

Biodiversity and Endemism within the Mount Canobolas Volcanic Complex

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Mt Canobolas State Conservation Area (SCA) hosts a small remnant of sub-alpine vegetation consisting of seven recognisable communities with the heathlands on the rock plates appearing to be unique to the SCA. The SCA has a known biota of 884 native species that includes 14 threatened species and at least 10 endemic taxa. Some 200 species are regionally significant, being either rare or at the limits of known geographic range. The vascular flora is particularly species-rich being considerably more diverse than nearby regional reserves and over 12 fold richer than comparable areas of the Kosciuszko National Park. One of three endangered ecological communities, the Mt Canobolas *Xanthoparmelia* Lichen Community, is unique to the volcanic province.

While there is some indication the endemic lithophytic lichens, the threatened *Eucalyptus canobolensis* and the heath communities may be substrate specific, there is no strong evidence of a geological association among other flora and fauna. We postulate that the presence of multiple endemic species reflects the geographic isolation which has provided an environment for species evolution by vicariance. Alternatively, Mt Canobolas has acted as a refugium for formerly widespread species that have become extinct elsewhere.

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KEYWORDS: Central Tablelands, endemic, evolution, inselberg, refugium, sub-alpine, vicariance

INTRODUCTION

Mount Canobolas is an extinct intraplate alkaline volcano (Middlemost 1981; Sutherland 2003; 2011), provincially known as The Mount Canobolas Volcanic Complex (MCVC). Extensive eruptions in probably three main episodes occurred over ± 1 million years in the Middle to Early/Late Miocene, between 13 to 11 mya (Branagan and Packham 2000). Mt Canobolas is the southernmost and youngest central volcano on the Bunya Mountains to Canobolas hotspot track (Sutherland 2003; Davies et al. 2015), also known as the Inland Hotspot Track, which includes the Nandewar Volcanic Suite and Mt Kaputar, and the Warrumbungle Ranges. Each central volcano in this chain formed tall isolated cone-shaped mountains that rose up to 2,500 m above the surrounds with lava spreading up to 80 kilometres from the source. The MCVC initially produced large outpourings of basic lava, of mainly hawaiitic composition, which radiated across the landscape. Subsequent eruptions

of felsic domes and copious amounts of pyroclastic material coincided with the extrusion of more mafic trachyte kindred lavas, which comprise the volcanic pile of domical landforms in the central core (Middlemost 1981). The evidence of interlaced lavas and associated ash of various eruptions provides a complex heterogeneous matrix within the central core area, which Middlemost (1981) contends is difficult to unravel because rocks from different events are juxtaposed by volcanic subsidence.

Before the Miocene volcanism the ancient geologies, particularly of the Lachlan Fold Belt which is provincial to the Central West (CW) of NSW, underwent major tectonic events from the Silurian to Early Carboniferous epochs (Foster and Gray 2000). It remains unclear if broad uplift which occurred during these orogenic events gave rise to the eastern highlands or if they are remnants of an even older orogenic mountain range (Branagan and Packham 2000). In any event, there has been significant erosion of both the central volcanoes and adjoining highlands

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over the last 10 to 25 million years. As a consequence, the volcanic provinces along the chain have decreased in size and altitude, and increased in isolation from each other, with resultant fragmentation into pockets of alpine and sub-alpine areas on high peaks. Mt Canobolas being the youngest and smallest volcano is now the most intact, prominently protruding as a 'landlocked island' up to half a kilometre above the surrounding plateau of the western Central Tablelands (CT). Mt Canobolas ranges in altitude from c. 900 m to 1,397 m at the summit with several peaks, steep valleys and waterfalls (NPWS 2003a). It is surrounded by highlands having variable relief of up to 1,000 m altitude of the extensive CT plateau but dips away to the west into the Central Western Slopes (CWS). The boundary between the CT and CWS is an undulating series of erosional step-down scarps.

Situated on the western boundary of the CT, the MCVC is separated from coastal drainage by the Great Divide (GD), c. 120 km to the east. The western CT can be regarded as a western trending spur of the GD. The so-called Canobolas Divide is a north-west trending range and passes through the centre of the MCVC, forming the watershed dividing the inland drainage of the northern Macquarie-Darling River system from the southern Lachlan River system (Chan 2003). The different constructional landforms that have evolved from the tempestuous geological past have given rise to polymorphic drainage patterns and microclimates around the mountain. The high altitudes dictate a climate of the mountain's own making and the geology provides a geodiversity not found elsewhere in the region (Branagan and Packham 2000). Also, Mt Canobolas supports a significant isolated remnant of vegetation with montane and sub-alpine affinities; the only such area of this ecosystem on the western CT. Much of the high altitude remnant vegetation is contained within the Mt Canobolas State Conservation Area (SCA) covering an area of 1,672 ha (NPWS 2003a) which is situated within the South Eastern Highlands Bioregion in the Interim Biogeographic Regionalisation for Australia (IBRA) sub-region of Orange (NPWS 2003b).

