1 | Flowers in response to rain. | Benson & McDougall (2005). |
| *Eragrostis trachycarpa* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | Benson & McDougall (2005). |
| *Eremophila debilis* | Resprouter | | Fruit | | | | | Resprouter from thick root stocks. | Benson & McDougall (1997). |
| *Eucalyptus acaciiformis* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | Williams (1998). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Eucalyptus acmenoides* | Resprouter | No dormancy. | Seed | Locally dispersed by wind, gravity, no dormancy. | | | 100+ | Resprouts from base by epicormic buds. | Benson & McDougall (1998). |
| *Eucalyptus andrewsii* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | |
| *Eucalyptus banksii* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | |
| *Eucalyptus biturbinata* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | Williams (1998). |
| *Eucalyptus bridgesiana* | Resprouter | Seeds require light for germination, optimum temperature 25 degrees C. | Seed | Dispersed locally by wind and gravity. No dormancy mechanism. | | | <200 | Resprouts from epicormic buds. | Benson & McDougall (1998). |
| *Eucalyptus brunnea* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | |
| *Eucalyptus caliginosa* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | Williams (1998). |
| *Eucalyptus cameronii* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | Williams (1998). |
| *Eucalyptus campanulata* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | Resprouter - lignotuber and coppice. | Gill (1981). |
| *Eucalyptus codonocarpa* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | |
| *Eucalyptus dalrympleana* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | Williams (1998). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Eucalyptus dealbata* | Resprouter | No dormancy mechanism. | Seed | Dispersed locally. | | | | | Benson & McDougall (1998). |
| *Eucalyptus dorrigoensis* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | |
| *Eucalyptus laevopinea* | Resprouter | No dormancy. | Seed | Dispersed locally. | | | 100+ | Resprouter - lignotuber and coppice. | Gill (1981), Benson & McDougall (1998). |
| *Eucalyptus melliodora* | Resprouter | No dormancy. | Seed | Dispersed locally. | | | 100+ | Seedlings remarkable tolerance for being burnt. | Gill (1997), Leigh & Holgate (1979). |
| *Eucalyptus microcorys* | Resprouter | No dormancy. | Seed | Dispersed locally. | | | 100+ | Epicormic resprouter, lignotuber and coppice. Survives 100% scorch. Heavy flowering every 3-4 yrs. | Siddiqi et al. (1976), Gill (1982), NPFR, Benson & McDougall (1998). |
| *Eucalyptus notabilis* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | |
| *Eucalyptus nova-anglica* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | Williams (1998). |
| *Eucalyptus obliqua* | Resprouter | No dormancy. Seeds require light for germination. | Seed | Requires disturbance for regeneration but may regrow from coppice as well as seed. Seed released en mass after fire. | | | 100+ | Epicormic, lignotuber and coppice. 66% seeds in woody friut killed by fire. Lignotubers developed in seedlings 9-12 weeks old. Treefalls release domrant | Gill (1997), Ashton (1986), Hamilton et al. (1991), Leigh & Holgate (1979), Keith (1996), Dickinson & Kirkpatrick (1987), Jordan et al. (1992), Ashton (1986), Wilkinson & Hennings (1993), Gill (1981), NPFR, Benson & McDougall (1998). |

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| | | | | | | | | lignotubers. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Eucalyptus oreades* | Variable | No dormancy. Recruitment in open areas, fire not necessary, but better after fire. Successive fires make suppressed trees produce seed earlier. | Seed | Dispersed locally by wind or gravity. | 25 | | 100-150 | One of the very few eucalypts very sensitive to fire. Feeble rsprouting from epicormic buds. | Benson & McDougall (1998). |
| *Eucalyptus pauciflora* | Resprouter | Seeds require cool moist conditions for germination. | Seed | Lignotuberous seedlings. Disapore: seed. Dispersed locally by wind or gravity. No dormancy. | | | <400 | Resprouter - coppice from lignotuber, epicormic to survive 100% scorch. Burning/grazing combination can substantially increase mortality of this plant. | Gill (1997), Keith (1997), Noble (1984), Leigh & Holgate (1979), Keith (1996), Gill (1981), NPFR, Benson & McDougall (1998). |
| *Eucalyptus prava* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. No dormancy mechanism. | | | | | |
| *Eucalyptus propinqua* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. No dormancy mechanism. | | | 100+ | Lignotuber and coppice. Seedlings with lignotubers. | Gill (1981), Benson & McDougall (1998). |
| *Eucalyptus radiata* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. No dormancy mechanism. | | | | Resprouter - lignotuber and coppice. Epicormics to survive 100% scorch. | Gill (1997), Gill & Ashton (1968), Gill (1981), NPFR. |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Eucalyptus saligna* | Resprouter | No dormancy. Seed germinates without treatment. | Seed | Dispersed locally by wind or gravity. No dormancy mechanism. Average seed dispersed 35.3 m. | | | 200+ | Resprouter - coppice and lignotuber. 96% have lignotuber. Seedlings have lignotuber. | Eldridge et al. (1993), Burgess & Bell (1983), Gill (1997), Gill (1981), Benson & McDougall (1998). |
| *Eucalyptus scoparia* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | |
| *Eucalyptus tereticornis* | Resprouter | No dormancy. Recruitment not fire related. Germination requries light, optimal temperature 25-30C. | Seed | Dispersed locally by wind or gravity. | | | | Resprouts strongly from epicormic buds. | Benson & McDougall (1998), Williams (1998). |
| *Eucalyptus tindaliae* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | |
| *Eucalyptus viminalis* | Resprouter | No soil-stored seedbank. | Seed | Wind-dispersed locally. No dormancy. | | | 100+ | Resprouts from lignotuber and weakly from epicormic buds, mortality following high intensity fire 12.1%. Seed retained on tree for 1 yr. | Gill (1981), Strasser et al. (1996), Benson & McDougall (1998). |
| *Eucalyptus williamsiana* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | |
| *Eucalyptus youmanii* | Resprouter | No dormancy. | Seed | Dispersed locally by wind or gravity. | | | | | |
| *Euchiton gymnocephalus* | Obligate Seeder | | Fruit | Coloniser. | | | | | NPFR. |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Euchiton involucratus* | Obligate Seeder | | | Seedlings recorded 1 yr after fire | | | | Obligate seeder. Therophyte. Seedlings 1yr after fire in burnt and unburnt areas. | Benson & McDougall (1994), Purdie & Slayter (1976), Purdie (1977), NPFR. |
| *Euchiton sphaericus* | Obligate Seeder | | Fruit | Coloniser. | <1 | | | Probably killed by fire | NPFR, Benson & McDougall (1994). |
| *Euroschinus falcata* | | | | Seeds dispersed by animals. | | | 30+ | | Clarke (1989). |
| *Eustrephus latifolius* | Resprouter | | Seed | Bird dispersed. | | 3 m | | Facultative resprouter. | NPFR, Williams (1998), Benson & McDougall (2005). |
| *Exocarpos cupressiformis* | Resprouter | Hard seed is difficult to germinate. | Fruit. | Limited root suckering. Hemi-parasite on roots of other plants, commonly eucalypts but also other species. | | | Indefinite. | Facultative resprouter. Fire resistant increaser. Survives 100% scorch by root suckers and basal sprouts. Resprouts with numerous suckers from lateral roots and from rootstock. Seedlings recorded <1y after fire. | NPFR; Benson & McDougall (2001). |
| *Exocarpos strictus* | Resprouter | | Fruit. | Often forming dense thickets, presumably from root suckers. Hemi-parasite on roots of other plants. | | | Indefinite. | Resprouts from base. | Benson & McDougall (2001). |
| *Ficus coronata* | Resprouter | | Inflorescene | | | | | Probably no soil stored seedbank, no dormancy | Benson & McDougall (1997), Melick & Ashton (1991), NPFR. |

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| | | | | | | | | mechanism. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Ficus obliqua* | Resprouter | | Inflorescence | | | | | | Williams (1998). |
| *Ficus rubiginosa* | Resprouter | | Inflorescence | | | | | | Williams (1998). |
| *Fimbristylis dichotoma* | Resprouter | | | | | | | Resprouter. | Benwell (1998). |
| *Gahnia aspera* | Resprouter | | | | | | | | |
| *Gahnia sieberiana* | Resprouter | | | | | | | Facultative resprouter. Non-clonal decreaser. | Keith (1996), Benwell (1998), NPFR. |
| *Galium binifolium* | Obligate Seeder | | Seed | With no special morphology for dispersal. | | | | | NPFR, Benson & McDougall (2000). |
| *Galium gaudichaudii* | Obligate Seeder | | | No particular mechanism for dispersal. Vegetative spread by weak development of nodal roots up to 5 cm from rootstock. | | | | 100% scorch kills. Possibly resprouts. | NPFR, Benson & McDougall (2000). |
| *Galium migrans* | Obligate Seeder | | | | | | | | |
| *Galium propinquum* | Resprouter | | Seed | Seed with tiny hooks presumably for dispersal by attachment to animals. Vegetative spread. | | | | Facultative resprouter. | NPFR, Benson & McDougall (2000). |
| *Geitonoplesium cymosum* | Resprouter | | Seed | Dispersed by birds & other animals. | | <1 | | Resprouts from base. | Williams (1998), Benson & McDougall (2005). |
| *Genoplesium fimbriatum* | Resprouter | | Seed, winged | | | <1 | Indefinite | | Benson & McDougall (2005). |
| *Geranium potentilloides* | Obligate Seeder | | | Diaspore: probably seed, possibly animal | | | | | NPFR. |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | dispersed. | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Geranium solanderi* | Obligate Seeder | | | | 1-Feb | | | | |
| *Geranium solanderi* | Obligate Seeder | | | | 1-Feb | | | | Williams (1998). |
| *Gleichenia dicarpa* | Resprouter | | | | | | | At ground level or below. Facultative resprouter - basal sprouts. Survives 100% scorch. | Benson & McDougall (1993), NPFR. |
| *Glochidion ferdinandi* | Resprouter | Seeds germinate in 1-4 months. | Seed | Seed with dry aril, bird dispersed. Possible dormancy mechanism. | | | 60+ | Stems killed, resprouts from base. A few resprouting from the trunk after high intensity fire, fruit mature in <5 months. | Benson & McDougall (1995). |
| *Glossogyne tannensis* | Resprouter | | | | | | | Probably resprouts from ground level after low intensity fires: pers obs | |
| *Glycine clandestina* | Resprouter | Rare in non-heated soil. Seed viability 100%, non-dormant fraction 4%. | | Soil stored seed. Diaspore: hard-coated seed. No particular morphology for dispersal. | | | <5 | pers.obs. Has persistent root stock. Probably resprouts. Regeneration from seed in soil (Clarke). | Floyd (1966), Auld & O'Connell (1991), Jarrett & Petrie (1929), NPFR. Benson & McDougall (1996), Clarke (1989). |
| *Glycine microphylla* | Resprouter | | | | | | | | |
| *Glycine tabacina* | Resprouter | Soil-stored seedbank. | | No particular mechanism for dispersal. | | | | pers.obs. Resprouter from basal sprouts. | Stewart (1996), NPFR. Benson & McDougall (1996). |

| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Survives 100% scorch. Probably resprouts from above ground level (taxon B). | |
| *Gomphocarpus fruticosus* | Obligate Seeder | | | | | | | | |
| *Gompholobium huegelii* | Resprouter | | | | | | | Probably resprouts | Benson & McDougall (1996). |
| *Gonocarpus oreophilus* | Resprouter | | | | | | | | |
| *Gonocarpus tetragynus* | Variable | Seedlings <1yr after fire (Purdie, 1977). May occur on disturbed sites. | | Diaspore: fruit. No particular dispersal mechanism. Episodic recruitment mainly after fire. | | 2 | | Obligate Seeder (NPFR-CH, W?.) Facultative resprouter - regrowth & suckers from root stocks and lateral roots. Soil stored seed. Seedlings recorded <1yr after fire. | NPFR, Benson & McDougall (1997). |
| *Gonocarpus teucrioides* | Variable | Reproduction by sexual means in the first year. | | Episodic recruitment mainly after fire. Seeds dispersed by wind. | | | <5 | Soil stored seed. Resprouts from base. | Benson (1985), Keith (1996), Benson & McDougall (1997), NPFR, Clarke (1989). |
| *Goodenia bellidifolia* | Resprouter | | | | | | | | |
| *Goodenia hederacea* | Variable | Mucialginous rim may be mechanism for absorbing water to secure germination. | | Diaspore: seed, no particular mechanism for dispersal. | 1 | | | Regrowth and suckers from rootstocks and lateral roots, but fire appeared to retard vegetative multiplication. | Purdie (1977), Benson & McDougall (1997). |

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| | | | | | | | | Seedlings recorded <1yr after fire. Resprouting plants reached maturity in about 2 yrs. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Grammitis billardieri* | Obligate Seeder | | | | | | | Probably killed | Benson & McDougall (1993). |
| *Gratiola peruviana* | Resprouter | | | | | | | | NPFR, Williams (1998). |
| *Grevillea juniperina* | | | Seed | | | | | | |
| *Grevillea linearifolia* | Obligate Seeder | Soil stored seedbank. Untreated 5-13%, smoke, heat & scarification increase germination. 1/2 life 10 | Seed | Has elaiosome. | | | | Germination mainly 30-40 days after treatment. Persistent seed bank, high dormancy initially. | Benson & McDougall (2000). |
| *Guioa semiglauca* | Resprouter | | | | | | | | Williams (1998). |
| *Gymnoschoenus sphaerocephalus* | Resprouter | | | | | | | | |
| *Gymnostachys anceps* | Obligate Seeder | | | | 2-Apr | | | | Williams (1998). |
| *Haemodorum planifolium* | Resprouter | | | | | | | Survives 100% scorch - basal sprouts. | Clemens & Franklin (1980), NPFR. |
| *Hakea eriantha* | Obligate Seeder | | Seed (winged) | | | | | | NPFR, Williams (1998). |
| *Hakea florulenta* | | | Seed (winged) | | | | | | |
| *Hakea laevipes* | Obligate Seeder | | Seed (winged) | | | | | | |
| *Hakea macrorrhyncha* | Obligate Seeder | | Seed (winged) | | | | | | |
| *Hakea microcarpa* | Resprouter | Seed viability 81.2%. Waterlogging inhibits | Seed (winged) | Gravity or short distance wind- | | | | Resprouts from lignotuber. | Benson & McDougall (2000). |

| | | germination. | | dispersed. | | | | | |
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| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Hakea salicifolia* | Obligate seeder | | Seed (winged) | Gravity or short distance wind-dispersed. | 6.5y | | ?20-30y | Killed by fire, re-establishes from canopy-stored seedbank. | Benson & McDougall (2000). |
| *Haloragis heterophylla* | Resprouter | | | No particular mechanism for dispersal. | 1 | | | Multiplied vegetatively after autumn fire. Probably killed (7114). | Lunt (1990), Benson & McDougall (1997), Benson & McDougall (1997). |
| *Hardenbergia violacea* | Variable | Seed viability 99%, non-dormant fration 5%. Coloniser of disturbed sites. | | Seedlings recored 1 yr after fire and will establish in charcoal beds. Diaspore: seeds, ant-adapted. | 1 | >1 yr | | From base or below (will survive annual fires: pers. obs.). Regrowth from surviving rootstocks, seedlings recorded <1yr after fire. Regeneration from seed in soil (Clarke) | Fox (1988), Floyd (1966), Auld & O'Connell (1991), Purdie (1977), NPFR, Benson & McDougall (1996), Clarke (1989). |
| *Hedycarya angustifolia* | Variable | 3-6wks general (A. Bofeldt, pers.comm.) | Seed | Bird dispersed. In pellets of Currawongs & Bulbuls. Dispersed vegetatively by rhizomes. | | 2 | | Obligate Seeder (NPFR - CT). Killed by fire. Resprouted after high intensity fire. | Chesterfield et al. (1991), Melick & Ashton (1991), Gill (1981), Benson & McDougall (1997), NPFR, Benson & McDougall (2005). |
| *Helichrysum boormanii* | Obligate Seeder | | Fruit | | | | | | |
| *Helichrysum collinum* | Variable | | Fruit | Wind dispersed. | | | | Obligate seeder (NPFR-P). Survives 100% scorch - basal | Purdie (1977), Purdie & Slayter (1976), NPFR. |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
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| | | | | | | | | sprouts. Facultative root resprouter. Fire resistant decreaser. | |
| *Helichrysum elatum* | Obligate Seeder | Germinates readily after fire | Fruit | | 1 yr | | | Will germinate readily after fire and seed within high intensity fire: pers obs | Benson & McDouall (1994). |
| *Helichrysum rutidolepis* | Resprouter | | Fruit | | | | | Facultative resprouter. Multiplied vegetatively after autumn fire. | Lunt (1990), NPFR. |
| *Helichrysum scorpioides* | Resprouter | | Fruit | | <1 yr | | | Flower in 16 wks and fruit 23 wks after high intensity fire | Benson & McDouall (1994), Dickinson & Kirkpatrick (1987), Lunt (1994), NPFR. |
| *Hemarthria uncinata* | | | Fruit (dry indihiscent 1 seeded) | | | | | | |
| *Hibbertia acicularis* | Variable | Soil stored seedbank | Seed | | 2 | | | Killed by fire. Obligate seeder - soil stored. Facultative resprouter. Non-clonal decreaser. | Fox (1988), Benson & McDougall (1995), Benwell (1998), NPFR. |
| *Hibbertia aspera* | Resprouter | | Seed | | | 1 yr | | Stems killed, resprout from base | Benson & McDougall (1995). |
| *Hibbertia cistoidea* | Resprouter | | Seed | | | | | | |
| *Hibbertia dentata* | Resprouter | | Seed | | | 1 yr | | Resprout from base and | Benson & McDouall (1995), NPFR. |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | flowering within 10 m after fire, some seedlings 10 m after fire | |
| *Hibbertia linearis* | Obligate Seeder | | Seed | within 7 m | <2 yr | | | Killed by high intensity, seedlings within 7 m flowering 18 m after fire | Benson & McDouall (1995). |
| *Hibbertia obtusifolia* | Variable | Within 1yr after fire (7020). | Seed | Seedlings within 1 yr | | | | Resprout from suckers of roots and lateral root stock. Soil seedbank. Fire resistant increaser. | Benson & McDougall (1995), Fox & Fox (1986), Purdie & Slayter (1976), Siddiqi et al. (1976), Purdie (1977), Benwell (1998), NPFR. |
| *Hibbertia pedunculata* | Resprouter | | Seed | | | | | | |
| *Hibbertia riparia* | Resprouter | | Seed | Ant-adapted food body. No particular dispersal mechanism. | | | 60+ | From base | Benson & McDougall (1995), Benson & McDougall (1995). |
| *Hibbertia rufa* | | | Seed | | | | | | |
| *Hibbertia scandens* | Resprouter | Also soil stored seed germination. Reproduction by sexual means, by seed propagation between 1-5 yrs | Seed | Seeds dispersed by expulsion. | | | | From base after high intensity fire | Benson & McDougall (1995), Fox & Fox (1986), NPFR, Clarke (1989). |
| *Hibbertia sericea* | | | Seed | | | | | | |
| *Hibbertia serpyllifolia* | Resprouter | Also soil stored seed germination | Seed | | | 2 yr | | Facultative resprouter - basal sprouts. | Benson & McDougall (1995), Bradstock et al. (1997), NPFR. |
| *Hibbertia sp. B* | Obligate Seeder | | Seed | | | | | | |
| *Hibbertia vestita* | Resprouter | | Seed | | | | | Facultative resprouter. Non- | Benwell (1998), NPFR. |

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| | | | | | | | | clonal decreaser. Soil seedbank. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Hibbertia villosa* | Resprouter | | Seed | | | | | | |
| *Hibiscus heterophyllus* | Resprouter | Germination stimulated by disturbance. 1-6 weeks. Coloniser. | Seed | | | | | Killed, vigorous recruitment from seed stimulated by fire. | Benson & McDougall (1997), Williams (1998). |
| *Hirschfeldia incana* | | | | Winter-spring growing. | | | <5 | | |
| *Homoranthus lunatus* | Obligate Seeder | | | | | | | | |
| *Homoranthus papillatus* | Obligate Seeder | | | | | | | | |
| *Hovea heterophylla* | Resprouter | | | | | | | | |
| *Hovea pannosa* | Obligate Seeder | | | | | | | | |
| *Hovea pedunculata* | Resprouter | | | | | | | | |
| *Hybanthus monopetalus* | Obligate Seeder | | | | | | | 100% scorch kills - soil stored seed. | NPFR. |
| *Hydrocotyle laxiflora* | Obligate Seeder | | | | 1 | | | | NPFR, Williams (1998). |
| *Hydrocotyle peduncularis* | Obligate Seeder | | | | 1 | | | | Williams (1998). |
| *Hymenophyllum cupressiforme* | Obligate Seeder | | Spores | | | | | Spores. Epiphytic fern. widley distributed pre fire, not recorded after wildfire. | Chesterfield et al. (1991), NPFR. |
| *Hyparrhenia hirta* | Resprouter | | Fruit (dry indihiscent 1 seeded) | Wind & vehicles. | | | | Encouraged by regular burning. | Benson & McDougall (2005). |
| *Hypericum gramineum* | Resprouter | Will recruit heavily after fire | Seed | Probably wind-dispersed. | | 1 yr | | Will fruit within 3m after high intensity fire. | Benson & McDougall (1995), Lunt (1990), Purdie & SLatyer (1976), |

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| | | | | | | | | Facultative root resprouter. Fire resistant decreaser. Also obligate seeder. | Dickinson & Kirkpatrick (1987), NPFR, Benson & McDougall (1995). |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Hypericum japonicum* | Resprouter | | | | | | | | |
| *Hypochaeris glabra* | Obligate Seeder | | | | | | | | |
| *Hypochaeris radicata* | Variable | decreased after burning. Seedlings up within 1yr of fire. | Seed | Dispersed by wind. | | | <5 | Obligate seeder - minor regeneration. Post burn seed coloniser. Facultative root resprouter. Fire resistant decreaser. | Lunt (1990), Hamilton et al. (1991), Purdie & Slatyer (1976), Dickinson & Kirkpatrick (1987), Purdie (1977), NPFR, Clarke (1989). |
| *Hypolepis glandulifera* | Obligate Seeder | | Spores | | | | | Probably killed | Benson & McDougall (1993), NPFR. |
| *Hypoxis hygrometrica* | Resprouter | | | | | | | Facultative resprouter | NPFR, Williams (1998). |
| *Imperata cylindrica* | Resprouter | No germination after application of smoke for 1 hr. May become dormant after low intensity fire. | Fruit (dry indihiscent 1 seeded) | Wind. | 1 | <1 | Indefinite | Survives 100% scorch - root suckers. Absent from infrequently burnt sites. Stimulated by fire. Flowers prolifically within weeks of burning. Can be eliminated by regular mowing. | Benson & McDougall (1993), Nieuwenhuis (1987), Gill (1981), NPFR, Benson & McDougall (2005). |
| *Indigofera adesmiifolia* | Obligate Seeder | | Seed | Hard-coated? No particular | | | | | Williams (1998). |

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| | | | | mechanism for dispersal. | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Indigofera australis* | Resprouter | Soil-stored seedbank. | | Seedlings <1 yr after fire. Diaspore: hard-coated seed. No particular mechanism for dispersal. | | | | From suckers, rootstocks and lateral roots. Fire resistant increaser. Seedlings recorded <1yr after fire. | Fox (1988), Benson & McDougall (1996), Gill (1975), Leigh & Holgate (1979), Purdie & Slatyer (1987), Purdie (1977), NPFR, Benson & McDougall (1996). |
| *Isachne globosa* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | 1 | | | | Williams (1998), Benson & McDougall (2005). |
| *Isotoma anethifolia* | Resprouter | | Seed | | | | | | |
| *Isotoma axillaris* | Resprouter | | Seed | | 1 | | | Probably from base after fire. | Benson & McDougall (1997). |
| *Isotoma fluviatilis* | | | Seed | | | | | | |
| *Jacksonia scoparia* | Resprouter | Soil stored seedbank | | | | | | Root suckers. Size of stem may influence survival after low intensity fire. 20-60% stems killed by low intesity fire, all killed by high. Fewer stems after high intensity than low intensity fire. No new shoots unless upper part of stem killed. | Benson & McDougall (1996), Floyd (1966), Morrison & Renwick (2000). |
| *Joycea pallida* | Resprouter | Total germination 67 days if smoked. | Fruit (dry indihiscent 1 seeded) | | | <1 | Indefinite | | Benson & McDougall (2005). |
| *Juncus bufonius* | Obligate Seeder | | | | | | | Significantly more | Lunt (1990), NPFR. |

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| | | | | | | | | abundant in burnt areas. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Juncus continuus* | Resprouter | | | | | | | | |
| *Juncus firmus* | Resprouter | | | | | | | | |
| *Juncus pauciflorus* | Resprouter | | | | | | | Obligate resprouter. | NPFR. |
| *Juncus remotiflorus* | Resprouter | | | | | | | | |
| *Juncus usitatus* | Resprouter | | | | | | | Obligate resprouter. | NPFR, Williams (1998). |
| *Kennedia rubicunda* | Obligate Seeder | Soil stored seedbank. Reproduction sexual, by seed propagation betweem 1-5yrs. | Seed | vigorous recruitment after high intensity fire. Seeds dispersed by expulsion. | | | <5 | Killed. Obligate seeder (NPFR-I, Clarke). Facultative resprouter (NPFR-A, 7048). 100% scorch kills - soil stored seed. | Fox (1988), Benson & McDougall (1996), Auld & O'Connell (1991), FLoyd (1976), NPFR, Clarke (1989). |
| *Kunzea bracteolata* | Obligate Seeder | | | | | | | | |
| *Kunzea ericoides* | Resprouter | No soil stored seedbank. Germinates abundantly after clearing. | Seed | Dispersed by wind and water. | | | 70+ | Resprouts from lignotuber. Soil stored seed. | Melick & Ashton (1991), NPFR, Benson & McDougall (1998). |
| *Kunzea obovata* | Resprouter | | | | | | | | |
| *Kunzea parvifolia* | Resprouter | | Seed | Colonises open sites. | | | | | Benson & McDougall (1998). |
| *Lachnagrostis aemula* | | | Fruit (dry indihiscent 1 seeded) | Adhesion & wind. | | | | | Benson & McDougall (2005). |
| *Lachnagrostis filiformis* | Obligate Seeder | | Fruit (dry indihiscent 1 seeded) | | <1 | | <1 | Facultative resprouter. Notrecorded in seedbank before fire. Regenerated from seed after | Williams (1998), Lunt (1990), NPFR. |

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| | | | | | | | | intense autumn fire (flowered within 9m). | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Lagenifera stipitata* | Resprouter | | Fruit | No special dispersal morphology. | | < 1yr | | Stems killed, resprouts from ground level, flowers 9 wks after high intensity fire and 12 wks fruiting. Seeds shed within 12 weeks of high intensity fire. | Benson & McDougall (1994), NPFR, Benson & McDougall (1994). |
| *Lasiopetalum ferrugineum* | Obligate Seeder | | | | | | | | |
| *Lastreopsis decomposita* | | | Spores | | | | | | |
| *Laxmannia compacta* | Resprouter | | | | | | | | |
| *Laxmannia gracilis* | Resprouter | | | | | | | | |
| *Leionema ambiens* | Obligate Seeder | | | | | | | | |
| *Leionema rotundifolium* | Obligate Seeder | | | | | | | | |
| *Lepidosperma elatius* | Resprouter | | | | | | | | |
| *Lepidosperma gunnii* | Resprouter | | | | | | | | |
| *Lepidosperma laterale* | Resprouter | Reproduction by sexual means, reproducing by seed propagation in 1st year. | | Seeds dispersed by wind. | 1 | | <5 | Facultative resprouter (NPFR-VE), obligate resprouter (NPFR - H, M, WO, CH.) Facultative and obligate | Hamilton et al. (1991),Dickinson & Kirkpatrick (1987), Gill (1989, NPFR, Dickinson & Kirkpatrick (1987), Hamilton et al. (1991), Clarke (1989). |

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| | | | | | | | | resprouter. First recorded 1m after fire. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Lepidosperma limicola* | Resprouter | | | | | | | Facultative resprouter - underground stocks. Relatively rare before hot spring fire, luxuriant growth after fire. | Siddiqi et al. (1976), NPFR. |
| *Lepidosperma neesii* | Resprouter | | | | | | | | |
| *Lepidosperma tortuosum* | Resprouter | | | | | | | | |
| *Leptomeria drupacea* | Resprouter | | Fruit. | | | | | | Benson & McDougall (2001). |
| *Leptorhynchos squamatus* | Variable | | | | | | | Resprouter. Obligate Seeder: minor regeneration - most vegetative. | Lunt (1990). |
| *Leptospermum arachnoides* | Resprouter | Recruitment mainly after fire. | Seed | Dispersed locally by gravity and wind. | | <2.5 | 60+ | Survives 100% scorch - basal sprouts. | NPFR, Benson & McDougall (1998). |
| *Leptospermum brachyandrum* | Resprouter | No soil stored seedbank. | Seed | Dispersed locally by gravity and wind. | | | | | |
| *Leptospermum brevipes* | Resprouter | No soil stored seedbank. | Seed | Dispersed locally by gravity and wind. | | | | 100+ | Williams (1998). |
| *Leptospermum gregarium* | Resprouter | No soil stored seedbank. | Seed | Dispersed locally by gravity and wind. | | | | | |
| *Leptospermum* | Resprouter | No soil stored seedbank. | Seed | Dispersed locally | | | | | Williams (1998). |

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| *minutifolium* | | | | by gravity and wind. | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Leptospermum novae-angliae* | Variable | No soil stored seedbank. | Seed | Dispersed locally by gravity and wind. | | | | | Williams (1998). |
| *Leptospermum polygalifolium* | Resprouter | No soil stored seedbank. | Seed | Dispersed locally by gravity and wind. | | | | | |
| *Leptospermum trinervium* | Resprouter | Soil stored seedbank. | Seed | Dispersed locally by gravity and wind. | | 1 | 30-60 | Non-clonal decreaser. Some stems survive 100% scorch. Produced fewer stems after high intensity fire than low. Not usually produce new shoots unless upper part of stem killed. | Benwell (1998), Morrison & Renwick (2000). |
| *Leptospermum variabile* | Resprouter | No soil stored seedbank. | Seed | Dispersed locally by gravity and wind. | | | | | |
| *Lepyrodia anarthria* | Resprouter | | | | | 1 | Indefinite | Rhizomes contain large reserves of starch. | NPFR, Benson & McDougall (2005). |
| *Lepyrodia scariosa* | Resprouter | | | No special morphology for dispersal. | | | Indefinite | Survives 100% scorch - root suckers. Rhizomes. Soil seedbank, capability for vegetative spread. Recruitment mainly after fire. Rhizomes contain | Bradstock et al. (1997), Siddiqi et al. (1976), NPFR, Benson & McDougall (2005). |

| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
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| | | | | | | | | large reserves or starch. Flowering more abundant after fire. | |
| *Lespedeza juncea* | Resprouter | Stimulated by fire | | | | <1 yr | | | Benson & McDougall (1996). |
| *Leucopogon biflorus* | Resprouter | | Fruit | | | | | | |
| *Leucopogon juniperinus* | | | Fruit | | | | | | |
| *Leucopogon lanceolatus* | Resprouter | | Fruit | | | < 2yr | | From ground level after fire, flowering within 20 m of fire | Benson & McDougall (1995). |
| *Leucopogon melaleucoides* | Resprouter | | Fruit | | | | | | |
| *Leucopogon microphyllus* | | | Fruit | Dispersal: ant-adapted food body. | | | May-20 | Killed by high intensity fire, regenerates from soil-storedseed seedlings, flowering within 2yrs. Regrowth from rootstock reported. | B.Wiecek (1993), Benson & McDougall (1995). |
| *Leucopogon muticus* | Resprouter | | Fruit | | | 1 yr | | May resprout from after low to medium intensity fire and flower following winter | Benson & McDougall (1995). |
| *Leucopogon neoanglicus* | Obligate Seeder | Soil stored seedbank which lasts for many years | Fruit | Will recruit in the absence of fire | | | | pers. obs. | |
| *Leucopogon virgatus* | Resprouter | | Fruit | No seedlings within 1 yr of fire | | | | Soil level or below. Facultative resprouter. Basal | Fox (1988), Gill (1975), Fox & Fox (1986), Purdie & Slatyer (1976), Purdie |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | sprouts. Soil seedbank. Non-clonal decreaser. Fire resistant decreaser. | (1977), Benwell (1998), NPFR, Benson & McDougall (1995). |
| *Lindsaea linearis* | Resprouter | | | | | | | At ground level or below | Benson & McDougall (1993). |
| *Lindsaea microphylla* | Resprouter | | | | | | | At ground level or below | Benson & McDougall (1993). |
| *Lissanthe strigosa* | Resprouter | | Fruit | | | < 1yr | | From base, may flower in 9 m of fire | Benson & McDougall (1995). |
| *Lobelia dentata* | | | | Recruitment episodic, mainly fire related. | | | | Conspicuous after fire, apparently resprouting from very deeply-buried fleshy rhizome. Some plants flowering within 5m after high intensity fire. Plants shedding seeds in <1yr. Plant not in unburnt ar | Benson & McDougall (1997). |
| *Lobelia gibbosa* | Obligate seeder | | | | | | | Possibly resprouter (7114). Obligate resprouter (NPFR-W). | Benson & McDougall (1997), NPFR. |
| *Lobelia gracilis* | Obligate Seeder | | | | | | | | |
| *Logania albiflora* | Resprouter | | | | | | | Resprouts from base after high intensity fire. | Benson & McDougall (1997). |
| *Lomandra* | Resprouter | | Seed | | | | | | |

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| *confertifolia* | | | | | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Lomandra cylindrica* | Resprouter | | Seed | Ant adapted elaiosome. | | 1 | Indefinite | | Benson & McDougall (2005). |
| *Lomandra filiformis* | Resprouter | | Seed | Ant adapted elaiosome. | | | | Survives 100% scorch. Facultative resprouter. | NPFR, Benson & McDougall (2005). |
| *Lomandra longifolia* | Resprouter | Reproduction sexual, reproducing by seed propagation beween 1-5 yrs. | Seed | Ant adapted elaiosome. | | 1 | | Obligate Seeder (E). Facultative and obligate resprouter. Clonal decreaser. Survives 100% scorch - root suckers. Fire resistant increaser. Clonal decreaser. | Hamilton et al. (1991), Fox et al. (1979), Leigh & Holgate (1979), Dickinson & Kirkpatrick (1987), Purdie (1977), Benwell (1998), NPFR, Clarke (1989), Benson & McDougall (2005). |
| *Lomandra multiflora* | Resprouter | Seed viability 96%. Smoke increases germination. | Seed | Ant adapted elaiosome. | | 2yrs | 1 | Facultative and obligate resprouter. Fire resistant increaser. Obligate root resprouter. veg. regeneration. Absent from infrequently burnt sites. | Nieuwenhuis (1987), Purdie & Slatyer (1976), Purdie (1977), Roche et al. (1997), NPFR, Benson & McDougall (2005). |
| *Lomatia fraseri* | Resprouter | | | | | | | | Williams (1998). |
| *Lomatia silaifolia* | Resprouter | No dormancy mechanism. Germination related to seed mass, viable seed > 7mg. | Seed | Wind-dispersed. Recruitment mainly after fire. | | 1y | >60y | Stems killed, resprouts from lignotuber within 2 months. Survives 100% scorch - basal sprouts. Flowers | Bradstock (1990), Beadle (1940), Keith (1996), Gill (1997), NPFR, Benson & McDougall (2000), Benson & McDougall (2000). |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | abundantly only in first year after fire has destroyed previous shoot system, predominantly in second summer after flowering. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Lophostemon confertus* | Resprouter | Germination without treatment. | Seed | | | | 100-200 | Survives 100% scorch - basal sprouts. | NPFR, Benson & McDougall (1998). |
| *Luzula flaccida* | Obligate Seeder | | | | | | | | |
| *Lycopodiella lateralis* | Resprouter | | Spores | | | | | | |
| *Lycopodium deuterodensum* | Resprouter | | Spores | | | | | | |
| *Lythrum salicaria* | | | Seed | | | | | | |
| *Maclura cochinchinensis* | Resprouter | Reproduction sexual, reproducing by seed propagation between 1-5yrs. | Seed | By expulsion. | | | 30+ | Vigorous suckering after clearing or fire. | Benson & McDougall (1997), Clarke (1989). |
| *Marsdenia rostrata* | Resprouter | | Seed | Seeds dispersed by expulsion. | | | <5 | Facultative resprouter. Survives 100% scorch - basal sprouts. Prolific after fire. | Melick & Ashton (1991), NPFR, Clarke (1989). |
| *Maytenus silvestris* | Resprouter | Germinates easily, 3-10 weeks. | Seed | Ant-adapted food-body for dispersal. | | | 30+ | Stems killed, resprouts from base. May form dense colonies of suckers. | Benson & McDougall (1995). |
| *Medicago arabica* | Obligate Seeder | | | | | | | | |
| *Melichrus procumbens* | Resprouter | | | | | | | From ground level or below. | Benson & McDougall (1995), NPFR. |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Survives 100% scorch - basal sprouts. | |
| *Melichrus urceolatus* | Resprouter | | | No seedlings within 1 yr of fire. Diaspore: fruit, adaptation for dispersal by ingestion. | | | | From rootstock. Facultative root resprouter. Fire resistant decreaser. | Gill (1975), Purdie & Slatyer (1976), Purdie (1977), NPFR, Benson & McDougall (1995). |
| *Mentha diemenica* | Obligate Seeder | | | | | | | | |
| *Mentha satureioides* | Resprouter | | | Diaspore: seed. No particular morphology for dispersal. | 1 | | | Probably resprouts from rhizome. | Benson & McDougall (1997). |
| *Micrantheum hexandrum* | Obligate Seeder | From long lived soil stored seedbank | | Seedlings prolifically within 6 m of fire where none recorded before | | | | pers. obs. | |
| *Microlaena stipoides* | Resprouter | Total germination 25 days. Little dormancy. Germination slow if if under 10C and develope slowly. | Fruit (dry indihiscent 1 seeded). | No particular mechanism for dispersal. | | <1 | | Flowers at anytime of the year. | Williams (1998), Benson & McDougall (2005). |
| *Micromyrtus sessilis* | Obligate Seeder | | | | | | | | |
| *Microtis unifolia* | Resprouter | Readily germinates & can colonise new sites especially after disturbance. | Seed, winged | | | 1 | Indefinite | Flowering diminishes the longer since fire. | Williams (1998), Benson & McDougall (2005). |
| *Mirbelia confertiflora* | Obligate Seeder | | Seed | | | | | | |
| *Mirbelia pungens* | Obligate Seeder | | Seed | | | | | | |
| *Mirbelia speciosa* | Obligate Seeder | Soil stored seedbank | Seed | | | | | Killed | Benson & McDougall (1996). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Mitrasacme polymorpha* | Obligate Seeder | | | | 2-Mar | | | Absent from infrequently burnt sites. | Benson & McDougall (1993), Nieuwenhuis (1987). |
| *Monotoca scoparia* | Resprouter | | | No seedlings within < 1 yr after fire. Diaspore: fruit, adapted for dispersal by ingestion. | | < 2yr | | Stems killed, resprout from soil level or below, may flower within 17 m of fire. | Benson & McDougall (1995), Fox & FOx (1986), Leigh & Hogate (1979), Purdie & Slatyer (1976), Purdie (1977), Benwell (1998), NPFR. |
| *Morinda jasminoides* | Resprouter | | Fruit (orange, fleshy) | Vertebrate adapted dispersal. Fruit eaten by fruit bat & reported from Currawong pellets. | | <2y | | | Benson & McDougall (2000). |
| *Muehlenbeckia costata* | Obligate Seeder | Prolifically after fire, fire ephemeral, from long lived soil stored seeds | | Much growth and dominating communities within 6 m of fire | < 1yr | | 2-5yr | Fire ephemeral will fruit prolifically within 2-3 m of fire and continuously for lifespan, may resprout with a quick succession fire but will reduce biomass and seed set | Hunter (1995), Richards & Hunter (1997). |
| *Muehlenbeckia rhyticarya* | Obligate Seeder | Prolifically after fire, from long lived soil stored seedbank | | Much growth within 6 m of fire | < 1yr | | | pers. obs. | |
| *Muellerina eucalyptoides* | Resprouter | | | Bird and bat dispersal. | | | | Resprouter after low - medium intensity fire, with host canopy <100% scorched. | Benson & McDougall (1997), Williams (1998). |
| *Murdannia graminea* | Resprouter | | | | | | | | |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Myoporum montanum* | Resprouter | | | | | | | | Williams (1998). |
| *Myriophyllum aquaticum* | | | | | | | | No males in Australia - unknown consequences if introduced. | Benson & McDougall (1997). |
| *Neolitsea australiensis* | Resprouter | | | | | | | | Williams (1998). |
| *Notelaea linearis* | Resprouter | | | | | | | | |
| *Notelaea longifolia* | Resprouter | Reproduction sexual, reproducing by seed propagation between 1-5 yrs. | Seed | Dispersed by animals. | | <2 | 30+ | Survives fire by suckering. Resprouted after high intensity fire. | Benson & Howell (1994), Benson & McDougall (1999), Clarke (1989). |
| *Notelaea microcarpa* | Resprouter | | | | | | | | |
| *Notelaea ovata* | Resprouter | | | | | | | | Benson & McDougall (1999). |
| *Notelaea sp. A.* | Resprouter | | | | | | | | |
| *Notelaea venosa* | Resprouter | | | | | | | Facultative resprouter. | NPFR. |
| *Notodanthonia longifolia* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | | Benson & McDougall (2005). |
| *Notothixos subaureus* | Obligate Seeder | | | | 3-Jun | | | | Williams (1998). |
| *Nyssanthes diffusa* | Obligate Seeder | | | | 1-Feb | | | | Williams (1998). |
| *Olax stricta* | Resprouter | | | | | 3.5yr | | Stems killed, resprouts at base or below. | Fox (1988), Benson & McDougall (1999). |
| *Olearia elliptica* | Obligate Seeder | | Fruit | | | | | | |
| *Olearia gravis* | Obligate Seeder | | Fruit | | | | | | |
| *Olearia microphylla* | Obligate Seeder | | Fruit | | | | | Moderate intensity fire probably kills but | Benson & McDougall (1994). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | will flower soon after moderate to high intensity fire, very high fire will probably kill most of the viable soil-stored seed | |
| *Olearia oppositifolia* | Obligate Seeder | | Fruit | | | | | | |
| *Olearia ramulosa* | Obligate Seeder | | Fruit | | | | | | |
| *Omalanthus nutans* | | Germination with fresh seed. Grows quickly in disturbed sites. | Seed | Bird-dispersed. Fruit reported from regurgitated pellets of Currawongs. | 3 | | 20-30 | Some plants resprouting and scattered seedlings noted after high intensity fire. | Benson & McDougall (1995). |
| *Opercularia aspera* | Variable | Reproduction sexual, reproducing by seed propagation in the first year. | Seed | Ant-adapted food body for dispersal. Coloniser. Plants taller on better soils. Seeds dispersed by wind. | | <33w | <5 | Obligate seeder after hot fire. Soil stored seed. Resprouted after high intensity fire. | Benson & McDougall (2000), Fox & Fox (1986), Clemens & Franklin (1980), NPFR, Clarke (1989). |
| *Opercularia diphylla* | ?Resprouter | | | Soil stored seedbank. | | | | 100% scorch kills, soil stored seed. Probably resprouts (herbarium specimen). | NPFR, Benson & McDougall (2000). |
| *Opercularia hispida* | Resprouter | | Seed | No particular morphology for dispersal. | | | | Survives 100% scorch - basal sprouts. | NPFR, Benson & McDougall (2000). |
| *Oplismenus aemulus* | Obligate Seeder | | Fruit (dry indihiscent 1 seeded). | No specieal dispersal morphology. Coliser of bare | 1 | <1 | Indefinite | Flowering 5 m after high intensity fire. | Williams (1998), Benson & McDougall (2005). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | shady sites. | | | | | |
| *Oplismenus imbecillis* | Obligate Seeder | | Fruit (dry indihiscent 1 seeded). | Bird dispersed. Coloniser of bare sites. | 1 | | Indefinite | Flowers at anytime of the year. | Williams (1998), Benson & McDougall (2005). |
| *Oxalis chnoodes* | Resprouter | | | | | | | | |
| *Oxalis exilis* | Resprouter | | | | | | | | |
| *Oxalis perennans* | Variable. | | | | | | | Resprouter. Minor Obligate seeder. Seedlings not flowered within 9m of autumn fire. | Lunt (1990). |
| *Oxylobium arborescens* | Resprouter | | Seed | | | | | | |
| *Ozothamnus diosmifolius* | Resprouter | | Fruit | | | | | Killed by high intensity fire, few resprout from base, stem resprouter under lower fire intensity, scattered germinations | Benson & McDougall (1994), Williams (1998). |
| *Ozothamnus obcordatus* | Obligate Seeder | | Fruit | | | | | | Williams (1998). |
| *Pandorea pandorana* | Variable | Reproducing by seed propagation between 1-5 years of age. | | Seeds dispersed by wind. | | < 1yr | | Killed and known to resprout after high intensity fire, few plants flowering after 26-29 wks | Fox (1988), Benson & Howell (1994), NPFR, Clarke (1989), Williams (1998). |
| *Panicum effusum* | Resprouter | | Inflorescence | Wind dispersed. In mud on cars. Coloniser of disturbed sites. | 1 | | | | Williams (1998), Benson & McDougall (2005). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Panicum simile* | Resprouter | | Inflorescence | | | <1 | | Fruit within 4 m of high intensity fire. | Benson & McDougall (2005). |
| *Parsonsia eucalyptophylla* | Resprouter | | | | | | | | |
| *Parsonsia purpurascens* | Obligate Seeder | | | | 2-Apr | | | | Williams(1998). |
| *Parsonsia straminea* | Obligate Seeder | | | | 2-Apr | | | Probably killed | Benson & McDougall (1993), NPFR, Williams (1998). |
| *Parsonsia velutina* | Obligate Seeder | | | | 2-Apr | | | | Williams (1998). |
| *Paspalidium constrictum* | Resprouter | | Inflorescence | | | | | | |
| *Paspalidium gracile* | Resprouter | | Inflorescence | | | | | | Benson & McDougall (2005). |
| *Paspalum dilatatum* | Resprouter | | Inflorescence | Adhesive for dispersal. In mud on cars. | | <1 | Indefinite | Fruit within 4 m of high intensity fire. | Benson & McDougall (2005). |
| *Paspalum urvillei* | Resprouter | | Inflorescence | In horse dung. | | <1 | | Fruit within 9 weeks after high intensity fire. | Benson & McDougall (2005). |
| *Passiflora aurantia* | Resprouter | | | | | | | | |
| *Patersonia glabrata* | Resprouter | | | | | | | Non-clonal decreaser. Soil seed bank. | Benwell (1998), Roche et al. (1997). |
| *Patersonia sericea* | Resprouter | | | | | | | Transient seedbank. Non-clonal decreaser. No veg. spread. | Clark (1988), Bradstock et al. (1997), Lumley & Spencer (1990). |
| *Pavonia hastata* | Resprouter | | | | | | | | Williams (1998). |
| *Pelargonium australe* | Resprouter | Reproduction sexual, by seed propagation in first year. | Fruit | Seeds dispersed by wind. | | | <5 | | NPFR, Clarke (1989). |
| *Pellaea falcata* | Resprouter | | Spores | | | | | | Williams (1998). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Pellaea nana* | Resprouter | | Spores | Wind-dispersed. Probably no dormancy mechanism. | | | | | Williams (1998). |
| *Pennantia cunninghamii* | | | | Bird dispersed. | | | | Probably killed. | Benson & McDougall (1997). |
| *Pennisetum alopecuroides* | Resprouter | | Fruit (dry indihiscent 1 seeded) | Wind dispersal & adhesion. | 1 | | | | Williams (1998), Benson & McDougall (2005). |
| *Persoonia cornifolia* | Resprouter | | Fruit | | | | | | |
| *Persoonia daphnoides* | | | Fruit | | | | | | |
| *Persoonia fastigiata* | Obligate Seeder | | Fruit | | | | | | |
| *Persoonia microphylla* | | Triggers unknown. | Fruit | Probably dispersed by large birds e.g. Currawongs, and possibly large mammals, kangaroos, possums. | | | | | Benson & McDougall (2000). |
| *Persoonia oleoides* | Resprouter | | Fruit | | | | | | |
| *Persoonia sericea* | Resprouter | | Fruit | | | | | | |
| *Persoonia tenuifolia* | Resprouter | | Fruit | | | | | | NPFR. |
| *Persoonia virgata* | | | Fruit | | | | | | |
| *Petrophile canescens* | Resprouter | | Fruit (nut) | Gravity dispersed locally | | | | Stems killed, resprouts from base. Canopy seedbank. Non-clonal decreaser. | Benwell (1998), Benson & McDougall (2000). |
| *Phalaris aquatica* | Resprouter | | Fruit (dry indihiscent 1 | No particular morphology for | | | | | Benson & McDougall (2005). |