Mt Canobolas shares many characteristics with Mt Kaputar. Both were produced by the same magma source on the Inland Hotspot Track with Mt Kaputar arising some seven million years earlier. Like Mt Canobolas, the summit of Mt Kaputar supports remnant montane and sub-alpine plant communities that are isolated by large distances from other occurrences of these vegetation types on the Northern Tablelands along the GD to the east. The biota of Mt Kaputar includes some 18 species (8 plants and 10 invertebrates, mainly molluscs) considered to be

endemic to the mountain (OEH 2018a; Murphy and Shea 2015). Given the similar geology, geographical isolation, high altitudes, and remnant montane and sub-alpine vegetation, it seems plausible that Mt Canobolas may similarly host a range of unique endemic life forms.

However, there has been no comprehensive documentation of the biodiversity of the MCVC, with knowledge of the mountain's biota confined to a limited number of scientific publications and records of opportunistic specimen collections in various institutional and national databases. Accordingly, the biodiversity of Mt Canobolas is poorly known and its scientific significance and conservation value has not been widely appreciated.

The purpose of this paper is to compile for the first time a record of the biodiversity of the Mt Canobolas SCA which covers the core of the MCVC. Emphasis is given to identifying the endemic species and discussing the importance of the area for speciation by vicariance and as a refugium for montane and sub-alpine taxa. The possibility of rare species being linked to a previously more coherent volcanic continuum, allowing the movement of biota along it, is also considered.

MATERIALS AND METHODS

Species lists, arranged by family, of the main components of biodiversity known for the SCA have been compiled mainly from literature sources and the Atlas of Living Australia database (ALA 2018). For plants, recordings were compiled from the Australasian Virtual Herbarium (AVH 2018) as these are based on specimen records held in herbaria, as well as from the literature (Hunter 2002), personal observations by the authors and other recent surveys (M. Porteners pers. comm.). Fungi and invertebrate records from the Biosecurity Collections Unit, NSW Department of Primary Industries at Orange, have been included.

Records of endemics and threatened species were extracted from these data lists. The distribution of each plant and fungal species was examined in the AVH/ALA distribution maps to determine core range limits, with outliers that occur distant to the MCVC noted. Data for vascular plant species occurring in 22 other conservation reserves located within the near CW have also been extracted from BioNet (2018a) to use comparatively. Physiographic data from individual reserve Plans of Management and other sources have also been compiled for each of the reserves. The near CW is defined as within c. 150 km west of the GD Range summit. Most of these reserves

are situated within or in close proximity to the CT Botanical Subdivision (Anderson 1961). The western portions of the large Wollemi and Blue Mountain NPs falling within the CT have not been considered.

No published vegetation classification currently exists for the CT west of the Blue Mountains. The only classification available for this area is the online BioNet Vegetation Classification (BVC) (OEH 2018b) which is derived from cluster analysis of data from multiple surveys conducted by government and consultant botanists. The survey data is published and accessible online in the BioNet Vegetation Classification application (OEH 2018b). The output vegetation associations (Plant Community Types [PCT]) are vetted by the Plant Community Type Change Control Panel to ensure its reliability and robustness (OEH 2018b). The BVC supports a state-wide environmental assessment regulatory regime.

For this study, montane and sub-alpine vegetation communities described by Hunter (2002) in the Mt Canobolas SCA were compared with PCTs currently recognised in similar habitats on the Great Dividing Range over 100 km to the east (BioNet 2018b). BioNet (2018b) assigns PCTs to threatened ecological communities (TEC) and the conformity of the relevant PCT on the mountain to each TEC was checked against the community description in the Final Determination (Scientific Committee 2018).

Comments on data accuracy, points of interest about species and threatened communities are provided.