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|---|---|---|---|---|---|---|---|---|---|
| | | | seeded) | dispersal. In mud on cars. | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Phebalium glandulosum* | Obligate Seeder | | | | | | | | |
| *Phebalium squamulosum* | Obligate Seeder | | | | | | | | |
| *Philotheca epilosa* | Obligate Seeder | | | | | | | | |
| *Philydrum lanuginosum* | Resprouter | | Seed | | | <1 | Short lived | Fruiting within 5 m of high intensity fire. | Benson & McDougall (2005). |
| *Phyllanthus gunnii* | Variable | | Seed | Explosive | | | | Resprouter from base (3453, 4264). Obligate Seeder (NPFR-W). | Benson & Howell (1994), Benson & McDougall (1995), NPFR. |
| *Phyllanthus hirtellus* | Resprouter | | Seed | Explosive | | < 1yr | | (Will withstand yearly burning: pers. obs.) From base, fruits within 10 m of high intensity fire | Benson & McDougall (1995), Benwell (1998), NPFR. |
| *Phyllanthus similis* | | | Seed | Explosive | | | | | |
| *Phyllanthus virgatus* | Resprouter | From soil stored seedbank | Seed | Explosive | | < 1yr | | Will resprout and flower within 6 m of fire | pers. obs. |
| *Phyllota phylicoides* | Resprouter | | Seed | | | | | | |
| *Phytolacca octandra* | Obligate Seeder | | | | 2 | | | Weed promoted by fire. Seedlings grew vigorously after high intensity fire, fruiting 5m after fire. | Chesterfield et al. (1991), Floyd (1976), Gill (1981), NPFR, Benson & McDougall (1999). |
| *Pittosporum undulatum* | Variable | Reproduction sexual, reproducing by seed | | Seeds dispersed by animals. | | | 30+ | Obligate seeder, killed by fire. Fire | Benson & Howell (1994), Hill (1982), Chesterfield et |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| | | propagation after 5yrs. | | | | | | sensitive: thin bark & incapacity to coppice. Survives fire by suckering. Crown fire: obligate seeder. Partial burn: resprouts above ground. | al. (1991), Melick & Ashton (1991), NPFR, Clarke (1989). |
| *Plantago debilis* | Resprouter | | | | | | | | Williams (1998). |
| *Plantago major* | Resprouter | | | | | | | | |
| *Plantago varia* | Resprouter | | | | | | | Facultative resprouter. Recorded 1 month after fire in grassy forest. | NPFR, Dickinson & Kirkpatrick (1987). |
| *Platycerium bifurcatum* | Obligate Seeder | | | | | | | Probably killed, (can survive a high degree of scorch: pers obs) | Benson & McDougall (1993). |
| *Platysace ericoides* | Variable | | | | | 1 yr | | Stems killed and resprouts or killed outright | Benson & McDougall (1993), Fox (1988). |
| *Plectranthus graveolens* | Resprouter | | | | | | | | |
| *Plectranthus parviflorus* | Resprouter | | | | | | | Killed after high intensity fire. Soil stored seedbank. | Benson & McDougall (1997). |
| *Plectranthus suaveolens* | Resprouter | | | | | | | | |
| *Poa labillardieri* | Resprouter | Total germination approx. 39 days. | Fruit (dry indihiscent 1 seeded) | No particular morphology for dispersal. | | <1 | | Flowers at anytime of the year. Flowering within 10 m of high intensity fire. | Benson & McDougall (2005). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Poa queenslandica* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | <1 | | Flowers anytime in response to seasonal conditions. | Benson & McDougall (2005). |
| *Poa sieberiana* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | Facultative resprouter. No mortality when grazed and burnt. | Lunt (1990), Leigh & Holgate (1979), Keith (1996), NPFR. |
| *Podolepis arachnoidea* | | | Fruit | | | | | | |
| *Podolepis hieracioides* | | | Fruit | | | | | | |
| *Podolepis jaceoides* | Resprouter | | Fruit | | | | | Perennial. | Lunt (1990). |
| *Podolepis neglecta* | Resprouter | | Fruit | | | | | | |
| *Podolobium ilicifolium* | Resprouter | | Seed | | | | | Stems killed, from base. 100% scorch kills, soil stored seed. | Fox (1988), Benson & McDougall (1996), NPFR. |
| *Polygala japonica* | | | | | | | | Possibly resprouts. | Benson & McDougall (1999). |
| *Polymeria calycina* | Resprouter | | | | | < 2yr | | Resprout after high intensity fire, fruit within 13 m | Benson & McDougall (1995). |
| *Polyscias elegans* | | Reproducing by seed propagation after 5 years. | | Seeds dispersed by animals. | | | 30+ | | Clarke (1989). |
| *Pomaderris andromedifolia* | Obligate Seeder | | Seed | | | | 10-25y | Probably killed. | Benson & McDougall (2000). |
| *Pomaderris lanigera* | Obligate Seeder | | Seed | Coloniser species in absence of fire. | | | 10-25y | Probably killed. | Benson & McDougall (2000). |
| *Pomaderris ligustrina* | | | Seed | | | | | | Benson & McDougall (2000). |
| *Pomaderris nitidula* | Resprouter | | Seed | | | | | | Williams (1998). |
| *Pomax umbellata* | Obligate Seeder | Reproduction by sexual | Seed | Ejected | <1y | | <5 | Soil stored seed - | Benson & McDougall |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| | | means, reproducing by seed propagation in the first year. | | ballistically when ripe capsules touched (?and by wind). Coloniser. Soil stored seedbank. | | | | no veg. regeneration in dry heath. 100% scorch kills. | (2000), Benwell (1998), NPFR, Clarke (1989). |
| *Poranthera microphylla* | Obligate Seeder | Readily after fire from soil stored seedbank | | Within 5 m of fire. Diaspore: seed. Both ballistic & ant-adapted dispersal mech. Coloniser. | < 1yr | | 1 | (Will have an initial flush after fire which is reduced soon after: pers. obs.) Flowers profusely after high intensity fire. Killed. Seedlings recorded <1yr after fire. | Benson & McDougall (1995), Purdie & Slatyer (1976), Bradfield (1981), NPFR, Fox (1988), Purdie (1977). |
| *Potamogeton tricarinatus* | | Germination in autumn-winter in the Northern Tablelands. | Fruit (nutlets) | | | | | | Benson & McDougall (2005). |
| *Pratia purpurascens* | Resprouter | Reproduction both sexual and vegetative, reproducing by seed propagation in first year. | | Seeds dispersed by expulsion. | | | <5 | Resprouter after high intensity fire. | Benson & McDougall (1997), Clarke (1989). |
| *Prostanthera caerulea* | | | Seed | | | | | | |
| *Prostanthera nivea* | Obligate Seeder | | Seed | | | | | | |
| *Prostanthera saxicola* | Obligate Seeder | | Seed | | | | | | |
| *Prostanthera petraea* | Obligate Seeder | Readily germinates from soil stored seedbank after fire | Seed | | > 3yr | | | Will germinate prolifically after fire, does not germinate readily in the absence of fire: pers. obs. | |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Prunella vulgaris* | Obligate Seeder | Germinates in spring. | | Seeds dispersed by water, animals and humans. | 1 | | | Probably killed by high intensity fire, seedlings flowering and fruiting within 1 year. | Benson & McDougall (1997). |
| *Pseudognaphalium luteoalbum* | | Coloniser. | | Wind-dispersed locally. | <1 | | 1 | Probably killed. | Benson & McDougall (1994). |
| *Psychotria loniceroides* | | | Fruit (fleshy) | Vertebrate adapted for dispersal. | | | | | Benson & McDougall (2000). |
| *Pteridium esculentum* | Resprouter | Dormant rhizome buds may remain dormant for at least 10 years. | Spores | Wind-dispersed. Probably no dormancy mechanism. | | < 1yr | | Resprouts rapidly, maybe indicative of fire, survives annual burning, may become dominant after low intensity burn but not spread after high, biomass increase 1 yr after spring fire, autumn fire not | Fox (1988), Benson (1985), Barker (1990), Hamilton et al. (1991), Fox et al. (1979), Keith (1996), Dickinson & Kirkpatrick (1987), Cremer & Mount (1965), NPFR, Benson & McDougall (1993). |
| *Pteris comans* | | | Spores | Dispersed by wind. Probably no dormancy mechanism. | | | | | |
| *Pteris tremula* | Obligate Seeder | Spores retain viability 10-15 years. Establishes during wet periods and grows quickly. | Spores | Wind-dispersed. Probably no dormancy mechanism. | | | 2-5y | Spores. Probably killed. | NPFR, Benson & McDougall (1993). |
| *Pterostylis cycnocephala* | Resprouter | | Seed | | | | Indefinite | | Benson & McDougall (2005). |
| *Pterostylis daintreana* | Resprouter | | Seed | | | <1 | Indefinite | Fruiting within 31 weeks of high | Benson & McDougall (2005). |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | intensity fire. | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Pterostylis longifolia* | Resprouter | | Seed | | | <1 | Indefinite | Flowering 24-33 weeks after high intensity fire. | Williams (1998), Benson & McDougall (2005). |
| *Pterostylis obtusa* | Resprouter | | Seed | | | | Indefinite | | Williams (1998), Benson & McDougall (2005). |
| *Pultenaea altissima* | | | Seed | | | | | | |
| *Pultenaea dentata* | | | Seed | | | | | | |
| *Pultenaea flexilis* | Obligate Seeder | Prolific after fire from soil stored seedbank | Seed | | | | | Killed | Benson & McDougall (1996). |
| *Pultenaea hartmannii* | Obligate Seeder | | Seed | | | | | | |
| *Pultenaea linophylla* | Obligate Seeder | Soil stored seedbank | Seed | | | | | Killed | Benson & McDougall (1996). |
| *Pultenaea polifolia* | | Seed viability 90-100%, non-dormant fraction 10-19-59%. | Seed | Seed hard-coated seed. | | | | Probably killed. | Auld & O'Connell (1991), Benson & McDougall (1996). |
| *Pultenaea pycnocephala* | Obligate Seeder | Soil stored seedbank | Seed | | | | | pers. obs. | |
| *Pultenaea retusa* | Obligate Seeder | | Seed | | | | | Killed | Benson & McDougall (1996), NPFR. |
| *Pultenaea stuartiana* | Obligate Seeder | | Seed | | | | | | |
| *Pultenaea villosa* | | | Seed | | | | | | |
| *Pyrrosia rupestris* | Obligate Seeder | | Spores | | | | | Probably killed. Spores. | Benson & McDougall (1993), Chesterfield et al. (1991), NPFR. |
| *Quintinia sieberi* | Resprouter | | | | | | | Stems killed, resprouts from base | Benson & McDougall (1995). |
| *Ranunculus inundatus* | | | Fruit (achene) | | | | | | Benson & McDougall (2000). |
| *Ranunculus lappaceus* | Resprouter | | Fruit (achene) | Morphology for dispersal by | | | | | Benson & McDougall (2000). |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | adhesion. | | | | | |

| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
|---|---|---|---|---|---|---|---|---|---|
| *Rhodanthe anthemoides* | Obligate Seeder | | | | 1-Feb | | | | Williams (1998). |
| *Rhytidosporum procumbens* | Resprouter | | | | | | | One plant resprouted and flowered <10m after high intensity fire, but most plantswere seedlings. | Benson & McDougall (1999). |
| *Ripogonum album* | | | Berry (black) | | | | | | Benson & McDougall (2005). |
| *Rosa rubiginosa* | Obligate Seeder | | Fruit (fleshy Red) | Bird dispersed. Coloniser of previously cleared land. | | | | | Benson & McDougall (2000). |
| *Rostellularia adscendens* | Obligate Seeder | | | | 1 | | | | Williams (1998). |
| *Rubus fruticosus* | Obligate Seeder | | Infructesence | | | | | | |
| *Rubus moluccanus* | | | Infructescence | Fleshy edible fruits, vertebrate adapted dispersal. | | | | | Benson & McDougall (2000). |
| *Rubus parvifolius* | Resprouter | | Infructescence | Attractive fleshy edible fruits, vertebrate adapted dispersal. Vegetative spread. | | | Indef. | Probably resprouts. | Benson & McDougall (2000). |
| *Rubus ulmifolius* | | | Infructescence | Animal dispersed. Vegetative spread by layering of arched canes. | | | | | Benson & McDougall (2000). |
| *Rumex brownii* | Resprouter | | | | | <5m | | Resprouted after high intensity fire. | Benson & McDougall (1999). |
| *Sacciolepis indica* | Obligate Seeder | | Fruit (dry indihiscent 1 | | <1 | | <1 | | Benson & McDougall (2005). |

| | | | seeded) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Sarcochilus falcatus* | Obligate Seeder | | Seed | | | | | | Williams (1998). |
| *Sarcopetalum harveyanum* | Resprouter | Reproduction by both sexual and vegetative means, by seed propagation in 1st year. | | Seeds dispersed by animals. | | | <5 | Resprouts from base after high intensity fire. Survives 100% scorch - basal sprouts. | Benson & McDougall (1997), NPFR, Clarke (1989). |
| *Schizaea bifida* | Resprouter | | | | | | | From underground rhizome | Benson & McDougall (1993). |
| *Schizaea dichotoma* | Resprouter | | | | | | | From at or below ground level | Benson & McDougall (1993), Fox (1988). |
| *Schizomeria ovata* | Resprouter | | | | | | | From base after high intensity fire | Benson & McDougall (1995), Williams (1998). |
| *Schoenus apogon* | Variable | | | | | | | Variable, obligate seeder and facultative and obligate seeder. Secondary juv. period <9m after intense autumn fire. 1st recorded 3m after fire in wet forest, 1m after fire in grassy forest. | NPFR, Dickinson & Kirkpatrick (1987), Lunt (1990). |
| *Schoenus melanostachys* | Resprouter | | | | | | | Obligate resprouter. | NPFR. |
| *Schoenus turbinatus* | Resprouter | | | | | | | | |
| *Scirpus polystachyus* | Resprouter | | | | | | | | |
| *Scleranthus* | Obligate Seeder | | | No particular | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| *biflorus* | | | | dispersal morphology. | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Scleria mackaviensis* | Obligate Seeder | | | | | | | | |
| *Scutellaria humilis* | Obligate Seeder | | | | | | | | |
| *Secale cereale* | Obligate Seeder | | | | <1 | | <1 | | Benson & McDougall (2005). |
| *Senecio amygdalifolius* | Obligate Seeder | | Fruit (achene) | | | | | | |
| *Senecio bathurstianus* | Obligate Seeder | | Fruit (achene) | | | | | | |
| *Senecio bipinnatisectus* | Obligate Seeder | | Fruit (achene) | | | | | | |
| *Senecio biserratus* | Obligate Seeder | | Fruit (achene) | Wind-dispersed. | <1 | | 1 | | |
| *Senecio diaschides* | Obligate Seeder | Many after fire | Fruit (achene) | Wind-dispersed. | | | | Killed, many seedlings after fire. Seedlings grow vigorously after fire. | Benson & McDougall (1994), NPFR, Benson & McDougall (1994). |
| *Senecio hispidulus* | Obligate Seeder | | Fruit (achene) | | | | | | |
| *Senecio lautus* | Obligate Seeder | Germination 80%. | Fruit (achene) | Probably wind-dispersed. | <1 | | | | Williams (1998). |
| *Senecio linearifolius* | Obligate Seeder | Germination 75%. | Fruit (achene) | Wind-dispersed, possibly also water-dispersed. Possibly colonises disturbed sites. | <1 | | <5 | Killed by crown fire or partial burn: regeneration from soil-stored seed. | Gill (1981), NPFR, Clarke (1989). |
| *Senecio minimus* | Variable | | Fruit (achene) | More easily in bare soil. | | | | Obligate seeder (C,I). Resprouter. Roots and shoots survive & resprout next season. | Dickinson & Kirkpatrick (1987), Cremer & Mount (1965), Gill (1981), NPFR. |
| *Senecio prenanthoides* | Obligate Seeder | | Fruit (achene) | Probably wind-dispersed. | | | | | |

| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
|---|---|---|---|---|---|---|---|---|---|
| *Senecio quadridentatus* | Obligate Seeder | Germination fire related. Germination 95%. | Fruit (achene) | Probably wind-dispersed. Recruitment fire-related. | < 1yr | | | Killed, recruitment fire related. Therophyte. Seedlings recorded <1yr after fire. | Harden (1992), Benson & McDougall (1994), Purdie & Slatyer (1976), Purdie (1977), Gill (1981), NPFR. |
| *Senecio tenuiflorus* | Obligate Seeder | | Fruit (achene) | | | | | | |
| *Setaria verticillata* | Obligate Seeder | | Fruit (dry indihiscent 1 seeded) | Retrosely barbed seeds readily adhere to clothing and animal coats, aiding dispersal. | <1 | | <1 | | Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Sigesbeckia orientalis* | Obligate Seeder | Vigorous immediately after fire | | | < 1yr | | | Killed, germinates vigorously from soil stored seed emmediately after fire, will flower within 11 wks to 4 m and may fruit within 16 wks | Benson & McDougall (1994), NPFR. |
| *Sisyrinchium sp. A* | Obligate Seeder | | | | 1 | | | | Williams (1998). |
| *Smilax australis* | Resprouter | Reproduction sexual, reproducing by seed propagation between 1-5yrs. | Fruit (black berry) | Seeds dispersed by animals, vertebrates & ants. | | | | Survives 100% scorch - basal sprouts. Prolific flowering after fire. Flowers all year round. Vigorous growth after high intensity fire. | Melick & Ashton (1991), NPFR, Jones (1983), Clarke (1989), Benson & McDougall (2005). |
| *Smilax glyciphylla* | Resprouter | | Fruit (black berry) | Dispersed by Pied Currawong, also ant adapted. | | 1 | | Survives 100% scorch - basal sprouts. | NPFR, Benson & McDougall (2005). |
| *Solanum* | Obligate Seeder | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| *campanulatum* | | | | | | | | | |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Solanum cinereum* | Obligate Seeder | | | | | | | | |
| *Solanum elegans* | Obligate Seeder | | | | | | | | |
| *Solanum nobile* | Obligate Seeder | | | | | | | | |
| *Solanum prinophyllum* | Obligate Seeder | | | | 2-Apr | | | | Williams (1998). |
| *Solanum stelligerum* | Obligate Seeder | Reproduction sexual, reproducing by seed propagation between 1-5yrs. | | Seeds dispersed by animals. | | | | Regeneration from seed in soil. | Clarke (1989), Williams (1998). |
| *Solenogyne bellioides* | Resprouter | | | | | | | Probably resprouts from ground level or below | Benson & McDougall (1994). |
| *Sonchus asper* | Obligate Seeder | Within first year after fire. | | | | | | Therophyte. Successful post-burn seed coloniser. | Purdie & Slatyer (1976), Dickinson & Kirkpatrick (1987), Purdie (1977), NPFR. |
| *Sonchus oleraceus* | Obligate Seeder. | | | Seeds dispersed by wind. | 1 | | | | Lunt (1990), Clarke (1989). |
| *Sorghum leiocladum* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | 1 | | | | Williams (1998), Benson & McDougall (2005). |
| *Spiranthes sinensis* | Resprouter | | Seed | | | | <5 | Self pollinating. | Williams (1998), Benson & McDougall (2005). |
| *Sporobolus creber* | Resprouter | | Fruit (dry indihiscent 1 seeded) | No particular morphology for dispesal. | 1 | <1 | | Flowering within 4 m of high intensity fire. | Williams (1998), Benson & McDougall (2005). |
| *Sporobolus elongatus* | Resprouter | | Fruit (dry indihiscent 1 seeded) | No particular morphology for dispersal. | 1 | | | | Williams (1998), Benson & McDougall (2005). |
| *Stackhousia monogyna* | Variable | | | | | | | Obligate Seeder (CH, BU). Facultative resprouter (W, | Lunt (1990), NPFR, Williams (1998). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | WO, E?). 100% scorch kills - soil seed storage. | |
| *Stackhousia viminea* | Obligate Seeder | | | | 1-Feb | | | | Keith (1996), NPFR. |
| *Stellaria flaccida* | Obligate Seeder | | Seed | Stem fragments that take root. Coloniser. | 1 | | | Probably killed. | Melick & Ashton (1991), Jarrett & Petrie (1929), NPFR, Benson & McDougall (1995). |
| *Stellaria media* | Obligate Seeder | | | | 1 | | | | |
| *Stephania japonica* | Resprouter | Reproduction both sexual and vegetative, by seed propagation in first year. | | Seeds dispersed by animals. | | | <5 | Facultative resprouter - from base after high intensity fire. | Benson & McDougall (1997), NPFR, Clarke (1989). |
| *Streblus brunonianus* | Resprouter | | | | | | | | Williams (1998). |
| *Stylidium graminifolium* | Variable | | | | | | | Obligate Seeder (E). Obligate and facultative resprouter. Root resprouter. Fire resistant decreaser. Non-clonal decreaser. Soil seed bank. | Leigh & Holgate (1979), Purdie & Slatyer (1976), Kirkpatrick (1984), Puride (1977), Purdie (1977), Benwell (1998), NPFR. |
| *Stylidium laricifolium* | Obligate Seeder | | | | | | | | |
| *Stypandra glauca* | Resprouter | Viability of fresh seed 71%. | Seed | | | | | Facultative resprouter. Survives 100% scorch - basal sprouts. | NPFR. Roche et al. (1997). |
| *Styphelia triflora* | Obligate Seeder | | | Within 15 m of high intensity fire | | | | Killed | Benson & McDougall (1995). |
| *Styphelia viridis* | Obligate Seeder | From soil stored seed | | | | | | Killed | Fox (1988), Van Steenis |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | (1934). |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Swainsona fraseri* | Obligate Seeder | | | | | | | | |
| *Swainsona reticulata* | Obligate Seeder | | | | | | | | |
| *Synoum glandulosum* | Resprouter | w/o treatment. Seedling growth slow. | | ?Bird dispersal. | | | | Facultative resprouter, from base after high intensity fire. Lignotuber in <5yrs. | Benson & McDougall (1997), NPFR, Williams (1998). |
| *Syzygium australe* | Resprouter | Germination period 15-35 days. Viability only 1-3 m. | Fruit (Red) | Bird & water. | | | 100-200 | Lignotuber absent in seedlings. | Benson & McDougall (1998), Williams (1998). |
| *Taraxacum officinale* | | | Fruit (achene) | Wind-dispersed many kilometres. | | | | Probably resprouted. Flowering within 11 wks and fruiting within 25 wks of high intensity fire. | Benson & McDougall (1994). |
| *Tasmannia stipitata* | Resprouter | | | | | | | | |
| *Tetrarrhena juncea* | Resprouter | | Fruit (dry indihiscent 1 seeded) | | | | | Flowers most of the year. | Benson & McDougall (2005). |
| *Tetrastigma nitens* | Resprouter | | | | | | | | Williams (1998). |
| *Tetratheca thymifolia* | Variable | | | | | | | Soil stored obligate seeder. Seedling regenerator. Facultative resprouter. Clonal increaser. | Fox & Fox (1986), Bradstock et al. (1997), Benwell (1998), NPFR. |
| *Thelionema caespitosum* | Resprouter | | Seed | | | 2 | | Flowering & fruiting 2 yrs after high intensity fire. | Benson & McDougall (2005). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Thelionema grande* | Resprouter | | Seed | | | | | | |
| *Thelychiton gracilicaulis* | Resprouter | | Seed | | | | Indefinite | | Benson & McDougall (2005). |
| *Thelychiton kingianus* | Obligate Seeder | | Seed | | | | | | Williams (1998). |
| *Thelychiton tarberi* | Resprouter | | Seed | | | | | | Williams (1998), Benson & McDougall (2005). |
| *Thelymitra ixioides* | Resprouter | | Seed | | | | Indefinite | Self compatable. | Benson & McDougall (2005). |
| *Thelymitra pauciflora* | Resprouter | | Seed | | | 1 | Indefinite | Flowers open on hot, sunny, humid days. Self compatable. | Benson & McDougall (2005). |
| *Themeda triandra* | Resprouter | Primary dormancy usually breaks slowly with storage up to 12 m ormore. To break dormancy, seeds need cold 4C for at least 1 month. Total germination 100 days. | Fruit (dry indihiscent 1 seeded) | Dispersal by adhesion, also by gravity. Coloniser of bare clay banks & slopes. | 1 | 1 | Indefinite | Non-clonal decreaser. Soil seedbank. Survives 100% scorch - root suckers. Flowers in response to rain & temperature. Flowers c. 12 after high intensity fire. | Benson & McDougall (1994), Rowley & Brooker (1987), Lunt (1990), NPFR, Benson & McDougall (2005). |
| *Thysanotus tuberosus* | Variable | | | | | | | Obligate seeder (E?). Facultative resprouter (I, WO). Obligate resprouter (W, P). Common in areas burnt severly 2 years ago. | Bradfield (1981), Fox (1974), Benwell (1998), NPFR. |
| *Toona ciliata* | Obligate Seeder | | | | 8-Dec | | | Fire sensitive | Conroy (1996), Williams (1998). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Trachymene incisa* | Resprouter | | | | 1 | | | | Williams (1998). |
| *Trachymene sp. nov.* | Respouter | | | | | | | Swollen stems usually protected between rocks: pers obs | |
| *Tricoryne elatior* | Resprouter | fresh seed : 0% germination. 76% initial viability. | | | | | | Facultative resprouter. Veg. regrowth. Survives 100% scorch - basal sprouts. soil stored seed. | Lunt (1991), Clancy (1981), Roche et al. (1997), Benwell (1998), NPFR, Williams (1998). |
| *Trifolium campestre* | Obligate Seeder | | | | 1 | | <1 | | Lunt (1990). |
| *Trifolium repens* | Obligate Seeder | Usually germinates in autumn. | | No particular morphology for dispersal. Dispersed in mud on cars, & by wind, animals & humans. | | | | | |
| *Tripogon loliiformis* | Obligate Seeder | | | | | | | | |
| *Trochocarpa laurina* | Resprouter | Needs long period of dormancy | | | | | | From base after high intensity fire, from stem and branches after low intensity fire | Floyd (1989), Benson & McDougall (1995). |
| *Urtica incisa* | Resprouter | | | | | | | Prolific after fire, eg. Tasmania. | Gill (1981), Melick & Aston (1991). |
| *Utricularia dichotoma* | Resprouter | Recruitment mainly after fire. | | | | | | Facultative resprouter. 100% scorch kills (BW) - soil stored seed. Carnivorous herb. | Benson & McDougall (1997), NPFR. |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| *Velleia paradoxa* | Resprouter | | | | | | | Veg. regeneration. | Lunt (1990). |
| *Verbascum thapsus* | Obligate Seeder | | | | 2 | | | | Williams (1998). |
| *Verbena bonariensis* | Obligate Seeder | | | | 1 | | | | Williams (1998). |
| *Veronica calycina* | Resprouter | | | | | | | | Williams (1998). |
| *Viola betonicifolia* | Resprouter | | | | 1 | | | | Williams (1998). |
| *Viola hederacea* | Variable | Reproduction sexual and vegetative, reproducing by seed propagation in the first year. | | Seeds dispersed by expulsion. Vegetative dispersal by landslip. | | | <5 | Facultative resprouter from rhizomes. Obligate seeder. 100% scorch kills - soil stored seed. | Hamilton et al. (1991), Bradfield (1981), Jarrett & Petrie (1929), NPFR, Clarke (1989). |
| *Vulpia bromoides* | Obligate Seeder | | Fruit (dry indihiscent 1 seeded) | Adhesive for dispersal. In mud on cars. | 1 | <1 | <1 | Increased 100-fold after an autumn fire. Significantly different mean number of plants between burnt & unburnt areas. Flowering within 10 m after high intensity fire. | Lunt (1990), Benson & McDougall (2005). |
| *Wahlenbergia ceracea* | | | | Diaspore: seed. | | | | | |
| *Wahlenbergia communis* | Obligate Seeder | Soil-stored seedbank. Coloniser. | | Diaspore: seed. Wind-dispersed. No particular dispersal morphology. | 3-6m | | | Killed, flowers within 15 wks, flower and fruit 10 months high intensity fire | Benson & McDougall (1995), NPFR, Fox (1988), Benson & McDougall (1995). |
| *Wahlenbergia gracilis* | Variable | | | Seeds dispersed by expulsion. | < 1yr | | | Probably killed by high intensity fire, flowering within 4 m and fruiting | Benson & McDougall (1995), NPFR, Clarke (1989). |

| Species | Response | Germination | Diaspore | Disp. & Estab. | Longev. | 1 Juv | 2 Juv | Notes | Refs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | within 6 m of fire. Regenerates after crown fire & partial burn by resprouting above ground. | |
| *Wahlenbergia graniticola* | Obligate Seeder | Vigorous to regular fire | | | < 1yr | | | Will respond to regular burning | Benson & McDougall (1995). |
| *Wahlenbergia luteola* | Obligate Seeder | | | Diaspore: seed, mobile. | | | | | |
| *Wahlenbergia stricta* | Obligate Seeder | | | | 1 | | | | Williams (1998). |
| *Wurmbea biglandulosa* | Resprouter | | | | | | | | |
| *Wurmbea dioica* | Resprouter | | | | | | | Regenerative strategy uncertain. Perennial. Flowered during spring/summer 9m after intense autumn fire. | Lunt (1990). |
| *Xanthorrhoea acaulis* | Resprouter | | | | | | | | Williams (1998). |
| *Xanthorrhoea glauca* | Resprouter | | | | | | | | |
| *Xanthorrhoea johnsonii* | Resprouter | | | | | | | | Williams (1998), Benson & McDougall (2005). |
| *Xanthorrhoea macronema* | Resprouter | | | | | | | Flowers abundantly only after fire. | Gill (1981), Benson & McDougall (2005). |
| *Xanthosia pilosa* | Variable | | | | | | | Different forms will either resprout or are killed outright | Benson & McDougall (1993). |
| *Xerochrysum* | Obligate Seeder | Disturbance related, fire or | Fruit | Wind-dispersed. | 1 | | | Probably killed. | Benson & McDougall |

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|---|---|---|---|---|---|---|---|---|---|
| *bracteatum* | | other | | | | | | | (1994), Williams (1998). |
| **Species** | **Response** | **Germination** | **Diaspore** | **Disp. & Estab.** | **Longev.** | **1 Juv** | **2 Juv** | **Notes** | **Refs** |
| *Xyris complanata* | Resprouter | | Seed | | | 1 | Indefinite | Flowers usually remain open from 10 am till 4 pm. | |
| *Xyris gracilis* | Resprouter | | Seed | | | 1 | Indefinite | | |
| *Xyris operculata* | Resprouter | | Seed | | | 1 | Indefinite | Recruitment mainly after fire. | Benson & McDougall (2005). |
| *Zieria cytisoides* | Obligate Seeder | | Seed | Seed dispersed ballistically from dehiscent segmented fruit. | | | | | |
| *Zieria fraseri* | Obligate Seeder | | Seed | Seed dispersed ballistically from dehiscent segmented fruit. | | | | | Benson & McDougall (2001). |
| *Zieria smithii* | Obligate Seeder | | Seed | Seed dispersed ballistically from dehiscent segmented fruit. Also myrmecochorous. | | | | Obligate seeder after hot fire. | Fox & Fox (1986), Benson & McDougall (2001). |

### 3.8.2 Autecological observations of *Muehlenbeckia costata*

*Muehlenbeckia costata* populations were only found on granitic outcrops burnt in the 1994 fires at altitudes above 1100 m. Populations occurred within Bald Rock and Girraween National Parks (BR). Prior to these fires no individuals had ever been recorded in Bald Rock National Park. Adjacent unburnt patches on the same outcrops had no germination of this species. In addition, this species was only found on the largest of the rocky outcrops within any region, and these outcrops were mostly over 10 ha in area. When *M. costata* was found on smaller outcrops, these were satellite outcrops in close proximity to the larger outcrops bearing populations. In no instance has a single germination ever been seen in localities off outcrops.

In early February 1995, only four months after the passage of wildfire, individuals of *M. costata* had already spread 2 m in all directions from the central root and were flowering. Flowering was noted in all individuals and fruiting in all female plants on all occasions, including during all monthly visits to populations within Bald Rock National Park, and it is assumed that flowering and fruiting are continuous from about three months after germination until senescence. Individuals of this species were found to extend up to 5 m from the central rootstock in any direction and clamber up the stems of nearby plants to a height of 4 m. A single plant is able to dominate an area 10 m in diameter and 4 m vertically when mature.

By June of 1996, most plants in all localities had senesced, almost two years after original germination. Individuals that had not died were present only as small *c.* 20 cm long shoots, resprouting at the central taproot. Persistent plants were still flowering, but a heavy infestation of a rust fungus was noted on all plants immediately prior to, and during, the senescence of plants.

### 3.8.3 Seed germination of *Muehlenbeckia costata*

Viability tests indicated that 63% of *Muehlenbeckia costata* were viable. A total of 34 seeds (6%) of *M. costata* germinated. Due to the low number of germinations the results of treatments were pooled into two treatments ‘smoked’ and ‘non-smoked’. Twenty-nine seeds germinated after being treated with smoke (17 after scarification and heating to 80°C) with only five seeds germinating without smoke treatment all of which were also unscarified and not heat treated. However, the null hypothesis that germinations were not different could not be rejected as the differences were found to be insignificant ($P = 0.072$; *t* test). Plants growing from those seeds that germinated flowered within 3 months after radicle appearance (plants 5 cm in length) and continued to flower until senescence at around 18 months.

### 3.8.4 Multivariate analyses on species composition

The floristic species composition of outcrops before and after treatment and on previously unburned, cleared and reburned plots is significantly different from that of any of the forest plots. The first division on the dendrogram is between forest plots and outcrop plots. This is then followed by a less distinct separation between the two experiments conducted on outcrops. Temporal plots from each site and treatment clustered together within the analyses.

The ordination analysis and scatter plot clearly show the forest sites distinctly allied to each other and separated from the outcrop sites. Although there is evidence to suggest that the two experiments conducted on outcrops were separated in the ordination, this is less distinct. Some widely separated sites (outliers) within the scatter plot are evident and all are from the reburned fire trials on outcrops indicating that this experiment led to some major changes in floristic composition and abundance over the period of the trial. The results of the ordination corroborate those of the dendrogram indicating that the results are robust.

Overall, Monte Carlo significance testing (999 iterations) of the first canonical axis and the overall test on trace are highly significant ($P<0.001$) for all three CCA’s. The first canonical axis accounts for 77.9%, 64.7% and 55.6% for Experiment 1, Experiment 2 and Experiment 3 respectively. Site locality was the strongest explanatory component of species composition and cover, along with two treatments of more minor explanatory power in each of the CCA’s conducted on the three experiments (Figure 9.9). The correlation of site locality and composition is more clearly discernible in Experiment 2 than Experiment 1 and more effective in outcrop sites in general than forest sites (i.e. as indicated by the clumping of sites along the locality vectors).

The treatments of ‘control’ and ‘burning’ were significantly correlated with the CCA ordination of Experiment 1. The treatments of ‘clearing’ and time-since-fire (TimeFire) were insignificant in this analysis. The ‘burning’ treatment was more effective within plots on Outcrop 2. ‘Control’ plots were more distinct from cleared or burnt plots within Outcrop 3.

In addition to site locality, the ‘control’ treatment and the recorded time-since-fire (TimeFire) were significant in explaining ordination position, however the ‘burning’ treatment was insignificant. Both ‘control’ and time-since-fire (TimeFire) were more positively correlated with Site 3.

The CCA ordination of the forest plots indicates that the treatment of ‘burning’ and, less significantly, time-since-fire (TimeFire) were important in site distribution. Unlike the outcrop plots however, the ‘control’ treatment was insignificant in analyses of forest plots.

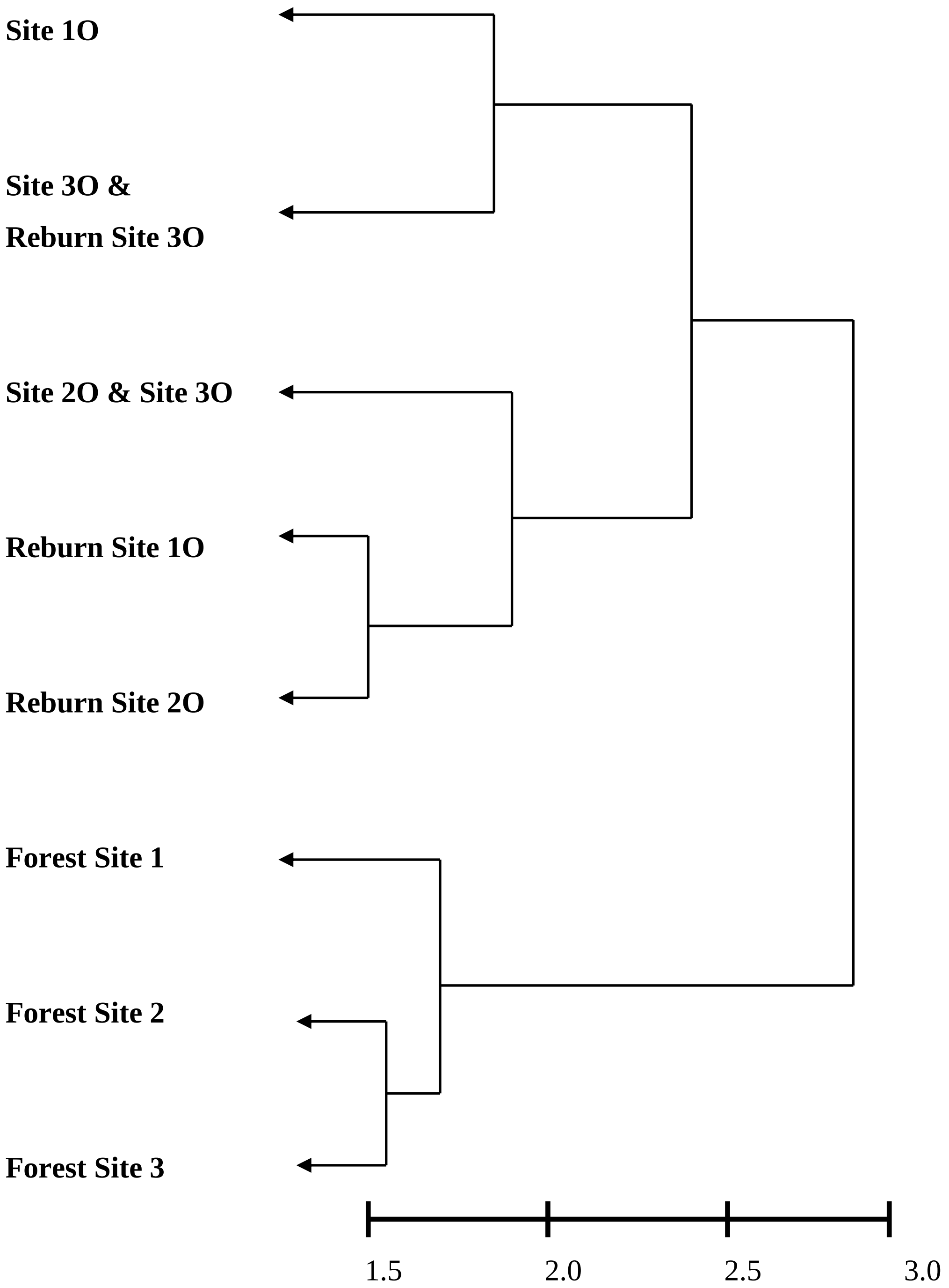



**Figure 79:** Summary dendrogram of eight floristic groups based on Kulczynski association and flexible UPGMA fusion classification of all temporal fire experimental plots (402 in total). The full dendrogram is given in Appendix G.

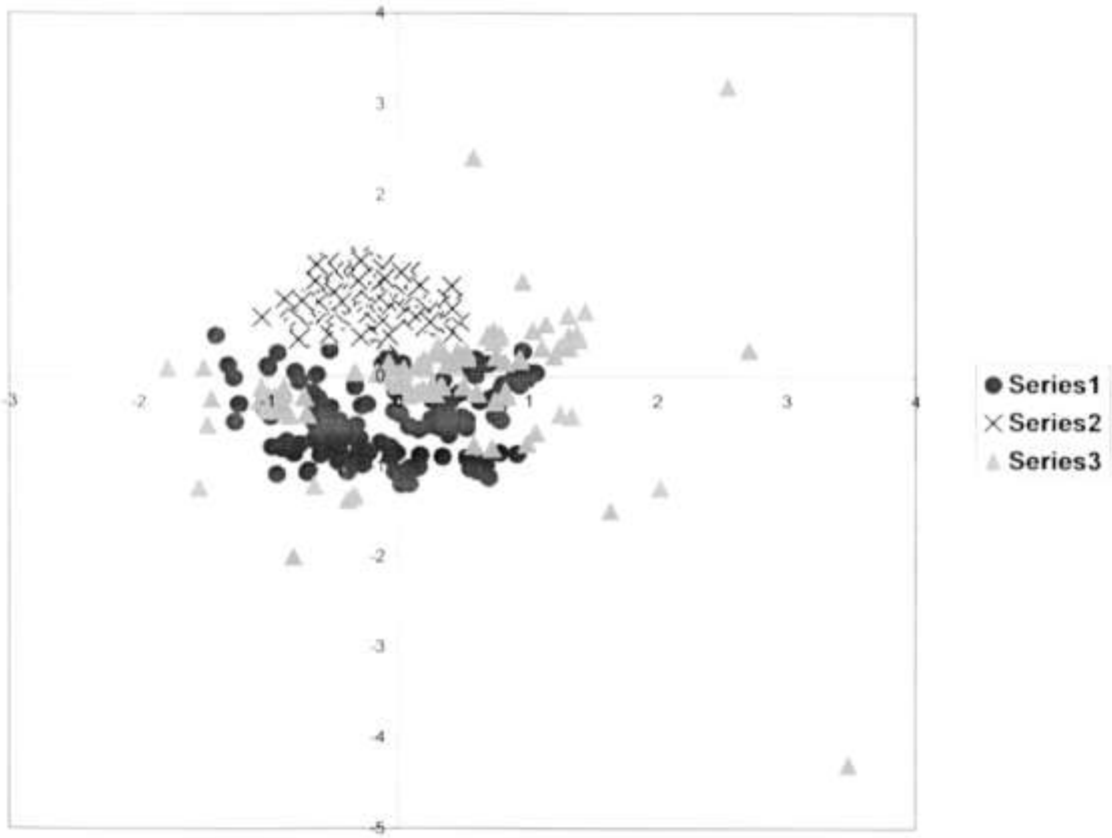



**Figure 80:** Ordination scatter plot of all temporal plots (402) based on full floristics and analysis by Flexible UPGMA association measure and Semi-Strong-Hybrid Multi-dimensional Scaling. Series 1 = burned outcrop plots; series 2 = burned forest plots; series 3 = reburned outcrop plots.

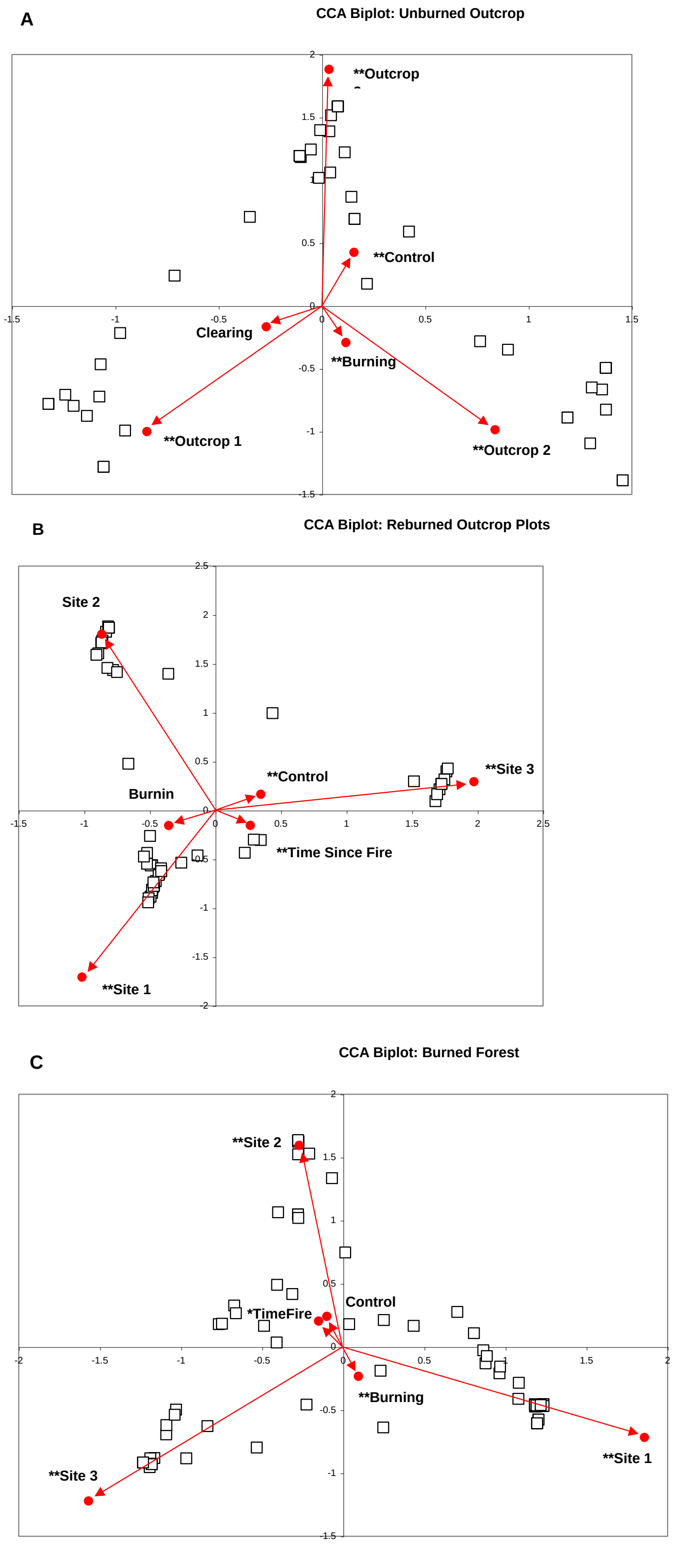



**Figure 81:** Biplots of CCA results of the significant variables chosen by forward selection and Monte Carlo significance testing against sites (squares). Significance of variables based on Monte Carlo simulations are; **P<0.001, *P<0.01, no * variable insignificant. A) unburned outcrop plots. B) reburned outcrop plots. C) burned forest plots. The length of the lines indicates the strength of the relationships.

### 3.8.5 Univariate analyses on richness and diversity

ANOVA analyses performed on species richness and diversity before and at the end of the experimental trials (Po – Px) were insignificant and are therefore not presented. Species richness declines across most replicates in all experiments initially after burning. The initial drop in species richness is most marked in Experiments 1 and 2 (outcrop plots) and in particular in Experiment 2 (outcrops previously burned the year before). The difference between the initial and end species richness in burning treatments is mixed and non-significant, however in most treatments richness returns to a level comparable to pre-treatments. Species diversity as measured by Simpson's *D* in most instances does not return to the pre-burning treatment diversity in Experiments 1 and 2 (outcrop plots) but appears to be more variable in Experiment 3 (forest plots). Species accumulation occurs in most plots over time after burning. This is most pronounced in Experiment 3 (forest plots).

Clearing as a treatment only occurred in Experiment 1. Although non-significant, most plots decreased in richness by a small amount over the period of the trial. A sudden initial decrease in richness after treatment was not as apparent as in the burning trial. Although species richness overall decreased in most plots, some species accumulation still occurred over time. Species diversity changed throughout the period of the experiment in this treatment.

The species richness of control treatments changed over time in most plots. This was less pronounced in Experiment 1 but more so in Experiment 2 and clearly so in Experiment 3. In Experiment 1, species diversity is highly variable over time, in contrast to species richness. Variability in species diversity although less pronounced also occurs in Experiments 2 and 3. Species accumulation increased in most control treatment plots over time, however this was less pronounced in Experiment 1, where at least half of the plots had no increase in species numbers.

### 3.8.6 Regeneration strategies between habitats

Species have two major responses to fires, namely obligate resprouting or obligate seeding (Gill & Bradstock 1992). Resprouting species are believed to be more commonly associated with fire prone environments and obligate seeders with environments with a low fire frequency (Gill & Bradstock 1992). The responses of species to fire in terms of these two responses were collected via anecdotal observations and during the fire trials. This information is held in an unpublished interactive identification database (DELTA) (Dallwitz 1980; Dallwitz *et al.* 1993) of granitic occurring species created by the author. There is a substantially greater percentage of obligate seeders in the flora of granitic outcrops as compared to the flora that surrounds outcrops.

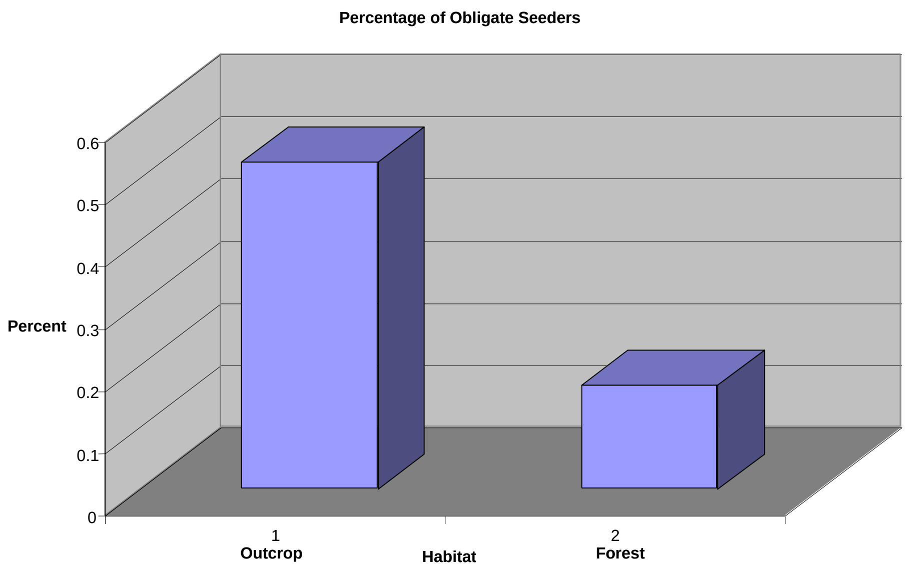



**Figure 82:** Overall percentage of obligate seeders represented in the outcrop and forest floras sampled during the fire trials at Bald Rock National Park.

# Discussion

### *4.1 Floristic and environmental relations*

A total of 898 taxa (*c.* 17% of the state flora) were found within the reserve. This is of great significance as there is only one rock type that describes both parks. Additionally, apart from the current survey of Gibraltar Range and Washpool National Parks, all other surveys with greater species recovery are surveys of entire management areas. The current number of taxa could be increased significantly in the second stage of the survey. Site richness was comparatively high with most sites considered species rich. Most 0.1 ha plots had 50 and 60 taxa. A number of sites had a richness of over 70 taxa. This is in contrast to the results of Clarke (1998) who surveyed 0.1 ha sites within Boonoo Boonoo National Park yet only recovered an average of 38 species per plot. The differences are probably due to the lack of experience of the team members who were all undergraduate students. The richness found during this current investigation is similar to the results of Clarke *et al.* (1998) for the Torrington region and Hunter (1999) for forests along the eastern escarpment. However it is above the richness of similar communities surveyed by Binns (1994) in nearby areas, Hunter (1998) in the Washpool National Park Western Additions and much higher that found by Hunter and Alexander (1999) for Guy Fawkes River National Park. These differences may in fact be rock type mediated. As both Torrington and Bald Rock and Boonoo Boonoo are wholly granite areas but the other regions are predominantly metasediments and acid volcanics. Region wide analysis could clear this matter.

The significant environmental correlations highlight many of the general trends that occur throughout the north east. The strongest factor is a moisture or drainage gradient that affects the overall floristics. This is one of the most noticeable affects along the eastern escarpment and is often colinear with Altitude. Other significant environmental factors included slope, soil depth and protection as indicated by protection from higher lands. Clearing was also an important factor effecting the association of species in some assemblages.

Analyses of evenness has highlighted that the disjunct communities, in particular Community 3-5 have a high to almost perfect evenness score indicating that no species dominate these assemblages. This suggests that each occurrence is likely to have different dominants. The more widespread communities are also dominated by species that are common to all parts as indicated by the lower evenness scores. This same pattern was shown in similar communities within the Guy Fawkes River National Park by Hunter and Alexander (1999).

### 4.2 Comparison with previous work

A very large number of floristic surveys and predictive analyses have been performed for communities within the north east and on areas covered by the current reserve boundaries. Some of the more recent full floristic surveys and analyses are very comparable to the results presented here. Communities predicted by forest type, aerial photography interpretation and predictive analyses are less comparable to what was actually found within the reserve. In particular these models and API investigations have neglected to recognise specialised and highly disjunct communities that are the most significant communities in terms of rare taxa and overall floristic conservation significance.

Clarke (1998) undertook an investigation to sample a broad range of sites that were representative of the southern section of Boonoo Boonoo National Park and to produce a classification of the vegetation based on numerical analysis. Despite the intent, the classification presented by Clarke (1998) lacks a true local and regional context that makes the communities unrealistic in terms of those described here. Five vegetation types are described, one of which was subjectively defined. Many of the specialised communities, as with many large scale investigations were ignored, such as the riparian habitat and outcrops. Two of the communities were stated as occurring predominantly below 1000 m, yet only a few hectares below 1000 m exist within the southern section of Boonoo Boonoo. Overall the investigation is of little comparative use due to its limited size and limited area of study; but does supply some useful records and distributional information.

Gilmour (1993) sampled and described the closed forest community below the Boonoo Boonoo Falls and placed this community in context of other closed forest remnants in the Clarence Valley. The community as described by Gilmour (1993) is completely compatible with the results obtained during this investigation. The community as found within the reserve however does not fit clearly into Floyds (1990) rainforest communities of New South Wales. Broadly though it has affinities with dry closed forests and is therefore broadly similar to other communities described for deep gorge country along the escarpment. A similar pattern of highly unique species associations that do not conform to published types was found within the gorge country of Guy Fawkes River National Park by Hunter and Alexander (1999).

Forest typing has occurred a number of times within both reserves but the most recent of which is that completed for NRAC (1996). However due the emphasis on a few dominant trees this method of classification usually poorly corresponds within communities defined by numerical analysis. Fourteen communities were mapped for Bald Rock and Boonoo Boonoo National Parks. Broadly all of these could be considered to occur within the two reserves however, their distribution does not match the map produced for this report. As with broad scale mapping in general small and highly significant communities not dominated by trees are completely ignored and in areas where this may occur over larger areas the regions are generally classed as untyped.

Forest type 152 dominated by *E. obliqua* and *E. brunnea* was considered a priority for reservation within the region and was surveyed for by Richards (1996). This forest type was found within Community 9 and is worthy of comment here, particularly since it was not recognised to occur in the mapping carried out by NRAC in 1998. Richards (1996) describe this forest type as occurring in high rainfall, elevated and cool situations with moist soils. Richards (1996) did not find this forest type in areas predicted and considered the area of this community reserved was an overestimate. However, Hunter (1998) found this forest type within a large proportion of the Washpool National Park Western Additions and Hunter & Alexander (1999) has also found it within Guy Fawkes River National Park. Based on this it is likely that this forest type is more widespread and that the reservation status of this forest type has increased considerably

## *4.3 Fire*

Fire is a natural component of many communities within Australia, particularly for the south east. A lot of research has been conducted over recent years into the effects of fire regimes (in terms of frequency, intensity and seasonality) on individual species and communities as a whole. Most of this research has centred on temperate communities such as coastal forests and heaths, tablelands and alpine areas. This research is often habitat and site specific and the usefulness of the findings to other areas, even somewhat synonymous ones, is debatable. Table 5 shows the responses of many of the Bald Rock and Boonoo Boonoo National Parks species to the effects of fire. Several of these recorded responses are anecdotal and/or contradictory. The contradictory nature of these observations may be based on miss-classification of functional type, the taxa in question being a complex of yet undefined entities or as some recent research suggests plant age (Hansen *et al.* 1991), seed age and dormancy requirements (Roche *et al.* 1997: Hunter *et al.* 1998) and local population differences (Benwell 1998; Hunter 1999). Such differences may exist in nearby or the same sites. The application of fire regimes at the community level based on the culmination of the responses of individual taxa, is of debatable use. However, from the literature and the responses of individual taxa broad general statements can be formulated for many communities. These suggestions should then be modified to suite the local variation in responses, as data that is more specific becomes available. This can only be achieved by constant monitoring.

### 4.3.1 Closed forest and fire

Community 5 is a closed forest community and Community 6 has many closed forest affinities in its representative taxa and both are refugial in nature. They are at present confined to creeks in protected gullies. Even with both combined the total area is only few hectares. Fire frequency on the surrounding gorge woodlands has probably limiting the expansion of these communities into the surrounding areas. There is at present some room for expansion of closed forest territory and if this is an objective then fire frequencies will need to be lowered around these communities in order to promote expansion. Fires should be excluded from closed forest communities indefinitely and from around their margins as much as possible.

### 4.3.2 Fire and granite outcrops

Both cluster analysis and ordination of the 402 temporal fire plots show the flora within outcrop plots is distinct from those of the surrounding forests. This difference is found even after burning and clearing treatments. The distinctiveness of the flora in Experiment 3 from forest plots was evident even with fires occurring in two consecutive years (one natural and one experimental). However, published evidence suggests that under a continuous frequent burning regime the flora of outcrops may lose their distinctiveness. For example, Binns (1992) found that a high frequency of fire on granitic outcrops, in the same region, caused heaths that were dominated by outcrop endemic taxa to be reduced to grasslands and herbfields dominated by ubiquitous species such as *Lomandra longifolia* and *Imperata cylindrica*. Hunter *et al.* (1999) has made similar anecdotal observations at Demon.

Of particular note in the dendrogram and scatter plot, is the groupings of temporal plots in analyses, despite the treatments imposed. This result is complemented in the CCA biplots that show site locality as the most significant and strongest explanatory variable. It can be concluded that, regardless of treatment, initial floristic composition is the most important factor in structuring the composition after the imposition of each treatment. In addition, as site was the most important factor in each analysis, and plots from each site largely grouped together, the surrounding species pool is also of considerable importance. Responses to the treatments imposed were individualistic and based on the surrounding species pool available at each site (outcrop or forest area) and the initial composition of each plot. Similar results have been obtained in many Australian systems and illustrate the 'initial floristic composition' model (Engler 1954), where the initial species composition after a disturbance determines the subsequent composition (Purdie 1977; Noble & Slatyer 1981; Clark 1988; Williams & Gill 1995). This is a surprising result as all sites are within relatively close proximity, being within only a few kilometres of each other and subsequently within the same Element and community.

The individual treatments (burning, clearing, control and time-since-fire) varied in the strength and significance of their effects at different localities. This indicates an individualistic response to the treatments at each site that is due to initial species composition, thus reinforcing the above observations. Formulating strategies or responses of communities with unsurveyed floristic composition are almost impossible, regardless of their overall affinities or structure. On the other hand if initial species composition is known and sufficient information exists on species responses to treatments (such information does not exist at present), reliable predictions may occur.

In Experiment 1 treatment of clearing had no significant effect, with control and burning being significant. This may be due to mixed responses of species to being severely pruned with some dying and others recovering by resprouting. Comparatively little overall change occurred in the composition of the control plots making them significantly different from the other treatments. Time-since-fire (TimeFire) was insignificant in Experiment 1 probably due to the overriding effects of the treatment burn. Control and time-since-fire were significant treatments in Experiment 2 with the burning treatment being insignificant. This is probably due to sites being burned only one year previously and therefore, reburning sites had little effect except in reinforcing the overall changes due to the initial fire. The scatter of plots in the CCA biplot of Experiment 3 (forest plots) is greater and less clumped than in the Experiment 1 or 2, indicating that although initial site composition is of overriding importance, it is comparatively less important than in the outcrop plots (Experiment 1 & 2). The scatter of plots may have been affected by the overall greater effect of fire on forest plots as indicated by both time-since-fire (TimeFire) and burning both being significant in analyses.

No significant results were obtained among analyses of the difference between the initial and subsequent species richness and diversity. Therefore the null hypothesis of no difference in germination responses could not be rejected. The differences tested were insignificant due to the highly individualistic and stochastic responses of the plots to each treatment. Although control plots were less stochastic overall, changes occurred with no consistency between replicate plots in their responses. Within Experiment 1 species accumulation was low over time indicating little species replacement after treatment and over time. The control plots in Experiment 1 had at least half of the plots with no species replacement at all and yet the species diversity changed in all, indicating little change in composition and also richness, but many changes in dominance. Grubb (1986) found this to be commonplace in communities and termed such changes in abundances 'drifting clouds of abundance'. Conversely, the control plots of both Experiment 2 and 3 showed changes both in species richness over time and in species replacement in almost all plots, with dominance changing in all (measured by species diversity).

It is likely that the small size of the experiment reduced the likelihood of a significant result (Bellehumeur *et al.* 1997). Regardless, it is of note that no consistency was found in any of the treatments over time, with even control plots showing changes in species number, abundance and composition over time, albeit inconsistently. Such results reinforce those found for multivariate analyses in indicating the highly individualistic changes and responses of plots over time. This is likely to be due to the highly stochastic composition and dominance of species at individual sites. Even though there was no consistent increase or decrease in richness and diversity over time between or within treatments, species richness and diversity was maintained consistently close to the pre-treatment level. This indicates that some inherent structure exists at each site for a predetermined level of richness and diversity. This may once again be due to the interaction of species present that are largely the same before and after treatments (initial floristic composition model).

It is apparent that there is a great inherent variability in responses that are based on initial composition and individual site characteristics. Such inherent variability has been found consistently in studies of granitic outcrops and their component floras at all levels. Such responses would enable the maintenance of a high level of biodiversity and richness on a habitat (beta diversity) and landscape (gamma diversity) scale. Richness and diversity however, would be limited on the local scale (alpha diversity) by initial composition and the available species pool.

The results presented here are in marked contrast to a number of anecdotal observations made by other researchers (Binns 1992; Hunter *et al.* 1999) and those presented here that indicate marked changes in composition. Such inconsistencies may not be contradictory. The small scale and size of experimental plots, there placement and the intensity and temperature of the fires may easily account for such differences. Bradstock and Auld (1995) have shown that low-intensity fires may be detrimental, as the heat may be insufficient to stimulate the germination of buried and dormant seeds. Even after the very large 1994 fires discussed here, a number of vegetation patches did not change dramatically in their composition even when they occurred on the same outcrop as patches that did.

Autecological observations, both qualitative and experimental, provide sufficient evidence that a fire-ephemeral flora exists on granitic outcrops within Bald Rock National Park, at least in some localities. Similar findings have occurred within the outcrop flora of Western Australia where it is believed that up to 30% of species only appear after fire (Stephen Hopper, *pers. comm.*, Nov 1998). Fire-ephemeral species have been noted in many communities and occur across a range of plant families (Gill 1993). The appearance of herbaceous fire-ephemeral species has been noted around the world (Thanos & Rundel 1995) and in other heath and shrubland communities within Australia (Gill & Groves 1981; Gill 1993). Certain lifeform traits are thought to be associated with fire-ephemeral taxa which have evolved in fire prone environments: I) germination stimulated by the passage of fire, II) individual plants have a short life span, III) a large biomass produced in a short period of time, IV) flowering occurring shortly after germination, and V) non-persistent populations in the absence of fire. Many of the taxa found on granitic outcrops after fire possess such characteristics (Section 9.3.1).

*Muehlenbeckia costata* may be considered a fire-ephemeral species. A single plant may dominate an area of 10 m in diameter and 5 m in height in as little as 1 year. The population size as given by Hunter *et al.* (1998) changed from zero to 1200 to zero individuals in a matter of three years within Bald Rock and Girraween National Park. A large number of seeds are produced over the life span of *M. costata*. A single plant may yield many hundreds of nuts at any one time, and production is continuous throughout the one to three year life of the plant. Much of the seed is viable. If such a large seed 'rain' is normal for this species, a limiting factor of population size must be the local dispersal distance. If dispersal was efficient, a larger number of burnt outcrops, including many of the smaller outcrops, should have had populations of this species and populations would be able to re-invade areas where it has become locally extinct. This was not the case. Such localised dispersal is typical of species in poorly connected systems (Gaston & Lawton 1990; Green 1994; Dieckmann *et al*. 1999). *Muehlenbeckia costata* has adaptations that allow the diaspore to be dispersed by vertebrates (fleshy, sweet, coloured expanded calyx), but which also allow it to withstand high temperatures associated with fires (thick, hard-walled nut). Germination was observed to occur after heat treatment of 120°C for ten minutes providing evidence that the nut can survived high temperatures associated with fires.

It may be expected that fire promoted taxa would occur in areas with a frequent occurrence of fire. However, granitic outcrops, especially if large, have been considered refuge areas for taxa that are not fire adapted (Gillham 1961; Ashton & Webb 1977; Craven & Jones 1991; Erickson *et al.* 1991; Fuls *et al*. 1992; Binns 1995a; Groger & Barthlott 1996; Beard 1997; Hopper *et al.* 1997; Heinze *et al.* 1998; Hunter 1998a; Lawler *et al.* 1998; Hopper 1999). Fire occurs much less frequently on granitic outcrops than in the surrounding areas. Even in the 1994 fires which burnt 90% of Girraween National Park, up to half of the outcrop vegetation patches were unaffected, including many small outcrops of about 1 ha in size (*pers. obs.*). Many of the vegetation patches on the New England Batholith are of a substantial age, and humus development is considerable. Some of the larger outcrops are refugial areas for rainforest taxa such as *Quintinia sieberi, Rapanea* spp., *Notelaea* spp., *Tasmannia glaucophylla* and *Trochocarpa laurina* (at South Bald Rock). Ashton and Webb (1977), working in south-eastern Australia, considered the intervals between fires on granitic outcrops, within a matrix of fire prone vegetation, would still be in the order of several centuries. Erickson *et al.* (1991) considered that inter-fire intervals on outcrops in the fire prone Western Australian south west were also very large as evidenced by the very thick trunks and relative size of shrubs. The floras of outcrops have a higher proportion of obligate seeders than many other temperate Australian communities (Gillham 1961; Ashton & Webb 1977; Craven & Jones 1991; Erickson *et al.* 1991; Fuls *et al*. 1992; Binns 1995a; Gr★ger & Barthlott 1996; Beard 1997;

Hopper *et al.* 1997; Heinze *et al.* 1998; Hunter 1998a; Lawler *et al.* 1998; Hopper 1999) implying a low fire frequency (Figure 9.14).

Such observations suggest that fires are indeed much less frequent on outcrops and that even within fire prone environments they are likely to have fire intervals many times greater than the surrounding forested or woodland vegetation and in fact the surrounding vegetation may act as a buffer displacing the worst effects of fire. At the base of most large granitic outcrops is a circle of mesic vegetation that is supported by the almost double precipitation derived from the runoff of rain from the outcrops. These more mesic forests may in fact act as a small buffer surrounding each outcrop preventing all but the more intense fires from being carried onto the larger outcrops. Outcrops are unlikely to evolve a fire promoted flora. Only the most intense fires are likely to affect areas on the larger outcrops where many of the fire promoted taxa occur. It is therefore paradoxical that fire promoted taxa are not only restricted to granitic outcrops but are in many cases restricted to only the largest outcrops.

Species are not independent entities and commonly share adaptations through a common ancestry. It is, therefore, important to examine the phylogenetic distribution of traits (Harvey & Pagel 1991). Brandbyge (1992) for instance states that species of *Muehlenbeckia* are ‘weedy’, rapidly build up a large biomass, and are characteristically found in open, rocky, sun exposed habitats. Mallinson *et al.* (1998) has also found that often post disturbance recruitment with a long dormancy of propagules in the soil seed bank are common in *Muehlenbeckia* from various habitats. It appears therefore, that the ecology of many species of *Muehlenbeckia*, apart from the apparent fire promotion, shares the life form traits listed here as fire-ephemeral characteristics. These traits are probable adaptations that, in general, allow *Muehlenbeckia* species to survive, and be promoted by, disturbance such as occurs on forest margins, in landslides and along road verges (Henty 1978; Wilson 1990; Brandbyge 1992). It is likely that *M. costata* is phylogenetically predisposed to growing on rocky outcrops and is promoted by disturbance. Granitic outcrop communities are potentially some of the least disturbed and fire, although relatively infrequent, is the only large disturbance apart from possibly severe drought, with any regularity.

The germination responses after fire are likely more a consequence of fire being a disturbance factor than to species evolving fire specific strategies due to a fire prone environment. Fires provide open high light conditions and extremely low competition sites with abundant free nutrients especially when they occur in communities intolerant of fire such as on granitic outcrops. The species studied here, in addition to fire-ephemeral characteristics, all share other strategies. All are primarily low growing prostrate or procumbent plants with flat well-displayed and often large leaves. Fire ephemeral species on outcrops are poor competitors that are obligately restricted to high light environments (Platt 1951; Baskin & Baskin 1988; Sampson *et al.* 1988; Ware 1991). The traits shown by these supposed fire-ephemeral species on outcrops suggest that they are competition evaders that demand extreme high light environments. The same may also be true for other plants that occur on outcrops only after disturbances other than fire (Murdy 1966).

Trials showed that despite high viability, only a few germinations occurred in germination trials, and although there was more germination in smoked treatments of the trials this was statistically insignificant. Similar poor, or no germination, results have been obtained on treatments of outcrop plant seed by Clarke and Fullon (1999). Previous studies have shown that endemics of granite outcrops require cold treatment for effective seed germination and that aging is necessary (Chapman & Jones 1971). Roche *et al.* (1997) showed that there was a great heterogeneity in germination strategies in Australian species but that some taxa positively responded to seed aging before smoke treatments. Chapman and Jones (1971) postulated that it would be deleterious for outcrop species to germinate immediately, as there will be competition from those already established and it is likely the climate will be unfavourable in such unpredictable environments. These species spread widely and dominate large areas rapidly; seeds that germinated immediately are likely to be unsuccessful. Not all *Muehlenbeckia* seed was fresh, but included a small portion of seed having been sieved from the surrounding soil. This seed bank seed alone could explain the low germination rate encountered in this trial.

Auld and Bradstock (1996) have shown in forested areas that temperatures can reach 60°C in the top 0.5 cm of soil and that this is sufficient to break the dormancy of many fire induced legumes. Such soil temperatures are frequent on outcrops even without fire (Chapter 1), yet sporadic germinations of the species discussed in the preceding sections do not occur. Twenty-six of the 29 seeds that germinated in the *M. costata* germination trial did so when treated to temperatures of over 80°C (up to 120°C).

Such anecdotal and qualitative evidence suggests that fire-induced germination of ephemeral taxa on outcrops is reliant on seeds being of sufficient age and fire temperatures being above 60°C. Implicit in this scenario is that seeds must be able to remain dormant in the seed bank for decades or even centuries and that only high temperature fires will induce germination.

The frequency of large and extensive fires such as those that occurred in 1994 is low and it is, therefore, not surprising that so few collections and sightings have been made of *Muehlenbeckia costata*. The development of management strategies for the promotion of these species is problematical. General fuel reduction burning for asset protection in the surrounding forest and woodland systems is common in and near these reserves. Such strategies are likely to decrease the likelihood of extreme fires that are needed to promote germination on the larger outcrops. Direct ignition of outcrops is labour intensive and the required combination of environmental factors for promoting these fire-ephemeral species is unknown. Certainly fires of the wrong intensity or at the wrong time of the year could be harmful (Bradstock & Auld 1995). The experimental results suggest that the responses of patches of vegetation on outcrops are highly individualistic and framed by the initial species composition and source pools both in the seed bank and as above ground extant individuals. These communities, particularly on high altitude granitic outcrops, have evolved with a frequency of fire that is much reduced compared with the surrounding vegetated matrix. Also the recorded history of the district does not shed much light on past fire frequency. Therefore, an increase in the frequency of fires on outcrops may have undesirable effects on outcrop communities, particularly as the majority of species may be fire evaders. Thus, fire management for conservation of granitic outcrop floras is problematical and will need separate consideration from fire management regimes for the region in general.

Fire is a natural component of many communities within Australia. Much research has been conducted into the effects of fire regimes (frequency, intensity and seasonality) on individual species and on communities as a whole. The research is often habitat and site specific and the usefulness of the findings to other areas (even somewhat similar ones) is debatable. Outcrop communities are generally collectively lumped with other shrubland or heath communities although this allocation is often inappropriate from a management perspective. For instance 'heaths' in general are thought to regenerate well after fire, having a high proportion of resprouting species. Russell and Parsons (1978) showed that 73% of shrub species in 'heaths' at Wilson's Promontory were able to regenerate from resprouting. These researchers showed that fire intervals of 10 years were likely to cause only minor changes in floristics and that an inter-fire periods greater than this would cause a decline in species richness. Similar results have been achieved in heaths in coastal areas of New South Wales (Cary & Morrison 1995). The granitic outcrop 'heaths' do not respond in the same way as other structurally similar communities. Even where the same taxa are shared with communities their responses may be different. Observations of species responses to fire may be site specific (Benwell 1998). Lawler *et al.* (1998) provides, evidence to suggest that there is a decreased ability of *Eucalyptus mitchelliana* to respond to fires on exposed granite sites compared with nearby stands away from rocks. This does not mean that fire should be permanently excluded from outcrops but that the inter-fire periods should be on a much longer time scale than for surrounding heathlands.

### 4.3.3 Fire and areas of impeded drainage

Only a small number of areas exist with impeded drainage and these predominantly have a sedgeland/grassland community (Community 2). Research in sedgelands conducted within Gibraltar Range National Park suggests that composition is little changed by time since fire and richness does not decrease (Williams 1995). Williams (1995) suggests that although fires as frequent as six years apart can be tolerated but 10 yrs is probably more appropriate. This will not be the case for other areas of impeded drainage. Community 1 surrounds many areas containing Community 2. Community one is likely to cope best with a variable fire regime but one in which smaller fires occur within a 10-25 year period.

The rocky granite banks of the Boonoo Boonoo River however, probably require a completely different regime from other waterlogged sites. These communities have a number of rare obligate seeders that probably are fire avoiders and have a fire regime similar to that of the granite outcrops discussed above.

### 4.3.4 Tall Open Forests and fire

The understorey of alliances described by Beadle (1981) that are similar to Tall Open Forest communities found within the reserve that are circumscribed by Community 9 and in some instances Community 7. Such assemblages are usually characterised as being mesomorphic with many closed forest taxa and a herb layer dominated by *Calochlaena dubia*. Closed forest taxa are eliminated by fire and are replaced by *Acacia irrorata* and *Allocasuarina torulosa* (Beadle 1981). If fires are repeated in close succession only an understorey of grasses dominated by *Imperata* and *Themeda* remains (Figure 90). These comments are corroborated by Binns (1991; 1995b) who observed the replacement of mesomorphic closed forest taxa with an understorey of grasses. Moore and Floyd (1994) describe the replacement series in forests such as these in the Grafton Forestry District. In the absence of fire for 20 years or more, there is a range of wet sclerophyll understorey communities with a more or less sparse shrub layer and a ground cover of *Poa* spp., *Sorghum leiocladum, Doodia aspera* and *Blechnum cartilagineum*. With an increasing frequency of fires, only a simple layer of resistant grasses and forbs (*Imperata cylindrica, Themeda triandra* and *Pteridium esculentum*) remain (Moore & Floyd 1994). Fires of low intensity have been common in the area and probably have not sufficient heat to stimulate the germination of hard seeds (Moore & Floyd 1994). It is therefore likely that many areas within the current reserves have had a fire regime of high frequency and low intensity that has decreased the diversity of understorey types and allowed all to converge to a less diverse range of ‘disclimax’ communities (Moore & Floyd 1994). This is achieved by the elimination of the once mesomorphic, and in some areas shrubby understorey, intensities of fire that do not break the dormancy of many seeds and the promotion of a less diverse fire tolerant open grassy understorey. Even within the wetter parts of the Upland Forests many open grassy areas exist, other parts have the understorey dominated by *Calochlaena dubia*, *Xanthorrhoea glauca*, and Tree Fern taxa all of which are fire resistant.

Mesomorphic taxa will limit the regeneration capacity of eucalypt species but they are removed by fire. Mixed forests are probably the norm for communities such as these therefore a fire regime that encourages the development of a mesomorphic understorey but will periodically allow regeneration of eucalypt species is appropriate. Binns (1991) describes relationships within wet sclerophyll forests and suggests a major fire event in the order of 100-300 years is probably applicable in these communities. Although the grassy understorey is in the main probably artificial, it may be important biodiversity wise to maintain some areas in this state. It is suggested (if a return to a more 'natural' state is a management goal) that fires should be excluded from these communities for a period up to 200 yrs and that some smaller areas are retained as they are for completeness.

This however is unlikely to be true for Community 10 and parts of Community 7. Community 10 is dominated in the understorey by heathy species. Such communities elsewhere require a variable fire regime that has occasional hot fires generally within an 8 to 25 year period. Community 7 in many areas may be a derived system. Its total distribution may have expanded over recent decades due to frequent fires that have removed the mesic understorey that would have expanded from Community 9 in some places but also removed the shrubby understorey that characterises Community 10. In other words it is possible that in the past Community 7 may have occupied much less area but has expanded into both Community 9 and 10 due to an increase in fire frequencies.

### 4.3.5 General comments

Fire research has often emphasized species richness as a management goal. In most situations, overall richness is achieved by maintaining communities at an intermediate stage of development by constant and moderate disturbance. However, as Gill (1977) comments, managers should consider recommending protection of older stands of vegetation from fire so that chronosequences remain. Variability and adaptability in fire regimes is the goal suggested by recent research (Bradstock *et al.* 1995; Conroy

1996; Benson 1999). It is suggested that rigorously imposed fire regimes based on blocks in the landscape is unachievable. Single wildfire events can severely disrupt imposed fire regimes. It is suggested that overall, the results of wildfires should be incorporated in an adaptive a regime that creates a variability in chronosequences (Bradstock *et al.* 1995) and that some mature systems be maintained even though richness will decline. This will require that the extent and affects of fire both natural and human induced are constantly monitored and updated. This approach should be modified in communities that are highly restricted or have known frequency thresholds, in such communities management of fire regimes will need to be more direct. The extremes of the frequency scale of fires should be based on the population extinction risk of taxa of importance rather than richness and density (i.e. diversity) (Bradstock *et al.* 1995).

It is suggested that a subset of the floristic plots placed be resurveyed periodically to assess the changes in the communities. At a minimum three plots should be chosen from each of the 11 communities defined were applicable and that these should be surveyed at least once every three years. Manipulated fire experiments would be of most benefit as an addition to the perpetually monitored sites.

**Table 5:** Suggested fire regimes for each of the 11 defined communities. The suggestions made here are only broadly applicable and much variability should occur within them but they should ultimately be constrained by the ability of the flora within each to recovery between fires i.e. primary and secondary juvenile periods.

| Community | Suggest fire regimes |
|---|---|
| **Community 1** | 10-30 year cycles in general. |
| **Community 2** | Probably similar to above but care should be taken not to increase the dominance of weedy species which may increase under some fire regimes. |
| **Community 3** | Exclude fire for the majority, but allow some to encroach into small areas. No two fires in any one area within a 15 yr period. |
| **Community 4** | Exclude fires. |
| **Community 5** | Exclude fires. |
| **Community 6** | Fire regimes within this community should be highly variable. Areas close to Community 9 should have a much reduced regime > 100 yrs. Other parts probably should have regimes from 15-100 yr cycles. |
| **Community 7** | 10-30 cycles. Usually affected by more low intensity fires |
| **Community 8** | 100-300 yr periods. |
| **Community 9** | 15-50 yr cycles with much variability and some high intensity fires. |
| **Community 10** | 100-300 yr periods. |
| **Community 11** | Exclude fires from most areas allow some irregular hot fires to incur but probably cycles of 100-300 yrs are likely with only small areas being burnt with greater regularity. |

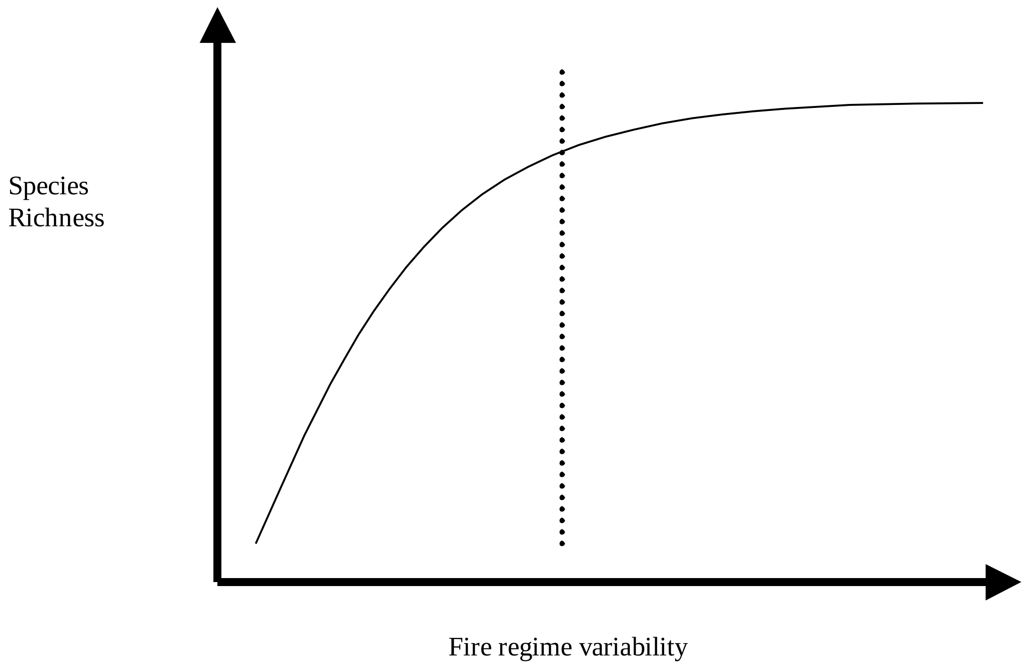



**Figure 83:** Taken from Bradstock *et al.* (1995). A variability of fire regime beyond a certain threshold is likely to maintain richness at an optimum.

## *4.4. Conservation status of taxa and communities*

### 4.4.1 Communities

Specht *et al.* (1995) discusses the reservation status of communities within New South Wales. This work is a starting point for investigations into the conservation status of Australian communities. It does, however, have a number of limitations. The analysis is based on survey sites existing at the time of compilation. The analyses incorporated in this work were necessarily of a large scale and therefore many unique assemblages are lumped together with larger more widespread associations. Furthermore, the reservation status is based on the area reserved and the number of reserves that have a vegetation type. These criteria do not take into account representativeness across the range of a community or the quality of the stands. Benson (1999) states that only 7.5% of the Northern Tablelands is represented in conservation reserves. One of the major features of the district is that it forms a major east west corridor and forms a hub from which major regional corridors extend from the Tableland to the Border Ranges (Morgan & Terrey 1999).

The significance of the communities within Bald Rock and Boonoo Boonoo National Park are variable. The Tall Open Forests and Woodlands associated with Communities 6 to 10 are very indicative of their type and synonymous types are found along most of the eastern escarpment from Barrington Tops to just over the Queensland Border. These some of these communities were until recently probably inadequately conserved, however in the last few years a number of new reserves have conserved very similar assemblages across the most of their range. The most significant feature of these assemblages is that they are probably at or near the northern limit of their distribution as circumscribed here.

Community 1 though potentially widespread across the Northern Tablelands is significant, despite much of it being disturbed in the past. Assemblages such as these have been greatly cleared and disturbed across their whole range (Benson 1999) and are usually little reserved even with the many recent service acquisitions.

Other assemblages within the two parts are very restricted, highly variable across their range, generally poorly conserved and easily disturbed, particularly by cattle or human induced drainage. Communities 2 and 3 are highly restricted with unique combinations of species. These communities are of highly significant conservation importance. In particular Community 3 has a high number of rare or threatened species that or more or less endemic to the region.

Much work regarding Community 11 has been undertaken by Hunter (1999). This work has shown that the granite outcrops of Bald Rock and Boonoo Boonoo National Parks contain the greatest level of endemism and uniqueness compared to all other outcrop systems in the whole New England (Figure !!!). This research also shows that the outcrop systems of this region are unlike those elsewhere on the tablelands but that they do share broad affinities with other outcrop systems along the eastern escarpment. Hunter (2000; 2002; 2004) has shown that due to the very high species turnover between outcrops and the highly idiosyncratic distribution of component species any outcrop no matter how small is likely to contain a comparably unique assemblage of species. Any outcrop may also contain a number of unique species that may not be found anywhere nearby. Hence the preservation of such large expanses of granite outcrops within this region is highly significant.

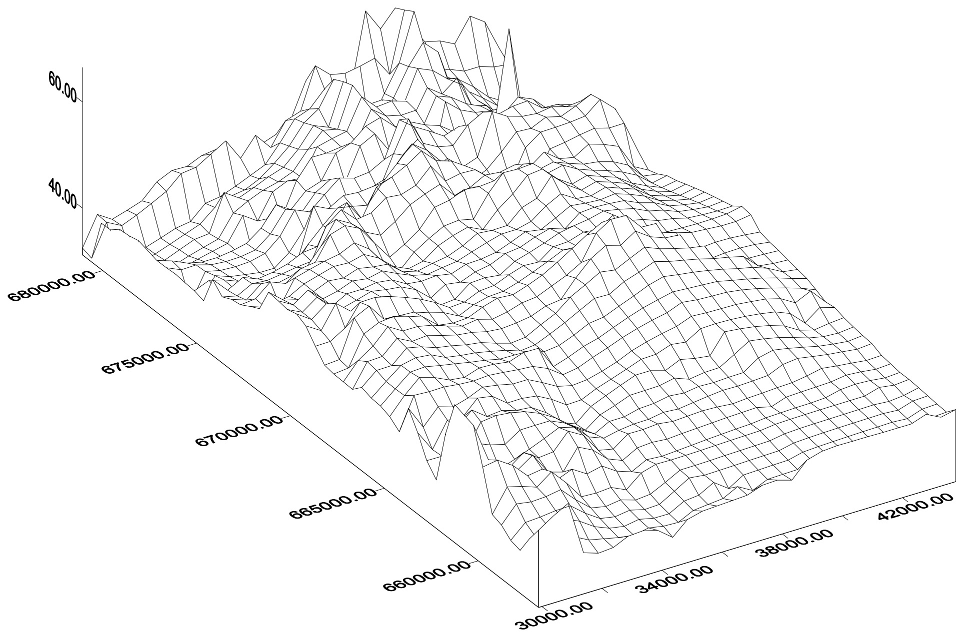



**Figure 84:** Diagram taken from Hunter (2002). The diagram is based on the insularity of outcrops from the surrounding forests. Higher the level the more different outcrops are from the surrounding vegetation. The diagram takes in the entire New England and the top right corresponds to Bald Rock and Boonoo Boonoo, indicating that the outcrops here are the most divergent from there systems and contain the greatest number of outcrop endemic species.