RESULTS AND DISCUSSION

The SCA occupies the core of the MCVC consisting predominately of trachyte kindred rocks and encompasses the high altitude components of the primary ecosystem remnants. Few orders or classes of biota have been systematically surveyed by specialists on Mt Canobolas and much of the data available has not been formally published. Consequently, substantial listings of species have been published only for the bryophytes (Downing et al. 2002) and vascular plants (Hunter 2002). Other non-commissioned surveys of lichens, birds, reptiles, amphibians and mammals have also been undertaken with results recorded only in online databases. The currently known native biota of the SCA consists of 884 species, however systematic surveys have not occurred for many groups so the figure is likely to underestimate the overall numbers. Current knowledge of each major grouping is summarised below. Reference is also made to some of the most

important publications for Mt Canobolas relating to taxonomic works describing new species endemic to the mountain.

Vegetation Communities

Hunter (2000; 2002) defined seven vegetation communities within the SCA (Fig. 1). The significance of these is discussed in relation to similar high altitude vegetation types on the GD to the east (Table 1). One Endangered Ecological Community (EEC) and one Critically Endangered Ecological Community (CEEC) are represented.

Community 1. Stringybark–Peppermint Shrubby Open Forests and Woodlands

Covering around 26% of the SCA in areas above 1000 m altitude, this community is characterised by predominantly *Eucalyptus macrorhyncha* and *E. dives*, in association with *E. canobolensis*, *E. pauciflora*, *E. dalrympleana* subsp. *dalrympleana*, *Acacia dealbata*, *A. melanoxylon* and *Exocarpos cupressiformis*. It has a well-developed shrub layer and ground cover of herbs and grasses. Hunter (2002) states the occurrence within the SCA is significant due to the unusual assortment of associated species, and the community is at its north western geographic limit of occurrence. Hunter's observation that this community, which principally occurs on upper slopes and ridgetops around the peripheral areas of the SCA (Fig. 1), has an unusual assemblage of tree species is pertinent. There are no PCTs in the BioNet Vegetation Classification database (BioNet 2018b) that closely match it. Most recognised PCTs dominated by *E. macrorhyncha* and *E. dives* occur in drier environments than on Mt Canobolas as reflected in their understory shrubs and grasses. The closest PCT in BioNet (2018b) is PCT 730, which does not include *E. canobolensis* as a dominant.

Communities 2 and 4. Outcrop Heaths and Shrublands / Outcrop Low Open Woodlands

These two closely similar communities (Table 1) are found on skeletal soils on rock outcrops. Together they occupy some 6% of the SCA, occurring as small highly disjunct patches throughout (Fig. 1). The main difference between the two is that Community 2 lacks trees. Community 4 may have scattered trees of *E. canobolensis*, *E. bridgesiana* and *A. dealbata*. In both communities the shrubs are scattered and depauperate, although sometimes forming dense thickets, and occur in association with cryptogams, scattered herbs and grasses. These rock outcrops contain the endangered Mt Canobolas *Xanthoparmelia* lichen community.

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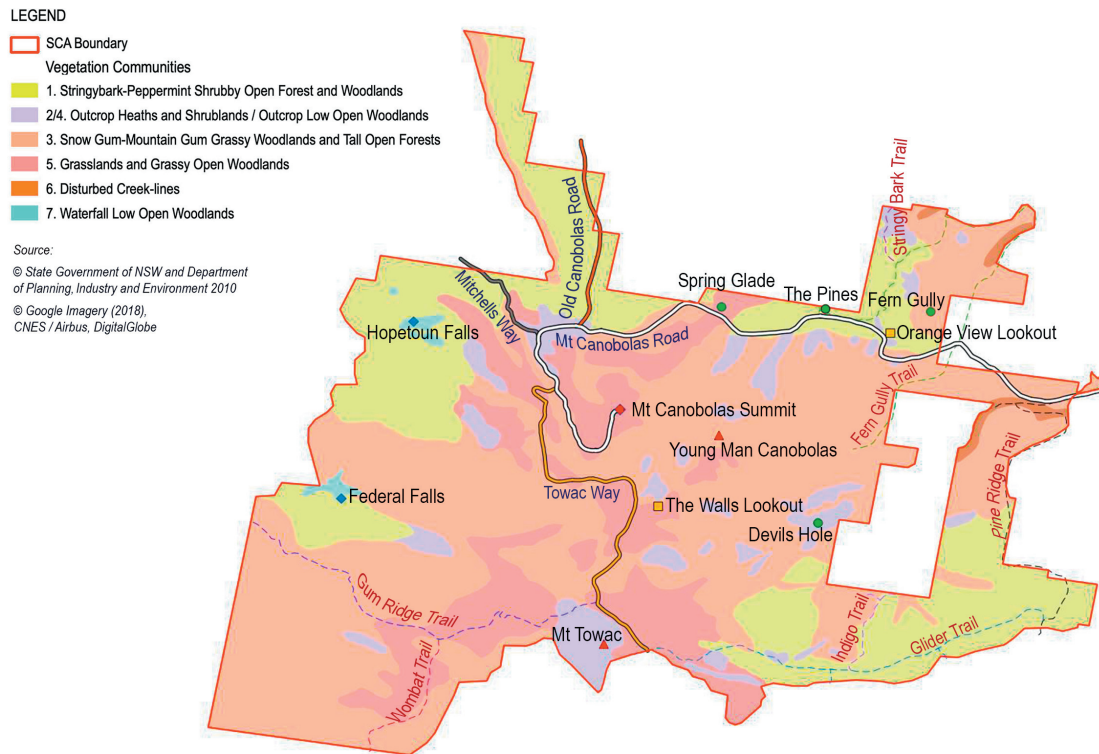