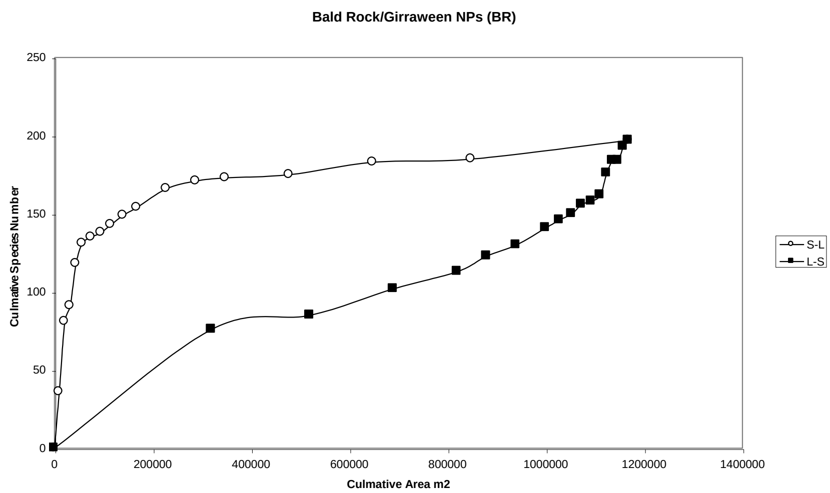



**Figure 85:** Cumulative species-area curves for the outcrops at Bald Rock. Circles = outcrops ranked smallest-to-largest. Squares = ranked largest-to-smallest. This diagram shows how a collection of smaller outcrops contain a greater number of

species than a collection of larger outcrops of the same area. Taken from Hunter (2000).

Morgan and Terrey (1999) presented a bioregional investigation of the entire New England and the results of their investigation into the Tenterfield district are given in Figure 90. Such investigations are of relevance to the broader vegetation types. Thus and other large scale investigations that have occurred in the past such as NRAC, NFBS and RACAC are limited by their concentrated efforts on forested systems. If only the more common forested systems were looked at in this investigation the results would have suggested that little was of importance in terms of reservation in these two National Parks, i.e. Communities 6-11 or not especially of great significance in themselves.

Overall it appears the more significant vegetation communities are those associated with small isolated systems as described by Communities 1, 2, 3, 4, 5, 6 and 11. These communities are easily disturbed and are hard to regenerate once disturbed. They have a higher concentration of specialised and rare species in terms of numbers and the areas they are contained in. Yet they appear to have a greater proportion of incedental disturbances. Most trials and tracks pass across or along the margins of many of these systems. Visitor usage of the river and outcrops areas and even the base of the falls is higher than that the forested areas. However the forested areas are more widespread, both locally and regionally and are far more resilient to disturbances.

In recent years a number of communities have been listed as endangered on the NSW *TSC* Act (1995), two of these are synonymous with parts of the whole of two communities described here. Parts of Community 1 may fall within the determination of *Eucalyptus nova-anglica* communities on sediments and Community 2 falls within the endangered determination of upland swamps.

### 4.4.2 Species

There are at least 27 ROTAP taxa within the two reserves. This number may yet increase within subsequent surveying. A further 51 species are considered to be regionally significant. Only 16 rare or threatened species were found within the Washpool Additions by Hunter (1998) and only eight were found within Guy Fawkes River National Park by Hunter and Alexander (1999). Most of the rare taxa found within the reserves are associated with exposed granite surfaces either in association with the larger granite outcrops or along the banks of the Boonoo Boonoo River. As such many appear to be fire avoiders. The two reserves appear to form a 'hotspot' for many restricted species and as such they are great conservation significance. Boonoo Boonoo National Park in particular has a large number of regionally rare species, many of which are at the northern distributional limit within the reserve.

### 4.4.3 Management considerations

Due to the large number of rare or threatened species a number of management options may need to be considered and these could include:

- Targeted surveys to establish the population sizes of rare species.
- Targeted searches for species not yet found, but which are likely to occur.
- Research into appropriate fire regimes.
- Following of population fluctuations in species where this may be an issue such as *Muehlenbeckia costata* and *Acacia latisepala*.
- Reduced access to parts of the Boonoo Boonoo River, or at least reducing the ease of access to many areas. In some places it may be beneficial to mark as sensitive areas, for example Morgan's Gully.
- Signposting outcrop vegetation as sensitive to trampling, possibly at the visitor area at the camping area at the base of Bald Rock.
- Regeneration of low lying cleared areas.

**PROVINCE 15: STANTHORPE PLATEAU: MAJOR ECOSYSTEMS**

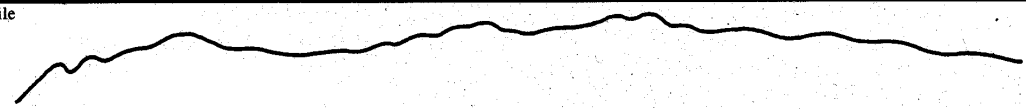
| | | | | | | |
|---|---|---|---|---|---|---|
| Distribution | Drier sites in west and southwest; 600-950m above sea level, sub-dominant. | Upland valleys, mainly west of Great Divide; 650-850m above sea level; co-dominant. | Upland hills, mainly west of Divide; 850-1100m above sea level; co-dominant. | Highest areas mainly on Divide and to east; 1000-1200m above sea level; co-dominant. | Upland valleys in southeast; 900-1000m above sea level; minor. | Lowlands in north and northeast; 600-800m above sea level; minor. |
| Land Profile |  | | | | | |
| Geology | Fine-grained Carboniferous sediments and adamellites. | Adamellite | Adamellite | Adamellite | Adamellite | Adamellite; some fine-grained Carboniferous sediments. |
| Landform and Soils | Mountainous to hilly; shallow loams or siliceous sands. | Undulating valley areas; yellow and gleyed podzolics. | Hills usually with extensive rock pavement; siliceous sands. | Hilly to undulating crests of ranges and upland areas; yellow and gleyed podzolics, some sands. | Low hills and undulating valleys; yellow and gleyed podzolics. | Low hills and undulating slopes; yellow and gley podzolics, minor shallow loams and sands. |
| Natural Vegetation | *E. dealbata*, *E. youmanii*, and *E. caleyi* woodland. In the south-west, small areas of *E. laevopinea* on some peaks, and low microphyll thickets on sheltered slopes. | *E. blakelyi*, *E. conica*, *E. nova-anglica* woodland. | *E. andrewsii* open forest. | *E. campanulata*- *E. deanei* open forest with *E. caliginosa* and in east *E. obliqua*. Dry heath and *E. codonocarpa* mallee, with *E. youmanii* and *E. andrewsii* on rocky hilltops; sedgelands in valleys. Small areas of *E. scoparia* and *E. camphora* in central south. | *E. pauciflora*, *E. nova anglica* and *E.acaciiformis* on lower areas with occasional *E. dalrympleana* ssp. *heptantha*. *E. caliginosa* on rises. | *E. caliginosa* and *E. tereticornis* open forest. *Angophora* ssp. usually present. *E. viminalis*, *E. blakelyi* and *E. melliodora* on lower slopes. |
| Condition | Sediments largely undeveloped. Adamellites partly cleared. Dieback slight. | Largely developed although numerous very small remnants remain. Horticulture widespread. Dieback slight to moderate. | Largely undeveloped, but being fragmented by valley clearing. | Developed in north, largely cleared in east. Large areas remain in south and southeast. Dieback limited and slight to moderate. | Largely cleared with developed native pastures dominant. Extensive sown pastures. Dieback slight to moderate. | Largely cleared with developed native pastures. Dieback slight to moderate. |
| Representation in Conservation Reserves | Moderate areas of sediment in Sundown National Park. Small areas of adamellite in Girraween National Park. | Small areas in Girraween National Park. | Large areas in Girraween National Park. | Large areas in Girraween National Park and Bald Rock National Park. Minor in Boonoo Boonoo National Park. | Small areas in Bald Rock National Park, minor areas in Boonoo Boonoo National Park. | None |
| Comments | Extensive areas in Multiple Use Zone | Minor areas in Multiple Use Zone. | Large areas in Multiple Use Zones. | Large areas in Multiple Use Zones. | Sall areas in Multiple Use Zones. | Extensive disturbed areas in Multiple Use Zones. |

**Figure 84:** Conservation and management considerations for the Tenterfield district that includes Bald Rock and Boonoo Boonoo National Parks. Taken from Morgan and Terry (1999).

## *4.5 Introduced taxa*

In most instances, introduced plants require some form of disturbance or modification of the environment, such as an increase in nutrients, to become established. Within the reserve there are only 5% of the flora was found to be introduced in origin. This is comparable to that found for the Torrington Recreation Area (5%) and other parts of the eastern escarpment such as Washpool Western Additions (Hunter 1998) and Guy Fawkes River (Alexander & Hunter 1999), but significantly different from the recent survey of the proposed Kwiambal National Park (17%). Most of the exotic taxa are associated with tracks, disturbed creek margins, and areas frequented by goats and cattle. Community 3 has a very high percentage of introduced species and this is likely due to past clearing and management practices. A few taxa are found in relatively undisturbed areas. Exotic taxa can be segregated into; those that are a serous problem and are invasive, those that are confined to disturbed areas (e.g. *Cirsium*) and those that are ubiquitous and therefore would be a problem to remove in the long term.

### 4.5.1 Riparian zones

Increased nutrients from fertilizer application on neighbouring land and the naturally richer soils and soil moister can also favour exotic species. Some of the most troublesome weeds along the creek banks are *Sigesbeckia orientalis, Gomphocarpus fruiticosus, Bidens, Maclura* spp., *Juncus bufonius* and *Rubus chloocladus*. However, it is notable that compared to many other riparian systems, those in Boonoo Boonoo have a very low percentage of weedy species.

It should be noted however that invasions from upstream outside the boundaries of the reserve are difficult or impossible to manage from the perspective of the park managers. In the short term many species can be rapidly replaced due to seeds from upstream, these weed invasions should be controlled to reduce their incidence and subsequent build up of seed banks.

### 4.5.2 Fire trails

Exotic taxa occur along boundaries and tracks but they will usually be restricted to a short distance from the disturbed area. The movement of vehicles along tracks encourages the spread of weeds. This is particularly true if vehicles have to move through heavily infested areas prior to reaching the desired trails. This is particularly important in terms of species such as *Andropogon virginicus* that may invade from one patch of Community 2 to another on vehicle tyres and can be washed down the many creeks into new patches. There are a number of tracks within the reserve of which many are important for fire management purposes. Some tracks may be of little use however and probably should not be maintained or at least only used infrequently. The trail through the centre of south Bald Rock National Park which has recently been pushed through may warrant closure or at minimum upgrading. This trail has been pushed through and along one of the main creeks from its start to its finish within the reserve. This is likely to cause a great deal of weed introductions to this creek system and an increase erosion and siltation. If trails are to be upgraded at any time then modification of creek crossings may need to occur on major trails or at major crossings. Periodic weed spraying or pulling may need to occur seasonally along the major roads and fire trails within the reserves.

### 4.5.3 Management priorities for weeds

Priorities will need to be established in order to develop an effective weed management system. In particular major source areas should be reduced and those weeds likely to spread should be given highest priority. Although the incidence of weeds in the reserve is considered only to be minor, broad priorities may include:

- Finding major weed infestations and reducing these source populations, particularly along major creek lines that are disturbed by traffic.
- Weed invasions into areas of vegetation of regional significance or restricted distribution in the reserve, for example the Closed Forests and Sedgelands.
- Invasive or noxious weeds should be eradicated as soon as possible.

- Closing of non-essential access tracks or using them only infrequently, in particular the trail through the centre of the southern section of Bald Rock may need attention or closure.
- Keeping well used trails in good condition particularly on creek crossings.
- Co-ordination of weed programs with local authorities.
- Removal of feral goats and wild cattle.

The control of exotic plants within a national park is a complex issue. Application of herbicides can be inappropriate as native vegetation or animals in streams may be affected. The effects on native vegetation needs to be minimised. Many weeds while a problem due to their widespread occurrence in natural areas may be left as a low priority for management. Some examples include *Hypochaeris radicata* and *Stellaria* spp. that are in general ubiquitous to most communities in the north east and would be impossible to eradicate.

### *4.6 General conclusions*

Bald Rock and Boonoo Boonoo National Parks are highly significant conservation reserves as they represent comparatively little disturbed habitat. They conserve some of the major and widespread communities found along the eastern escarpment that in general are at the northern limit of their geographic distribution. Many of the communities within the reserves are unique and probably restricted to the study area and nearby holdings. A large number of rare species can be found within the two reserves and this area may represent one of the highest concentrations of restricted species in the north east. Some of these species may need targeted searches and such searches for some rare species that have as yet not been found may be fruitful.

Much of the stability of the vegetation communities and the rare species found within the reserves will depend on the management of appropriate fire regimes and potentially the management of what may be increasing numbers of visitors. A high variability of fire regimes should occur as this will maximise richness across the landscape. There is potential for an increase in the area occupied by some communities if the fire regimes around them are lowered. Monitoring of selected sample sites within each community should be made on a continuing basis and manipulated fire experiments would be an asset.

At present weeds are only a minor problem within the reserves. A few however will need targeted eradication, particularly within Community 3. Trails will in general need to be maintained at a high standard and seasonal eradication weeds along their margins may need to occur. Reduced usage of some trails may be appropriate and usage should be reduced in wet weather.

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**Appendix A**: Site Record Forms.

# PAWD: Vegetation Survey Form

Date: ____________ Recorder: ______________________________Site No: __________________

Film No: __________ Photo No: ____________________ Quadrat Size:_______________________

General Location: ___________________________________________________________________

Map Name: ____________________ Scale: ____________________
AMG Ref: ____________________E ________________________N
Lat:_____________________'S Long: ________________________'E

Landform Pattern: __________________________________________________________________
Physiography:(circle)
Crest Upper Slope Mid-slope Lower Slope Flat Open Depression

Altitude: ____________________metres
Slope: ____________________degrees
Aspect: ____________________degrees (magnetic)
Horizontal Elevation: N_____NE_____E_____SE_____S_____SW_____W_____NW_____

Map Geology: ______________________________ Lithology: ______________________________

Soil: (circle)
Drainage: Waterlogged Damp Moist Well drained
Texture: ___________________________________
Colour: ___________________________________
Depth: Deep (>1m) Shallow (0.3-1m) Skeletal (<0.3m)

Fire History (how determined)___________________________________________________________

Other Disturbance: (circle) clearing logging grazing erosion feral animals
other
(state):________________________________________________________________________

Vegetation Structure: (Walker & Hopkins, 1990)

| Stratum | Height (m) | % Cover | Dominant Species |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Structural Formation Class: __________________________________________________________
Comments:__________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

____________________

## **Appendix A:** Site Record Forms.

Floristic Composition: Site No:

| No. | Species | C/A | Canopy Spp | Data | No. | Species | C/A | Canopy Spp | Data |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 31 | | | | |
| 2 | | | | | 32 | | | | |
| 3 | | | | | 33 | | | | |
| 4 | | | | | 34 | | | | |
| 5 | | | | | 35 | | | | |
| 6 | | | | | 36 | | | | |
| 7 | | | | | 37 | | | | |
| 8 | | | | | 38 | | | | |
| 9 | | | | | 39 | | | | |
| 10 | | | | | 40 | | | | |
| 11 | | | | | 41 | | | | |
| 12 | | | | | 42 | | | | |
| 13 | | | | | 43 | | | | |
| 14 | | | | | 44 | | | | |
| 15 | | | | | 45 | | | | |
| 16 | | | | | 46 | | | | |
| 17 | | | | | 47 | | | | |
| 18 | | | | | 48 | | | | |
| 19 | | | | | 49 | | | | |
| 20 | | | | | 50 | | | | |
| 21 | | | | | 51 | | | | |
| 22 | | | | | 52 | | | | |
| 23 | | | | | 53 | | | | |
| 24 | | | | | 54 | | | | |
| 25 | | | | | 55 | | | | |

C/A: Cover Abundance Scale -Modified Braun Blanquet
Data: to be marked when entered into computer database

1 = cover less than 5% of site and uncommon
2 = cover less than 5% of site and common
3 = cover of 6-20% of site
4 = cover of 21-50% of site
5 = cover of 51-75% of site
6 = cover of 76-100% of site

**Appendix B:** Taxon list with recognised authorities and common names.

## Flora of Bald Rock and Boonoo Boonoo National Parks

**by**

**Dr John T. Hunter**

**<u>Fern & Fern Allie</u>**

**Adiantaceae**
*Adiantum aethiopicum* L. ....................................................................................Common Maidenhair
*Adiantum formosum* R.Br. ...................................................................................Giant Maidenhair
*Adiantum hispidulum* Sw. ....................................................................................Rough Maidenhair
*Cheilanthes distans* (R.Br.) Mett. ........................................................................Hairy Rock Fern
*Cheilanthes sieberi* Kunze
subsp. *sieberi* .......................................................................................Narrow Rock Fern
*Pellaea falcata* (R.Br.) Fée ..................................................................................Sickle Fern
*Pellaea nana* (Hook.) Bostock ...........................................................................Sickle Fern

**Aspleniaceae**
*Asplenium australasicum* (J.Sm.) Hook. ............................................................Bird's Nest Fern
*Asplenium flabellifolium* Cav. ............................................................................Necklace Fern
*Asplenium polyodon* G.Forst ..............................................................................Spleenwort

**Blechnaceae**
*Blechnum cartilagineum* Sweet ..........................................................................Gristle Fern
*Blechnum minus* (R.Br.) Ettingsh. ......................................................................Soft Water Fern
*Blechnum nudum* (Labill.) Mett. ex Luerss. ......................................................Fishbone Water Fern
*Blechnum wattsii* Tindale ...................................................................................Hard Water Fern
*Doodia aspera* R.Br. ...........................................................................................Prickly Rasp Fern
*Doodia australis* (Parris) Parris .........................................................................Common Rasp Fern

**Colchicaceae**
*Wurmbea biglandulosa* (R.Br.) T.D.Macfarl. .....................................................Early Nancy
*Wurmbea dioica* (R.Br.) F.Muell.
subsp. *dioca* .........................................................................................Early Nancy

**Cyatheaceae**
*Cyathea australis* (R.Br.) Domin .......................................................................Rough Treefern

**Davalliaceae**
*Davallia solida*
var. *pyxidata* (Cav.) Noot. ....................................................................Hare's Foot Fern

**Dennstaedtiaceae**
*Calochlaena dubia* (R.Br.) M.D.Turner & R.A.White .......................................Common Ground Fern
*Hypolepis glandulifera* Brownsey & Chinnock .................................................Ground Fern
*Pteridium esculentum* (G.Forst.) Cockayne .......................................................Bracken Fern

**Dryopteridaceae**
*Lastreopsis decomposita* (R.Br.) Tindale ..........................................................Ground Fern

**Gleicheniaceae**
*Gleichenia dicarpa* R.Br. ................................................................................Coral Fern
*Sticherus flabellatus* (R.Br.) H.St.John ...........................................................Umbrella Fern

**Hymenophyllaceae**
*Hymenophyllum cupressiforme* Labill. ............................................................Common Filmy Fern

**Lindsaeaceae**
*Lindsaea linearis* Sweet ..................................................................................Screw Fern
*Lindsaea microphylla* Sweet ...........................................................................Lacy Wedge Fern

**Lycopodiaceae**
*Lycopodiella lateralis* (R.Br.) B.Ollg. .............................................................Slender Club-moss
*Lycopodium deuterodensum* Herter.................................................................Bushy Club-moss

**Ophioglossaceae**
*Botrychium australe* R.Br...............................................................................Parsley Fern

**Osmundaceae**
*Todea barbara* (L.) T.Moore...........................................................................King Fern

**Polypodiaceae**
*Dictymia brownii* (Wikstr.) Copel. ..................................................................Stiff Strap Fern
*Grammitis billardieri* Willd.............................................................................Finger Fern
*Platycerium bifurcatum* (Cav.) C.Chr.
subsp. *bifurcatum* ..............................................................................Elkhorn
*Pyrrosia confluens*
var. *dielsii* (C.Chr.) Hovenkamp .......................................................Horsehoe Felt Fern
*Pyrrosia rupestris* (R.Br.) Ching......................................................................Rock Felt Fern

**Psilotaceae**
*Psilotum nudum* (L.) P.Beauv..........................................................................Skeleton Fork Fern

**Pteridaceae**
*Pteris comans* G.Forst. ....................................................................................Hairy Bracken
*Pteris tremula* R.Br. ........................................................................................Tender Brake

**Schizaeaceae**
*Schizaea bifida* Willd. .....................................................................................Forked Comb Fern
*Schizaea dichotoma* (L.) Sm............................................................................Branched Comb Fern

**Selaginaceae**
*Selaginella uliginosa* (Labill.) Spring.............................................................Selaginella

**Thelypteridaceae**
*Christella dentata* (Forssk.) Brownsey & Jermy .............................................Christella

**<u>Gymnosperm</u>**

**Cupressaceae**
*Callitris endlicheri* (Parl.) F.M.Bailey ............................................................Black Cypress Pine
*Callitris monticola* J.Garden............................................................................Steelhead
*Callitris oblonga*
subsp. *parva* K.D.Hill .........................................................................Pigmy Cypress Pine
*Callitris rhomboidea* R.Br. ex Rich.................................................................Port Jackson Pine

**<u>Monocotyledon</u>**

**Anthericaceae**
*Arthropodium milleflorum* (DC.) J.F.Macbr....................................................Vanilla Lily

**Anthericaceae**
*Arthropodium minus* R.Br. ............................................................................Small Vanilla Lily
*Dichopogon fimbriatus* (R.Br.) J.F.Macbr.......................................................Nodding Chocolate Lily
*Laxmannia compacta* Conran & P.I.Forst. ......................................................Wire Lily
*Laxmannia gracilis* R.Br. ...............................................................................Wire Lily
*Thysanotus tuberosus* R.Br.
subsp. *tuberosus* .................................................................................Common Fringe-lily
*Tricoryne elatior* R.Br. ..................................................................................Yellow Autumn-lily

**Araceae**
*Gymnostachys anceps* R.Br. ...........................................................................Settler's Flax

**Asteliaceae**
*Cordyline petiolaris* (Domin) Pedley .............................................................Broad-leaved Palm Lily

**Burmanniaceae**
*Burmannia disticha* L. ....................................................................................Burmannia

**Centrolepidaceae**
*Centrolepis fascicularis* Labill. ......................................................................Centrolepis

**Commelinaceae**
*Commelina cyanea* R.Br.................................................................................Scurvy Weed
*Murdannia graminea* (R.Br.) G.Bruckn. ........................................................Chocolate Lily

**Cyperaceae**
*Baumea articulata* (R.Br.) S.T.Blake .............................................................Jointed Twig-rush
*Baumea juncea* (R.Br.) Palla ..........................................................................Baumea
*Baumea planifolia* (Benth.) K.L.Wilson..........................................................Baumea
*Baumea rubiginosa* (Forst.) Boeck. .................................................................Baumea
*Bulbostylis barbata* (Rottb.) C.B.Clarke ........................................................Sedge
*Bulbostylis densa* (Wall.) Hand.-Mazz............................................................Sedge
*Carex appressa* R.Br. .....................................................................................Sedge
*Carex breviculmis* R.Br. .................................................................................Sedge
*Carex gaudichaudiana* Kunth ........................................................................Sedge
*Carex inversa* R.Br..........................................................................................Knob Sedge
*Carex lobolepis* F.Muell. .................................................................................Sedge
*Carex polyantha* F.Muell.................................................................................Sedge
*Caustis flexuosa* R.Br. ....................................................................................Curly Wig
*Chorizandra cymbaria* R.Br. ..........................................................................Sedge
*Cyperus enervis* R.Br......................................................................................Sedge
*Cyperus gracilis* R.Br. ....................................................................................Sedge
*Cyperus imbecillis* R.Br..................................................................................Sedge
*Eleocharis sphacelata* R.Br. ...........................................................................Tall Spike Rush
*Fimbristylis dichotoma* (L.) Vahl ...................................................................Common Fringe Rush
*Gahnia aspera* (R.Br.) Spreng.........................................................................Rough Saw Sedge
*Gahnia sieberiana* Kunth ...............................................................................Red-fruit Saw Sedge
*Gahnia subaequiglumis* S.T.Blake .................................................................Saw Sedge
*Gymnoschoenus sphaerocephalus* (R.Br.) Hook.f.........................................Button Grass
*Isolepis inundata* R.Br.....................................................................................Swamp Club Rush
*Isolepis subtilissima* Boeck. ...........................................................................Salaisoi
*Lepidosperma elatius* Labill. ..........................................................................Tall Sword Sedge
*Lepidosperma gunnii* Boeck.............................................................................Little Sword Sedge
*Lepidosperma laterale* R.Br. ..........................................................................Variable Saw Sedge
*Lepidosperma limicola* N.A.Wakef. ...............................................................Razor Sword Sedge
*Lepidosperma neesii* Kunth............................................................................Stiff Rapier Sedge
*Lepidosperma tortuosum* F.Muell. .................................................................Tortuous Rapier Sedge
*Philothrix deusta* (R.Br.) K.L.Wilson ............................................................Beak Rush
*Rhynchospora brownii* Roem. & Schult. ........................................................Grassy Beak Rush

*Schoenoplectus mucronatus* (L.) Palla ex A.Kern. ..........................................Rush
*Schoenus apogon* Roem. & Schult. ................................................................Common Bog Rush
*Schoenus latelaminatus* Kuk ..........................................................................Medusa Bog Rush
*Schoenus melanostachys* R.Br. .......................................................................Club Rush
*Schoenus turbinatus* (R.Br.) Poir. ex Roem. & Schult. ..................................Rush
*Scirpus polystachyus* F.Muell. ........................................................................Large-head Club-rush
*Scleria mackaviensis* Boeck. .........................................................................White Head Sedge

**Dioscoreaceae**
*Dioscorea transversa* R.Br. ............................................................................Native Yam

**Haemodoraceae**
*Haemodorum austroqueenslandicum* Domin .................................................Bloodroot
*Haemodorum planifolium* R.Br. .....................................................................Bloodroot

**Hypoxidaceae**
*Hypoxis hygrometrica* Labill. .........................................................................

**Iridaceae**
*Patersonia fragilis* (Labill.) Asch. & Greaebn. ..............................................Swamp Iris
*Patersonia glabrata* R.Br. ...............................................................................Native Iris
*Patersonia sericea* R.Br. ................................................................................Silky Purple Flag
**Sisyrinchium* sp. A.........................................................................................Scourweed

**Juncaceae**
**Juncus articulatus* L. .......................................................................................Jointed Rush
**Juncus bufonius* L. ..........................................................................................Toad Rush
*Juncus caespiticius* E.Mey. ............................................................................Rush
*Juncus continuus* L.A.S.Johnson ....................................................................Rush
*Juncus firmus* L.A.S.Johnson .........................................................................Rush
*Juncus pauciflorus* R.Br. ................................................................................Rush
*Juncus prismatocarpus* R.Br. ........................................................................Branching Rush
*Juncus remotiflorus* L.A.S.Johnson ................................................................Rush
*Juncus usitatus* L.A.S.Johnson ......................................................................Common Rush
*Luzula flaccida* (Buchenau) Edgar .................................................................Grass Rush

**Lomandraceae**
*Lomandra confertifolia*
subsp. *pallida* A.T.Lee .....................................................................Mat-rush
*Lomandra cylindrica* A.T.Lee .......................................................................Round-leaved Mat-rush
*Lomandra filiformis* (Thunb.) Britten
subsp. *filiformis* ...............................................................................Wattle-leaved Mattrush
*Lomandra longifolia* Labill. ..........................................................................Spiny-headed Mat-rush
*Lomandra multiflora* (R.Br.) Britten
subsp. *multiflora* ..............................................................................Many-flowered Mat-rush
*Lomandra spicata* A.T.Lee .............................................................................Mat-rush

**Luzuriagaceae**
*Eustrephus latifolius* R.Br. ex Ker Gawl. ......................................................Wombat Berry
*Geitonoplesium cymosum* (R.Br.) A.Cunn. ex R.Br. ......................................Scrambling Lily

**Orchidaceae**
*Acianthus exsertus* R.Br. ................................................................................Mosquito Orchid
*Bulbophyllum elisae* (F.Muell.) F.Muell. ex Benth. .......................................Pineapple Orchid
*Caladenia carnea* R.Br.
var. *carnea* .......................................................................................Pink Fairy
*Caladenia fuscata* (Rchb.f.) M.A.Clem. & D.L.Jones ...................................Caladenia
*Calochilus campestris* R.Br. ...........................................................................Copper Beard Orchid
*Calochilus gracillimus* Rupp .........................................................................Slender Beard Orchid
*Calochilus robertsonii* Benth. .........................................................................Purplish Beard Orchid

*Chiloglottis diphylla* R.Br. ............................................................................Bird Orchid
*Cryptostylis subulata* (Labill.) Rchb.f. ..........................................................Large Tongue-orchid
*Dipodium punctatum* (Sm.) R.Br....................................................................Hyacinth Orchid
*Dipodium variegatum* D.L.Jones & M.A.Clem. ...........................................Hyacinth Orchid
*Diuris abbreviata* Benth. ................................................................................Lemon Doubletail
*Diuris abbreviata* F.Muell. ex Benth. ............................................................Lemon Doubletail
*Diuris punctata* Sm.
var. *punctata*..........................................................................................Purple Donkey Orchid
*Diuris tricolour* Fitzg. ...................................................................................Donkey Orchid
*Dockrillia linguiformis* (Sw.) Brieger.............................................................Tongue Orchid
*Dockrillia pugioniformis* (A.Cunn.) Rauschert ..............................................Dagger Orchid
*Genoplesium fimbriatum* (R.Br.) D.L.Jones & M.A.Clem. .............................Fringed Midge Orchid
*Microtis unifolia* (G.Forst.) Rchb.f. ...............................................................Common Onion Orchid
*Pterostylis cycnocephala* R.Br. .....................................................................Swan Greenhood
*Pterostylis daintreana* F.Muell. ex Benth.......................................................Greenhood
*Pterostylis longifolia* R.Br. ...........................................................................Tall Greenhood
*Pterostylis obtusa* R.Br. ..................................................................................Greenhood
*Sarcochilus falcatus* R.Br. .............................................................................Orange Blossom Orchid
*Spiranthes sinensis*
subsp. *australis* (R.Br.) Kitam. ........................................................Ladies' Tresses
*Taeniophyllum muelleri* Lindl. ex Benth. .......................................................Orchid
*Thelychiton gracilicaulis* (F.Muell.) M.A.Clem. & D.L.Jones........................Spotted Orchid
*Thelychiton kingianus* (Bidwill ex Lindl.) M.A.Clem. & D.L.Jones..............Pink Rock Orchid
*Thelychiton tarberi* (M.A.Clem. & D.L.Jones) M.A.Clem. & D.L.Jones .......Rock Lily
*Thelymitra ixioides* Sw.
var. *ixioides* ........................................................................................Dotted Sun Orchid
*Thelymitra pauciflora* R.Br. ..........................................................................Slender Sun Orchid

**Philydraceae**
*Philydrum lanuginosum* Banks & Sol. ex Gaertn. ..........................................Frogsmouth

**Phormiaceae**
*Dianella caerulea*
var. *assera* R.J.F.Hend. ....................................................................Blue Flax Lily
var. *caerulea*.......................................................................................Rough Flax Lily
var. *producta* R.J.F.Hend. .................................................................Rough Flax Lily
*Dianella longifolia* R.Br.
var. *longifolia* .....................................................................................Pale Flax Lily
var. *stenophylla* Domin .....................................................................Pale Flax Lily
*Dianella nervosa* R.J.F.Hend. .......................................................................Blue Flax Lily
*Dianella revoluta* R.Br.
var. *revoluta* .......................................................................................Spreading Flax Lily
var. *vinosa* R.J.F.Hend. ....................................................................Spreading Flax Lily
*Dianella tasmanica* Hook.f. ...........................................................................Tasman Flax Lily
*Stypandra glauca* R.Br. ..................................................................................Nodding Blue Lily
*Thelionema caespitosum* (R.Br.) R.J.F.Hend. ...............................................Tufted Blue Lily
*Thelionema grande* (C.T.White) R.J.F.Hend. ................................................Granite Tufted Blue Lily

**Poaceae**
**Aira cupaniana* Guss. ....................................................................................Silvery Hairgrass
*Amphipogon strictus*R.Br.
var. *strictus* ........................................................................................Greybeard Grass
**Andropogon virginicus* L. ..............................................................................Whiskey Grass
**Anthoxanthum odoratum* L. ............................................................................Sweet Vernal Grass
*Aristida acuta* S.T.Blake ................................................................................Speargrass
*Aristida jerichoensis*
subsp. *subspinulifera* Henrard ..........................................................Jericho Wiregrass
*Aristida ramosa* R.Br. ......................................................................................Purple Wiregrass
*Aristida vagans* Cav. .......................................................................................Threeawn Speargrass
*Aristida warburgii* Mez ..................................................................................Speargrass

*Austrodanthonia bipartita* (Link) H.P.Linder ................................................Wallaby Grass
*Austrodanthonia caespitosa* (Gaudich.) H.P.Linder.......................................Ringed Wallaby Grass
*Austrodanthonia fulva* (Vickery) H.P.Linder .................................................Wallaby Grass
*Austrodanthonia monticola* (Vickery) H.P.Linder ..........................................Wallaby Grass
*Austrodanthonia penicillata* (Labill.) H.P.Linder ..........................................Slender Wallaby Grass
*Austrodanthonia pilosa*
var. *pilosa* (R.Br.) H.P.Linder...................................................... Smooth-flowered Wallaby Grass
*Austrodanthonia racemosa* (R.Br.) H.P.Linder
var. *racemosa* ...................................................................................Wallaby Grass
*Austrodanthonia setacea* (R.Br.) H.P.Linder .................................................Small-flowered Wallaby Grass
*Austrodanthonia tenuior* (Steud.) H.P.Linder ................................................Wallaby Grass
*Austrostipa aristiglumis* (F.Muell.) S.W.L.Jacobs & J.Everett .......................Plains Grass
*Austrostipa pubescens* (R.Br.) S.W.L.Jacobs & J.Everett...............................Hairy Speargrass
*Austrostipa racemosa* (R.Br.) H.P.Linder
var. *racemosa* ...................................................................................Speargrass
*Austrostipa ramosissima* (Trin.) S.W.L.Jacobs & J.Everett...........................Stout Bamboo Grass
*Austrostipa rudis*
subsp. *nervosa* (Vickery) S.W.L.Jacobs & J.Everett.........................Speargrass
*Austrostipa rudis* (Spreng.) S.W.L.Jacobs & J.Everett
subsp. *rudis* .......................................................................................Speargrass
*Austrostipa scabra* (Lindl.) S.W.L.Jacobs & J.Everett ..................................Rough Speargrass
*Austrostipa setacea* (R.Br.) S.W.L.Jacobs & J.Everett ..................................Corkscrew Grass
**Axonopus affinis* Chase ...................................................................................Narrow-leaved Carpet Grass
*Bothriochloa macra* (Steud.) S.T.Blake .........................................................Red Grass
**Briza minor* L. ...................................................................................................Shivery Grass
*Cenchrus caliculatus* Cav...............................................................................Hillside Burrgrass
*Cymbopogon refractus* (R.Br.) A.Camus .......................................................Barbed Wire Grass
*Cynodon dactylon* (L.) Pers............................................................................Couch
*Deyeuxia decipiens* (R.Br.) Vickery...............................................................Bent
*Deyeuxia gunniana* (Nees) Benth...................................................................Bent
*Deyeuxia imbricata* Vickery...........................................................................Bent
*Deyeuxia parviseta* Vickery ...........................................................................Bent
*Deyeuxia quadriseta* (Labill.) Benth. ..............................................................Bent
*Deyeuxia reflexa* Vickery ...............................................................................Bent
*Dichelachne crinita* (L.f.) Hook.f...................................................................Longhair Plumegrass
*Dichelachne inaequiglumis* (Hack. ex Cheeseman) Edgar & Connor............Plumegrass
*Dichelachne micrantha* (Cav.) Domin ............................................................Short-haired Plumegrass
*Dichelachne parva* B.K.Simon........................................................................Plumegrass
*Dichelachne rara* (R.Br.) Vickery...................................................................Plumegrass
*Dichelachne sieberiana* Trin. & Rupr. ...........................................................Plumegrass
*Digitaria breviglumis* (Domin) Henrard..........................................................Finger Panic Grass
*Digitaria diffusa* Vickery ...............................................................................Panic Grass
*Digitaria ramularis* (Trin.) Henrard ..............................................................Finger Panic Grass
*Echinopogon caespitosus* C.E.Hubb.
var. *caespitosus* ..............................................................................Tufted Hedgehog Grass
*Echinopogon mckiei* C.E.Hubb. .....................................................................McKie's Hedgehog Grass
*Echinopogon ovatus* (G.Forst.) P.Beauv. .......................................................Forest Hedgehog Grass
*Elymus scaber* (R.Br.) A.Love .......................................................................Wheatgrass
*Enneapogon nigricans* (R.Br.) P.Beauv. ........................................................Niggerheads
*Entolasia marginata* (R.Br.) Hughes..............................................................Bordered Panic
*Entolasia stricta* (R.Br.) Hughes ....................................................................Wiry Panic
**Eragrostis curvula* (Schrad.) Nees ..................................................................African Lovegrass
*Eragrostis lacunaria* F.Muell. ex Benth.........................................................Purple Lovegrass
*Eragrostis leptostachya* (R.Br.) Steud.............................................................Paddock Lovegrass
*Eragrostis molybdea* Vickery.........................................................................Granite Lovegrass
*Eragrostis parviflora* (R.Br.) Trin. .................................................................Weeping Lovegrass
*Eragrostis trachycarpa* (Benth.) Domin..........................................................Lovegrass
*Hemarthria uncinata* R.Br..............................................................................Matgrass
*Hierochloe rariflora* Hook.f. ..........................................................................Scented Holygrass
**Hyparrhenia hirta* (L.) Stapf ..........................................................................Coolatai Grass

*Imperata cylindrica*
var. *major* (Nees) C.E.Hubb............................................................Blady Grass
*Isachne globosa* (Thunb.) Kuntze ..................................................................Swamp Millet
*Joycea pallida* (R.Br.) S.W.L.Jacobs ..............................................................Red-anther Wallaby Grass
*Lachnagrostis aemula* (R.Br.) Trinius............................................................Blown Grass
*Lachnagrostis filiformis* (Forst.) Trinius .......................................................Blown Grass
*Microlaena stipoides* (Labill.) Druce
var. *stipoides* ........................................................................................Weeping Meadow Grass
*Notodanthonia longifolia* (R.Br.) H.P.Linder.................................................Long-leaved Wallaby Grass
*Oplismenus aemulus* (R.Br.) Roem. & Schult. ................................................Creeping Beard Grass
*Oplismenus imbecillis* (R.Br.) Roem. & Schult. ..............................................Small Beard Grass
*Panicum effusum* R.Br......................................................................................Hairy Panic
*Panicum simile* Domin ....................................................................................Two Colour Panic
*Paspalidium constrictum* (Domin) C.E.Hubb.................................................Knottybutt Grass
*Paspalidium gracile* (R.Br.) Hughes ..............................................................Slender Panic
**Paspalum dilatatum* Poir..................................................................................Paspalum
**Paspalum urvillei* Steud. .................................................................................Vasey Grass
*Pennisetum alopecuroides* (L.) Spreng...........................................................Swamp Foxtail
*Pentapogon quadrifidus* (Labill.) Baill...........................................................Fiveawn Speargrass
**Phalaris aquatica* L..........................................................................................Phalaris
*Poa labillardieri* Steud. ....................................................................................Tussock
*Poa queenslandica* C.E.Hubb..........................................................................Poa
*Poa sieberiana* Labill. .....................................................................................Snow Grass
*Rhytidosperma nudiflorum* (P.Morris) Connor & Edgar ................................Wallaby Grass
*Sacciolepis indica* (L.) Chase ..........................................................................Indian Cupscale Grass
**Secale cereale* L. .............................................................................................Cereal Rye, Ryecorn
**Setaria verticillata* (L.) P.Beauv. ....................................................................Whorled Pigeon Grass
*Sorghum leiocladum* (Hack.) C.E.Hubb. ........................................................Wild Sorghum
*Sporobolus creber* De Nardi............................................................................Slender Rat's Tail Grass
*Sporobolus elongatus* R.Br..............................................................................Slender Rat's Tail Grass
*Tetrarrhena juncea* R.Br. ................................................................................Wiry Rice Grass
*Themeda triandra* Forssk. ...............................................................................Kangaroo Grass
*Tripogon loliiformis* (F.Muell.) C.E.Hubb. ....................................................Five Minute Grass
**Vulpia bromoides* (L.) Gray ............................................................................Squirrel Tail Fescue

**Potamogetonaceae**
*Potamogeton tricarinatus* F.Muell. & A.Benn. ex A.Benn. ............................Floating Pondweed

**Restionaceae**
*Baloskion fimbriatum*
(L.A.S.Johnson & O.D.Evans) B.G.Briggs & L.A.S.Johnson ..........Rush
*Baloskion stenocoleum*
(L.A.S.Johnson & O.D.Evans) B.G.Briggs & L.A.S.Johnson ..........Rush
*Empodisma minus* (Hook.f.) L.A.S.Johnson & D.F.Cutler .............................Rush
*Lepyrodia anarthria* F.Muell............................................................................Scale Rush
*Lepyrodia scariosa* R.Br. .................................................................................Scale Rush

**Ripogonaceae**
*Ripogonum album* R.Br. ..................................................................................White Supplejack
*Ripogonum brevifolium* Conran & Clifford....................................................Small-leaved Supplejack

**Smilaceae**
*Smilax australis* R.Br.......................................................................................Sarsaparilla
*Smilax glyciphylla* Sm. .....................................................................................Sweet Sarsaparilla

**Xanthorrhoeaceae**
*Xanthorrhoea acaulis* (A.T.Lee) D.J.Bedford................................................Grasstree
*Xanthorrhoea glauca* D.J.Bedford ..................................................................Grasstree
*Xanthorrhoea johnsonii* A.T.Lee....................................................................Grasstree
*Xanthorrhoea macronema* F.Muell. ex Benth. ................................................Grasstree

**Xyridaceae**
*Xyris complanata* R.Br. ....................................................................................Xyris
*Xyris gracilis* R.Br.
subsp. *gracilis* ....................................................................................Xyris
*Xyris operculata* Labill. ....................................................................................Xyris

**<u>Dicotyledon</u>**

**Acanthaceae**
*Brunoniella australis* (Cav.) Bremek. .............................................................Blue Trumpet
*Rostellularia adscendens* (R.Br.) R.M.Barker
subsp. *adscendens* .............................................................................Pink Justicia

**Alangiaceae**
*Alangium villosum*
subsp. *polyosmoides* (F.Muell.) Bloemb. ..........................................Muskwood

**Amaranthaceae**
*Nyssanthes diffusa* R.Br. ...................................................................................Barb-wire Weed

**Anacardiaceae**
*Euroschinus falcata* Hook.f.
var. *falcata* ........................................................................................Ribbonwood

**Apiaceae**
*Actinotus gibbonsii* F.Muell. ...........................................................................Gibbon's Flannel Flower
*Actinotus helianthi* Labill. ...............................................................................Flannel Flower
*Centella asiatica* (L.) Urb. ..................................................................................Pennywort
*Daucus glochidiatus* (Labill.) Fisch., C.A.Mey. & Ave-Lall. .........................Native Carrot
*Eryngium paludosum* (Moore & Betche) P.W.Michael ..................................Long Eryngium
*Hydrocotyle digitata* A.R.Bean & Henwood ..................................................Pennywort
*Hydrocotyle laxiflora* DC. ..................................................................................Stinking Pennywort
*Hydrocotyle pedicellosa* F.Muell. ex Benth. ...................................................Pennywort
*Hydrocotyle peduncularis* R.Br. ex A.Rich. ....................................................Small-leaved Pennywort
*Platysace ericoides* (Sieber ex Spreng.) C.Norman ........................................Platysace
*Trachymene anisocarpa* (Turcz.) B.L.Burtt ....................................................Native Parsnip
*Trachymene incisa* Rudge
subsp. *incisa* .....................................................................................Native Parsnip
*Trachymene* sp. nov. ...........................................................................................Native Parsnip
*Xanthosia pilosa* Rudge ......................................................................................Hairy Xanthosia

**Apocynaceae**
*Alyxia ruscifolia* R.Br. .......................................................................................Prickly Alyxia
*Parsonsia eucalyptophylla* F.Muell. ................................................................Gargaloo
*Parsonsia purpurascens* J.B.Williams ............................................................Black Silkpod
*Parsonsia straminea* (R.Br.) F.Muell. .............................................................Common Silkpod
*Parsonsia velutina* R.Br. ..................................................................................Silkpod

**Araliaceae**
*Astrotricha longifolia* Benth. ...........................................................................Star-hair
*Cephalaralia cephalobotrys* (F.Muell.) Harms ...............................................Climbing Panax
*Polyscias elegans* (C.Moore & F.Muell.) Harms ............................................Celery Wood
*Polyscias sambucifolia* (Sieber ex DC.) Harms ..............................................Elderberry Panax

**Asclepiadaceae**
**Gomphocarpus fruticosus* (L.) R.Br. ex Spreng. ..............................................Narrow-leaved Cotton Bush
*Hoya australis* R.Br. ex Traill
subsp. *australis* ..................................................................................Native Hoya
*Marsdenia rostrata* R.Br. ................................................................................Common Milk Vine

*Tylophora woollsii* Benth. ....................................................................Vine

**Asteraceae**

**Ageratina adenophora* (Spreng.) R.King & H.Robinson ................................Crofton Weed
*Ammobium alatum* R.Br. ....................................................................Winged Everlasting
**Bidens pilosa* L. ....................................................................Cobbler's Pegs
*Brachyscome angustifolia* A.Cunn. ex DC.
var. *angustifolia*....................................................................Daisy
*Brachyscome microcarpa* F.Muell. ....................................................................Small Fruited Daisy Bush
*Brachyscome nova-anglica* G.L.R.Davis ....................................................New England Daisy
*Brachyscome scapigera* (Sieber ex Spreng.) DC.............................................Daisy
*Brachyscome spathulata* Gaudich. ....................................................................Daisy
*Brachyscome stuartii* Benth....................................................................Granite Daisy
*Brachyscome tenuiscapa*
var. *pubescens* (Benth.) G.L.R.Davis ................................................Daisy
*Calotis cuneifolia* R.Br. ....................................................................Purple Burr-daisy
*Calotis dentex* R.Br. ....................................................................Burr-daisy
**Carduus tenuiflorus* S.Curtis....................................................................Winged Slender Thistle
*Cassinia aculeata* (Labill.) R.Br....................................................................Dolly Bush
*Cassinia hewsoniae* Orchard ....................................................................Hewson’s Cough Bush
*Cassinia laevis* R.Br. ....................................................................Cough Bush
*Cassinia quinquefaria* R.Br. ....................................................................Rosemary Cassinia
*Centipeda minima*
var. *lanuginosa* (DC.) Domin..........................................................Centipeda
*Chrysocephalum apiculatum* (Labill.) Steetz ................................................Common Everlasting
*Chrysocephalum semipapposum* (Labill.) Steetz............................................Yellow Buttons
**Cirsium vulgare* (Savi) Ten. ....................................................................Spear Thistle
**Conyza albida* Willd. ex Spreng. ....................................................................Tall Fleabane
**Conyza bonariensis* (L.) Cronq. ....................................................................Flaxleaf Fleabane
**Conyza canadensis* (L.) Cronq.
var. *canadensis*....................................................................Canadian Fleabane
**Conyza chilensis* Spreng....................................................................Fleabane
**Conyza parva* Cronq....................................................................Fleabane
**Coreopsis lanceolata* L. ....................................................................Coreopsis
*Craspedia canens* J.Everett & Doust. ....................................................Common Billy Buttons
*Craspedia variabilis* Everett & Doust ....................................................Billy Buttons
*Euchiton gymnocephalus* (DC.) Holub ....................................................Creeping Cudweed
*Euchiton involucratus* (G.Forst.) Holub ....................................................Star Cudweed
*Euchiton sphaericus* (Willd.) Holub....................................................Cudweed
**Gamochaeta americanum* (Mill.) Wedd....................................................Cudweed
**Gamochaeta spicata* (Lam.) Cabrera ....................................................Spiked Cudweed
*Glossogyne tannensis* (Spreng.) Garn.-Jones ................................................Cobbler's Tack
*Helichrysum boormanii* Maiden & Betche....................................................Boorman’s Everlasting
*Helichrysum collinum* DC. ....................................................................Everlasting
*Helichrysum elatum* A.Cunn. ex DC. ....................................................White Everlasting
*Helichrysum rutidolepis* DC. ....................................................................Pale Everlasting
*Helichrysum scorpioides* Labill. ....................................................................Button Everlasting
**Hypochaeris glabra* L. ....................................................................Smooth Catsear
**Hypochaeris radicata* L....................................................................Catsear
*Lagenifera stipitata* (Labill.) Druce....................................................Blue Bottle-daisy
*Leptorhynchos squamatus* (Labill.) Less
subsp. A....................................................................Scaly Buttons
*Leucochrysum albicans* (A.Cunn.) Paul G.Wilson.........................................Grey Daisy-bush
*Olearia elliptica* DC. ....................................................................Daisy Bush
*Olearia gravis* (F.Muell.) Benth. ....................................................................Daisy Bush
*Olearia microphylla* (Vent.) Maiden & Betche ................................................Small-leaved Daisy Bush
*Olearia oppositifolia* (F.Muell.) Lander ....................................................Daisy Bush
*Olearia ramulosa* (Labill.) Benth. ....................................................................Daisy Bush
*Ozothamnus diosmifolius* (Vent.) DC. ....................................................White Dogwood

*Ozothamnus obcordatus*
subsp. *major* (Benth.) P.Short ............ Daisy Bush
*Picris evae* Lack ............ Hawkweed
*Picris hieracioides* L. ............ Hawkweed Picris
*Podolepis arachnoidea* (Hook.) Druce ............ Clustered Copper-wire Daisy
*Podolepis hieracioides* F.Muell. ............ Copper-wire Daisy
*Podolepis jaceoides* (Sims) Voss ............ Showy Copper-wire Daisy
*Podolepis neglecta* G.L.R.Davis ............ Copper-wire Daisy
*Pseudognaphalium luteoalbum* (L.) Hilliard & B.L.Burtt ............ Jersey Cudweed
*Rhodanthe anthemoides* (Spreng.) Paul G. Wilson ............ Daisy
**Scolymus maculatus* L. ............ Spotted Thistle
*Senecio amygdalifolius* F.Muell. ............ Forest Fireweed
*Senecio bathurstianus* (DC.) Sch.Bip. ............ Hill Fireweed
*Senecio bipinnatisectus* Belcher ............ Fireweed
*Senecio biserratus* Belcher ............ Fireweed
*Senecio diaschides* W.H.Drury ............ Fireweed
*Senecio hispidulus* A.Rich.
var. *hispidulus* ............ Hill Fireweed
*Senecio lautus*
subsp. *dissectifolius* Ali ............ Variable Groundsel
*Senecio linearifolius* A.Rich. ............ Fireweed Groundsel
*Senecio minimus* Poir. ............ Groundsel
*Senecio pinnatifolius*
var. *serratus* I.Thomps. ............ Groundsel
*Senecio prenanthoides* A.Rich. ............ Fireweed
*Senecio quadridentatus* Labill. ............ Cotton Fireweed
*Senecio tenuiflorus* (DC.) Sieber ex Sch.Bip. ............ Fireweed
*Sigesbeckia orientalis* L.
subsp. *orientalis* ............ Indian Weed
*Solenogyne bellioides* Cass. ............ Daisy
**Sonchus asper*
subsp. *glaucescens* (Jordan) Ball ............ Prickly Sowthistle
**Sonchus oleraceus* L. ............ Common Sowthistle
**Taraxacum officinale* L. ............ Dandelion
*Vernonia cinerea* (L.) Less.
var. *cinerea* ............ Vernonia
*Xerochrysum bracteatum* (Vent.) Tzvelev ............ Golden Everlasting

**Baueraceae**
*Bauera rubioides* Banks ex Andr.
var. *rubioides* ............ Black-eyed Susan

**Bignoniaceae**
*Pandorea pandorana* (Andrews) Steenis ............ Wonga Wonga Vine

**Boraginaceae**
*Austrocynoglossum latifolium* (R.Br.) R.Mill ............ Hounds Tongue

**Brassicaceae**
**Hirschfeldia incana* (L.) Lagr.-Fossat ............ Buchan Weed

**Campanulaceae**
*Wahlenbergia ceracea* Loth. ............ Waxy Bluebell
*Wahlenbergia communis* Carolin ............ Tufted Bluebell
*Wahlenbergia gracilis* (Forster f.) A. DC. ............ Sprawling Bluebell
*Wahlenbergia graniticola* Carolin ............ Granite Bluebell
*Wahlenbergia littoricola* P.J.Sm. ............ Bluebell
*Wahlenbergia luteola* P.J.Sm. ............ Bluebell
*Wahlenbergia planiflora*
subsp. *longipila* Carolin ex P.J.Sm. ............ Bluebell

subsp. planiflora ........ Bluebell
*Wahlenbergia stricta*
subsp. *alterna* P.J.Sm. ........ Tall Bluebell

**Caryophyllaceae**
**Cerastium balearicum* Herm. ........ Mouse-ear Chickweed
*Scleranthus biflorus* (G.Forst. & Forst.f.) Hook.f. ........ Knawel
*Stellaria flaccida* Hook. ........ Chickweed
**Stellaria media* (L.) Cirillo ........ Common Chickweed

**Casuarinaceae**
*Allocasuarina littoralis* (Salisb.) L.A.S.Johnson ........ Black She-oak
*Allocasuarina rigida* (Miq.) L.A.S.Johnson
subsp. *rigida* ........ Rock She-oak
*Allocasuarina rupicola* L.A.S.Johnson ........ She-oak
*Allocasuarina torulosa* (Aiton) L.A.S.Johnson ........ Forest She-oak
*Casuarina cunninghamiana* Miq. ........ River Oak

**Celastraceae**
*Cassine australis* (Vent.) Kuntze
var. *australis* ........ Red Olive Plum
*Celastrus subspicata* Hook. ........ Large Staff Vine
*Denhamia celastroides* (F.Muell.) Jessup ........ Denhamia
*Denhamia pittosporoides* F.Muell. ........ Veiny Denhamia
*Maytenus bilocularis* Lander & L.A.S.Johnson ........ Orangebark
*Maytenus silvestris* Lander & L.A.S.Johnson ........ Narrow-leaved Orangebark

**Chenopodiaceae**
*Chenopodium melanocarpum* (J.M.Black) J.M.Black ........ Black Crumbweed
*Chenopodium pumilio* R.Br. ........ Goosefoot
*Einadia hastata* (R.Br.) A.J.Scott ........ Berry Saltbush

**Chloanthaceae**
*Chloanthes parviflora* Walp. ........ Chloanthes

**Clusiaceae**
*Hypericum gramineum* Forst.f. ........ Small St. John's Wort
*Hypericum japonicum* Thunb. ........ St. John's Wort

**Convolvulaceae**
*Dichondra repens* Forst. & Forst.f. ........ Kidney Weed
*Dichondra* sp. A ........ Kidney Weed
*Polymeria calycina* R.Br. ........ Polymeria
*Polymeria pusilla* R.Br. ........ Polymeria

**Crassulaceae**
*Crassula colorata*
var. *acuminata* (Reader) Toelken ........ Stonecrop
*Crassula sieberiana* (Schult. & Schult.f.) Druce ........ Australian Stonecrop

**Cucurbitaceae**
*Zehneria cunninghamii* F.Muell. ........ Wild Cucumber

**Cunoniaceae**
*Caldcluvia paniculosa* (F.Muell.) Hoogland ........ Soft Corkwood
*Callicoma serratifolia* Andrews ........ Callicoma
*Schizomeria ovata* D.Don ........ Crabapple

**Dilleniaceae**
*Hibbertia acicularis* (Labill.) F.Muell. ........ Sharp Guinea Flower

*Hibbertia aspera*
subsp. *pilosifolia* Toelken ....................Guinea Flower
*Hibbertia cistoidea* (Hook.) C.T.White ....................Guinea Flower
*Hibbertia dentata* R.Br. ex DC. ....................Twining Guinea Flower
*Hibbertia linearis* R.Br. ex DC. ....................Guinea Flower
*Hibbertia obtusifolia* DC. ....................Grey Guinea Flower
*Hibbertia pedunculata* R.Br. ex DC. ....................Guinea Flower
*Hibbertia riparia* (R.Br. ex. DC.) Hoogl. ....................Common Guinea Flower
*Hibbertia rufa* N.A.Wakef. ....................Guinea Flower
*Hibbertia scandens* (Willd.) K.D.Konig & J.Sims ....................Climbing Guinea Flower
*Hibbertia sericea* (R.Br. ex DC.) Benth. ....................Guinea Flower
*Hibbertia serpyllifolia* R.Br. ex DC. ....................Guinea Flower
*Hibbertia* sp. B ....................Guinea Flower
*Hibbertia vestita* A.Cunn. ex Benth. ....................Guinea Flower
*Hibbertia villosa* B.J.Conn ....................Hairy Guinea Flower

**Droseraceae**
*Drosera auriculata* Backh. & Planchon ....................Sundew
*Drosera binata* Labill. ....................Sundew
*Drosera burmannii* Vahl ....................Burman's Sundew
*Drosera peltata* Thunb. ....................Sundew
*Drosera spatulata* Labill. ....................Sundew

**Ebenaceae**
*Diospyros australis* (R.Br.) Hiern ....................Black Plum
*Diospyros pentamera* (Woolls & F.Muell.) F.Muell. ....................Myrtle Ebony

**Elaeocarpaceae**
*Elaeocarpus holopetalus* F.Muell. ....................Black Olive Berry
*Elaeocarpus obovatus* G.Don ....................Hard Quandong
*Elaeocarpus reticulatus* Sm. ....................Blueberry Ash

**Epacridaceae**
*Acrotriche aggregata* R.Br. ....................Acrotriche
*Brachyloma daphnoides*
subsp. *glabrum* (Blakely) J.T.Hunter ....................Red-Flowered Daphne Heath
*Epacris breviflora* Stapf. ....................Drumstick Heath
*Epacris microphylla* R.Br.
var. *microphylla* ....................Coral Heath
*Epacris obtusifolia* Sm. ....................Blunt-leaved Heath
*Epacris pulchella* Cav. ....................Heath
*Leucopogon biflorus* R.Br. ....................Twin-flowered Beard Heath
*Leucopogon juniperinus* R.Br ....................Beard Heath
*Leucopogon lanceolatus* (Sm.) R.Br.
var. *lanceolatus* ....................Lance-leaf Beard Heath
*Leucopogon melaleucoides* A.Cunn. ex DC. ....................Melaleuca Beard Heath
*Leucopogon microphyllus*
var. *microphyllus* (Cav.) R.Br. ....................Small-leaved Beard Heath
*Leucopogon muticus* R.Br. ....................Twisted Beard Heath
*Leucopogon neoanglicus* F.Muell. ex Benth. ....................New England Beard Heath
*Leucopogon virgatus* (Labill.) R.Br. ....................Beard Heath
*Lissanthe strigosa* (Sm.) R.Br. ....................Peach Heath
*Melichrus adpressus* A.Cunn. ex DC. ....................Large Nectar-heath
*Melichrus procumbens* (Cav.) Druce ....................Jam Tarts
*Melichrus urceolatus* R.Br. ....................Urn Heath
*Monotoca scoparia* (Sm.) R.Br. ....................Heath
*Styphelia triflora* Andrews ....................Five-corners
*Styphelia viridis* Andrews ....................Five-corners
*Trochocarpa laurina* (Rudge) R.Br. ....................Tree Heath

**Eriocaulaceae**
*Eriocaulon scariosum* Sm. ..........Eriocaulon

**Escalloniaceae**
*Quintinia sieberi* A.DC. ..........Possumwood

**Euphorbiaceae**
*Alchornea ilicifolia* (J.Sm.) Muell.Arg. ..........Native Holly
*Amperea xiphoclada* (Sieber ex Spreng.) Druce
var. *xiphoclada* ..........Broom Spurge
*Baloghia inophylla* (G.Forst.) P.S.Green ..........Brush Bloodwood
*Bertya glandulosa* Gruning ..........Spurge
*Breynia cernua* (Poir.) Muell.Arg. ..........Coffee Bush
*Claoxylon australe* Baill. ..........Brittlewood
*Croton verreauxii* Baillon ..........Green Cascarilla
*Glochidion ferdinandi* (Muell.Arg.) Bailey
var. *ferdinandi* ..........Cheese Tree
*Micrantheum hexandrum* Hook.f. ..........Micrantheum
*Omalanthus nutans* (G.Forst.) Guill. ..........Bleeding Heart
*Phyllanthus gunnii* Hook.f. ..........Shrubby Spurge
*Phyllanthus hirtellus* (F.Muell.) Muell.Arg. ..........Spurge
*Phyllanthus similis* Muell.Arg. ..........Spurge
*Phyllanthus virgatus* G.Forst. ..........Wiry Spurge
*Poranthera microphylla* Brongn. ..........Small Poranthera

**Fabaceae**
*Acacia binervata* DC. ..........Two-veined Hickory
*Acacia blakei*
subsp. *diphylla* (Tindale) Pedley ..........Hairy Wattle
*Acacia brownii* (Poir.) Steud. ..........Heath Wattle
*Acacia buxifolia* A.Cunn.
subsp. *buxifolia* ..........Box-leaved Wattle
*Acacia falciformis* DC. ..........Broad-leaved Hickory
*Acacia filicifolia* Cheel & M.B.Welch ..........Fern-leaved Wattle
*Acacia floribunda* (Vent.) Willd. ..........White Sally
*Acacia gunnii* Benth. ..........Ploughshare Wattle
*Acacia implexa* Benth. ..........Hickory Wattle
*Acacia irrorata* Sieber ex Spreng. ..........Green Wattle
*Acacia latisepala* Pedley ..........Wattle
*Acacia leucoclada* Tindale
subsp. *leucoclada* ..........Wattle
*Acacia longifolia* (Andrews) Willd.
subsp. *longifolia* ..........Sydney Golden Wattle
*Acacia macnuttiana* Maiden & Blakely ..........McNutt's Wattle
*Acacia maidenii* F.Muell. ..........Maiden's Wattle
*Acacia melanoxylon* R.Br. ..........Blackwood
*Acacia myrtifolia* (Sm.) Willd. ..........Red-stemmed Wattle
*Acacia obtusifolia* A.Cunn. ..........Thick-leaved Wattle
*Acacia penninervis* Sieber ex DC.
var. *penninervis* ..........Mountain Hickory
*Acacia rubida* A.Cunn. ..........Red-leaved Wattle
*Acacia stricta* (Andrews) Willd. ..........Straight Wattle
*Acacia ulicifolia* (Salisb.) Court ..........Prickly Moses
*Acacia venulosa* Benth. ..........Veined Wattle
*Acacia viscidula* Benth. ..........Sticky Wattle
*Aotus subglauca* Blakely & McKie
var. *subglauca* ..........Aotus
*Bossiaea neo-anglica* F.Muell. ..........New England Bossiaea
*Bossiaea obcordata* (Vent.) Druce ..........Bossiaea
*Bossiaea rhombifolia* Sieber ex DC. ..........Round-leaved Bossiaea

*Bossiaea scortechinii* F.Muell. ........................................................................Scortechini's Bossiaea
*Crotalaria montana* Roth
var. *montana*......................................................................................Rattlepod
*Daviesia elliptica* Sm. ........................................................................................Bitter Pea
*Daviesia latifolia* R.Br...........................................................................................Bitter Pea
*Daviesia nova-anglica* Crisp ...............................................................................New England Bitter Pea
*Daviesia umbellulata* Sm. ....................................................................................Bitter Pea
*Desmodium brachypodum* A.Gray .........................................................................Large Tick Trefoil
*Desmodium rhytidophyllum* F.Muell. ex Benth.............................................Hairy Tick Trefoil
*Desmodium varians* (Labill.) Endl. ...................................................................Slender Tick Trefoil
*Dillwynia phylicoides* A.Cunn..........................................................................Heath Parrot Pea
*Dillwynia retorta* (J.C.Wendl.) Druce ............................................................Bacon & Egg Pea
*Dillwynia sericea* A.Cunn. ..................................................................................Bacon & Egg Pea
*Dillwynia sieberi* Steud. ......................................................................................Bacon & Egg Pea
*Glycine clandestina* Wendl.................................................................................Twining Glycine
*Glycine microphylla* (Benth.) Tindale ..............................................................Small-leaved Glycine
*Glycine tabacina* (Labill.) Benth. .....................................................................Variable Glycine
*Gompholobium huegelii* Benth...........................................................................Pale Wedge Pea
*Hardenbergia violacea* (Schneev.) Stearn..........................................................False Sarsaparilla
*Hovea beckeri* F.Muell. .......................................................................................Becker's Hovea
*Hovea heterophylla* A.Cunn. ex Hook.f. ............................................................Hovea
*Hovea pannosa* Hook. ...........................................................................................Hovea
*Hovea pedunculata* I.Thomps.............................................................................Hovea
*Hovea purpurea* Sweet .........................................................................................Hairy Hovea
*Indigofera adesmiifolia* A.Gray..........................................................................Indigo
*Indigofera australis* Willd. .................................................................................Australian Indigo
*Jacksonia scoparia* R.Br. ex Sm. .......................................................................Dogwood
*Kennedia rubicunda* (Schneev.) Vent...............................................................Red Kennedy Pea
*Lespedeza juncea*
subsp. *sericea* (Thunb.) Steenis...........................................................Lespedeza
*Lotus australis* Andrews.....................................................................................Australian Trefoil
**Lotus corniculatus* L............................................................................................Birds-foot Trefoil
**Medicago arabica* (L.) Huds...............................................................................Spotted Burr Medic
*Mirbelia confertiflora* Pedley ...........................................................................Pea
*Mirbelia pungens* A.Cunn. ex G.Don................................................................Pea
*Mirbelia speciosa* Sieber ex DC.
subsp. *speciosa* ...................................................................................Pea
*Oxylobium arborescens* R.Br. ...........................................................................Tall Shaggy Pea
*Pararchidendron pruinosum* (Benth.) Nielsen
var. *pruinosum* ...................................................................................Snow Wood
*Phyllota phylicoides* (Sieber ex DC.) Benth.....................................................Heath Phyllota
*Podolobium ilicifolium* (Andrews) Crisp & P.H.Weston ..................................Prickly Shaggy Pea
*Pultenaea altissima* F.Muell...............................................................................Bush Pea
*Pultenaea dentata* Labill. ...................................................................................Bush Pea
*Pultenaea flexilis* Sm...........................................................................................Bush Pea
*Pultenaea hartmannii* F.Muell. ..........................................................................Hartman's Bush Pea
*Pultenaea linophylla* Schrad. & J.C.Wendl.......................................................Bush Pea
*Pultenaea polifolia* A.Cunn. ..............................................................................Bush Pea
*Pultenaea pycnocephala* F.Muell. ex Benth.....................................................Hard-head Bush Pea
*Pultenaea retusa* Sm............................................................................................Blunt-leaf Bush Pea
*Pultenaea stuartiana* H.B.Will..........................................................................Bush Pea
*Pultenaea villosa* Willd. ....................................................................................Hairy Bush Pea
*Sphaerolobium vimineum* Sm...........................................................................Sphaerolobium
*Swainsona fraseri* Benth.....................................................................................Fraser's Darling Pea
*Swainsona reticulata* J.M.Black .......................................................................Variable Swainsona
*Tephrosia grandiflora* (L.'Her ex Aiton) Pers..................................................Tephrosia
**Trifolium campestre* Schreb. ...........................................................................Hop Clover
**Trifolium repens* L.............................................................................................White Clover
*Zornia dyctiocarpa* DC.
subsp. *dyctiocarpa*..............................................................................Zornia

**Gentianaceae**
*Centaurium erythraea* Rafn............................................................................Common Centaury
**Centaurium tenuiflorum* (Hoffm. & Link) Fritsch ..........................................Centaury

**Geraniaceae**
*Geranium neglectum* Carolin.........................................................................Geranium
*Geranium potentilloides* L.'Her. ex DC.
var. *potentilloides*.............................................................................Geranium
*Geranium solanderi*
var. *grande* Carolin .........................................................................Native Geranium
*Geranium solanderi* Carolin
var. *solanderi* ..................................................................................Native Geranium
*Pelargonium australe* Willd. ..........................................................................Native Storksbill

**Goodeniaceae**
*Dampiera purpurea* R.Br. ..............................................................................Grey Dampiera
*Dampiera stricta* (Sm.) R.Br. .........................................................................Blue Dampiera
*Goodenia bellidifolia* Sm.
subsp. *argentea* Carolin ....................................................................Goodenia
subsp. *bellidifolia* .............................................................................Goodenia
*Goodenia hederacea* Sm.
subsp. *hederacea* ..............................................................................Ivy Goodenia
*Velleia montana* Hook.f..................................................................................Velleia
*Velleia paradoxa* R.Br.....................................................................................Velleia

**Haloragaceae**
*Gonocarpus micranthus*
subsp. *ramosissimus* Orchard..........................................................Swamp Raspwort
*Gonocarpus oreophilus* Orchard ....................................................................Forest Raspwort
*Gonocarpus tetragynus* Labill. .......................................................................Poverty Raspwort
*Gonocarpus teucrioides* DC. .........................................................................Raspwort
*Haloragis heterophylla* Brongn.......................................................................Variable Haloragis
**Myriophyllum aquaticum* (Vell. Conc.) Verdc. ...............................................Parrot's Feather
*Myriophyllum pedunculatum* Hook.f. .............................................................Water-milfoil
*Myriophyllum striatum* Orchard ....................................................................Water-milfoil
*Myriophyllum variifolium* Hook.f...................................................................Water-milfoil

**Icacinaceae**
*Pennantia cunninghamii* Miers .....................................................................Brown Beech

**Lamiaceae**
*Ajuga australis* R.Br. .....................................................................................Australian Bugal
*Mentha diemenica* Spreng. .............................................................................Pennyroyal Mint
*Mentha satureioides* R.Br................................................................................Mintbush
*Plectranthus graveolens* R.Br.........................................................................Cockspur Flower
*Plectranthus nitidus* P.I.Forster ......................................................................Mintbush
*Plectranthus parviflorus* Willd. ......................................................................Cockspur Flower
*Plectranthus suaveolens* S.T.Blake ................................................................Cockspur Flower
*Prostanthera caerulea* R.Br. ..........................................................................Mint-bush
*Prostanthera nivea* A.Cunn. ex Benth...........................................................Snowy Mint-bush
*Prostanthera saxicola* R.Br. ..........................................................................Rock Mint-bush
*Prostanthera petraea* B.J.Conn .....................................................................Mint-bush
**Prunella vulgaris* L. .......................................................................................Self-heal
*Scutellaria humilis* R.Br. ...............................................................................Dwarf Skullcap

**Lauraceae**
*Cassytha pubescens* R.Br. ..............................................................................Hairy Devil's Twine
*Cryptocarya rigida* Meissn.............................................................................Forest Maple
*Endiandra hayesii* Kosterm. ...........................................................................Rusty Rose Walnut

*Neolitsea australiensis* Kosterm. ....................................................................Green Bolly Gum

**Lentibulariaceae**
*Utricularia dichotoma* Labill..........................................................................Fairy Aprons
*Utricularia lateriflora* R.Br. ..........................................................................Small Bladderwort

**Lobeliaceae**
*Isotoma anethifolia* Summerh. .......................................................................Isotome
*Isotoma axillaris* Lindl. .................................................................................Showy Isotome
*Isotoma fluviatilis*
subsp. *borealis* McComb.................................................................Swamp Isotome

**Lobeliaceae**
*Lobelia dentata* Cav. ......................................................................................Lobelia
*Lobelia gibbosa* Labill....................................................................................Tall Lobelia
*Lobelia gracilis* Andrews ................................................................................Trailing Lobelia
*Pratia purpurascens* (R.Br.) F.Wimmer........................................................Whiteroot

**Loganiaceae**
*Logania albiflora* (Andrews) Druce ...............................................................Narrow-leaved Logania
*Logania pusilla* R.Br. ......................................................................................Logania
*Mitrasacme paludosa* R.Br.............................................................................Mitrasacme
*Mitrasacme polymorpha* R.Br. ......................................................................Mitrasacme

**Loranthaceae**
*Amyema cambagei* (Blakely) Danser.............................................................Needle-leaf Mistletoe
*Amyema miquelii* (Lehm. ex Miq.) Tiegh.......................................................Drooping Mistletoe
*Amyema pendulum* (Sieber ex Spreng.) Tiegh................................................Drooping Mistletoe
*Muellerina eucalyptoides* (DC.) Barlow.........................................................Mistletoe

**Lythraceae**
*Lythrum salicaria* L. ........................................................................................Purple Loosestrife

**Malvaceae**
*Hibiscus heterophyllus* Vent.
subsp. *heterophyllus*..........................................................................Native Rosella
*Pavonia hastata* Cav. ..........................................................................................Pink Pavonia

**Meliaceae**
*Synoum glandulosum* (Sm.) A.Juss. ...............................................................Scentless Rosewood
*Toona ciliata* M.Roemer .................................................................................Red Cedar

**Menispermaceae**
*Sarcopetalum harveyanum* F.Muell. ..............................................................Pearl Vine
*Stephania japonica*
var. *discolor* (Blume) Forman ..........................................................Snake Vine
*Tinospora smilacina* Benth.............................................................................Tinospora

**Menyanthaceae**
*Nymphoides geminata* (R.Br.) Kuntze...........................................................Marshwort

**Monimiaceae**
*Hedycarya angustifolia* A.Cunn. ....................................................................Native Mulberry

**Moraceae**
*Ficus coronata* Spin & Colla..........................................................................Creek Sandpaper Fig
*Ficus obliqua* G.Forst.....................................................................................Small-leaved Fig
*Ficus rubiginosa* Desf. ex Vent.
forma *rubiginosa*..............................................................................Port Jackson Fig
*Maclura cochinchinensis* (Lour.) Corner .......................................................Cockspur Thorn

*Streblus brunonianus* (Endl.) F.Muell. ............................................................ Whalebone Tree

**Myoporaceae**
*Eremophila debilis* (Andrews) Chinnock ........................................................ Winter Apple
*Myoporum montanum* R.Br. ............................................................................ Western Boobialla

**Myrsinaceae**
*Myrsine howittiana* (F.Muell. ex Mez) Jackes ................................................ Brush Muttonwood
*Myrsine variabilis* R.Br. ................................................................................... Muttonwood

**Myrtaceae**
*Acmena smithii* (Poir.) Merr. & L.M.Perry ...................................................... Lilly Pilly
*Angophora floribunda* (Sm.) Sweet ................................................................. Rough-barked Apple
*Angophora subvelutina* F.Muell. ...................................................................... Broad-leaved Apple
*Babingtonia densifolia* (Sm.) F.Muell. ............................................................. Babingtonia
*Backhousia myrtifolia* Hook. f. & Harvey ........................................................ Grey Myrtle
*Baeckea omissa* A.R.Bean ................................................................................ Forgotten Baeckea
*Callistemon flavovirens* (Cheel) Cheel ............................................................ Green Bottlebrush
*Callistemon pallidus* (Bonpl.) DC. .................................................................. Lemon Bottlebrush
*Callistemon pityoides* F.Muell. ........................................................................ Alpine Bottlebrush
*Callistemon sieberi* DC. .................................................................................. River Bottlebrush
*Callistemon viminalis* (Sol. ex Gaertn.) G.Don ex Loudon ............................. Weeping Bottlebrush
*Calytrix tetragona* Labill. ................................................................................ Fringe Myrtle
*Corymbia gummifera* (Sol. ex Gaertn.) K.D.Hill & L.A.S.Johnson ................ Red Bloodwood
*Corymbia intermedia* (R.T.Baker) K.D.Hill & L.A.S.Johnson ....................... Pink Bloodwood
*Eucalyptus acaciiformis* H.Deane & Maiden .................................................. Wattle-leaved Peppermint
*Eucalyptus acmenoides* Schauer ...................................................................... White Mahogany
*Eucalyptus andrewsii* Maiden ......................................................................... New England Blackbutt
*Eucalyptus banksii* Maiden .............................................................................. Tenterfield Woollybutt
*Eucalyptus biturbinata* L.A.S.Johnson & K.D.Hill ......................................... A Grey Gum
*Eucalyptus bridgesiana* R.T.Baker .................................................................. Apple Box
*Eucalyptus brunnea* L.A.S.Johnson & K.D.Hill .............................................. Round-leaved Gum
*Eucalyptus caliginosa* Blakely & McKie ......................................................... Broad-leaved Stringybark
*Eucalyptus cameronii* Blakely & McKie ........................................................ Diehard Stringybark
*Eucalyptus campanulata* R.T.Baker & H.G.Sm. ............................................. New England Blackbutt
*Eucalyptus codonocarpa* Blakely & McKie .................................................... Granite Eucalyptus
*Eucalyptus dalrympleana*
subsp. *heptantha* L.A.S.Johnson ....................................................... Mountain Gum
*Eucalyptus dealbata* A.Cunn. ex Schauer ....................................................... Tumbledown Red Gum
*Eucalyptus dorrigoensis* L.A.S.Johnson & K.D.Hill ....................................... Dorrigo White Gum
*Eucalyptus laevopinea* R.T.Baker ................................................................... Silver-top Stringybark
*Eucalyptus melliodora* A.Cunn. ex Schauer .................................................... Yellow Box
*Eucalyptus microcorys* F.Muell. ...................................................................... Tallowwood
*Eucalyptus notabilis* Maiden ........................................................................... Mountain Mahogany
*Eucalyptus nova-anglica* H.Deane & Maiden ................................................. New England Peppermint
*Eucalyptus obliqua* L'Her. ............................................................................... Messmate
*Eucalyptus oreades* R.T.Baker ........................................................................ Blue Mountain Ash
*Eucalyptus pauciflora* Sieber ex Spreng. ......................................................... Snow Gum
*Eucalyptus prava* L.A.S.Johnson & K.D.Hill ................................................. Orange Gum
*Eucalyptus propinqua* H.Deane & Maiden ..................................................... Small-fruited Grey Gum
*Eucalyptus radiata*
subsp. *sejuncta* L.A.S.Johnson & K.D.Hill ...................................... Narrow-leaved Peppermint
*Eucalyptus saligna* Sm. ................................................................................... Sydney Blue Gum
*Eucalyptus scoparia* Maiden ........................................................................... Wallangarra Gum
*Eucalyptus tereticornis* Sm. ............................................................................ Forest Red Gum
*Eucalyptus tindaliae* Blakely .......................................................................... Stringybark
*Eucalyptus viminalis* F.Muell. ....................................................................... Manna Gum
*Eucalyptus williamsiana* L.A.S.Johnson & K.D.Hill ...................................... William's Stringybark
*Eucalyptus youmanii* Blakely & McKie .......................................................... Youman's Stringybark
*Homoranthus lunatus* Craven & S.R.Jones ..................................................... Crescent-leafed Heath Myrtle

*Kunzea bracteolata* Maiden & Betche ....................Granite Kunzea
*Kunzea ericoides* (A.Rich.) Joy Thomps. ....................Burgan
*Kunzea obovata* Byrnes....................Kunzea
*Kunzea parvifolia* Schauer ....................Violet Kunzea
*Leptospermum arachnoides* Gaertn. ....................Spider Tea-tree
*Leptospermum brachyandrum* (F.Muell.) Druce ....................Tea-tree
*Leptospermum brevipes* F.Muell. ....................Grey Tea-tree
*Leptospermum gregarium* Joy Thomps. ....................Swamp Tea-tree
*Leptospermum minutifolium* C.T.White ....................Small-leaved Tea-tree
*Leptospermum novae-angliae* Joy Thomps. ....................New England Tea-tree
*Leptospermum polygalifolium*
subsp. *montanum* Joy Thomps. ....................Creek Tea-tree
subsp. *transmontanum* Joy Thomps. ....................Creek Tea-tree
*Leptospermum trinervium* (Sm.) Joy Thomps. ....................Paperbark Tea-tree
*Leptospermum variabile* Joy Thomps. ....................Variable Tea-tree
*Lophostemon confertus* Peter G.Wilson & J.T.Waterh....................Brush Box
*Micromyrtus sessilis* J.W.Green ....................Micromyrtus
*Rhodamnia argentea* Benth. ....................White Myrtle
*Syzygium australe* (Wendl. ex Link) B.Hyland ....................Brush Cherry

**Nyctaginaceae**
*Boerhavia dominii* Meikle & Hewson....................Tarvine

**Olacaceae**
*Olax stricta* R.Br. ....................Olax

**Oleaceae**
*Notelaea linearis* Benth. ....................Narrow-leaved Mock Olive
*Notelaea longifolia* Vent. ....................Large Mock-Olive
*Notelaea microcarpa* R.Br. ....................Native Olive
*Notelaea ovata* R.Br. ....................Mock Olive
*Notelaea* sp. A ....................Apple Mock Olive
*Notelaea venosa* F.Muell. ....................Veined Mock-Olive

**Onagraceae**
*Epilobium billardierianum*
subsp. cinereum (Rich) Raven & Engelhorn ....................Hairy Willow Herb
subsp. *hydrophilum* Raven & Engelhorn ....................Variable Willow Herb
*Epilobium gunnianum* Hausskn. ....................Willow Herb
*Epilobium hirtigerum* A.Cunn. ....................Willow Herb

**Oxalidaceae**
*Oxalis chnoodes* Lourteig ....................Wood Sorrel
*Oxalis exilis* A.Cunn. ....................Wood Sorrel
*Oxalis perennans* Haw. ....................Wood Sorrel

**Passifloraceae**
*Passiflora aurantia* G.Forst.
var. *aurantia* ....................Blunt-leaved Passionfruit

**Peperomiaceae**
*Peperomia blanda*
var. *floribunda* (Miq.) H.Huber ....................Pepper Plant
*Peperomia tetraphylla* (G.Forst.) Hook. & Arn. ....................Four-leaved Pepper Plant

**Phytolaccaceae**
**Phytolacca octandra* L. ....................Inkweed

**Pittosporaceae**
*Billardiera longiflora* Labill. ....................Purple Appleberry

*Billardiera scandens* Sm.
var. *scandens* ........ Apple Dumplings
*Bursaria spinosa* Cav.
var. *spinosa* ........ Native Blackthorn
*Citriobatus pauciflorus* Ettingsh. ........ Orange Thorn
*Pittosporum undulatum* Vent. ........ Sweet Pittosporum
*Rhytidosporum procumbens* (Hook.) F.Muell. ........ Rhytidosporum

**Plantaginaceae**
*Plantago debilis* R.Br. ........ Small Plantain
**Plantago major* L. ........ Large Plantain
*Plantago varia* R.Br. ........ Variable Plantain

**Polygalaceae**
*Comesperma ericinum* DC. ........ Heath Milkwort
*Comesperma sphaerocarpum* Steetz ........ Grass Comesperma
*Comesperma sylvestre* Lindl. ........ Milkwort
*Comesperma volubile* Labill. ........ Climbing Milkwort
*Polygala japonica* Houtt. ........ Polygala

**Polygonaceae**
**Acetosella vulgaris* Fourr. ........ Sheep Sorrel
*Muehlenbeckia costata* m.s. ........ Climbing Fire Lignum
*Muehlenbeckia rhyticarya* F.Muell. ex Benth. ........ Trailing Lignum
*Persicaria hydropiper* (L.) Spach ........ Waterpepper
*Rumex brownii* Campd. ........ Swamp Dock

**Portulacaceae**
*Calandrinia eremaea* Ewart ........ Small Purslane
*Calandrinia pickeringii* A.Gray ........ Pickering’s Purslane

**Proteaceae**
*Banksia cunninghamii* Sieber ex Rchb.
subsp. A. ........ New England Banksia
*Banksia integrifolia*
subsp. *monticola* K.R.Thiele ........ Mountain Banksia
*Banksia marginata* Cav. ........ Banksia
*Banksia spinulosa*
var. *collina* (R.Br.) A.S.George ........ Hairpin Banksia
*Conospermum taxifolium* C.F.Gaertn. ........ Coneseeds
*Grevillea juniperina*
subsp. *allojohnsonii* Makinson ........ Grevillea
*Grevillea linearifolia* (Cav.) Druce ........ Grevillea
*Hakea eriantha* R.Br. ........ Tall Hakea
*Hakea florulenta* Meisn. ........ Hakea
*Hakea laevipes*
subsp. *graniticola* Haegi ........ Granite Hakea
*Hakea macrorhyncha* R.T.Baker ........ Hakea
*Hakea microcarpa* R.Br ........ Small-fruited Hakea
*Hakea salicifolia* (Vent.) B.L.Burtt.
subsp. *salicifolia* ........ Willow-leaved Hakea
*Lomatia fraseri* R.Br. ........ Silky Lomatia
*Lomatia silaifolia* (Sm.) R.Br. ........ Crinkle Bush
*Orites excelsa* R.Br. ........ Prickly Ash
*Persoonia cornifolia* A.Cunn. ex R.Br. ........ Common Geebung
*Persoonia daphnoides* A.Cunn. ex R.Br. ........ Daphne Geebung
*Persoonia fastigiata* R.Br. ........ Geebung
*Persoonia microphylla* R.Br. ........ Geebung
*Persoonia oleoides* L.A.S.Johnson & P.H.Weston ........ Geebung
*Persoonia sericea* R.Br. ........ Silky Geebung

*Persoonia tenuifolia* R.Br. ............................................................................Geebung
*Persoonia virgata* R.Br. ...............................................................................Geebung
*Petrophile canescens* A.Cunn. ex R.Br. ........................................................Prickly Conesticks

**Ranunculaceae**
*Clematis aristata* R.Br. ex Ker Gawl. ............................................................Traveller's Joy
*Clematis glycinoides* DC. .............................................................................Headache Vine
*Ranunculus inundatus* R.Br. ex DC. ...............................................................River Buttercup
*Ranunculus lappaceus* Sm. ...........................................................................Common Buttercup

**Rhamnaceae**
*Alphitonia excelsa* (Fenzl) Benth. .................................................................Red Ash
*Cryptandra amara* Sm.
 var. *amara* ...................................................................................Common Cryptandra
*Cryptandra lanosiflora* F.Muell. ....................................................................Woolly Cryptandra
*Cryptandra scortechinii* F.Muell. ..................................................................Clustered Cryptandra
*Pomaderris andromedifolia* A.Cunn.
 subsp. *andromedifolia* ....................................................................Pomaderris
*Pomaderris lanigera* (Andrews) Sims ...........................................................Pomaderris
*Pomaderris ligustrina* Sieber ex DC. ............................................................Rusty Cryptandra
*Pomaderris nitidula* (Benth.) N.A.Wakef. ......................................................Shining Pomaderris

**Rosaceae**
*Acaena agnipila* Gand. ................................................................................Bidgee Widgee
*Acaena novae-zelandiae* Kirk ........................................................................Bidgee Widgee
**Rosa rubiginosa* L. ......................................................................................Sweet Briar
**Rubus fruticosus* L. .....................................................................................Blackberry
*Rubus moluccanus*
 var. *trilobus* A.R.Bean ...................................................................Molucca Bramble
*Rubus parvifolius* L. .....................................................................................Small-leaved Bramble
**Rubus ulmifolius* Schott ...............................................................................Blackberry

**Rubiaceae**
*Asperula conferta* Hook.f. .............................................................................Common Woodruff
*Coprosma quadrifida* (Labill.) Robinson .......................................................Prickly Currant Bush
*Galium binifolium* N.A.Wakef. ......................................................................Bedstraw
*Galium gaudichaudii* DC. ..............................................................................Rough Bedstraw
*Galium migrans* Ehrend. & McGillivray .........................................................Bedstraw
*Galium propinquum* A.Cunn. .........................................................................Bedstraw
*Morinda jasminoides* A.Cunn. .......................................................................Jasmin Morinda
*Opercularia aspera* Gaertn. ..........................................................................Coarse Stinkweed
*Opercularia diphylla* Gaertn. ........................................................................Stinkweed
*Opercularia hispida* Spreng. .........................................................................Hairy Stinkweed
*Pomax umbellata* (Gaertn.) Sol. ex A.Rich. ...................................................Pomax
*Psychotria loniceroides* Sieber ex DC. ..........................................................Hairy Psychotria

**Rutaceae**
*Acronychia laevis* Forst. & Forst.f. ...............................................................Glossy Acronychia
*Asterolasia correifolia* (A.Juss.) Benth. ........................................................Star Bush
*Boronia amabilis* S.T.Blake ..........................................................................Boronia
*Boronia anemonifolia*
 subsp. *variabilis* P.G.Neish .............................................................Boronia
*Boronia anethifolia* A.Cunn. ex Endl. ...........................................................Boronia
*Boronia microphylla* Sieber ex Rchb. ............................................................Small-leaved Boronia
*Boronia parviflora* Sm. .................................................................................Swamp Boronia
*Boronia pinnata* Sm. .....................................................................................Boronia
*Boronia polygalifolia* Sm. .............................................................................Dwarf Boronia
*Correa reflexa* (Labill.) Vent.
 var. *reflexa* ......................................................................................Green Correa

*Crowea exalata* F.Muell.
subsp. *exalata*.....Crowea
*Leionema ambiens* (F.Muell.) Paul G.Wilson.....Forest Leionema
*Leionema rotundifolium* (Endl.) Paul G.Wilson.....Round-leaved Leionema
*Phebalium glandulosum* Hook.
subsp. *glandulosum*.....Desert Phebalium
*Phebalium squamulosum* Vent......Scaly Phebalium
*Philotheca epilosa* (Paul G.Wilson) P.I.Forst.....Philotheca
*Zieria cytisoides* Sm......Downy Zieria
*Zieria fraseri*
subsp. *compacta*.....Smooth Zieria
*Zieria smithii* Andrews.....Sandfly Zieria

**Santalaceae**
*Choretrum candollei* F.Muell......White Sour Bush
*Exocarpos cupressiformis* Labill......Cherry Ballart
*Exocarpos strictus* R.Br......Dwarf Cherry
*Leptomeria drupacea* (Labill.) Druce.....Leptomeria

**Sapindaceae**
*Alectryon subcinereus* (A.Gray) Radlk......Wild Quince
*Alectryon subdentatus* (F.Muell. ex Benth.) Radlk.
forma *subdentatus*.....Alectryon
*Dodonaea hirsuta* (Maiden & Betche) Maiden & Betche.....Hairy Hop Bush
*Dodonaea triquetra* J.C.Wendl......Hop Bush
*Dodonaea viscosa* Jacq......Hop Bush
*Guioa semiglauca* (F.Muell.) Radlk......Guioa

**Scrophulariaceae**
*Derwentia arcuata* B.G.Briggs & Ehrend......Derwentia
*Gratiola peruviana* L......Brooklime
**Verbascum thapsus* L.
subsp. *thapsus*.....Aaron's Rod
*Veronica calycina* R.Br......Hairy Speedwell
*Veronica plebeia* R.Br......Trailing Speedwell

**Solanaceae**
*Solanum campanulatum* R.Br......Nightshide
*Solanum cinereum* R.Br......Narrawa Burr
*Solanum elegans* Dunal ex Poir......Spiny Kangaroo Apple
*Solanum nobile* A.R.Bean.....Nightshade
*Solanum prinophyllum* Dunal.....Forest Nightshade
*Solanum stelligerum* Sm......Devil's Needles

**Stackhousiaceae**
*Stackhousia monogyna* Labill......Creamy Candles
*Stackhousia viminea* Sm......Slender Stackhousia

**Sterculiaceae**
*Brachychiton discolor* F.Muell......Lacebark Tree
*Brachychiton populneus* (Schott & Endl.) R.Br.
subsp. *populneus*.....Kurrajong
*Lasiopetalum ferrugineum* Sm. ex Andrews
var. *ferrugineum*.....Lasiopetalum
*Rulingia dasyphylla* (Andrews) Sweet.....Rulingia

**Stylidiaceae**
*Stylidium graminifolium* Sm. ex Willd......Grass Triggerplant
*Stylidium laricifolium* A.Rich......Tree Triggerplant

**Thymelaeaceae**
*Pimelea glauca* R.Br. ........................................................................................Rice Flower
*Pimelea ligustrina* Labill. ..................................................................................Rice Flower
*Pimelea linifolia*
subsp. *collina* (R.Br.) Threlfall ..........................................................Rice Flower
*Pimelea strigosa* Gand. ....................................................................................Rice Flower

**Tremandraceae**
*Tetratheca thymifolia* Sm. .................................................................................Black-eyed Susan

**Ulmaceae**
*Aphananthe philippinensis* Planch....................................................................Rough-leaved Elm

**Urticaceae**
*Australina pusilla* Gaudich. ...............................................................................Australina
*Dendrocnide excelsa* (Wedd.) Chew ...............................................................Giant Stinging Tree
*Dendrocnide photinophylla* (Kunth) Chew ......................................................Shiny-leaved Stinging Tree
*Urtica incisa* Poir. ............................................................................................Stinging Nettle

**Verbenaceae**
*Clerodendrum tomentosum* R.Br. .....................................................................Hairy Clerodendrum
**Verbena bonariensis* L. ....................................................................................Purpletop
*Verbena officonalis* L. ......................................................................................Common Verbena

**Violaceae**
*Hybanthus monopetalus* (Schult.) Domin.........................................................Slender Violet-bush
*Viola betonicifolia* Sm. .....................................................................................Long-leaf Violet
*Viola caleyana* G.Don .......................................................................................Violet
*Viola hederacea* Labill. ....................................................................................Ivy-leaf Violet
*Notothixos subaureus* Oliv. ..............................................................................Golden Mistletoe

**Vitaceae**
*Cayratia clematidea* (F.Muell.) Domin ...........................................................Slender Grape
*Cissus antarctica* Vent. ....................................................................................Water Vine
*Cissus hypoglauca* A.Gray ...............................................................................Giant Water Vine
*Tetrastigma nitens* (F.Muell.) Planch. ..............................................................Shiny-leaved Grape

**Winteraceae**
*Tasmannia stipitata* (Vickery) A.C.Sm. ...........................................................Northern Pepperbush

**Appendix C:** Introduced taxa: their life history, control and distribution. The distribution of these taxa within the defined communities are given within the description of each community in section 3.5. A priority scale of invasiveness is suggested with 1 being of highest priority for eradication due to high invasiveness in natural habitats to 5 either ubiquitous or non invasive.