Figure 1. Vegetation communities occurring within the Mt Canobolas State Conservation Area (after Hunter 2002).

Hunter (2002) considers these communities to be restricted to the SCA and unique. No floristically similar heathlands are recognised as PCTs in the BioNet Vegetation Classification (BioNet 2018b).

Community 3. Snow Gum-Mountain Gum Grassy Woodland and Tall Open Forest

This community occupies some 52% of the SCA (Fig. 1) and occurs above 900 m altitude. It is characterised by predominantly *E. pauciflora*, *E. dalrympleana* subsp. *dalrympleana*, and *E. canobolensis* in association with *E. dives*, *E. macrorhyncha*, *E. viminalis* and *A. dealbata*. It has a well-developed layer of low and tall shrubs and a dense ground layer of 80 to 100% cover of climbers and trailers, herbs and grasses. PCT 1197 is closest to community 3 (Table 1).

Community 5. Grasslands and Grassy Open Woodlands

Trees are a minor component of this community which occurs above 1200 m altitude and occupies around 15% of the SCA area (Fig. 1). It is characterised by low densities of *E. pauciflora*, *E. canobolensis*, *E. dalrympleana* subsp. *dalrympleana*, *A. dealbata* and

A. melanoxylon. The shrub layer is of low stature and sparse or absent whereas the ground layer of twiners, herbs and grasses is well developed. This assemblage is most similar to PCT 1197 in the BioNet Vegetation Classification (BioNet 2018b) (Table 1).

Community 6. Disturbed Creek-lines

Occupying about 1% of its area this community occurs in the north eastern lower reaches of the SCA (Fig. 1). It is characterised by tall open stands of *E. viminalis*, *E. stellulata*, *E. pauciflora*, *E. dalrympleana* subsp. *dalrympleana* and *A. melanoxylon* with a scattered to dense shrub layer, ferns and herbs. This assemblage is most similar to PCT 1191 that is dominated by *E. viminalis*, *E. pauciflora*, *E. rubida* and *E. stellulata* (BioNet 2018b). Within the SCA, *E. rubida* (Candlebark) is replaced by the threatened *E. canobolensis* (Silver-leaf Candlebark).

Community 7. Waterfall Low Open Woodlands

This community is restricted to locations at Federal and Hopetoun Falls, occupying less than 1% of the SCA (Fig. 1). It is an open shrubland community with occasional stunted trees of *Eucalyptus goniacalyx*, *E. canobolensis* and *A. melanoxylon*

Table 1. Vegetation Communities in the Mt. Canobolas State Conservation Area.

Hunter (2002)	Dominant Eucalypts and/or shrubs	Nearest PCT ¹	EEC ²	Comment
1. Stringybark – Peppermint Shrubby Open Forests and Woodlands	<i>E. macrorhyncha</i> , <i>E. canobolensis</i> , <i>E. dives</i> , <i>E. dalrympleana</i>	730. Broad-leaved Peppermint - Mountain Gum dry open forest of the Central Tablelands area of the South Eastern Highlands Bioregion	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	Although PCT 730 is closest to community 1, it is a dry forest type with sparser grass cover than the moist community on Mt Canobolas.
2. Outcrop Heaths and Shrublands	<i>Mirbelia oxylobioides</i> , <i>Calytrix tetragona</i> , <i>Kunzea parvifolia</i> , <i>Phebalium</i> sp.	N/A	-	No currently listed PCTs resemble this community.
3. Snow Gum – Mountain Gum Grassy Woodlands and Tall Open Forests	<i>E. pauciflora</i> , <i>E. dalrympleana</i>	1197. Snow Gum – Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	
4. Outcrop Low Open Woodlands	<i>E. canobolensis</i> , <i>E. bridgesiana</i> / <i>Mirbelia oxylobioides</i> , <i>Calytrix tetragona</i> , <i>Phebalium</i> sp.	N/A	-	This community occurs on similar sites to community 2, albeit with slightly more soil and scattered tree cover. No currently listed PCTs resemble this community.
5. Grasslands and Grassy Open Woodlands	<i>E. pauciflora</i> , <i>E. canobolensis</i> , <i>E. dalrympleana</i>	1197. Snow Gum – Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	
6. Disturbed Creek-lines	<i>E. viminalis</i> , <i>E. stellulata</i> , <i>E. pauciflora</i>	1191. Snow Gum – Candlebark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	-	This community is similar to the Monaro Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion CEEC ³ .
7. Waterfall Low Open Woodlands	Minor <i>E. goniocalyx</i> , <i>E. canobolensis</i>	N/A	-	A minor community related to communities 2 and 4.