*Acetosella vulgaris*

**Family:** Polygonaceae.

**Synonymy:** *Rumex acetosella*, *A. angiocarpa.*

**Common name:** Sheep Sorrel, Sorrel.

**Priority:** 4.

**Habit:** Slender erect herb, 10-50 cm high with creeping underground stems.

**Life cycle:** A vigorous winter to spring growing plant.

**Origin & distribution:** Probably native of Europe, now widespread especially in temperate regions. NC, CC, SC, NT, CT, ST, NWS, CWS, SWS, SWP in NSW. Qld, Vic., Tas., SA and WA.

**Dispersal:** Nut 1-1.5 mm long and vegetatively from pieces of the underground stems.

**Habitat:** Often on soils of an acid nature often in old gardens or areas of habitation, usually in higher rainfall areas.

**Properties:** Leaves can poison stock they contain oxalate and cause kidney trouble.

**Control & management:** Control not easy with 2,4-D but can use dicamba.

*Ageratina adenophora*

**Family:** .Asteraceae

**Synonymy:** .*Eupatorium adenophorum, E. glandulosum, E. pasdadense.*

**Common name:** .Crofton Weed, Catweed, Hemp Agrimony.

**Habit:** .A many-stemmed, perennial herb 1-2m high, reproducing by seed and vegetatively from a short, pale yellow rootstock.

**Life cycle:** .Seeds germinate in light, December to September. Peak of germination February and March. Seedlings fully established within 8 weeks of germination. Buds appear in late winter, flowering September. Seeds mature and are shed between October and mid-January.

**Origin & distribution:** .Native of Central America. NC, CC; Qld., SA.

**Dispersal:** .Seed dispersed by wind and water. Also in produce, sand, gravel, mud stuck to animals, machinery, footwear, clothing. Bent over or broken stems take root where they contact the soil.

**Priority:** .2

**Habitat:** .Humid subtropics, principally in creek beds, forest clearings, in areas with steep (greater than 20 degrees) frost free slopes where rainfall exceeds 1500mm per year.

**Properties:** .Reduces crop yield. Fatal to horses. Light is necessary for germination.

**Control & management:** Boomspray dense infestations on slopes with dicamba and MCPA. Treat scattered plants with granular formulations of the herbicides. Biological control has been investigated, but found unsuitable to Australia.

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*Aira cupaniana*

**Family:** Poaceae.

**Synonymy:**

**Common name:** Silvery Hairgrass.

**Priority:** 3.

**Habit:** Slender annual, erect or occasionally geniculate at the base to 0.5 m tall.

**Life cycle:** Flowers spring-early summer. Seeds in spring and winter growing. Can form monospecific stands following favourable autumn and winter rains.

**Origin & distribution:** Native to the Mediterranean. Found in all divisions except NFWP and SFWP, within all states except the NT.

**Dispersal:** Via cariopsis.

**Habitat:** Grows in pastures, disturbed grassland or open woodland on all soil types.

**Properties:**

**Control & management:** Burning will increase population numbers.

---

*Andropogon virginicus*

**Family:** .Poaceae

**Synonymy:** .

**Common name:** Whisky Grass, Broomsedge.

**Habit:** .Rather coarse perennial grass, growing in clumps and reproducing by seed and from the crown.

**Life cycle:** .Seeds germinate in autumn, develop slowly over winter. Stems develop late spring, flowering early summer – autumn.

**Origin & distribution:** .Native of the Americas. NC, CC, SC, NT, CT, ST; Qld.

**Dispersal:** .Awned seeds distributed in wool, fur, clothing etc. Also in mud on machinery and vehicles.

**Priority:** .2

**Habitat:** .Sub-humid to humid subtropical areas on a wide range of soils. Principally a weed of disturbed areas.

**Properties:** .Dried stalks may prevent a fire hazard.

**Control & management:** Spotspray seedlings with paraquat or glyphosate.

---

*Anagallis arvensis*

**Family:** Primulaceae.

**Synonymy:**

**Common name:** Scarlet Pimpernel, Blue Pimpernel.

**Habit:** Small perennial or annual herb to 30 cm tall.

**Life cycle:**

**Origin & distribution:** Native of Europe, Asia, North Africa; NC, CC, SC, NT, CT, ST, NWS, CWS, NWP, SWP, NFWP; Qld; Vic.; Tas.; SA; WA.

**Dispersal:**

**Priority:** 3.

**Habitat:** Usually in damp places in gardens, wasteland, roadsides, creek banks and irrigated and natural grasslands.

**Properties:** Has poisoned horses, sheep, cattle, birds and tested to be toxic to dogs and rabbits.

**Control & management:** MCPA or 2,4-D are partially effective on seedlings; Ioxynil will kill the plant, hand weeding.

---

*Anthoxanthum odoratum*

**Family:** Poaceae

**Synonymy:**

**Common name:** Sweat Vernal Grass

**Priority:** 3.

**Habit:** Tufted perennial to 1 m high.

**Life cycle:** Flowers spring to summer.

**Origin & distribution:** Native to Europe and temperate Asia. NC, CC, SC, NT, CT, ST, NWS, SWS in NSW. All states except the NT.

**Dispersal:** Cariopsis.

**Habitat:** Widespread in mown or grazed areas..

**Properties:** Contains coumarin which gives it its characteristic fragrance.

**Control & management:** -.

---

*Axonopus affinis*

**Family:** Poaceae.

**Synonymy:**

**Common name:** Narrow-leaved Carpet Grass, Mat Grass.

**Priority:** 4.

**Habit:** Glabrous rhizomatous and stoloniferous perennial to 0.5 m tall often forming dense mats.

**Life cycle:** Flowers during warmer months.

**Origin & distribution:** Native of America. NC, CC, SC, NT, ST and SWP in NSW. Qld.

**Dispersal:** Via cariopsis.

**Habitat:** Lawns, naturalized in run down pastures on alluvial soils. A serious weed of wetter regions.

**Properties:**

**Control & management:** Difficult to eradicate once established. Spot spraying with kerosene or diesel distillate. Glyphosate.

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*Bidens pilosa*

**Family:** Asteraceae.

**Synonymy:**

**Common name:** Cobbler’s Pegs, Stick-tights, Pitch-forks.

**Priority:** 3.

**Habit:** Erect annual forb 60 cm to 1 m with angular branches.

**Life cycle:** Germinates spring & summer after rain, flowers throughout year but mainly late summer-autumn.

**Origin & distribution:** Native of tropical South America; now spread throughout warm regions of world; widespread north of Milton NSW and ACT. Qld, Vic., NT, SA, WA.

**Dispersal:** Seeds which readily attach to fur/clothing by the 2 barbed spines.

**Habitat:** Gardens, cultivated land, waste areas, roadsides; usually on loam or clay loam soils (Western NSW).

**Properties:** One report indicates it may taint milk.

**Control & management:** Spray with 2,4–D or MCPA.

---

*Briza minor*

**Family:** Poaceae

**Synonymy:**

**Common name:** Shivery Grass.

**Priority:** 3.

**Habit:** Annual to 0.6 m.

**Life cycle:** Flowers spring.

**Origin & distribution:** Native to Europe. NC, CC, SC, NT, CT, ST, NWS, CWS, SWS, NWP, SWP. All states except NT.

**Dispersal:** Via cariopsis. Sometimes found in pasture seed.

**Habitat:** Weed of disturbed areas, cultivation and waste ground.

**Properties:** -.

**Control & management:** -.

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*Centaurium erythraea*

**Family:** Gentianaceae.

**Synonymy:**

**Common name:** Century.

**Priority:** 3.

**Habit:** Erect herb with basal rosette to 40 cm tall.

**Life cycle:** Flowers spring to summer.

**Origin & distribution:** Native to Europe. All division except SFWP in NSW. All mainland states except NT.

**Dispersal:** Capsule.

**Habitat:** Widespread in settled areas.

**Properties:**

**Control & management:** Chipping but make sure tap root removed. Spot spraying. Fire is known to increase population sizes.

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*Cerastium balearicum*

**Family:** Caryophyllaceae.

**Synonymy:** NA.

**Common name:** Mouse-ear Chickweed.

**Priority:** 5.

**Habit:** Annual herb.

**Life cycle:** Flowers spring.

**Origin & distribution:** Native of Europe. NT, CT, ST, CWS in NSW. SA.

**Dispersal:** Cylindrical capsule.

**Habitat:** Uncommon weed of disturbed ground.

**Properties:**

**Control & management:** Chipping and spot spraying.

---

*Cirsium vulgare*

**Family:** Asteraceae.

**Synonymy:** *Carduus lanceolatus*, *Carduus vulgaris*, *Cnicus lanceolatus*.

**Common name:** Spear thistle, Bull thistle, Scotch thistle (NZ), swamp thistle.

**Priority:** 2.

**Habit:** Erect biennial to 1.5 m high.

**Life cycle:** Seeds germinate mostly after autumn rains; winter development of root system; rosette grows through summer to next spring of the second year when it flowers August - April; plant dies end of summer-early autumn; grows after spring and summer rains.

**Origin & distribution:** Native to Europe, western Asia and North Africa. In all states except NT. All divisions NSW. Vic., Tas., SA, WA.

**Dispersal:** Seed – wind, water, mud, vehicles, and in feed.

**Habitat:** Weed of old cultivated land, run-down pastures and newly cleared brigalow country in Qld.

**Properties:** Noxious weed (all Vic; Tas, parts NSW and WA); smothers pastures; stock avoid grazing amongst plants; seeds short dormancy; low wind dispersal potential; rarely eaten by stock but infections are transmitted to animal by the spines of spear thistle; positive response to increased fertility.

**Control & management:** Spray with 2,4-D or MCPA (but old plants are fairly resistant) in the rosette to early flowering stages, or cut annual plant at base just as flower buds are opening and remove root; in cleared brigalow it often disappears after 2 years being replaced by other plants.

---

*Conyza albida*

**Family:** Asteraceae.

**Synonymy:**

**Common name:** Tall Fleabane.

**Priority:** 2.

**Habit:** Robust erect spreading annual herb to 2 m high.

**Life cycle:** Flowers summer to autumn (mainly December – ?August)

**Origin & distribution:** Native of North America. NC CC SC NT CT ST NWS CWS SWS SWP. Qld, Vic., SA, WA.

**Dispersal:** Achenes.

**Habitat:** Cultivated areas, pastures, wasteland.

**Properties:**

**Control & management:** Spraying with 2,4-D o MCPA plus dicamba.

---

*Conyza bonariensis*

**Family:** Asteraceae.

**Synonymy:** *Erigeron bonariensis*

**Common name:** Flax-leaf Fleabane.

**Priority:** 2.

**Habit:** Annual herb up to 1-2 m high.

**Life cycle:** Active growth starts spring-early autumn; seed production over long period; flowers throughout year.

**Origin & distribution:** Native of South America. All divisions in NSW. All states.

**Dispersal:** Seed by wind.

**Habitat:** Most soil types and plant communities particularly in disturbed soil eg roadsides, cultivation and lawns.

**Properties:** Suspected of poisoning stock; may irritate skin.

**Control & management:** Spraying with 2,4-D o MCPA plus dicamba. Pulling by hand probably an easy way for removing individuals.

---

*Conyza parva*

**Family:** Asteraceae.

**Synonymy:**

**Common name:** Fleabane, Ragweed.

**Priority:** 2.

**Habit:** Erect annual herb to 50 cm tall.

**Life cycle:** Flowers summer to autumn.

**Origin & distribution:** Native of South America. NC, CC, SC, NT, ST, SWS in NSW. Qld, Vic. And WA.

**Dispersal:** Achene with a pappus.

**Habitat:** Mainly in sandy soil usually in disturbed sites such as roadsides.

**Properties:**

**Control & management:** Susceptible to MCPA and 2,4-D at strength of 0.2%. Sometimes use in addition to dicamba.

---

*Crepis capillaris*

**Family:** Asteraceae.

**Priority:** 3

**Synonymy:**

**Common name:** Smooth Hawksbeard.

**Habit:** Annual or short-lived perennial herb to 75 cm.

**Life cycle:** Flowers summer.

**Origin & distribution:** Native of Europe; NC, CC, NT, CT, ST, NWS, NWP; Tas

**Dispersal:** Achene & pappus.

**Habitat:** Roadside & disturbed areas.

**Properties:**

**Control & management:**

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*Eragrostis curvula*

**Family:** Poaceae.

**Synonymy:**

**Common name:** African Lovegrass.

**Priority:** 1.

**Habit:** Tufted perennial to 120 cm tall.

**Life cycle:** Seeds germinate in autumn or spring if sufficient moisture. Seedlings grow slowly for the first 6 weeks and then increases. Growth ceases in winter.

**Origin & distribution:** Native to South Africa.

**Dispersal:** By mud, machinery, vehicles, road making and transportation of contaminated soil.

**Habitat:** Semi-arid to subtropical grasslands, mainly on acid soils. Found usually on disturbed soils.

**Properties:** Highly persistent.

**Control & management:** Remove seedlings from the sward by hoeing or with chemicals. Spot spray with amitrole T, glyphosate.

*Gamochaeta americanum*

**Family:** Asteraceae.

**Synonymy:** *Gnaphalium*

**Common name:** Cudweed.

**Priority:** 4.

**Habit:** Slender herb to 35 cm tall with a basal rosette.

**Life cycle:** Flowers mainly October to January.

**Origin & distribution:** Native of Central and Southern America. NC, CC, SC, NT, CT, ST in NSW. Qld.

**Dispersal:** Achenes.

**Habitat:** Grows in disturbed areas such as roadsides in damp sheltered situations.

**Properties:**

**Control & management:** Readily controlled by spraying with 2,4-D at 0.2% strength or by chipping and hand pulling.

*Gamochaeta spicata*

**Family:** Asteraceae

**Synonymy:** *Gnaphalium coarctatum*

**Common name:** Cudweed

**Habit:** Annual or biennial herb 7-40cm high.

**Life cycle:** Flowers mainly December-January.

**Origin & distribution:** Native to America. NC, CC, SC, NT, NWS, CWS, SWS; LHI, Qld., Vic., NI.

**Dispersal:**

**Priority:** 4.

**Habitat:**

**Properties:** Colonises disturbed ground.

**Control & management:**

---

*Gomphocarpus fruticosus*

**Family:** Asclepiadaceae.

**Synonymy:** *Asclepias arborescens, Asclepias fruticosa*.

**Common name:** Narrow Leaf Cotton Bush, Duck Bush.

**Priority:** 2.

**Habit:** Perennial erect shrub 0.6-2 m high.

**Life cycle:** Plants seeds germinate during warmer months so long as moisture is available; will germinate at any time however peak germination periods during late spring and early autumn; rapid initial seedling growth; seedlings can resprout from root or crown if injured; slow growth or dormant in winter; new shoot development in spring; flowers after 1st growth season; flowers October – April.

**Origin & distribution:** Native of South Africa and Ethiopia; naturalized in warmer regions of world; found throughout NSW, Qld, Vic, SA, WA.

**Dispersal:** Large quantities of seeds dispersed by wind and water; suckers.

**Habitat:** Humid tropics and subtropics, mainly on better soils; can thrive on low fertility soils; roadsides, wastelands, run-down pastures, old cultivation paddocks; prefers areas of moderate rainfall or moist soils along stream banks; also in areas regularly burned.

**Properties:** Poisonous to stock producing gastro-enteritits and severe congestion of the alimentary canal of an unknown toxic principal; noxious weed; exudes milky sap from all parts when damaged; capable of competing with undisturbed native vegetation; allelopathy restricts germination of other species; seeds especially long lived.

**Control & management:** Hand pulling, grubbing, ploughing, tractor-mounted blade for larger shrubs, slash & mow in winter and use herbicides before flowering (dicamba or seedlings MSMA, glyphosate & triclopyr for adults) and to actively growing plants from September to December.

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*Hyparrhenia hirta*

**Family:** Poaceae.

**Synonymy:**

**Common name:** Coolatai Grass.

**Priority:** 1

**Habit:** Densely tufted perennial to 1.2 m tall.

**Life cycle:**

**Origin & distribution:** Native to the Mediterranean. Common from the coast to the western plains. Also known from all mainland states except Victoria.

**Dispersal:** Seed.

**Habitat:** Common on roadsides.

**Properties:** Very invasive, even in pristine areas.

**Control & management:** This species is a serious weed and poses a great threat to communities within Kwiambal. The species has been found in all communities within the proposed park but is particularly bad at the Limestone Caves. It is also a serious problem along the roadsides and previously cleared lands within the park. No methods are listed for eradication of this species. Monitoring of this species is required and immediate action should be taken to control this species. Tracks leading through non-infested areas should be travelled on less frequently.

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*Hypochaeris glabra*

**Family:** Asteraceae.

**Synonymy:**

**Common Name:** Smooth Catsear, Flatweed, Glabrous Catsear.

**Habitat:** Glabrous annual forb with basal rosette and simple or branched flowering stems 10-40 cm high.

**Life Cycle:** Flowers in spring to autumn.

**Priority:** 4.

**Origin & Distribution:** Native of Europe, Asia and Africa. All divisions in NSW. All states.

**Dispersal:** Achenes dispersed by wind.

**Habitat:** Found in many plant communities, common in woodlands and pastures as well as disturbed sites.

**Properties:**

**Control & Management:**

---

*Hypochaeris radicata*

**Family:** Asteraceae.

**Synonymy:**

**Common name:** Catsear, Flatweed, False Dandelion.

**Habit:** Perennial rosette herb 30-60 cm high with taproot; may act as an annual (western NSW).

**Life cycle:** Flowers spring-autumn but mainly spring & summer.

**Origin & distribution:** Native of Europe; widespread - in all divisions NSW except NWP; all states.

**Dispersal:** seed

**Priority:** 5.

**Habitat:** Common weed in almost all situations, gravelly waste to pastures & lawns, roadsides, disturbed habitats.

**Properties:**

**Control & management:** Killed by spraying with 2,4-D (0.1-0.2%) or MCPA; hand weeding below crown in early spring.

---

*Juncus articulatus*

**Family:** Juncaceae

**Synonymy:**

**Common name:** Jointed Rush

**Priority:** 2.

**Habit:** tufted or shortly rhizomatous perennial to 60 cm, often rooting at the nodes.

**Life cycle:** Growth and flowering mainly in spring to summer.

**Origin & distribution:** Native to Europe, Asia, North Africa, and North America. NC, CC, SC, NT, CT, ST, NWS, CW, SWS, NWP, SWP in NSW. Qld, Vic., Tas., S.A. & W.A.

**Dispersal:** Numerous seeds in a capsule.

**Habitat:** Widespread in damp situations. .

**Properties:** Obstructs flow by growing along channel margins and drains. Will persist in dry conditions.

**Control & management:** Mowing in spring then spraying when 30 cm high with 2.2kg/ha 2,4-D is recommended for most *Juncus* sp.

---

*Juncus bufonius*

**Family:** Juncaceae

**Synonymy:** *Juncus plebeius*

**Common name:** Toad Rush

**Priority:** 2.

**Habit:** Slender tufted annual with terete culms to 30 cm long.

**Life cycle:** Flowers spring to summer. Germinates in autumn or winter and continues to grow while moist conditions last. After flowering plants die off in the onset of dry weather.

**Origin & distribution:** Native to temperate regions. All divisions except NWP and SFWP in NSW. All states.

**Dispersal:** Numerous seeds in a capsule.

**Habitat:** Mostly in disturbed habitats and damp situations around swamp margins, along drainage lines, roadside drains and dams.

**Properties:**

**Control & management:** Cogeners controlled by mowing in spring and spraying regrowth with 2,4-D. Glyphosate, dicamba plus MCPA, and 2,2-DPA may be equally affective.

---

*Lactuca serriola*

**Family:** Asteraceae.

**Synonymy:**

**Priority:** 3

**Common name:** Prickly lettuce, Milk thistle, Compass Plant (leaves orient N–S)

**Habit:** Biennial herb 1-2 m high.

**Life cycle:** Grows from seed or rootstock spring-early summer; growth continues provided sufficient water available; flowers September-April.

**Origin & distribution:** Native of Europe and Asia; weed in all divisions, all states.

**Dispersal:** Achenes.

**Habitat:** Common widespread weed of gardens, roadsides, wasteland, cultivation, degraded pastures and along channel banks.

**Properties:** Grazing of young plants and regrowth prior to prickle development on stems and leaves has resulted in poisoning of stock overseas. It is thought to cause lung problems in cattle and is mildly narcotic.

**Control & management:** –

---

*Medicago spp.*

**Family:** Fabaceae.

**Synonymy:** NA.

**Common name:** Burr Medic.

**Priority:** 5.

**Habit:** Decumbent or ascending herb with branches to 40 cm long and 3 foliolate leaves.

**Life cycle:** Primary juvenile period less than 1 year. Longevity less than 1 year.

**Origin & distribution:** Native of Mediterranean. NC, CC, SC, CT, ST, NWS, CWS, SWS, NWP, SWP, SFWP, SFWP; All states.

**Dispersal:** In mud on cars. High proportion of hard seeds survive beyond next growing season.

**Habitat:** Pastures, lawns, waste places. Annual rainfall 600 – 14000 mm. Recorded on saline sites in western NSW. Full sun.

**Properties:**

**Control & management:** .

---

*Myriophyllum aquaticum*

**Family:** Haloragaceae.

**Synonymy:** *Enydria aquatica; Myriophyllum proserpinacoides; Myriophyllum brasiliense*.

**Common name:** Parrot's Feather, Brazilian Water-milfoil, Thread-of-life.

**Priority:** 2.

**Habit:** Stoloniferous perennial aquatic and semi-aquatic herb, rooting freely from the lower nodes.

**Life cycle:** In Australian no male plants are known and therefore no seeds produced. Female plants flower throughout most of the year in warm coastal situations. Vegetative growth is most vigorous during summer months and once fully established in an area surface cover does not vary greatly from season to season.

**Origin & distribution:** Native to central South America. NC, CC, NT in NSW. Qld, Vic., Tas., WA, SA.

**Dispersal:** Spreads by stem fragments which produce roots. New stems develop from buds when fragments come to rest.

**Habitat:** Grows in freshwater, static or moving, to 2 m depth. Rooting in mud or gravel. Grows best in water containing high nitrogen levels. Tolerant of a wide temperature range. Principally in warm-temperate and subtropical regions.

**Properties:** Declared noxious weed in WA. Densely interwoven stems can impede water movement causing flooding in some areas. Growth rate reduced during winter.

**Control & management:** For temporary control hand pull, subsurface cut and use drag-lines. Minimize movement of stem fragments. In small areas cover with black plastic for several weeks. Herbicides give affective control in most situations but dichlobenil and diphenamid can be detoxified by plant over a period of time. Fine droplet spot spray with glyphosate chlorsulfuron or low volatile esters of 2,4-D.

---

*Paspalum dilatatum*

**Family:** Poaceae.

**Synonymy:**

**Common name:** Paspalum, Dallas Grass, Water Couch, Golden Crown Grass.

**Priority:** 4.

**Habit:** Tufted perennial to 2 m tall.

**Life cycle:** Flowers summer and autumn.

**Origin & distribution:** Native of South America. All division of NSW. All states except NT.

**Dispersal:** Seed.

**Habitat:** A pasture species also found in lawns and disturbed areas. Usually in drainage lines and creek banks.

**Properties:** Has an underground rootstock. Ergot infested seeds are poisonous and can cause dermatitis on humans.

**Control & management:** Can be controlled by diesel or kerosene. May be cut below the crown. This species is widespread and fairly ubiquitous, management would probably be ineffectual particularly on riversides.

*Plantago lanceolata*

**Family:** Plantaginaceae.

**Synonymy:**

**Common name:** Lamb's Tongues, Common Plantain, Ribwort, Ribgrass, Buckhorn Plantain.

**Habit:** Annual or biennial herb with a well developed and persistent tap root.

**Life cycle:** Flowers mainly September to April.

**Origin & distribution:** Native to Europe and north and central Asia. NC, CC, SC, NT, CT, ST, NWS, CWS, SWS, SWP in NSW. All states except NT.

**Dispersal:** Capsule.

**Habitat:** Grows in disturbed sites such as roadsides and waste places.

**Properties:** Important cause of hay fever and a host for some plant diseases.

**Control & management:** Chipping and hand pulling, Spot spraying.

---

*Paspalum urvillei* Stued.

**Family:** Poaceae

**Synonymy:**

**Common name:** Vasey Grass.

**Priority:** 2.

**Habit:** Erect tufted perennial to 2.5 m high.

**Life cycle:** Flowers summer.

**Origin & distribution:** Native to South America. NC, CC, NT, CWS, SWS, NWP, SWP in NSW. Qld & Vic.

**Dispersal:** Via cariopsis, sometimes found in other seed.

**Habitat:** Disturbed areas on low nutrient soils in damp situations. Common to bush tracks. Weed of Roadsides.

**Properties:**

**Control & management:** Spraying with sodium chlorate or 2,2 - DPA.

---

*Pavonia hastata*

**Family:** Malvaceae.

**Synonymy:**

**Common name:**

**Priority:** 2.

**Habit:** Spreading shrub to 1.5 m tall.

**Life cycle:** Flowers in summer.

**Origin & distribution:** Native of South America; NC, CC, NT, NWS, CWS, SWS, SWP; Qld.

**Dispersal:**

**Habitat:** Waste areas and hillsides.

**Properties:**

**Control & management:** Isolated plants should be grubbed and burnt before flowering and the area checked frequently for seedlings. Several herbicides are effective for treating individual plants and small patches. 2,4 – D MCPA, Amitrole T, Dicamba (with or with 2,4-D or MCPA), glyphosate, triclopyr and terbutryn. Some control of non arable areas is achieved by burning to destroy old bushes and encourage seed germination, followed by heavy grazing with sheep to kill seedlings.

---

*Phalaris arundinacea*

**Family:** Poaceae

**Synonymy:**

**Common name:** Reed Canary Grass.

**Priority:** 2.

**Habit:** Robust tufted and rhizomatous perennial to 2 m high.

**Life cycle:** Flowers spring.

**Origin & distribution:** Native to Africa, America, Asia, Europe. NC, CC, SC, NT, CT, ST, in NSW. Vic., Tas., WA.

**Dispersal:** Seed falling with lemna, palea and sterile florets.

**Habitat:** Swampy ground, creek banks, channel and drain banks, floodways and will invade most native sedgelands.

**Properties:** Causes problems in small drainage channels. Planted as pasture species on swampy grounds.

**Control & management:** -.

---

*Prunella vulgaris*

**Family:** Lamiaceae.

**Synonymy:**

**Common name:** Self-heal.

**Priority:** 4.

**Habit:** Perennial herb with decumbent branches to 50 cm long often with a short rhizome.

**Life cycle:** Flowers November to April.

**Origin & distribution:** Native of Europe. NC, CC, SC, NT, CT, ST, CWS, SWS, SWP in NSW. Qld, Vic., Tas. SA.

**Dispersal:** Via seed.

**Habitat:** Grows in disturbed areas particularly along roadsides, especially in moist sites.

**Properties:**

**Control & management:** Chipping and hand pulling.

---

*Phytolacca octandra*

**Family:** Phytolaccaceae.

**Synonymy:**

**Common name:** Inkweed, Red-ink Weed, Red-ink Plant, Dye Berry, Pokeweed.

**Priority:** 2.

**Habit:** An erect much branched perennial herb to 2 m tall.

**Life cycle:** Short lived perennial herb dying after 2 or 3 years.

**Origin & distribution:** Native of tropical America. NC, CC, SC, NT, CT, NWS, CWS, NWP, SWP of NSW. All mainland states.

**Dispersal:** Seed, birds often eat berries and distribute them.

**Habitat:** Very common in rainforest, disturbed sites of higher rainfall, often invades natural communities.

**Properties:** Suspected of poisoning stock.

**Control & management:** Spraying with 3,4-D or pulling.

---

*Plantago major*

**Family:** Plantaginaceae.

**Synonymy:**

**Common name:** Lamb’s Tongues, Common Plantain, Ribwort, Ribgrass, Buckhorn Plantain.

**Habit:** Annual or biennial herb with a well developed and persistent tap root.

**Life cycle:** Flowers mainly September to April.

**Origin & distribution:** Native to Europe and north and central Asia. NC, CC, SC, NT, CT, ST, NWS, CWS, SWS, SWP in NSW. All states except NT.

**Priority:** 3.

**Dispersal:** Capsule.

**Habitat:** Grows in disturbed sites such as roadsides and waste places.

**Properties:** Important cause of hay fever and a host for some plant diseases.

**Control & management:** Chipping and hand pulling, Spot spraying.

---

*Rosa rubiginosa*

**Family:** Rosaceae.

**Synonymy:** *Rosa eglanteria*.

**Common name:** Sweet Briar.

**Habit:** Erect or scrambling deciduous perennial shrub to 3m high.

**Life cycle:** Abundant seed, few seedlings survive, seeds germinate all year round, suckers from crown, flowers at 3 years old.

**Origin & distribution:** Native of Europe and Western Asia to northern India; CC, SC, NT, CT, ST, NWS, SWS, NWP, SWP; all states.

**Dispersal:** Seed dispersed by birds and mammals eating the fruit and possibly by water.

**Priority:** 2.

**Habitat:**

**Properties:** Spread increased by reduced grazing pressure and reduced competition, dense stands can harbor rabbits.

**Control & management:** Removal of established plants by hand or with Briarmatic unit when soil is moist, spraying base of canes with ester 2,4,5-T in flowering or early fruiting. Tordon at full leaf to ripe fruit stage. Misting with picloram; hexazinone applied to crowns with spot gun.

---

*Rubus discolor*

**Family:** Rosaceae.

**Synonymy:** *Rubus procerus*.

**Common name:** Blackberry.

**Priority:** 1.

**Habit:** Scrambling semi-deciduous shrub to 2 m, with primo-canes erect and arching rooting at the apex.

**Life cycle:** As above.

**Origin & distribution:** Native to Europe. NC, CC, SC, CT, ST, NWS in NSW. Vic., SA, WA.

**Dispersal:** Spread by birds when fruit is succulent. Arching canes can root and the thickets can be spread vegetatively.

**Habitat:** Mainly in areas with fertile soils, common on roadsides, stream banks and can be invasive in native bush.

**Properties:** May overcrowd and eliminate native species.

**Control & management:** Bulldoze large plants then rip to bring large roots out to surface dry, spray or pull emerging seedlings. Imazapyr or triclopyr during the early flowering period can be effective but the plants need to be thoroughly wetted. Dead canes should be left for 6 months and then burnt.

---

*Setaria cereale*

**Family:** Poaceae.

**Synonymy:** *Setaria geniculata* var. *pauciseta*.

**Common name:** Slender Pigeon Grass.

**Priority:** 3.

**Habit:** Tufted perennial to 1.2 m high.

**Life cycle:** Flowers summer.

**Origin & distribution:** Native of America. NC, CC, SC, NT, CT, ST, NWS, CWS, SWS, SWP in NSW. All mainland states except NT.

**Dispersal:** Via cariopsis.

**Habitat:** Roadsides and often disturbed areas.

**Properties:**

**Control & management:** Chipping and removal of plant material.

---

*Setaria verticellata*

**Family:** Poaceae.

**Synonymy:**

**Common name:** Pale Pigeon Grass.

**Priority:** 3.

**Habit:** Tufted annual to 1.3 m tall.

**Life cycle:** Flowers in summer.

**Origin & distribution:** Native of warm temperate areas of the Northern hemisphere. Known from the coast to the western slopes within New South Wales. All mainland states except NT.

**Dispersal:** Seed.

**Habitat:** In cultivated and disturbed areas.

**Properties:**

**Control & management:** Regeneration of pasture lands should aid in the control of this species.

---

*Sisyrinchium* sp. A

**Family:** Iridaceae.

**Synonymy:** *Sisyrinchium micranthum auct. non.* Cav.

**Common name:** Scourweed.

**Priority:** 3.

**Habit:** Tufted annual herb to 20 cm tall.

**Life cycle:** Flowers October to December.

**Origin & distribution:** Native of South America. NC, CC, SC, NT, CT, ST, NWS, CWS in NSW. Qld, Vic., WA.

**Dispersal:** Black seeds.

**Habitat:** Often grows in disturbed areas.

**Properties:** May be toxic if eaten.

**Control & management:** Chipping.

---

*Solanum nigrum*

**Family:** Solanaceae.

**Synonymy:** *Solanum opacum*.

**Common name:** Black-berry Nightshade, Black Nightshade, Nightshade, Potato Bush, Tomato Bush, Wild Currents.

**Priority:** 3.

**Habit:** Annual or short-lived perennial herb.

**Life cycle:**

**Origin & distribution:** Native of Europe; all divisions; all states.

**Dispersal:**

**Habitat:** Mainly areas of high soil fertility and rainfall, associated with waste or cultivations but sometimes well away from habitation.

**Properties:** Toxicity of berries varies, toxic when unripe.

**Control & management:** Susceptible to MCPA and 2,4-D.

---

*Stellaria media*

**Family:** Caryophyllaceae.

**Synonymy:**

**Common name:** Common Chickweed.

**Priority:** 3.

**Habit:** Annual or biennial with weak stems rooting at nodes.

**Life cycle:** Winter-spring annual.

**Origin & distribution:** Native of Europe; all divisions except NFWP; Qld; Vic.; Tas.; SA; WA.

**Dispersal:** Seed.

**Habitat:** Weed of cultivation; sometimes riverflats; shaded crevices and valleys on rocky hillsides.

**Properties:**

**Control & management:** Hand weeding, mecaprop and various herbicides.

---

*Sonchus asper* subsp. *glaucescens*

**Family:** Asteraceae.

**Synonymy:**

**Common name:** Rough Sow thistle, Prickly Sow thistle, Spiny Sow thistle, Rough Milk Thistle.

**Habit:** Erect annual or over wintering herb 20-150 cm high, with woody taproot.

**Life cycle:** Grows in cooler seasons and die after flowering October-December if favourable conditions do not persist; otherwise they grow throughout the year and flower at any time.

**Origin & distribution:** Native of Europe; all divisions except NWS NWP; all states.

**Dispersal:** Achene - readily dispersed.

**Priority:** 3.

**Habitat:** Weed of most habitats, particularly roadsides, cultivation, gardens, wasteland.

**Properties:** May causing photosensitization in cattle.

**Control & management:** Cultivation followed by hand weeding or hoeing of scattered plants; mow waste places before seeds form.

---

*Sonchus oleraceus*

**Family:** Asteraceae.

**Synonymy:**

**Common name:** Common Sow thistle, Milk thistle.

**Habit:** Erect succulent annual or over wintering herb 1-1.5 m high, taproot, with milky sap.

**Life cycle:** grow in cooler seasons and die after flowering if favorable conditions do not persist; otherwise they may grow throughout the year and flower at any time.

**Origin & distribution:** Native of Europe & central Asia (Eurasia); all divisions, all states.

**Dispersal:** Achene - readily dispersed.

**Priority:** 3.

**Habitat:** widespread weed of cultivation, pastures & disturbed areas; most soil types most communities.

**Properties:** Suspected of causing photosensitization in cattle

**Control & management:** Readily controlled by spraying with 2,4-D (1.1 kg/ha) or MCPA; normally can be controlled by cultivation and pulling isolated plants before seed set.

---

*Stellaria media*

**Family:** Caryophyllaceae.

**Synonymy:**

**Common name:** Common Chickweed.

**Habit:** Annual or biennial with weak stems rooting at nodes.

**Life cycle:** Winter-spring annual.

**Origin & distribution:** Native of Europe; all divisions except NFWP; Qld; Vic.; Tas.; SA; WA.

**Dispersal:** Seed.

**Priority:** 4.

**Habitat:** Weed of cultivation; sometimes river flats; shaded crevices and valleys on rocky hillsides.

**Properties:**

**Control & management:** Hand weeding, mecoprop and various herbicides.

---

*Tagetes minuta*

**Family:** Asteraceae

**Synonymy:**

**Common name:** Stinking Roger

**Habit:** Annual with stiff, erect stems to 2m high.

**Life cycle:**

**Origin & distribution:** Native of South America. Plentiful throughout coastal areas of NSW and Qld.

**Dispersal:**

**Priority:** 3

**Habitat:**

**Properties:** Occurs in damp, disturbed sites.

**Control & management:** Is susceptible to MCPA and 2,4-D at a strength of 0.2%.

*Taraxacum officinale*

**Family:** Asteraceae.

**Synonymy:**

**Common name:** Dandelion, Common Dandelion.

**Habit:** Prostrate perennial herb 15-30 cm and basal rosette of leaves, scapes 5-40 cm high.

**Life cycle:** Flowers most of year, in spring in western NSW; reproduces by seeds and new shoots from roots.

**Origin & distribution:** Native of Europe; NC, CC, SC, NT, CT, ST, NWS, SWS, NWP, SWP; all states except NT.

**Dispersal:** Achene

**Habitat:** Widespread weed of lawns, roadsides, wasteland, cultivated land and pastures; found where there is adequate moisture available throughout year; favours cool climates.

**Priority:** 4.

**Properties:** Not known to be poisonous; medicinal properties

**Control & management:** Spot spraying with selective herbicides and rotary hoe in arable land or cut crown below soil surface when hand pulling; very difficult to eradicate once established.

---

*Tradescantia zebrina*

**Family:** Commelinaceae.

**Synonymy:** *Zebrina pendula*, *Tradescantia pendula*.

**Common name:** Wandering Jew.

**Priority:** 3.

**Habit:** Creeping succulent herb with stems rooting at nodes and ascending at flowering tips.

**Life cycle:** Flowers spring to summer.

**Origin & distribution:** Native of Mexico and central America. NC, CC, NWS in NSW. Qld.

**Dispersal:**

**Habitat:** Cultivated as an ornamental occasionally naturalized in closed forest.

**Properties:**

**Control & management:** Hand pulling is effective.

---

*Trifolium repens* and other *Trifolium* spp.

**Family:** Fabaceae.

**Synonymy:**

**Common name:** White Clover.

**Priority:** 4.

**Habit:** Prostrate perennial herb with branches to 30 cm long.

**Life cycle:**

**Origin & distribution:** Native to Europe, Middle East and North Africa. NC, CC, SC, NT, CT, ST, NWS, SWS in NSW. Qld, Vic., Tas, SA, WA.

**Dispersal:** Via fruit often attached to animals.

**Habitat:** Frequently cultivated often on roadsides and waste places.

**Properties:** Can form roots at stem nodes.

**Control & management:** Spraying with mecoprop or 2,4.5-T amine at 0.2% or MCPA plus dicamba. Sulphate of ammonia crystals.

---

*Urtica urens*

**Family:** Urticaceae

**Synonymy:**

**Common name:** Stinging Nettles, Dwarf Nettle.

**Habit:** Usually upright herbs under 30cm high, sometimes up to 70cm. Either annual or perennial.

**Life cycle:**

**Origin & distribution:** Native of Europe.

**Dispersal:**

**Priority:** 3

**Habitat:**

**Properties:** Weed of disturbed areas, pasture and cultivation. Leaves and stems are scattered with transparent, rigid, stinging hairs.

**Control & management:** Young plants can be killed by spraying with 0.2% 2,4-D.

---

*Verbascum thapsus*

**Family:** Scrophulariaceae.

**Synonymy:**

**Common name:** Great Mullein, Blanket Weed, Aaron's Rod, Flannel Leaf, Velvet Mullein.

**Habit:** Erect, densely hairy biennial herb to 2.5 m tall.

**Life cycle:** Seeds germinate in autumn and spring; flowers January to March; die in autumn; seeds mostly viable and long lived.

**Origin & distribution:** Native of Eurasia; CC, SC, NT, CT, ST, NWS, CWS, SWP, NFWP; Qld; Vic.; Tas; SA.

**Dispersal:** Only be seeds.

**Habitat:** Temperate regions of moderate summer temperatures and more than 500 mm annual rainfall, on dry well drained soils, sites of lower fertility and high pH; disturbed land, woodlands an pastures.

**Properties:** Doesn't persist when soil fertility raised.

**Priority:** 3.

**Control & management:** Removal of individual plants with as much taproot as possible, glyphosate can be applied at rosette stage.

---

*Verbena bonariensis*

**Family:** Verbenaceae.

**Synonymy:**

**Common name:** Purpletop, Cluster-flower Verbena, Cluster-flower Vervain, Blue Top.

**Priority:** 2.

**Habit:** Rigid hairy perennial herb to 2 m tall.

**Life cycle:** Flowers mainly from October to June.

**Origin & distribution:** Native of South America. NC, CC, SC, NT, CT, ST, NWS, CWS, SWS, NWP, SWP in NSW. Qld, Vic., SA.

**Dispersal:** Prolific seeder and very persistent.

**Habitat:** An invasive weed in wasteland and neglected areas, often on roadsides and waterlogged areas.

**Properties:**

**Control & management:** Young plants susceptible to 2,4-D at 0.2%. Older plants are resistant. Chipping and removal of flowering material.

*Vulpia bromoides*

**Family:** Poaceae.

**Synonymy:**

**Common name:** Squirrel Tail Fescue, Silvery Grass, Brome Fescue, Rat’s Tail Fescue.

**Habit:** Tufted annual to 40 cm tall.

**Life cycle:** Flowers in spring.

**Origin & distribution:** Native of the Mediterranean. Known from most areas in New South Wales and in all states except the Northern Territory.

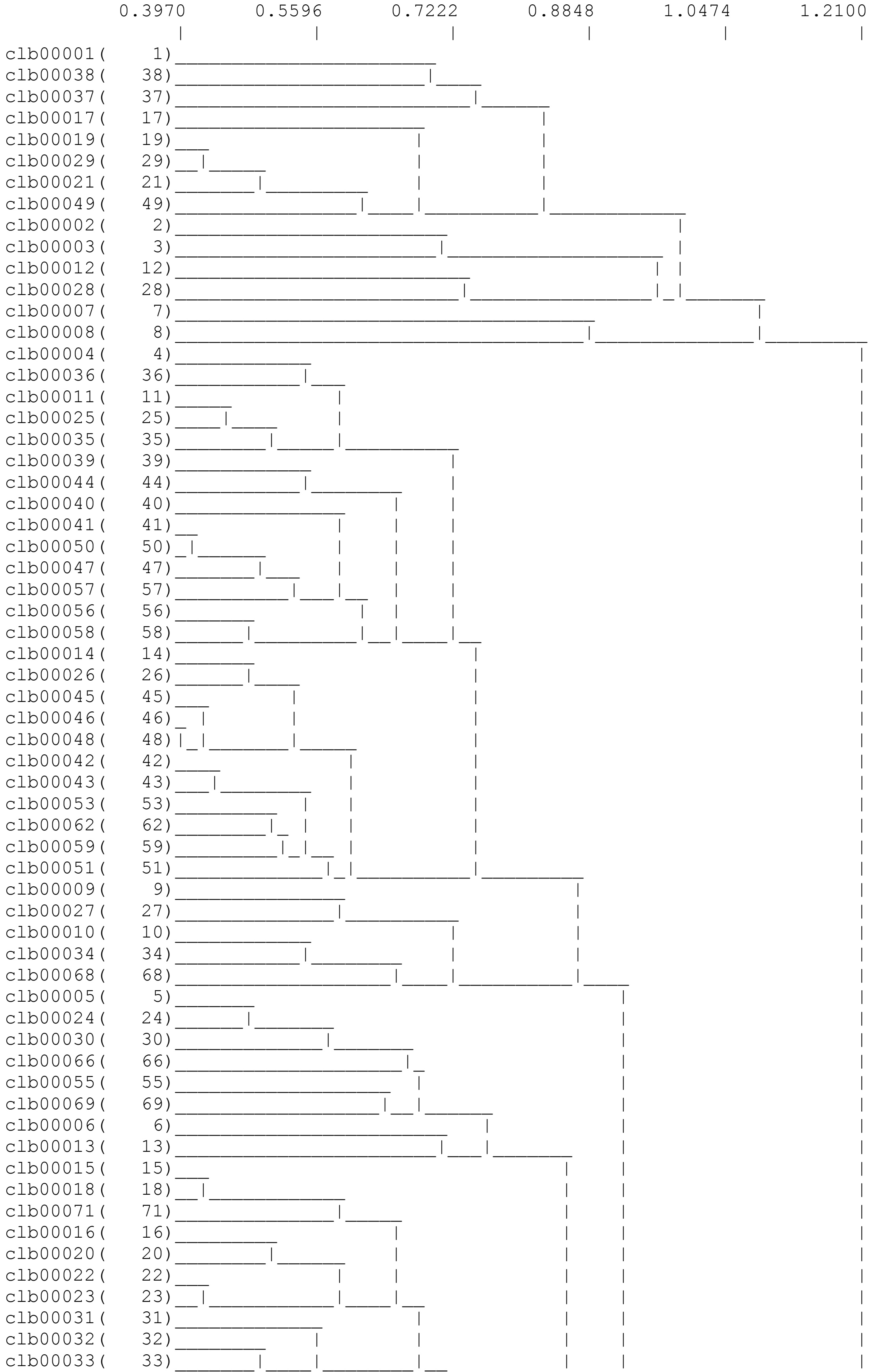
**Dispersal:** Seed.

**Habitat:** Usually in disturbed areas.

**Properties:** Prefers high winter rainfall when in can become prolific.

**Control & management:** Regeneration of cultivated areas should help control populations.

**Appendix D:** Original dendrogram from Kulczynski association and flexible UPGMA.



```
clb00052(   52)________________        |           |    |                     |
clb00063(   63)______        |         |           |    |                     |
clb00065(   65)_____|______  |         |           |    |                     |
clb00070(   70)____________|__|_       |           |    |                     |
clb00054(   54)________________|___    |           |    |                     |
clb00060(   60)____               |    |           |    |                     |
clb00061(   61)___|_________      |    |           |    |                     |
clb00064(   64)___________ |      |    |           |    |                     |
clb00067(   67)__________|_|______|____|___________|____|_____________________|
                |            |            |            |            |            |
              0.3970       0.5596       0.7222       0.8848       1.0474       1.2100
```

**Appendix E:** Locality and site information for all sites surveyed during this project. Details of sites conducted by Hunter (1999) are also included; in total 174 sites.

| Site | Altitude | Date | Easting | Northing | Notes |
|---|---|---|---|---|---|
| BR10OA | 1125 | 4/07/1995 | 405040 | 6805330 | |
| BR10OB | 1130 | 4/07/1995 | 405080 | 6805490 | recent fire affecting edge of the quadrat |
| BR11OA | 1240 | 5/07/1995 | 403730 | 6803590 | |
| BR11OB | 1210 | 5/07/1995 | 403590 | 6803650 | |
| BR11OC | 1190 | 4/07/1995 | 403470 | 6803680 | |
| BR11OD | 1185 | 5/07/1995 | 403520 | 6803690 | recent fire in one small corner |
| BR11OE | 1160 | 5/07/1995 | 403340 | 6803670 | |
| BR11OF | 1195 | 5/07/1995 | 403560 | 6803570 | |
| BR12OA | 1285 | 6/07/1995 | 406750 | 6806130 | recent fire affecting all of quadrat, some rabbit grazing |
| BR12OB | 1285 | 6/07/1995 | 406090 | 6806170 | fire affecting all of the quadrat |
| BR13OA | 1200 | 6/07/1995 | 406230 | 6806700 | recent fire affecting all of the quadrat |
| BR14OA | 1160 | 6/07/1995 | 405810 | 6807090 | fire affecting all but small proportion of the quadrat |
| BR14OB | 1155 | 6/07/1995 | 405610 | 6807100 | fire affecting all of the quadrat |
| BR15OA | 1180 | 11/08/1995 | 400550 | 6810800 | fire affecting all of the quadrat |
| BR15OB | 1190 | 11/08/1995 | 400570 | 6810830 | |
| BR15OC | 1185 | 11/08/1995 | 400610 | 6810420 | fire affecting most of the quadrat |
| BR15OD | 1190 | 11/08/1995 | 400670 | 6810350 | small corner of quad burnt |
| BR15OE | 1210 | 11/08/1995 | 400690 | 6810330 | |
| BR16OA | 1150 | 12/08/1995 | 400420 | 6810360 | fire affecting 1 third of the quad |
| BR16OB | 1145 | 12/08/1995 | 400470 | 6810270 | half quad burnt |
| BR17OA | 1230 | 12/08/1995 | 398450 | 6805550 | whole quadrat burnt |
| BR17OB | 1210 | 12/08/1995 | 398500 | 6805460 | |
| BR17OC | 1200 | 12/08/1995 | 398600 | 6805630 | |
| BR17OD | 1210 | 12/08/1995 | 398550 | 6805700 | |

| Site | Altitude | Date | Easting | Northing | Notes |
|---|---|---|---|---|---|
| BR17OE | 1190 | 12/08/1995 | 398580 | 6805780 | fire affecting half of quadrat |
| BR17OF | 1170 | 12/08/1995 | 398700 | 6805750 | |
| BR18OA | 1070 | 12/08/1995 | 410000 | 6807370 | all of quad burnt |
| BR18OB | 1060 | 12/08/1995 | 400920 | 6807350 | most of the quad burnt |
| BR18OC | 1070 | 12/08/1995 | 401900 | 6807230 | fire affecting most of quadrat |
| BR18OD | 1090 | 12/08/1995 | 400050 | 6807140 | |
| BR18OE | 1060 | 12/08/1995 | 400870 | 6807150 | three quarters of quadrat burnt |
| BR18OF | 1050 | 12/08/1995 | 400900 | 6807020 | fire affecting most of quadrat |
| BR19OA | 1210 | 13/08/1995 | 399190 | 6803180 | |
| BR1OA | 1105 | 26/08/1994 | 406100 | 6806100 | |
| BR2OA | 1110 | 26/08/1994 | 407100 | 6807500 | |
| BR5OA | 1155 | 31/05/1995 | 406760 | 6807980 | some rubbish from walkers |
| BR5OB | 1165 | 31/05/1995 | 406680 | 6807970 | some rubbish from walkers |
| BR5OC | 1250 | 31/05/1995 | 406530 | 6807750 | |
| BR5OD | 1270 | 31/05/1995 | 406240 | 6807780 | |
| BR5OE | 1245 | 31/05/1995 | 406500 | 6807680 | |
| BR5OF | 1250 | 31/05/1995 | 406530 | 6807750 | some rubbish from walkers, walking track and fire from 6 m previous affecting most of the quadrat |
| BR5OG | 1200 | 31/05/1995 | 406670 | 6807900 | some rubbish from walkers and fire from 6 months ago affecting one corner |
| BR6OA | 1170 | 3/07/1995 | 405790 | 6806520 | recent fire last october |
| BR6OB | 1180 | 3/07/1995 | 405800 | 6806590 | recent fire last october |
| BR7OA | 1220 | 3/07/1995 | 405580 | 6806210 | recent fire last october affecting most of the quadrat except some large shrubs |
| BR7OB | 1200 | 3/07/1995 | 405490 | 6806160 | recent fire last october affecting most of the quadrat |
| BR7OC | 1180 | 3/07/1995 | 405480 | 6806040 | recent fire last october affecting the outer edge of this quadrat |
| BR7OD | 1190 | 3/07/1995 | 405510 | 6806010 | recent fire last october affecting most of the quadrat |
| BR8OA | 1150 | 4/07/1995 | 406180 | 6805250 | recent fire last october affecting most of the quadrat |
| BR8OB | 1135 | 4/07/1995 | 406250 | 6805280 | recent fire affecting all of the quadrat |
| BR8OC | 1150 | 4/07/1995 | 406120 | 6805130 | recent fire affecting one corner of the quadrat |
| BR8OD | 1160 | 4/07/1995 | 406130 | 6805200 | recent fire affecting most of the quadrat |

| **Site** | **Altitude** | **Date** | **Easting** | **Northing** | **Notes** |
|---|---|---|---|---|---|
| BR9OA | 1135 | 4/07/1995 | 404950 | 6804890 | |
| BR9OB | 1140 | 4/07/1995 | 405020 | 6804930 | |
| BR9OC | 1150 | 4/07/1995 | 405050 | 6805070 | |
| BR9OD | 1130 | 4/07/1995 | 405180 | 6805290 | light recent fire affecting some of the quadrat |
| BRB1A | 940 | 14/12/1998 | 416345 | 6807129 | New Southern Boundary of BBNP 300 m west of cross road. Fire 20 + yrs |
| BRB2A | 960 | 14/12/1998 | 416494 | 6806983 | South west boundary of BBNP open falt 100 m west of access rd. Pig rootying. Loam brown soil. |
| BRB3A | 940 | 14/12/1998 | 416835 | 6807262 | Southern end of BBNP opposite gate to hut. No evidenc of fire. Brown Loam. |
| BRB4A | 940 | 14/12/1998 | 417234 | 6808785 | Past 2nd Ford beyond Morgans Gully. Falls acces Rd (100 m off). Undulating to hilly. 5 yrs + since fire. Past logging. Few dead trees in upper stratum. |
| BRB5A | 1030 | 14/12/1998 | 419357 | 6807967 | Midway down eastern boundary of southern block of BBNP. Hilly. 5 yrs + since fire. Sandy Loam, Dark Grey to Brown. |
| BRB6A | 980 | 14/12/1999 | 418347 | 6808023 | Midway down hut link rd, below centre of southern Block of BBNP. Hilly to undulating. Sandy Loam, Dark Brown. 5 yrs + since fire. |
| BRB7A | 580 | 15/12/1998 | 418490 | 6814300 | Gully at base of Boonoo Boonoo Falls. Gorge. Skeletal Brown soil. No evidence of fire. |
| BRB8A | 540 | 15/12/1998 | 418450 | 6814400 | Base of BB Falls - slightly downstream. Skeletal soil. No evidence of fire. Extensive rock platforms. River valley floor. |
| BRB9A | 800 | 15/12/1998 | 418170 | 6814407 | Saddle. Sandy Loam, Grey Brown. c. 5 yrs since fire. |
| BRB10A | 900 | 15/12/1998 | 418209 | 6814279 | Ridge north west of BB Falls. Ridge. Sandy loam, Grey brown. 5 yrs +. |
| BRB11A | 940 | 15/12/1998 | 416763 | 6807459 | Morgan Gully, undulating. Sandy loam, Grey brown. 4 yrs + since fire. Old fence, logging. |
| BRB12A | 930 | 15/12/1998 | 416962 | 6807599 | Morgans Gully, near race. Not fire evident. Some mining. |
| BRB13A | 840 | 16/12/1998 | 417819 | 6811781 | River terrace, western side of BB River 1 km past yard BBNP. Loamy sand, brown. Burnt within 2 yrs. |
| BRB14A | 860 | 16/12/1998 | 417711 | 6811912 | 1 km NW of yards, 400 m west of river BBNP. Undulating. Burnt within 2 yrs. Sandy loam. |
| BRB15A | 920 | 16/12/1998 | 417120 | 6811763 | 1 km west of yards, 600 m west of river BBNP. Sandy loam, light brown. 8 yrs since fire. Grazing, cattle droppings. Patch that missed fire 2 yrs previous. Saddle. |

| Site | Altitude | Date | Easting | Northing | Notes |
|---|---|---|---|---|---|
| BRB16A | 1000 | 16/12/1998 | 416178 | 6811297 | 1 km SW of Mt Prentice above branch of Swamp Ck. Ridge. Fire within 2 yrs. |
| BRB17A | 1000 | 16/12/1998 | 415356 | 6811007 | Swamp Sth of Mt Prentice, head of Branch Swamp Ck. Swamp, Loam, dark brown. Not recently burnt, ca. 5 yrs since fire. Some grazing by feral animals. |
| BRB18A | 1000 | 16/12/1998 | 415256 | 6811007 | 1 km south of Mt Prentice BBNP. 100 m east of site 17. Undulating. Loamy sand, grey brown. Light fire within 2 yrs. Some cattle grazing. |
| BRB19A | 1000 | 16/12/1998 | 414032 | 6811207 | 200 m south of Mt Prentice BBNP. Swamp. Loam, dark brown. No evidence of recent fire, burnt to margins 2 yrs previous. |
| BRB20A | 1030 | 16/12/1998 | 416001 | 6812279 | Eastern ridge, Mt Prentice BBNP. Spur. Sandy loam, brown grey. Burnt within 2 yrs. Cattle droppings. |
| BRB21A | 1080 | 17/12/1998 | 418859 | 6806616 | South east cnr of park. Undulating. Peaty, dark brown. Indeterminant fire history. Cattle grazing. |
| BRB22A | 1100 | 17/12/1998 | 418591 | 6805855 | Sth east cnr of BBNP. Fire within 6 yrs. Pig diggings. Coarse sandy light brown. Ridge top. |
| BRB23A | 1075 | 17/12/1998 | 419247 | 6807200 | Sth east BBNP. Sandy light brown. 5-6 yrs since fire. Pig diggings. |
| BRB24A | 950 | 17/12/1998 | 419210 | 6810019 | Eastern eadge of BBNP, top end of bottom block. Lower sloping ridge. Sandy dark brown. 2 yrs since fire. Cattle grazing. |
| BRB25A | 910 | 17/12/1998 | 417242 | 6809859 | 1 km Sth of yards. Sandy loam, grey brown. 4 yrs since fire with parts 2 yrs since. |
| BRB26A | 800 | 17/12/1998 | 418516 | 6813906 | Near picnic area BB Falls. Gulley. 2 yrs since fire. Sandy loam, brown. |
| BRB27A | 780 | 17/12/1998 | 418678 | 6814024 | Eastern side of Picnic area BB Falls. Coarse sandy, dark brown. 2 yrs since fire. |
| BRB28A | 870 | 17/12/1998 | 418350 | 6812416 | Opposite link rd at Crk. Rocky outcrop creek bank. Sandy light brown. Fire indeterminant. Riparian. Some camping nearby. |
| BRB29A | 940 | 17/12/1998 | 417388 | 6808803 | Top end of Sth BBNP. Undulating. Fire indeterminant. Peaty, dark brown. |
| BRB30A | 960 | 18/12/1998 | 416151 | 6814196 | Top left corner of BBNP near creek. Ridge. ca. 4 yrs since fire. Cattle grazing. Sandy loam, dark brown. |
| BRB31A | 920 | 18/12/1998 | 416466 | 6814266 | Top left corner of BBNP. Sandy loam grey brown. 5 yrs since fire. |
| BRB32A | 920 | 18/12/1998 | 416725 | 6814126 | Near fire trail at top Cnr of BBNP. Ridge top. Sandy loam, grey. 5 yrs since fire. |
| BRB33A | 890 | 18/12/1998 | 417317 | 6814207 | Near fire trail top end of BBNP. sandy loam grey brown. 5 yrs since fire. Cattle grazing and pig rutting. |
| BRB34A | 890 | 18/12/1998 | 418100 | 6814113 | Sandy brown grey soil. 5 yrs since fire. Cattle grazing. |

| Site | Altitude | Date | Easting | Northing | Notes |
|---|---|---|---|---|---|
| BRB35A | 970 | 18/12/1998 | 417439 | 6807392 | Behind BB hut. Sandy loam, grey brown. 10 yrs since fire. Walking track nearby. |
| BRB36A | 990 | 4/01/1999 | 411567 | 6806517 | Near airstrip Trail. Undulating. 5 yrs since fire. |
| BRB37A | 990 | 4/01/1999 | 411111 | 6806061 | Near airstrip trail. 5 yrs since fire. Much pig damage. |
| BRB38A | 990 | 4/01/1999 | 410920 | 6806023 | Near airstrip trail and Carrols Crk trail intersection. Flat. 5 yrs since fire. Sandy grey brown. |
| BRB39A | 990 | 4/01/1999 | 409936 | 6805908 | Airstrip trail, just past Carrols Crk junction. Sandy brown. 5 yrs since fire. |
| BRB40A | 980 | 4/01/1998 | 409276 | 6806001 | Near junction airstrip trail and Donut trail. 5 yrs since fire. Sandy loam, brown. |
| BRB41A | 990 | 4/01/1998 | 409357 | 6806268 | Just off airstrip trail towards border. Sandy loam, brown. 5 yrs since fire. |
| BRB42A | 1060 | 4/01/1999 | 408834 | 6806683 | Airstrip trail towards border. Sandy loam, dark brown. 5 yrs since fire. |
| BRB43A | 1060 | 4/01/1999 | 408521 | 6806870 | Airstrip trail near border. Sandy grey brown. 5 yrs since fire. |
| BRB44A | 970 | 5/01/1999 | 411854 | 6807217 | Top end of Bald Rock - near Carroll's Ck Fire Trail. Sandy loam, brown. Alluvial plain. 5 yrs since fire. |
| BRB45A | 1000 | 5/01/1999 | 410573 | 6808240 | Just off Carroll's Crk Fire Trail (Bald Rock). Undulating. Sandy grey brown. 5 yrs since fire. |
| BRB46A | 1030 | 5/01/1999 | 410645 | 6809052 | Just off Carrol's Ck Fire Trail. Coarse sandy, dark brown black. 5 yrs since fire. |
| BRB47A | 1010 | 5/01/1999 | 410132 | 6809355 | Off main road to BR. Fine sandy loam, dark brown. 5 yrs since fire. |
| BRB48A | 1050 | 5/01/1999 | 409362 | 6809479 | Just off main road to BR, picnic area. Sandy brown. 5 yrs since fire. |
| BRB49A | 990 | 5/01/1999 | 406603 | 6810965 | Near junction of Bookookoorara Fire Trail and Fairy Valley Fire Trail. Undulating. Sandy loam, dark brown. 5 yrs since fire. |
| BRB50A | 990 | 5/01/1999 | 406397 | 6810904 | Fairy Valley Fire Trail. Sandy loam, dark brown. 5 yrs since fire. Numerous pig diggings. |
| BRB51A | 1080 | 5/01/1999 | 405230 | 6810266 | Qld - NSW Border Trail. Sandy loam, brown. 5 yrs since fire. |
| BRB52A | 1100 | 5/01/1999 | 404082 | 6809666 | Border Trail. Fine sandy dark brown. 5 yrs since fire. |
| BRB53A | 1110 | 5/01/1999 | 403857 | 6807578 | Border Trail. Sandy loam, dark brown. 5 yrs. |
| BRB54A | 1140 | 5/01/1999 | 405613 | 6807546 | Off border trail. Sandy loam, dark brown. 5 yrs since fire. |
| BRB55A | 1120 | 5/01/1999 | 406433 | 6807418 | Trail towards picnic area, base of BR. Sandy loam, dark brown. Fence. |
| BRB56A | 950 | 6/01/1999 | 412147 | 6803367 | Just off Ressurection Trail bottom RH corner of main park. Sandy loam, dark brown. 5 yrs. |
| BRB57A | 970 | 6/01/1999 | 411316 | 6803538 | Just off Ressurection FT. Coarse sand, grey brown. 5 yrs since fire. |

| Site | Altitude | Date | Easting | Northing | Notes |
|---|---|---|---|---|---|
| BRB58A | 970 | 6/01/1999 | 411288 | 6803408 | Just off Resurrection FT. Sandy light brown. 5 yrs since fire. |
| BRB59A | 1200 | 6/01/1999 | 405548 | 6797073 | Top left hand side of sth section of BRNP. Sandy loam, dark brown. 5 yrs since fire. Cattle grazing. |
| BRB60A | 1190 | 6/01/1999 | 404597 | 6797182 | Top left hand crnr of sth section BRNP. Sandy loam, dark brown. 5 yrs since fire. |
| BRB61A | 980 | 6/01/1999 | 404404 | 6796208 | Left hand edge of sth sectio of BRNP. Undulating. Sandy loam, brown grey. 5 yrs since fire. |
| BRB62A | 1070 | 6/01/1999 | 406419 | 6796525 | Centre of sth section of BRNP. Sandy loam, dark brown. 5 yrs since fire. |
| BRB63A | 1030 | 6/01/1999 | 406021 | 6796078 | Centre of Sth section of BRNP. Sandy loam, grey brown. 5 yrs since fire. |
| BRB64A | 1000 | 6/01/1999 | 405795 | 6795595 | Centre of sth section of BRNP. Fine sandy dark brown. 5 yrs since fire. |
| BRB65A | 980 | 6/01/1999 | 405770 | 6795697 | Centre of sth section of BRNP. Fine sandy, grey. 5 yrs since fire. |
| BRB66A | 960 | 6/01/1999 | 405771 | 6795697 | Centre of sth section BRNP. Sandy loam, dark brown. 5 yrs since fire. |
| BRB67A | 900 | 6/01/1999 | 405422 | 6794090 | Bottom of middle of trial through sthn section of BRNP. Sandy grey. 5 yrs since fire. |
| BRB68A | 900 | 6/01/1999 | 405856 | 6793981 | Bottom end of sth section of BRNP. Fine sandy grey brown. 5 yrs since fire. |
| BRB69A | 1130 | 1/04/1993 | 403100 | 6803500 | Sandy. Fire within 7 years. |
| BRB70A | 1130 | 1/04/1993 | 404100 | 6803500 | Sandy. fire within 8 yrs. |
| BRB71A | 1040 | 1/04/1993 | 409200 | 6809400 | 2.5 km from BR parking area on access rd. Fire within 5 yrs. |
| BRB73A | 1020 | 8/09/1994 | 410700 | 6807900 | |
| BRB73B | 1000 | 24/08/1994 | 411400 | 6806100 | |
| BRB75C | 990 | 26/08/1994 | 406200 | 6806800 | |
| BRB76D | 1080 | 6/09/1994 | 405400 | 6809700 | |
| BRB77E | 1050 | 6/09/1994 | 405500 | 6809650 | |
| BRB78F | 1015 | 6/09/1994 | 405070 | 6809030 | |
| BRB79G | 1030 | 7/09/1994 | 407500 | 6809100 | |
| BRB80H | 990 | 7/09/1994 | 406700 | 6810100 | |
| BRB81I | 990 | 7/09/1994 | 406900 | 6811200 | |
| BRB82J | 1100 | 8/09/1994 | 407500 | 6809100 | Grazing mainly by pig ruttings. |
| BRB83K | 1120 | 8/09/1994 | 407200 | 6809100 | Some heavier than usual Macropod grazing. |
| BRB84L | 1190 | 13/08/1995 | 399240 | 6803290 | 2 past fires affecting quadrat none recent |
| BRB85M | 890 | 9/09/1994 | 417900 | 6810300 | |

| Site | Altitude | Date | Easting | Northing | Notes |
|---|---|---|---|---|---|
| BRB86A | 1040 | 21/10/1997 | 409000 | 6809100 | 200m S of Bald Rock Rd, 2.5km W of turnoff from Mt. Lindsay Hwy. Moderate fire 3 years ago. Moderate logging 30 years ago. Moderate grazing 25 years ago. |
| BRB87A | 950 | 21/10/1997 | 417700 | 6808898 | 400m E of Boonoo Boonoo Falls Rd, 2.3km NE of Roper Ck Crossing, Boonoo Boonoo NP. Fire 6 years ago. Moderate logging 30 years ago. grazing 20 years ago. |
| BRB88A | 1030 | 20/10/1997 | 410700 | 6808899 | 250m S of junction of Bald Rock Rd and Carrolls Ck Trail, Bald Rock NP. Intense fire 3 years ago. Moderate logging, 30 +/-10 years ago. Slight grazing 20 +/- 10 years ago. |
| BRB89A | 965 | 21/10/1997 | 411700 | 6802700 | 550m W of Mt. Lindsay Hwy, 1.3km S of Resurrection Ck, Bald Rock NP. Fire 6 years ago. Grazing 20 years ago. Moderate weeds. |
| BRB90A | 900 | 8/01/2000 | 420298 | 6815399 | Soil brown, coarse sandy loam. |
| BRB91A | 970 | 8/01/2000 | 420308 | 6814981 | Soil dark brown, clay loam. |
| BRB92A | 940 | 8/01/2000 | 420463 | 6814216 | Soil black/brown, clay loam. |
| BRB93A | 950 | 8/01/2000 | 419083 | 6814433 | Soil dark chocolate brown, coarse sandy loam. |
| BRB94A | 900 | 8/01/2000 | 419660 | 6813782 | Soil grey black, coarse sandy loam. |
| BRB95A | 940 | 8/01/2000 | 420278 | 6813569 | Soil grey black, coarse sandy loam. |
| BRB96A | 870 | 8/01/2000 | 421399 | 6811350 | Soil chocolate brown, coarse sandy loam. |
| BRB97A | 960 | 8/01/2000 | 419926 | 6810906 | Soil grey brown, coarse sandy loam. |
| BRB98A | 850 | 8/01/2000 | 420769 | 6810811 | Soil grey brown, coarse sand. |
| BRB99A | 1010 | 9/01/2000 | 411606 | 6800954 | Soil grey brown, coarse sandy loam. |
| BRB100A | 990 | 9/01/2000 | 411082 | 6800927 | Soil dark chocolate brown, clay. |
| BRB101A | 990 | 9/01/2000 | 410316 | 6801342 | Soil light cream brown, coarse sandy loam. |
| BRB102A | 1010 | 9/01/2000 | 409568 | 6820000 | Soil grey brown, coarse sand. |
| BRB103A | 1040 | 9/01/2000 | 408389 | 6801151 | Soil grey brown, coarse sandy loam. |
| BRB104A | 1070 | 9/01/2000 | 409144 | 6801002 | Soil brown, sandy loam. |
| BRB105A | 1050 | 9/01/2000 | 408772 | 6801442 | Soil grey brown, sandy loam. |
| BRB106A | 1000 | 9/01/2000 | 408684 | 6802118 | Soil grey brown, coarse sand. Pigs. |
| BRB107A | 1010 | 9/01/2000 | 408343 | 6805624 | Soil brown, coarse sandy loam. |
| BRB108A | 1010 | 9/01/2000 | 408609 | 6802980 | Soil grey brown, coarse sand. |
| BRB109A | 1030 | 9/01/2000 | 409000 | 6803414 | Soil cream brown, very coarse sand. |
| BRB110A | 1045 | 9/01/2000 | 408990 | 6803891 | Soil chocolate brown, loam. |

| Site | Altitude | Date | Easting | Northing | Notes |
|---|---|---|---|---|---|
| BRB111A | 1080 | 9/01/2000 | 408992 | 6864493 | Soil light brown, coarse sandy loam. |
| BRB112A | 1000 | 9/01/2000 | 409082 | 6805632 | Soil grey brown, coarse sandy loam, Pigs. |
| BRB113A | 1010 | 10/01/2000 | 407167 | 6811745 | Soil grey brown, coarse sandy loam, Pigs. |
| BRB114A | 980 | 10/01/2000 | 407127 | 6812554 | Soil grey brown, coarse sand. |
| BRB115A | 980 | 10/01/2000 | 407352 | 6813161 | Soil dark brown to black, very coarse sandy loam. |
| BRB116A | 1000 | 10/01/2000 | 407365 | 6814610 | Soil cream brown, very coarse sandy loam. |
| BRB117A | 990 | 10/01/2000 | 407583 | 6815628 | Soil brown loam. |
| BRB118A | 990 | 10/01/2000 | 406887 | 6811566 | Soil brown, fine sandy loam. Pigs. |
| BRB119A | 980 | 10/01/2000 | 405772 | 6811920 | Soil dark brown, clay loam. |

**Appendix F:** Known uses and notes for plants found within Bald Rock and Boonoo Boonoo National Parks.

| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
|---|---|---|---|---|---|---|---|
| *Acacia binervata* | | | | Timber, Fibre. | | Ornamental. | Lazarides & Hince (1993). |
| *Acacia floribunda* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Acacia implexa* | Poison. | Lazarides & Hince (1993). | Poison? | Fodder, Gum, Timber, Fuel, Honey. | C3. Drought tolerant. Intolerant of waterlogging, salinity and wind. | | Clarke (1989), Lazarides & Hince (1993). |
| *Acacia longifolia* | Pods can be roasted & seeds eaten. | Lazarides & Hince (1993). | Suspected poison. | Timber. | | Timber has been used to make tool handles. Gums, timber, honey (pollen), weed, ornamental, fibre. | Cunningham et al. (1981). Lazarides & Hince (1993). |
| *Acacia melanoxylon* | Timber. Bark & twigs if thrown into water will stupefy fish. | Lazarides & Hince (1993). | | Gum, Timber. | | | Lazarides & Hince (1993). |
| *Acacia penninervis* | The bark can stupefy fish. | | | | | | |
| *Acacia stricta* | Seeds are edible. | | | | | | |
| *Acaena agnipila* | | | | Weed. | | Wind pollinated. | Lazarides & Hince (1993), Benson & McDougall (2000). |
| *Acaena novae-zelandiae* | Leaves once used as a substitute for tea. | Lazarides & Hince (1993). | | Weed. Fruit burrs troublesome to humans and stock. | | Wind pollinated. Spreading by stolons. | Lazarides & Hince (1993), Benson & McDougall (2000). |
| *Acetosella vulgaris* | | | Poison? | Possibly grazed by stock. Suspected of poisoning stock. | | The leaves can be eaten raw or cooked or made into a soup. | Cunningham et al. (1981). |
| *Acianthus exsertus* | Tuber edible. | | | | | Possibly pollinated by tiny flies. | Benson & McDougall (2005). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
|---|---|---|---|---|---|---|---|
| *Acmena smithii* | Fruits are edible, with a taste of cinnamon & clovers, can be made into a vinegar. | Clarke (1989). Lazarides & Hince (1993). | | | C3. Intolerant of wind, drought, waterlogging and salinity. | Tertiary sand coloniser; food plant for Topknot Pigeon, Wonga Pigeon, King Parrot, Crimson Rosella, Pied Currawong, Rose-crowned Fruit-dove, Satin Bowerbird, Superb Fruit-dove, Grey-headed Flying Fox, moth larvae. Timber, wind barrier, floral display. | Clarke (1989), Lazarides & Hince (1993), Benson & McDougall (1998). |
| *Acrotriche aggregata* | Fruits are edible. | | | | | | |
| *Actinotus gibbonsii* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Actinotus helianthi* | | | | | C3. Seedlings shade intolerant, sun tolerant. | Tertiary sand coloniser, propagation by seed, garden plant, floral display. | Clarke (1989). |
| *Ageratina adenophora* | | | Poison. | Fodder. | | Weed. | Lazarides & Hince (1993). |
| *Aira cupaniana* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Ajuga australis* | | | | Fodder. | | Ornamental. | Lazarides & Hince (1993). |
| *Alectryon subcinereus* | Recorded as being used as a traditional food plant. Garden plant attracting birds & mammals. | Clarke (1989). | | | C3. Intolerant of wind, drought, waterlogging and salinity. | Food plant of Eastern Flat butterfly Netrocoryne repandra repandra. Fruit eaten by Green Catbird. | Clarke (1989). |
| *Allocasuarina littoralis* | Timber. | Lazarides & Hince (1993). | | | C3. Wind tolerant, drought | Tertiary sand coloniser, a wind barrier, propagation by seed. | Clarke (1989), Lazarides & Hince (1993). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
|---|---|---|---|---|---|---|---|
| | | | | | tolerant, tolerant of salinity. | Used for firewood. Honey (pollen), ornamental. | |
| *Allocasuarina torulosa* | | | | | | Timber, fuel, honey (pollen), ornamental. | Lazarides & Hince (1993). |
| *Alphitonia excelsa* | Timber, poison, medicinal, honey, miscellaneous. Leaves used to wrap meat. | Lazarides & Hince (1993). | | Fodder. | | Food plant for several butterfly larvae, fruit eaten by various birds and fruit bat. Pollination by honeybee and native bees. | Benson & McDougall (2000). |
| *Alyxia ruscifolia* | | | Poison. | | | | Lazarides & Hince (1993). |
| *Ammobium alatum* | | | | | | Weed. | Lazarides & Hince (1993). |
| *Amphipogon strictus* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Amyema cambagei* | Fruits eaten. | Cunningham et al. (1981). | | Readily grazed if lopped. | | Weed. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Amyema miquelii* | Fruits eaten. | Cunningham et al. (1981). | | Readily grazed if lopped. | | Weed. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Amyema pendulum* | Fruits eaten. | | | Fodder. | | Food, weed. | Lazarides & HInce (1993). |
| *Andropogon virginicus* | | | | Low value fodder. | | Weed. | Lazarides & Hince (1993). |
| *Angophora floribunda* | | | | Fodder. | C3. Drought tolerant. Intolerant of wind, waterlogging and salinity. | Tertiary sand coloniser, by seed propagation. Garden & shade plant. Bee attractant. Firewood, timber. | Clarke (1989), Lazarides & Hince (1993). |
| *Angophora subvelutina* | | | | Honey. | | | Lazarides & Hince (1993). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
|---|---|---|---|---|---|---|---|
| *Anthoxanthum odoratum* | | | | Fodder. | | Containc coumarin, fragrant, bitter-tasting. | Lazarides & Hince (1993). |
| *Aristida ramosa* | | | | Unpalatable to stock, except when young. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Aristida vagans* | | | | Useful drought fodder. | | Seed eaten by finches. | Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Arthropodium milleflorum* | Roots eaten raw or roasted. | | | Fodder, moderate forage. | | | Lazarides & Hince (1993). |
| *Arthropodium minus* | | | | Fodder. Moderate winter-spring forage. | | | Lazarides & Hince (1993). |
| *Asperula conferta* | | | | Fodder. Drought resistant forage plant providing green fodder rapidly after summer rains. | | Palatable to rabbits. | Lazarides & Hince (1993), Benson & McDougall (2000). |
| *Asplenium flavellifolium* | | | | Contains HCN, but unlikely to cause stock poisoning. | | | Cunningham et al. (1981). |
| *Austrodanthonia bipartita* | | | | Fodder. | | Produces high quality fodder during cooler months which is encouraged by moderate grazing. | Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Austrodanthonia caespitosa* | | | | Produces large quantities of very palatable forage. | | Seed eaten by Stubble Quail. | Cunningham et al. (1981), Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Austrodanthonia penicillata* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Austrodanthonia* | | | | Palatable to stock. | | | Cunningham et al. |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
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| *setacea* | | | | | | | (1981), Lazarides & Hince (1993). |
| *Austrostipa aristiglumis* | | | | Palatable, provides good quality forage. Sharp seeds can injure stock. | | | Cunningham et al. (1981). |
| *Austrostipa setacea* | | | | Readily eaten in young stages, particularly by cattle. | | | Cunningham et al. (1981). |
| *Axonopus affinis* | | | | Fodder. | | Cattle don't eat it. | Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Banksia integrifolia* | Recorded as being used as a traditional food plant. | | | | | | |
| *Banksia marginata* | Nectar can be sucked. | Lazarides & Hince (1993). | | | | The timber is soft, porous and reddish, and warps badly on drying. Gums, timber, honey, ornamental. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Banksia spinulosa* | Nectar can be eaten. | | | | | Honey, ornamental. | Lazarides & Hince (1993). |
| *Bidens pilosa* | | | | | | Honey, weed, medicinal. Seed burrs troublesome to clothing and wool. Medicinal uses in South Africa. | Lazarides & Hince (1993). |
| *Billardiera longiflora* | Fruit is edible if seeds removed. | | | | | | |
| *Billardiera scandens* | Fruit edible raw & tastes like stewed apples when ripe. | | | | | | |
| *Blechnum cartilagineum* | Edible rhizome (dried then roasted & bruised). | | | | | | |
| *Blechnum nudum* | | | | | | Gums, ornamental. | Lazarides & Hince |

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|---|---|---|---|---|---|---|---|
| | | | | | | | (1993). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Boerhavia dominii* | Outer flesh of the roots edible. | Lazarides & Hince (1993). | | | | Weed. | Lazarides & Hince (1993). |
| *Boronia pinnata* | Ornamental. | Benson & McDougall (2001). | | | Frost tolerant. | Probably pollinated by honeybees and native bees, with flies playing a minor role. Larvae of longicorn beetle Uracanthus triangularis feeds on stem. | Benson & McDougall (2001). |
| *Bossiaea obcordata* | | | | | | Honey (pollen). | Lazarides & Hince (1993). |
| *Bothriochloa macra* | | | | Fodder. | | Valuable coloniser of disturbed and degenerated areas. Seeding stems ovoided by stock, widespread in overgrazed paddocks. | Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Brachychiton discolor* | Food, timber. | Lazarides & Hince (1993). | | | | Ornamental. | Lazarides & Hince (1993). |
| *Brachychiton populneus* | Young roots can be boiled & taste like turnips. Seeds are edible & can make a beverage. Leaves also edible. | | | | | | |
| *Breynia cernua* | | | | | C3. Wind tolerant, drought intolerant, intolerant of waterlogging and salinity. | Tertiary sand coloniser. Cosmopolitan species, on the back dune. Shelter. | Clarke (1989), Lazarides & Hince (1993). |
| *Briza minor* | | | | Sparingly grazed by stock. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
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| *Brunoniella australis* | | | | Fodder. | | Reported good sheep herbage. | Lazarides & Hince (1993). |
| *Bulbostylis barbata* | Food. The root is edible. | | | Fodder. | | | Lazarides & Hince (1993). |
| *Bursaria spinosa* | Medicinal. Used for production of Aesculin (suntan lotions). | | | | | | |
| *Calandrinia eremaea* | Eaten as greens. Seeds are also edible. | | | Palatable to stock, contributes to water requirements of animals. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Callistemon sieberi* | | | | | | Seed eaten by Crimson Rosella. | Benson & McDougall (1998). |
| *Callistemon viminalis* | | | | | | Honey, ornamental. | Lazarides & Hince (1993). |
| *Callitris endlicheri* | | | | Antihelminthic for horses. | | Gums, timber, fuel, medicinal, shelter. | Lazarides & Hince (1993). |
| *Callitris rhomboidea* | | | | | | Gums, ornamental. | Lazarides & Hince (1993). |
| *Calochilus campestris* | | | | | | Olso pollinated by sexual deception of Scolis Wasps. | Benson & McDougall (2005). |
| *Calochilus robertsonii* | | | | | | Sometimes insect pollinated. | Benson & McDougall (2005). |
| *Calotis cuneifolia* | | | | Useful forage. Barbed seeds prolific and troublesome to sheep and fleece. | | Honey, weed. | Lazarides & Hince (1993). |
| *Calotis dentex* | | | | | | Weed. | Lazarides & Hince (1993). |
| *Calytrix tetragona* | The fruit is edible. | | | | | Visited by honeybees, nativve bees, flies & beetles and small wasps. | Benson & McDougall (1998). |
| *Carduus tenuiflorus* | | | | Flowerheads and | | Proclaimed noxious | Lazarides & Hince |

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| | | | | rosette leaves grazed. | | weed in Vic, Tas, SA and part of WA. | (1993). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Carex appressa* | The leaves were used by aborigines for weaving baskets and other such articles. | Cunningham et al. (1981), Lazarides & Hince (1993). | | Fodder. | | Shelter. Controls creek bank erosion, harbours rabbits. | Lazarides & Hince (1993). |
| *Carex inversa* | | | | Supplies limited amount of fair quality forage. | | Weed. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Cassinia aculeata* | | | Causes dermatitis in humans. | | | Weed. | Lazarides & Hince (1993). |
| *Cassinia laevis* | | | Poison? | Fodder. | | Weed. Suspected cause of coughing and eye irritation of people in close proximity. | Lazarides & Hince (1993). |
| *Cassytha pubescens* | Flesh surrounding the small fruit is edible. | | | | C3. | | Clarke (1989). |
| *Casuarina cunninghamiana* | | | | Fodder. | | Timber used for ornamental turnery and fuel. Gums, Honey (pollen), shelter, ornamental. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Cayratia clematidea* | Food. | Lazarides & Hince (1993). | | | C3. Intolerant of wind, drought, waterlogging and salinity. | tertiary sand coloniser. | Clarke (1989). |
| *Cenchrus caliculatus* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Centaurium erythraea* | | | | | | Weed. | Lazarides & Hince (1993). |
| *Centaurium tenuiflorum* | | | | Fodder, moderate in palatability. | | Weed. | Lazarides & Hince (1993). |
| *Cerastium balearicum* | | | | | | Weed. | Lazarides & Hince (1993). |

| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
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| *Cheilanthes distans* | | | Poison? | | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Cheilanthes sieberi* | | | Poison? | | | | Lazarides & Hince (1993). |
| *Chenopodium melanocarpum* | | | Poison? | Fodder. | | | Lazarides & Hince (1993). |
| *Chenopodium pumilio* | | | Poison. | Eaten sparingly in times of fodder shortage. Cause of sheep deaths. | | Weed. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Chiloglottis diphylla* | Tuber edible. | | | | | Pollination by sexual deception of Thynnine Wasps | Benson & McDougall (2005). |
| *Choretrum candollei* | | | | | | Probably hybridizes with C. pauciflora. Foodplant of moth caterpillar Chelepteryx chelepteryx. | Benson & McDougall (2001). |
| *Cirsium vulgare* | | | | | | Honey, weed, miscellaneous. Fleshy roots laced with strychnine formerly sold as rabbit bait. Noxious in Vic, Tas, SA, part of NT. | Lazarides & Hince (1993). |
| *Cissus antarctica* | Fruit is edible & can be made into a jam. | | | | | | |
| *Cissus hypoglauca* | Edible fruit. | Clarke (1989). | | | C3. Intolerant of wind, drought, waterlogging and salinity. | Tertiary sand coloniser. Bird attractant. | Clarke (1989). |
| *Clematis aristata* | | | Poison? | | | Tuberous roots to 30 cm deep branching | Lazarides & Hince (1993), Benson & |