¹PCT = Plant Community Type (OEH 2018b)²EEC = Endangered Ecological Community listed under the *Biodiversity Conservation Act 2016*.³CEEC = Critically Endangered Ecological Community listed under the *Biodiversity Conservation Act 2016*.

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in shallow soils around the falls' margins and often with taller *E. viminalis* near the base of the falls. This community is of very limited extent and it is doubtful that it deserves recognition as an entity distinct from the surrounding vegetation (Table 1).

Communities 1, 3 and 5 conform to the *Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions Endangered Ecological Community*. This EEC is generally a tall montane forest dominated by *Eucalyptus dalrympleana* (Mountain Gum) and *E. pauciflora* (Snow Gum) (Scientific Committee 2008). It is known to occur between 600 and 900 m altitude on the eastern parts of the CT. On Mt Canobolas, Tableland Basalt Forests occur extensively as tall open forests in valleys and on ridges in deep volcanic soils above 900 m altitude, hence representing a high altitude variant of the EEC on the western CT.

Community 6 closely resembles the newly recognised *Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion Critically Endangered Ecological Community*, which is predicted by the NSW Office of Environment and Heritage (OEH) to occur in the Orange district (OEH 2019a).

Bryophytes

Bryophytes include mosses, liverworts and hornworts. They are often referred to as 'lower plants' and form an important component of the vegetation but are regularly overlooked in biological surveys.

A rich and diverse mix of 79 species of bryophytes is recorded for Mt Canobolas in 29 families and 51 genera (Table 2), mostly from an initial survey by Downing et al. (2002).

Although no endemic bryophyte species are recorded, the assemblage includes an unusual mix of alpine, arid zone and rainforest species, with 6 species being at their northern range limits and 7 at their westernmost range. Exposed rock platforms with seepage areas on the upper flanks of the mountain are particularly species-rich. The geology of the area is complex and Downing et al. (2002) considered the presence of certain species at particular locations is probably determined by the chemical composition of the substrate rock, although clear patterns could not be discerned. Downing et al. (2002) gave an example of a curious combination of two opposed species growing together: *Encalypta vulgaris*, a calcicole (i.e. a species found only on calcareous substrates) and *Campylopus introflexus*, a calcifuge (i.e. a species never found growing on calcareous substrates). Around the summit some rare alpine species previously known only from Yarrangobilly

Caves in the Alps and Kosciuszko National Park occurred together with species from the arid zones to the west. Elsewhere in the SCA in a cool moist and shady gully habitat a thallose epiphytic liverwort occurred; a species usually associated with rainforest gullies of the coast and coastal ranges to the east. Other rare and uncommon mosses, liverworts and hornworts are highlighted in their manuscript. It is unclear if the disjunct and rare species consisting of contiguous arid zone, alpine and rainforest specialists are stranded relics from past climatic ages or whether such species have arrived through superior long-distance dispersal abilities.

Downing et al. (2002) also noted several rare and uncommon species occurred on roadside banks, walking trail margins, fallen logs, on rough basal bark of eucalypts and exposed rocks in the grassy woodlands, which elsewhere in NSW are usually devoid of bryophytes. The bryoflora of the nearby Towac Pinnacle outcrop, to the east of the SCA, was found to include a few species that were either not recorded or uncommon within the SCA, indicating that other species may well occur on the many volcanic outcrops, dykes, domes and plugs comprising the MCVC.

Vascular plants

Vascular plants constitute the largest component of the currently known biota within the SCA. Some 14 fern, 138 monocotyledon and 262 dicotyledon species are present (Table 2). The diversity spans 78 families and 228 genera (Appendix 1). Almost half of the 416 vascular plants are assigned to just 6 superfamilies, namely Asteraceae (47), Cyperaceae (18), Fabaceae (35), Myrtaceae (14), Orchidaceae (40) and Poaceae (47). A number of the species listed by Hunter (2002) cannot be substantiated and so have been excluded from the compilation.

Approximately 60% of the vascular flora species occurring in the SCA can be considered generalists in the sense that they have widespread distribution and display plasticity in being adaptable to a wide range of edaphic, climatic and other environmental variables. As Hunter (2000) observed, these species are generally the most common ones and are found in most of the communities. The remaining flora exhibits varying degrees of specialisation from narrow endemic species to regionally significant species.

Among the plants are at least five endemic species: *Prostanthera gilesii* (Conn and Wilson 2015), *Eucalyptus canobolensis* (Hunter 1998), *Bulbine* sp. (J. Bruhl pers. comm.), *Caladenia* sp. aff. *patersonii* and *Prasophyllum* sp. aff. *odoratum* (D. Jones pers. comm.). Other taxa, including the herb

Table 2. Summary of known biodiversity within the Mt Canobolas State Conservation Area.

Biodiversity	Families	Genera	Native species	Exotic species	Endemic species	Regionally significant species	EEC ¹	TS ²
Vegetation communities							2	
Bryophytes	29	51	79			13		
Gymnosperms	2	2	1	1				
Ferns and Allies	6	11	14			5		
Monocotyledons	12	61	121	17	3 +	39		
Dicotyledons	58	154	192	70	2 +	76		2
Fungi	28	47	102	1	4	46	1	
Mammals	19	30	29	9		5		5
Birds	35	69	97	2				7
Amphibians	3	4	5					
Reptiles	4	15	20			5		
Fish	1	1	1					
Molluscs	6	10	10	2	?	8		
Insects	81	154	210 +		?			
Velvet worms	1	1	1		1	1		
Flat worms	1	2	2		?	2		
TOTAL	286	612	884 +	102	10 +	200	3	14

¹ Endangered Ecological Communities listed under the *Biodiversity Conservation Act 2016*.

² Threatened Species listed under the *Biodiversity Conservation Act 2016* and/or *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*

Craspedia sp. aff. *lamicola* and shrubs in the genera *Asterolasia*, *Melichrus* and *Phebalium* are likely also to be endemics (I. Telford and J. Bruhl pers. comm.), along with two recently found orchids *Diuris* sp. aff. *chryseopsis* and *Dipodium* sp. aff. *atropurpureum* (Bower 2019).

Two of the endemic plants *P. gilesii* and *E. canobolensis* are listed as threatened (Table 2). The shrub *P. gilesii* (formerly *P. sp. C*) (Giles' Mintbush) is only known from two small colonies and is listed as Critically Endangered under the BC Act 2016 (Scientific Committee 2017). *E. canobolensis* (syn. *E. rubida* subsp. *canobolensis*) (Silver-leaf Candlebark) occurs throughout the SCA and is endemic to the MCVC. Its stronghold is above 1,000 m altitude within the SCA but it occurs sporadically down to ± 900 m altitude on the slopes surrounding the mountain. With a propensity to form hollows, the

species provides valuable nesting and roosting habitat as well as copious manna exudate as a food source for arboreal mammals and birds. It is listed as Vulnerable under the BC Act and Endangered under the EPBC Act (Department of the Environment 2008).

The sub-alpine forests and woodlands support 11 eucalypt species as canopy dominants and a broad array of understory shrubs, forbs and grasses, totalling 416 species. Approximately 120 of these can be considered as regionally significant because of their rarity or because they are at their geographical range limits within the CT. By comparison, 475 plant species occur in an area of almost 23,000 ha of montane forests occurring between 1,000 and 1,400 m altitude within Kosciuszko National Park (Doherty et al. 2015). The richness of the flora of the SCA is over 12 fold that of Kosciuszko NP, being almost 260 species per 1,000 ha compared with 20.6