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| | | | | | | underground may give rise to seperate plants. Moth larvae Phrissogonus laticostata on flowr | McDougall (2000). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Clematis glycinoides* | | | Poison? | | | Medicinal, ornamental. | Lazarides & Hince (1993). |
| *Commelina cyanea* | | | | | C3. | Used as a cooked green vegetable by early settlers to combat scurvey. | Clarke (1989), Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Conyza albida* | | | | | C3. Wind tolerant, drought tolerant, intolerant of waterlogging. | Secondary sand coloniser, floral display. Cosmopolitan species, on the foredune & backdune. Honey (pollen), weed. | Clarke (1989), Lazarides & Hince (1993). |
| *Conyza bonariensis* | | | | | | Weed. | Lazarides & Hince (1993). |
| *Conyza canadensis* | | | | | | Weed. | Lazarides & Hince (1993). |
| *Conyza chilensis* | | | | | | Weed. | Lazarides & Hince (1993). |
| *Conyza parva* | | | | | | Weed. | Lazarides & Hince (1993). |
| *Coprosma quadrifida* | Fruit is edible, and can be made into puddings. | | | | | Berries eaten by Yellow-faced Honeyeater Lichenostomus chrysops. Larval food plant of hawk moth Cizara ardenia. | Benson & McDougall (2000). |
| *Coreopsis lanceolata* | | | | | | Weed, ornamental. | Lazarides & Hince (1993). |
| *Correa reflexa* | | | | | | Leaves and roots eaten | Benson & |

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| | | | | | | by wombat. Pollen eaten by Red Wattlebird, Crescent Honeyeater, New Holland Honeyeater, Tawny-crowned Honeyeater & Eastern Spinebill. | McDougall (2001). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Corymbia gummifera* | | | | Wood resistant to termites. | | Blossoms eaten by Grey-headed & Little Flying Fox. New Holland, White Cheeked Honeyeaters, Yellow Glider use Nectar. | Benson & McDougall (1998). |
| *Crassula colorata* | | | | Palatable to stock. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Crassula sieberiana* | | | | Fodder, palatable to stock but limited in value due to its small size or inaccessible habitats. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Crowea exalata* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Cryptandra amara* | | | | | | Possibly pollinated by native bees, flies and butterflies. | Benson & McDougall (2000). |
| *Cryptocarya rigida* | | | | Timber. | | | Lazarides & Hince (1993). |
| *Cryptostylis subulata* | Roots & tubers eaten raw or roasted. | | | | | Pollinated by pseudocopulation with Ichneumonid Wasps. | Benson & McDougall (2005). |
| *Cyathea australis* | Food. New shoots eaten if | | | | | Gums, ornamental. | Lazarides & Hince |

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| | roasted. | | | | | | (1993). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Cymbopogon refractus* | Medicinal. | Lazarides & Hince (1993). | | Heavily grazed when young, unpalatable when mature. | | Shelter. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Cynodon dactylon* | | | Poison. | Grazed without ill effect. Some forms contain HCN. | C3. Wind tolerant. | Secondary sand coloniser. Tertiary sand coloniser, by transplants. Pollen known to cause asthma in humans. Food plant of Australian Shelduck, Plumed Whistling Duck, Freckled Duck & butterfly larvae. | Clarke (1989), Cunningham et al. (1981), Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Cyperus gracilis* | | | | | | Weed. | Lazarides & Hince (1993). |
| *Dampiera stricta* | | | | | C3. | Tertiary sand coloniser, propagation by seed, Garden plant. Cosmopolitan species, on backdune. | Clarke (1989). |
| *Daucus glochidiatus* | Tuber edible. | | | Fodder. | | Weed. | Lazarides & Hince (1993). |
| *Daviesia latifolia* | | | | | | Food, medicinal. | Lazarides & Hince (1993). |
| *Dendrocnide excelsa* | Medicinal. | Lazarides & Hince (1993). | Poison. | Timber, Fibre. | | | Lazarides & Hince (1993). |
| *Dendrocnide photinophylla* | Fibre. | Lazarides & Hince (1993). | Poison. | Fibre. | | | Lazarides & Hince (1993). |
| *Desmodium brachypodum* | | | Poison? | | | | Lazarides & Hince (1993). |
| *Desmodium varians* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Dianella caerulea* | Fruits & roots edible. Stems | | | | | Buzz pollinated by bees. | Benson & |

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| | can be pounded to make a fibre. | | | | | | McDougall (2005). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Dianella caerulea* | Fruits & roots edible. Stems can be pounded to make a fibre. | | | | | Food plant of butterfly larvae. | Benson & McDougall (2005). |
| *Dianella caerulea* | Fruits & roots edible. Stems can be pounded to make a fibre. | | | | | Probably pollinated by native bees. | Benson & McDougall (2005). |
| *Dianella longifolia* | Fruits & roots edible. Stems can be pounded to make a fibre. | | | | | | |
| *Dianella longifolia* | Fruits & roots edible. Stems can be pounded to make a fibre. LEaves used to make baskets. | Benson & McDougall (2005). | | | | | |
| *Dianella nervosa* | Fruits & roots edible. Stems can be pounded to make a fibre. | | | | | | |
| *Dianella revoluta* | Fruits & roots edible. Stems can be pounded to make a fibre. | | | | | | |
| *Dianella revoluta* | Fruits & roots edible. Stems can be pounded to make a fibre. | | | | | Pollinated by native bees. | Benson & McDougall (2005). |
| *Dianella tasmanica* | Fruits & roots edible. Stems can be pounded to make a fibre. | | | | | | |
| *Dichelachne crinita* | | | | Fodder. | C3. Intolerant of waterlogging and salinity. | Secondary sand coloniser. Tertiary sand coloniser, by transplants, propagation by seed. Cosmopolitan species, on the backdune. | Clarke (1989), Lazarides & Hince (1993). |
| *Dichelachne* | | | | Fodder. | | | Lazarides & Hince |

| *micrantha* | | | | | | | (1993). |
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| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Dichondra repens* | | | | Fodder. | C3. Wind intolerant, drought intolerant, tolerant of waterlogging, intolerant of salinity. | Tertiary sand coloniser. Gums, weed. | Clarke (1989), Lazarides & Hince (1993). |
| *Dichopogon fimbriatus* | Tubers eaten raw. | | | Readily grazed in the early stages of growth. | | | Cunningham et al. (1981). |
| *Dillwynia sericea* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Dioscorea transversa* | Food, medicinal. Roots eaten raw, larger ones roasted. | Lazarides & Hince (1993). | | | | | |
| *Diospyros australis* | Fruit is edible, but only when fully ripe. | | | | | | |
| *Diospyros pentamera* | | | | | | Timber. | Lazarides & Hince (1993). |
| *Dipodium punctatum* | Roots eaten raw or roasted. | | | | | | |
| *Dipodium variegatum* | Roots eaten raw or roasted. | | | | | | |
| *Diuris punctata* | | | | Grazed by stock. Infrequent occurrence makes it unimportant pastorally. | | Probably pollinated by small bees, & syrpiid flies & beetles. | Cunningham et al. (1981), Benson & McDougall (2005). |
| *Diuris punctata* | Tubers of some Diuris species were eaten by aborigines. | Cribb & Cribb (1974), Cunningham et al. (1981). | | Eaten by stock and rarely found in well grazed areas. | | Probably pollinated by small bees, & syrpiid flies & beetles. | Cunningham et al. (1981). |
| *Diuris tricolor* | | | | | | Probably pollinated by small bees, & syrpiid flies & beetles. | |

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| *Dockrillia linguiformis* | | | | | | Leaves eaten by Swamp Wallaby. Pollinated by insects. | Benson & McDougall (2005). |
| *Dockrillia pugioniformis* | | | | | | Pollinated by bees. | Benson & McDougall (2005). |
| *Dodonaea triquetra* | | | | | C3. Drought tolerant. Intolerant of waterlogging, wind and salinity. | Tertiary sand coloniser, by seed propagation. | Clarke (1989). |
| *Dodonaea viscosa* | Timber. | Lazarides & Hince (1993). | | Fodder. | | Food, gums, honey (pollen), shelter, ornamental. | Lazarides & Hince (1993). |
| *Drosera auriculata* | | | Poison? | | | Ornamental. | Lazarides & Hince (1993). |
| *Drosera peltata* | | | Poison? | | | Ornamental. | Lazarides & Hince (1993). |
| *Drosera spatulata* | | | Poison? | | | Ornamental. | Lazarides & Hince (1993). |
| *Echinopogon caespitosus* | | | | Grazed by stock. | | Food plant for butterfly larvae. | Benson & McDougall (2005). |
| *Echinopogon ovatus* | | | Poison | Fodder, low forage value. | | Young plants poisonous to stock. | Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Einadia hastata* | Edible fruit. | | | | | | |
| *Elaeocarpus obovatus* | | | | | | Timber. | Lazarides & Hince (1993). |
| *Elaeocarpus reticulatus* | | | | | | Timber, ornamental. | Lazarides & Hince (1993). |
| *Eleocharis sphacelata* | Tubers may be roasted & eaten. | | | Whilst green it is well regarded as forage for stock. Dense stands capable of | | | Cunningham et al. (1981), Lazarides & Hince (1993). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
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| | | | | fattening cattle and sheep. | | | |
| *Elymus scaber* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Enneapogon nigricans* | | | | Fodder. Susceptible to overgrazing. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Entolasia marginata* | | | | Fodder, low palatability. | | Seed eaten by Finches | Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Entolasia stricta* | | | | Fodder, low palatability. | | | Lazarides & Hince (1993). |
| *Epilobium billardierianum* | | | | | | Weed. | Lazarides & Hince (1993). |
| *Epilobium hirtigerum* | | | | Fodder. | | Weed. | Lazarides & Hince (1993). |
| *Eragrostis curvula* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Eragrostis lacunaria* | | | | Reasonable feed for sheep. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Eragrostis leptostachya* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Eragrostis molybdea* | | | | Useful forage alternative to Aristida jerichoensis. | | | Cunningham et al. (1981). |
| *Eragrostis parviflora* | | | | Moderately palatable when young. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Eragrostis trachycarpa* | | | Photosensitisation | | | Suspected of causing photosensitisation in sheep. | Benson & McDougall (2005). |
| *Eremophila debilis* | Fruit is edible, but slightly bitter. | | | | | | |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
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| *Eucalyptus acmenoides* | | | | Timber, Honey. | | Blossoms eatern by Grey-headed & Little Red Flying Fox. Host plant of Longicorn beetles. | Lazarides & Hince (1993), Benson & McDougall (1998). |
| *Eucalyptus andrewsii* | | | | Timber, Honey. | | | Lazarides & Hince (1993). |
| *Eucalyptus biturbinata* | | | | Timber. | | | Lazarides & Hince (1993). |
| *Eucalyptus bridgesiana* | | | | Gums, Honey. | | Seed eaten by Gang Gans. Crimson Rosella eats seed. Little Lorikeet eats Nectar. | Lazarides & Hince (1993), Benson & McDougall (1998). |
| *Eucalyptus caliginosa* | | | | Timber, Fuel, Honey. | | | Lazarides & Hince (1993). |
| *Eucalyptus cameronii* | | | | Timber. | | | Lazarides & Hince (1993). |
| *Eucalyptus dealbata* | | | | Valued for Honey and Pollen. | | Blossoms eaten by Grey-headed Flying Fox. | Benson & McDougall (1998). |
| *Eucalyptus laevopinea* | | | | Timber, Honey. | | | Lazarides & Hince (1993). |
| *Eucalyptus melliodora* | | | | Gum, Fuel, Honey. | | Pollinated by insects. Prolific flowering every 2nd yr. Irregular flowering related to rainfall. Blossoms eaten Grey Headed Flying Fox. Seed by Gang Gang & Crimson Rosella. Important food for Fuscous & Regent Honeyeaters. | Lazarides & Hince (1993), Benson & McDougall (1998). |
| *Eucalyptus microcorys* | | | | Gum, Timber, Honey. | | Blossoms eaten by Grey Headed Flying Fox. | Lazarides & Hince (1993), Benson & |

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| | | | | | | Moderately palatable to Koala. | McDougall (1998). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Eucalyptus nova-anglica* | | | | Gum, Timber. | | | Lazarides & Hince (1993). |
| *Eucalyptus obliqua* | | | | Gums, timber, pulp, honey. Timber marketed as 'Tasmanian oak'. | | Ants are predators to seed. Browsed by Koala. Provides hollows for arboreal mammals. | Lazarides & Hince (1993), Benson & McDougall (1998). |
| *Eucalyptus oreades* | | | | Timber, Honey. | | | Lazarides & Hince (1993). |
| *Eucalyptus pauciflora* | | | | Gum, Timber, Honey, Fuel. | | Ornamental. | Lazarides & Hince (1993). |
| *Eucalyptus propinqua* | | | | Timber, Honey. | | Blossoms eaten by Grey Headed Flying Fox. | Lazarides & Hince (1993), Benson & McDougall (1998). |
| *Eucalyptus saligna* | | | | Gum, Timber, Honey. | | Seed eaten by Crimson Rosella. Blossoms eaten by Grey Headed Flying Fox. Browsed by Koala. Susceptible to damage from root compaction by cattle & horses. | Lazarides & Hince (1993), Benson & McDougall (1998). |
| *Eucalyptus tereticornis* | Medicinal. | | | Gum, Timber, Fuel, Honey. | | Ornamental. Blossoms eaten by Grey Headed & Little Red Flying Fox. Staple of Koala. | Lazarides & Hince (1993), Benson & McDougall (1998). |
| *Eucalyptus tindaliae* | | | | Timber. | | | Lazarides & Hince (1993). |
| *Eucalyptus viminalis* | Edible manna. Medicinal. | Lazarides & Hince (1993). | | Gum, Timber, Pulp, Honey. | | Food for Koala. Greater Glider may eat young foliage. Crested Shrike-tit, Yellow-bellied Glider & small dasyurids forage for invertebrates in | Lazarides & Hince (1993), Benson & McDougall (1998). |

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| | | | | | | shedding bark. | |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Eucalyptus youmanii* | Medicinal. | | | Gum, Timber, Honey. | | | Lazarides & Hince (1993). |
| *Euroschinus falcata* | | | | | Wind tolerant, drought intolerant, intolerant of waterlogging, intolerant of salinity. | Tertiary sand coloniser, propagation by seed, bird attractant, mammal attractant. Grows on the back dune. | Clarke (1989). |
| *Eustrephus latifolius* | Tubers are sweet and edible. | | | | | Pollinated by honeybees, small beetles. | Benson & McDougall (2005). |
| *Exocarpos cupressiformis* | Succulent yellow to red pedicel of fruit edible. Food, timber, gums, ornamental. | Cunningham et al. (1981), Benson & McDougall (2001). | Foliage reputed to be poisonous to stock and horses. | | | Small fly (Diptera) feeds on flowers. Fruit eaten by Black-faced Cuckoo-shrike. Seed eaten by Aust. King Parrot, Crimson Rosella. Host to parasitic shrub Viscum articulatum. Host plant of Cerambycid beetle. Food plant of various butterfly & moth larvae. | Lazarides & Hince (1993), Benson & McDougall (2001). |
| *Exocarpos strictus* | Succulent whitish to reddish pedicel of fruit is edible. | Benson & McDougall (2001). | | | | Host to parasitic shrub Viscum articulatum. Food plant of butterfly larvae Delius aganippe. | Benson & McDougall (2001). |
| *Ficus coronata* | Leaves used as a sandpaper. | Lazarides & Hince (1993). | | Fodder. | | | Lazarides & Hince (1993). |
| *Ficus obliqua* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Ficus rubiginosa* | Fruit can be eaten raw or made into a jelly. | | | | | | |

| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
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| *Fimbristylis dichotoma* | | | | Must be utilised while green for forage. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Gahnia aspera* | Red-brown seeds were pounded by the aborigines to produce a flour. The roots are also edible. | Cribb & Cribb (1974), Cunningham et al. (1981), Lazarides & Hince (1993). | | Fodder, of little forage value. | | | Lazarides & Hince (1993). |
| *Gahnia sieberiana* | Food. The leaf base is edible. | | | | | | |
| *Geitonoplesium cymosum* | Young tender shoots taste like asparagus. | | | | | | |
| *Genoplesium fimbriatum* | | | | | | Probably pollinated by small flies. | Benson & McDougall (2005). |
| *Geranium potentilloides* | Roots can be roasted & eaten. | | | | | | |
| *Geranium solanderi* | Roots can be roasted & eaten. | | | | | | |
| *Glycine clandestina* | The root can be eaten. | | | Fodder. | C3. | Secondary sand coloniser. Cosmopolitan species, on the fore dune and backdune. | Clarke (1989), Lazarides & Hince (1993). |
| *Glycine tabacina* | Taproot has liquorice flavour and was chewed by Aborigines. | Lazarides & Hince (1993). | Poison? | Fodder. | | | Lazarides & Hince (1993). |
| *Gomphocarpus fruticosus* | | | Poison. | | | Ornamental. | Lazarides & Hince (1993). |
| *Gonocarpus teucrioides* | | | | | | Grows on sandstone and sand, on backdune. | Clarke (1989). |
| *Grevillea juniperina* | | | | | | Honey, ornamental. | Lazarides & Hince (1993). |
| *Grevillea linearifolia* | | | | | | Insect pollinated, native and honey bees. | Benson & McDougall (2000). |
| *Guioa semiglauca* | | | | | | Honey. | Lazarides & Hince (1993). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
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| *Hardenbergia violacea* | Food. | Lazarides & Hince (1993). | Poison. | Fodder. | C3. Wind intolerant, drought tolerant, intolerant of waterlogging and salinity. | Tertiary sand coloniser, propagation by seed, garden plant, floral display. Cosmopolitan species, on backdune. Food, ornamental. | Clarke (1989), Lazarides & Hince (1993). |
| *Helichrysum rutidolepis* | | | | Fodder. Moderately palatable. Suspected cause of tainted cream. | | | Lazarides & Hince (1993). |
| *Hemarthria uncinata* | | | | Fodder, of limited forage value. | | Shelter. | Lazarides & Hince (1993). |
| *Hibbertia acicularis* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Hibbertia obtusifolia* | | | Poison? | Fodder. | | | Lazarides & Hince (1993). |
| *Hibbertia riparia* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Hibbertia scandens* | | | | | C3. Wind tolerant, drought intolerant, intolerant of waterlogging and salinity. | Secondary sand coloniser. Tertiary sand coloniser, propagation by cuttings and seed, garden plant, floral display. | Clarke (1989). |
| *Hibbertia sericea* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Hibiscus heterophyllus* | Roots, shoots & leaves of young plants can be eaten raw. The fruit is also edible. | Lazarides & Hince (1993). | | | | Food, ornamental. Buds and young shoots edible raw or as a jam. | Lazarides & Hince (1993). |
| *Hierochloe rariflora* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Hirschfeldia incana* | | | | Edible to stock | | Persistent weed of | Cunningham et al. |

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| | | | | when young. May taint meat and milk. | | disturbed ground. | (1981), Lazarides & Hince (1993). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Hoya australis* | | | Poison? | | | Ornamental. | Lazarides & Hince (1993). |
| *Hyparrhenia hirta* | | | | Fodder. | | Can be used for fodder if constantly managed by generally unpalatable with age reducing productivity of pastures. Aggressive coloniser. | Lazarides & Hince (1993). |
| *Hypericum gramineum* | | | Poison. | Fodder. Causes enteritis in sheep. | | | Lazarides & Hince (1993). |
| *Hypochaeris glabra* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Hypochaeris radicata* | | | | Fodder. | C3. Wind tolerant, drought tolerant, intolerant of waterlogging, intolerant of salinity. | Secondary & tertiary sand coloniser. Cosmopolitan species, on the backdune. Honey, weed. | Clarke (1989), Lazarides & Hince (1993). |
| *Hypoxis hygrometrica* | Food. Tubers eaten. | Lazarides & Hince (1993). | | | | | |
| *Imperata cylindrica* | | | | Fodder, grazed when young. | | Food plant for butterfly larvae. | Lazarides & Hince (1993). |
| *Indigofera australis* | Poison. | Lazarides & Hince (1993). | Poison? | Fodder. Contains HCN; toxic when flowering and suspected cattle poison. | | Ornamental. | Lazarides & Hince (1993). |
| *Isachne globosa* | | | | Highly palatable fodder. | | | Lazarides & Hince (1993). |
| *Isotoma anethifolia* | | | Poison. | | | | Lazarides & Hince |

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| | | | | | | | (1993). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Isotoma axillaris* | | | Poison. | | | Ornamental. | Lazarides & Hince (1993). |
| *Jacksonia scoparia* | | | | Honey. | | Ornamental. Indicator of poor soils. | Lazarides & Hince (1993). |
| *Juncus articulatus* | | | Poison. | Cyanogenic reactions from this species in stock. Not known to be grazed. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Juncus bufonius* | | | | Grazed by stock. Not highly regarded as a forage plant. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Kennedia rubicunda* | | | | Fodder. | C3. Wind intolerant, drought tolerant, intolerant of waterlogging and salinity. | Secondary sand coloniser. Tertiary sand coloniser, propagation by seed, garden plant. Bird attractant, floral display. Cosmop. spp | Clarke (1989), Lazarides & Hince (1993). |
| *Kunzea ericoides* | | | | Unpalatable to stock. | | Ornamental. Seed eaten by Crimson Rosella. | Lazarides & Hince (1993). |
| *Kunzea parvifolia* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Lachnagrostis filiformis* | | | | Fodder. | | Detached seed heads cause acute fire hazard. | Lazarides & Hince (1993). |
| *Lepidosperma laterale* | | | | | C3. Wind intolerant, drought intolerant, intolerant of salinity and waterlogging. | Tertiary sand coloniser, propagation by transplants and seed. | Clarke (1989). |
| *Leptospermum* | | | | | | Host specific gall. | Hunter (1997) |

| *novae-angliae* | | | | | | | |
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| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Leptospermum trinervium* | | | | | | Native bees, honeybees, flies, beetles, wasps, butterflies & moths pollinate. | Benson & McDougall (1998). |
| *Lepyrodia scariosa* | | | | | | Honeybees gather pollen. | Benson & McDougall (2005). |
| *Leucopogon lanceolatus* | Fruits are edible. | | | | | | |
| *Lissanthe strigosa* | Fruit edible. | | | | | Host specific gall. | Hunter (1997) |
| *Lomandra confertifolia* | | | | | | Food plant of butterflies. | Benson & McDougall (2005). |
| *Lomandra filiformis* | | | | | | Food plant for butterflies. | Benson & McDougall (2005). |
| *Lomandra longifolia* | Leaf bases edible & taste like peas. Leaves used for baskets. Flowers edible. | | Poison? | Not observed to be grazed by stock, but suspected of causing a type of paralysis in stock. | C3. Tolerant of wind, drought and salinity. Intolerant of waterlogging. | Secondary & tertiary sand coloniser. Wind barrier. Propagation by transplants and seed. Bee & mammal attractant. | Clarke (1989), Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Lomandra multiflora* | | | Poison? | Suspected of poisoning sheep. | | Food for butterflies. | Cunningham et al. (1981), Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Lomatia silaifolia* | | | | | | Partially self-compatible, probably insect-pollinated, possibly by large flies, mostly visited by beetles and ants. | Benson & McDougall (2000). |
| *Lophostemon confertus* | | | | Gum, Timber, Fuel, Honey, Shelter. | | Ornamental. Blossoms eaten by Grey Headed Flying Fox. | Lazarides & Hince (1993), Benson & McDougall (1998). |
| *Lotus australis* | The seeds are edible. | | Poison. | Fodder. Drought | | | Lazarides & Hince |

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| | | | | resistant and palatable. HCN toxic to sheep and cattle, especially actively growing plants, pods and seeds. | | | (1993). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Lotus corniculatus* | | | | | | Weed. | Lazarides & Hince (1993). |
| *Lythrum salicaria* | Medicinal. | | | | | Ornamental. Reported to have astringent properties. | Lazarides & Hince (1993). |
| *Maclura cochinchinensis* | | | Poison? | | C3. Intolerant of wind, drought, waterlogging and salinity. | Tertiary sand coloniser. Cosmopolitan species, on the backdune. Ornamental. | Clarke (1989), Lazarides & Hince (1993). |
| *Marsdenia rostrata* | | | Poison. | Fodder, mostly unpalatable. | C3. Wind intolerant, drought intolerant, tolerant of waterlogging, tolerant of salinity. | Tertiary sand coloniser. | Clarke (1989), Lazarides & Hince (1993). |
| *Medicago arabica* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Mentha satureioides* | Medicinal. | Lazarides & Hince (1993). | Poison? | Honey. | | | Lazarides & Hince (1993). |
| *Microlaena stipoides* | | | | | | One of the few Australian native grasses that provide forage during the critical winter early spring period. Valuable for stock in dry times. | Benson & McDougall (2005). |

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| | | | | | | Food plant for butterfly larvae. Finches eat seeds. | |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Microtis unifolia* | Tubers of some species of Microtis were eaten by aborigines. | Cribb & Cribb (1974), Cunningham et al. (1981). | | | | Pollinated by worker ants. | Benson & McDougall (2005). |
| *Mirbelia pungens* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Monotoca scoparia* | Fruits are edible. | | | | | | |
| *Morinda jasminoides* | Fruits edible when ripe. | | | | | Larval food of hawk moths Macroglossum hirundo subsp. errans & Cizara ardenia. Pollen collected by honeybee. | Benson & McDougall (2000). |
| *Murdannia graminea* | Roots baked then eaten. | | | | | | |
| *Myoporum montanum* | Fruits are edible. | Lazarides & Hince (1993). | Poison. | Honey. | | Ornamental. | Lazarides & Hince (1993). |
| *Myriophyllum aquaticum* | | | | Food. | | Ornamental. | Lazarides & Hince (1993). |
| *Myriophyllum variifolium* | | | Poison. | Tested mildly HCN positive, but not palatable to stock. | | | Lazarides & Hince (1993). |
| *Notelaea longifolia* | | | | | C3. Intolerant of wind, drought, waterlogging and salinity. | Tertiary sand coloniser, by seed propagation. Bird attractant. Cosmopolitan species, on the backdune. | Clarke (1989). |
| *Notelaea microcarpa* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Nymphoides geminata* | Tubers roasted & eaten. | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Nyssanthes diffusa* | | | | | | Minor weed of usually wet wastelands. | Lazarides & Hince (1993). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
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| *Olax stricta* | | | | | | Possibly eaten by rabbits. | Benson & McDougall (1999). |
| *Olearia ramulosa* | | | | Low palatability fodder. | | | Lazarides & Hince (1993). |
| *Opercularia aspera* | | | | | C3. Intolerant of wind, drought, waterlogging and salinity. | Tertiary sand coloniser. Cosmopolitan species, on the backdune. Eaten by rabbits. | Clarke (1989), Benson & McDougall (2000). |
| *Oplismenus aemulus* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Oxalis exilis* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Oxalis perennans* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Pandorea pandorana* | Long wiry branches used as spear shafts by Aborigines. | Lazarides & Hince (1993). | | Moderately palatable fodder. | C3. Wind intolerant, drought intolerant, intolerant of waterlogging and salinity. | Tertiary sand coloniser, propagation by seed, garden plant, floral display. Cosmopolitan species, on the backdune. | Clarke (1989), Lazarides & Hince (1993). |
| *Panicum effusum* | Seeds utilised to make bread. | | Poison? | Palatable when young. Over consumption can cause photo-sensitisation and 'yellow bighead' in sheep. Susceptible to close grazing. | | Seed eaten by Stubble Quail. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Panicum simile* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Parsonsia eucalyptophylla* | | | Poison? | Often eaten by sheep and cattle as drought fodder. | | | Lazarides & Hince (1993). |

| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
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| | | | | Suspected sheep poison at certain times. | | | |
| *Parsonsia straminea* | | | Poison? | | | May cause severe chemical burns. | Lazarides & Hince (1993); Hunter (1997). |
| *Paspalidium constrictum* | | | | Very palatable to stock. Susceptible to preferential grazing. | Drought resistant. | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Paspalidium gracile* | Seeds are edible. | | | Hardy and readily grazed. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Paspalum dilatatum* | | | Poison. | Heavy producer of palatable fodder. Ingested fungus may poison livestock. | Withstands heavy grazing and drought. Frost tender. | Fungus attacks seed, causing ergot. Sticky exudate harmful to humans. Pollen known to cause allergies in humans. Food plant of Pacific Black Duck & butterfly larvae. | Cunningham et al. (1981), Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Paspalum urvillei* | | | | | | Food plant of butterfly larvae. | Benson & McDougall (2005). |
| *Patersonia glabrata* | Rhizome edible. | | | | | | |
| *Pavonia hastata* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Pelargonium australe* | | | | Fodder. | C3. Wind tolerant. | Secondary sand coloniser, propagation by seed. Garden plant, floral display. Grows on sand dunes only, on fore dune. | Clarke (1989), Lazarides & Hince (1993), |
| *Pentapogon quadrifidus* | | | | Fodder, low in forage value. | | | Lazarides & Hince (1993). |
| *Persicaria* | Salks can be roasted, peeled | | | | | | |

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| *hydropiper* | & eaten. Leaves can also be eaten but are hot. | | | | | | |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Persoonia cornifolia* | Fruit is edible. | | | | | | |
| *Persoonia daphnoides* | Fruit is edible. | | | | | | |
| *Persoonia fastigiata* | Fruit is edible. | | | | | | |
| *Persoonia microphylla* | Fruit is edible. | | | | | | |
| *Persoonia oleoides* | Fruit is edible. | | | | | | |
| *Persoonia sericea* | Fruit is edible. | | | | | | |
| *Persoonia tenuifolia* | Fruit is edible. | | | | | | |
| *Persoonia virgata* | Fruit is edible. | | | | | | |
| *Phalaris aquatica* | | | Poison. | Sown in irrigation pastures. May cause stock poisoning, especially in sheep: 'Phalaris Staggers'. | | Pollen known to cause allergies in humans. | Cunningham et al. (1981), Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Philydrum lanuginosum* | | | Poison? | Fodder. | | | Lazarides & Hince (1993). |
| *Phyllota phylicoides* | | | | Honey. | | | Lazarides & Hince (1993). |
| *Phytolacca octandra* | | | Poison? | Suspected of poisoning stock. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Pimelea glauca* | | | Poison. | | | | Lazarides & Hince (1993). |
| *Pimelea strigosa* | | | Poison? | | | | Lazarides & Hince (1993). |
| *Pittosporum undulatum* | | | | | C3. Intolerant of wind, drought, waterlogging and salinity. | Tertiary sand coloniser, propagation by seed, garden & shade plant. Gums, weed. | Clarke (1989), Lazarides & Hince (1993). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
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| *Plantago debilis* | Leaves are edible. | | | | | | |
| *Plantago varia* | Leaves are edible. | | | | | | |
| *Plectranthus parviflorus* | Medicinal. | Lazarides & Hince (1993). | | | | Ornamental. | Lazarides & Hince (1993). |
| *Poa labillardieri* | | | | New growth utilised by stock. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Poa sieberiana* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Podolepis arachnoidea* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Podolepis jaceoides* | Roots roasted. | | | Fodder. | | | Lazarides & Hince (1993). |
| *Polyscias elegans* | | | | | C3. Wind intolerant, drought intolerant, intolerant of waterlogging and salinity. | Tertiary sand coloniser by seed propagation. Timber, fuel, ornamental. | Clarke (1989), Lazarides & Hince (1993). |
| *Pomaderris andromedifolia* | | | | | | Food plant of butterfly larvae Hypochrysops byzos byzos | Benson & McDougall (2000). |
| *Pomaderris lanigera* | | | | | | Flowers visited by weevils and small flies. Food plant of butterfly larvae Hypochrysops byzos byzos. | Benson & McDougall (2000). |
| *Pomax umbellata* | | | Poison? | Fodder. Reputedly cyanogenetic, but rarely grazed. Considered to be a potential producer of hydrocyanic acid. | C3. Drought tolerant. Intolerant of wind, waterlogging and salinity. | Tertiary sand coloniser. Cosmopolitan species, on the backdune. | Clarke (1989), Lazarides & Hince (1993), Benson & McDougall (2000). |

| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
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| *Poranthera microphylla* | | | Poison? | HCN positive; suspected of deaths in sheep and cattle. | | | Lazarides & Hince (1993). |
| *Pratia purpurascens* | | | | | C3. Intolerant of wind, drought and salinity. Tolerant of waterlogging. | Tertiary sand coloniser, propagation by transplants. Garden plant. Cosmopolitan species, on the backdune. Weed. | Clarke (1989), Lazarides & Hince (1993). |
| *Prostanthera nivea* | | | | | | Ornamental. | Lazarides & Hince (1993). |
| *Pseudognaphalium luteoalbum* | Medicinal. Used for making a medicinal drink. | Lazarides & Hince (1993). | | Fodder, lightly grazed. | | | Lazarides & Hince (1993). |
| *Psychotria loniceroides* | Fruits eaten when ripe. | | | | | Larval food plant for hawk moth Macroglossum hirundo subsp. errans. | Benson & McDougall (2000). |
| *Pteridium esculentum* | Food, medicinal. Rhizomes & young fronds contain starch which is chewed out and beaten to a paste. Rhizomes roasted. Carbohydrate content better than potatoes. | Lazarides & Hince (1993). | Poison. | Causes poisoning of horses and cattle. Gums. | | | Lazarides & Hince (1993). |
| *Pterostylis cycnocephala* | Tubers eaten. | | | | | Pollinated by pseudocopulation by fungus gnats & mosquitoes. | Benson & McDougall (2005). |
| *Pterostylis daintreana* | Tubers eaten. | | | | | Pollinated by pseudocopulation by fungus gnats & mosquitoes. | Benson & McDougall (2005). |
| *Pterostylis longifolia* | Tubers eaten. | | | | | Pollinated by pseudocopulation by fungus gnats & | Benson & McDougall (2005). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
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| | | | | | | mosquitoes. | |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Pterostylis obtusa* | Tubers eaten. | | | | | Pollinated by pseudocopulation by fungus gnats & mosquitoes. | Benson & McDougall (2005). |
| *Pultenaea flexilis* | | | | Honey. | | | Lazarides & Hince (1993). |
| *Pultenaea villosa* | | | | Honey. | | | Lazarides & Hince (1993). |
| *Ranunculus inundatus* | | | | Fodder. | | Stoloniferous. | Lazarides & Hince (1993), Benson & McDougall (2000). |
| *Ranunculus lappaceus* | | | | Not keenly sought after by stock. More suited to cattle than sheep. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Rosa rubiginosa* | Rose hips can be eaten, may be made into ajam. Petals can be used in jams & salads. | Cunningham et al. (1981), Lazarides & Hince (1993). | | Foliage grazed by stock. | | Weed. Declared noxious in ACT, Vic, Tas, part NT. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Rostellularia adscendens* | | | | Moderately palatable fodder. | | Ornamental. | Lazarides & Hince (1993). |
| *Rubus fruticosus* | | | | Fruit eaten by numerous animals and birds. | | Fruits collected for making jams and pies. Ornamental, weed. Declared noxious in Qld, ACT, Vic, Tas, SA, WA. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Rubus parvifolius* | Fruits eaten raw or made into a jam. | Lazarides & Hince (1993). | | | | Adult jewel beetles Alcinous nodosus during early summer on leaves, larvae feed in stems and later pupate in hollowed out chamber. | Lazarides & Hince (1993). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
|---|---|---|---|---|---|---|---|
| *Rubus ulmifolius* | Fruit edible and sweet but insipid. | Benson & McDougall (2000). | | | | Weed. | Lazarides & Hince (1993). |
| *Rumex brownii* | Leaves and midrib can be steamed or boiled & used as a substitute for silver beet. Thick yellow taproot can be ground, roasted & used as a coffee substitute. | | Poison. | | | Weed. | Lazarides & Hince (1993). |
| *Sacciolepis indica* | | | | Fodder of low forage value. | | | Lazarides & Hince (1993). |
| *Sarcopetalum harveyanum* | | | | | C3. Intolerant of wind, drought, waterlogging and salinity. | Tertiary sand coloniser. Cosmopolitan species, on the backdune. | Clarke (1989). |
| *Schizomeria ovata* | Edible fruit, which can make a good jam. | | | | | | |
| *Schoenus apogon* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Scolymus maculatus* | | | | | | Weed, declared noxious in parts of NT. | Lazarides & Hince (1993). |
| *Secale cereale* | | | | Fodder. | | Food (rye), weed, shelter. | Lazarides & Hince (1993). |
| *Senecio linearifolius* | | | | | C3. Wind intolerant, drought intolerant, intolerant of waterlogging and salinity. | Tertiary sand coloniser. Cosmopolitan species, on the backdune. Weed. | Clarke (1989), Lazarides & Hince (1993). |
| *Senecio quadridentatus* | | | Poison. | Fodder. | Drought resistant. | Weed. | Lazarides & Hince (1993). |
| *Setaria verticillata* | | | | Quite palatable to stcok when young. | | Weed. | Cunningham et al. (1981), Lazarides & Hince (1993). |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
|---|---|---|---|---|---|---|---|
| *Sigesbeckia orientalis* | Medicinal | Lazarides & Hince (1993). | | Lighlty grazed fodder. | | Used for treatment of skin disorders. | Lazarides & Hince (1993). |
| *Smilax australis* | Leaf infusions used medicinally. Fruits edible & peppery. Woody stems used as fire sticks to ignite fire when rubbed together. | Lazarides & Hince (1993). | | | C3. Intolerant of wind, drought, waterlogging and salinity. | Tertiary sand coloniser. Medicinal, ornamental. | Clarke (1989), Lazarides & Hince (1993). |
| *Smilax glyciphylla* | Fruit and leaves eaten. Lease used as a substitute for sarsaparilla. | Benson & McDougall (2005). | | | | Medicinal, ornamental. Leaf infusions used medicinally. | Lazarides & Hince (1993). |
| *Solanum cinereum* | | | Poison? | Fodder. Berries suspected poisonous to sheep and horses. | | | Lazarides & Hince (1993). |
| *Solanum stelligerum* | Recorded as being used as a traditional food plant. Fruit eaten by coastal Aborigines. | Clarke (1989), Lazarides & Hince (1993). | | | C3. Intolerant of wind, drought, waterlogging and salinity. | Tertiary sand coloniser. Floral display. | Clarke (1989). |
| *Sonchus asper* | Eaten as a green. | | | Fodder. | | | Lazarides & Hince (1993). |
| *Sonchus oleraceus* | Food. Eaten as a vegetable. | Lazarides & Hince (1993). | Poison? | Fodder. Suspected cause of photo-sensitisation in cattle. Readily grazed by stock. | C3. Wind intolerant , drought intolerant, intolerant of waterlogging and salinity. | Cosmopolitan species, on the backdune. Juice used medicinally. Weed. | Clarke (1989), Lazarides & Hince (1993). |
| *Sorghum leiocladum* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Spiranthes sinensis* | Tubers eaten. | | | | | Pollinated by small native bees. | Benson & McDougall (2005). |
| *Sporobolus elongatus* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Stackhousia* | | | | Fodder. | | | Lazarides & Hince |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
|---|---|---|---|---|---|---|---|
| *monogyna* | | | | | | | (1993). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Stellaria media* | | | | Food. | | Edible as a vegetable, either cooked or raw. | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Stephania japonica* | | | Poison? | Suspected stock poison. | C3. Wind tolerant. Intolerant of drought, waterlogging and salinity. | Tertiary sand coloniser. Grows on sand dunes, headlands and in swamps, on fore dune and backdune. | Clarke (1989), Lazarides & Hince (1993). |
| *Stypandra glauca* | | | May be toxic to livestock if eaten when flowering. | | | Ornamental. | Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Styphelia triflora* | Fruit edible. | | | | | | |
| *Syzygium australe* | | | | Food, Timber. | | Ornamental. Fruit eaten by Grey Headed Flying Fox. Silvereye, Brown Pigeon, Wonga Pigeon, Satin Bowerbird also eat fruit. | Lazarides & Hince (1993), Benson & McDougall (1998). |
| *Taraxacum officinale* | | | | Honey. | | | Lazarides & Hince (1993) |
| *Tetrarrhena juncea* | Seeds pounded into a flour & eaten. | | | Fodder | | Food plant of butterfly larvae. | Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Thelionema caespitosum* | | | | | | Pollinated by native bees. | Benson & McDougall (2005). |
| *Thelychiton gracilicaulis* | | | | | | Probably pollinated by Trigona bees. | Benson & McDougall (2005). |
| *Thelychiton tarberi* | | | | | | Pollinated by Trigona bees. | Benson & McDougall (2005). |
| *Thelymitra ixioides* | Tubers eaten. | | | | | Pollinated by native bees & hoverflies. | Benson & McDougall (2005). |
| *Thelymitra pauciflora* | Tubers eaten. | | | | | | |

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| *Themeda triandra* | | | | Very palatable, heavily grazed in eastern NSW. Sparingly grazed in Western NSW. Young growth utilised | | Food plant of butterfly larvae. Will not tolerate continuous grazing. Very palatable when young but only moderate nutritive value. Provides much roughage to offset effects of highly improved grasslands. | Cunningham et al. (1981), Lazarides & Hince (1993), Benson & McDougall (2005). |
| *Thysanotus tuberosus* | | | | Leaves are readily eaten by stock. Amount of forage produced is negligible. | | | Lazarides & Hince (1993). |
| *Trachymene incisa* | Edible tap root eaten raw or roasted. | | | | | | |
| *Trachymene sp. nov.* | Edible tap root eaten raw or roasted. | | | | | | |
| *Tricoryne elatior* | | | | Eaten by stock but lacks bulk. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Trifolium campestre* | | | | Fodder. | | | Lazarides & Hince (1993). |
| *Trifolium repens* | | | | Fodder, honey. | | | Lazarides & Hince (1993). |
| *Tripogon loliiformis* | | | | Should be utilised quickly. Quite palatable. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Urtica incisa* | Young shoots edible when boiled. | Lazarides & Hince (1993). | Painfall when contacted. | | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Velleia paradoxa* | | | Poisonous? | Honey. | | | Lazarides & Hince (1993). |
| *Verbena bonariensis* | | | Poisonous? | Fodder. | | | Lazarides & Hince |

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|---|---|---|---|---|---|---|---|
| | | | | | | | (1993). |
| **Name** | **Use** | **Use Refs.** | **Toxicity** | **Agri. Use** | **Physiol.** | **Notes** | **Gen. Refs.** |
| *Verbena officonalis* | Medicinal. | Lazarides & Hince (1993). | Poisonous? | Fodder. | | | Lazarides & Hince (1993). |
| *Viola hederacea* | | | | | C3. Tolerant of waterlogging. Intolerant of wind, drought and salinity. | Tertiary sand coloniser. Propagation by cuttings, transplants and seed. Garden plant, floral display. | Clarke (1989). |
| *Vulpia bromoides* | | | | Generally ignored by sheep in good seasons. Can produce growth when other species fail. | | | Cunningham et al. (1981), Lazarides & Hince (1993). |
| *Wahlenbergia communis* | | | | Fodder, palatable to stock. | | | Lazarides & Hince (1993). |
| *Wahlenbergia gracilis* | | | | Palatable forage in cooler months. | C3. Wind intolerant, drought intolerant, intolerant of waterlogging and salinity. | Tertiary sand coloniser. Garden plant, floral display. Cosmopolitan species, on the backdune. | Clarke (1989), Lazarides & Hince (1993). |
| *Wahlenbergia stricta* | | | | Readily grazed, cool season plant. | | | Lazarides & Hince (1993). |
| *Wurmbea dioica* | Corms & roots eaten. | Lazarides & Hince (1993). | Poison. | Contains toxic alkaloid colchicine and implicated in stock deaths. | | | Lazarides & Hince (1993). |
| *Xanthorrhoea glauca* | Aboriginal people collected nectar for food, dryied flower stalks for fishing spears and fire making, trunk a source of resin. | | | Honey. | | | |

| Name | Use | Use Refs. | Toxicity | Agri. Use | Physiol. | Notes | Gen. Refs. |
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| *Xanthorrhoea johnsonii* | Aboriginal people collected nectar for food, dried flower stalks for fishing spears and fire making, trunk a source of resin. | | | Honey. | | Blossoms eaten by Grey Headed Flying Fox. | Benson & McDougall (2005). |
| *Xanthorrhoea macronema* | Aboriginal people collected nectar for food, dried flower stalks for fishing spears and fire making, trunk a source of resin. | | | Honey. | | Blossoms eaten by Grey Headed Flying Fox. | Benson & McDougall (2005). |
| *Zieria smithii* | | | | | | Probably pollinated by native bees, flies and honeybees Apis mellifera, with small butterflies, wasps and bugs playing a lesser role. Food plant of butterfly larvae Papilio aegus aegus. White wax scale may be Gascardia destructor, Coccidae, Hemiptera. | Benson & McDougall (2001). |

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