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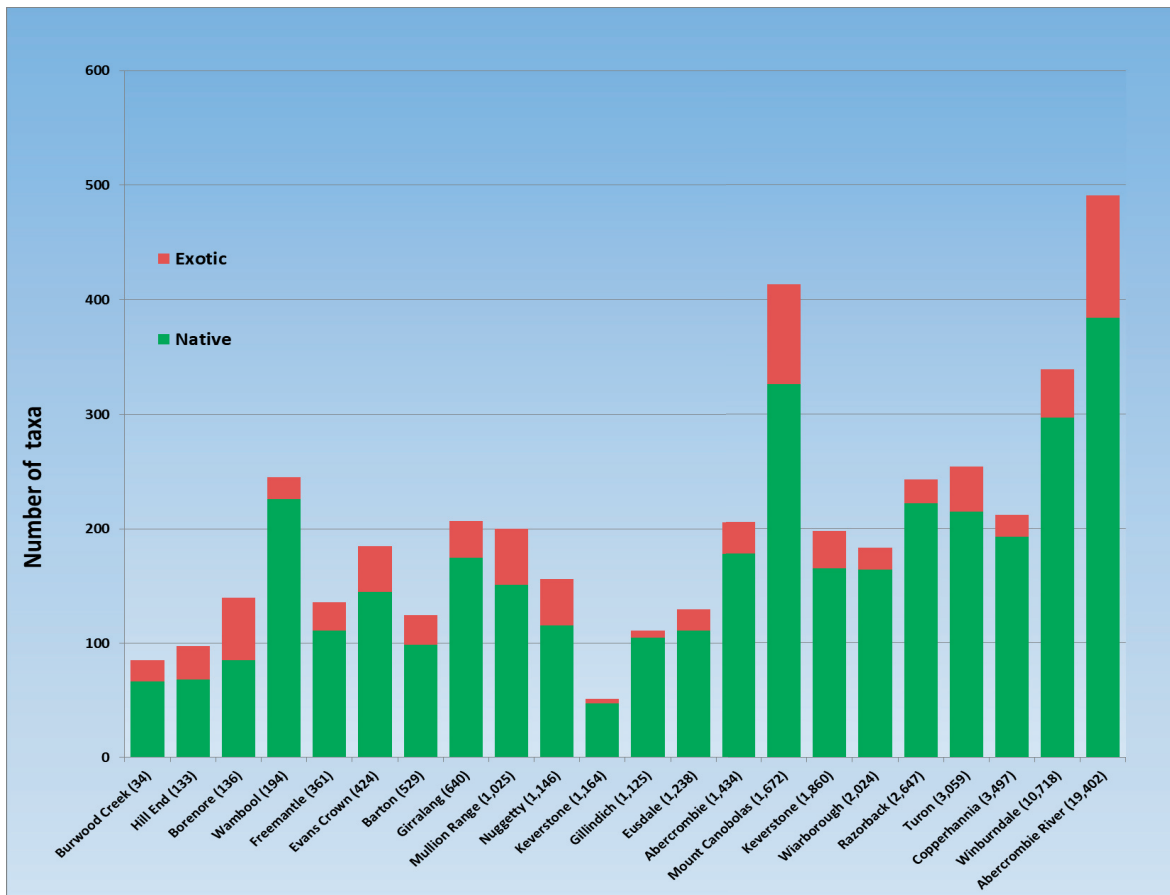


Figure 2. Number of native and exotic vascular plant species recorded for 22 conservation reserves (arranged by increasing area) in the near (eastern) Central West of NSW. Numbers in parentheses following reserve names indicated the area (ha) of each. Data from Bionet (2018a, see Appendix 2).

species per 1,000 ha respectively. Compositionally there are also differences in the floras with the ratio of dicotyledons to monocotyledons being lower in the SCA with 1.6:1 compared with 2.8:1 in Kosciuszko NP. No endemic species occur in the montane forests of Kosciuszko NP and 105 species, which are either disjunct or occurring at their geographic range limits is proportionally much lower than the 120 species for the SCA. In both reserves however, the dicotyledons were similarly dominated by taxa in the Asteraceae, Fabaceae and Myrtaceae and monocotyledons by Cyperaceae, Orchidaceae and Poaceae.

A rich and eclectic suite of 40 terrestrial orchid species occurs within the SCA (Appendix 1). A number of these orchids are unnamed and currently subject to further examination. At least one of these, *Prasophyllum* sp. aff. *odoratum*, recorded after a summer fire in 1982 and again in 2018, is considered to be a fire ephemeral (Bower 2019). Twenty-one orchid species are rare, confined to or at their geographic range limits in the SCA (Appendix 1). The SCA ranks among the most diverse areas for orchids

in the near CW along with the Calula Range north of Orange where some 60 species occur (C. Bower pers. obs.), Wambool NR with at least 47 species and Abercrombie Karst Conservation Reserve with 30 or more species (Bionet 2018a). Terrestrial Orchids are intrinsically important as bioindicators of ecosystem health (Swarts and Dixon 2009) so the presence of such a large species diversity is indicative of the stability and resilience of the ecosystems in the SCA.

Most conservation reserves in the near CW are < 2,000 ha in area and have been gazetted since the late 1960s (Appendix 2). The recorded diversity of the vascular flora generally is < 250 species for these reserves (Fig. 2). Mt Canobolas SCA stands out with 416 species, only being surpassed by 491 taxa within Abercrombie Rivers NP, which is almost 12 times larger in area. All of these reserves have been utilised since European settlement, mainly for grazing and or forestry, and in many cases for mining activities. Mt Canobolas had grazing leases in place until about the 1950s before being reserved for conservation and eventually gazetted in 1997. This, together with

the SCA's high perimeter to area ratio, rich volcanic soils and being surrounded by cleared and developed silvicultural, agricultural and horticultural lands, has facilitated invasion by exotic species. Twenty-one percent of the vascular flora is exotic, somewhat higher than the mean of 17.2 % for the comparable reserves in the near CW (Appendix 2). In Kosciuszko NP, which also has a history of post-European land use, exotic species contribute 23% of the flora (Doherty et al. 2015) which is higher than for most of the near CW reserves, including the SCA (Appendix 2).

Fungi

No published account of fungi exists for Mt Canobolas, but extensive lichen records (ALA 2018) are known from field work within the SCA, especially by JA Elix of the Australian National University and his colleagues.

Ascomycota fungi records, mainly lichens, show a great diversity among the > 90 species growing on logs, tree trunks, branches, soil and rocky outcrops or platforms in the SCA (Appendix 3). Together with Basidiomycetes, these occur in some 28 families and 47 genera (Table 2). Four lichens, *Gyalideopsis halocarpa*, *Sarcogyne sekikaica* (McCarthy and Elix 2014), *Megalania montana* (McCarthy and Elix 2016) and *Xanthoparmelia metastrigosa* (Scientific Committee 2001) are endemic to the SCA. One particular assemblage of at least nine species of foliose lichens, including the endemic *X. metastrigosa*, is listed as an Endangered Ecological Community; the only lichen community in Australia with such legal protection. It has been recognised as unique to the SCA, and gazetted as the *Mt Canobolas Xanthoparmelia Lichen Community Endangered Ecological Community* (Scientific Committee 2001).

The assemblage consists of *Cladia fuliginosa*, *Xanthoparmelia canobolasensis*, *X. digitiformis*, *X. metacystoides*, *X. metastrigosa*, *X. multipartita*, *X. neorimalis* and *X. sulcifera*. It occurs mainly above 1,100 m altitude on rock faces and soils unique to the MCV. *Xanthoparmelia metastrigosa* is endemic to Mt Canobolas and *X. canobolasensis* is known only from Mt Canobolas and one locality in Tasmania while *X. sulcifera* and *C. fuliginosa* are each known from a limited number of other localities within NSW.

Some 46 species of fungi are regionally significant as they are rare or at their natural geographical range limits. Opportunistic observations of Basidiomycota fungi have resulted in the recording of eight species, which is considered particularly depauperate and dedicated study will undoubtedly identify many additional taxa.

Vertebrates

Knowledge of the vertebrate fauna of the SCA is predominantly from opportunistic records as few systematic surveys have been undertaken and there are no published accounts. The array of 163 vertebrate species in 62 families and 119 genera involves mainly generalist species with no recorded endemics, but does include 12 threatened species (Table 2) that have undergone population decline principally through loss of habitat.

Twenty nine native mammal species have been recorded, five of which are threatened species (Table 3). The mammals include six species of gliders and possums, two species of marsupial mice, four macropods, the *Tachyglossus aculeatus* (Short-beaked Echidna) and *Vombatus ursinus* (Bare-nosed Wombat) (Appendix 4). Most species have widespread distributions, but five have geographic range limits in the SCA. *Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat), *Petauroides volans* (Greater Glider), *Petaurus australis* (Yellow-bellied Glider) and *Antechinus stuartii* (Brown Antechinus) occur at their western limits whilst *Antechinus agilis* (Agile Antechinus) occurs at its northernmost limit. Presence of the Agile Antechinus has been verified by molecular evidence (A. Kerle pers. comm.) but confirmation of both the Brown Antechinus and Yellow-bellied Glider is required as there have been no recent sightings of either. A camera trap record of *Rattus fuscipes* (Southern Bush Rat) has yet to be verified by live trapping (S. Woodhall pers. comm.). Indicative of the richness of the habitat of the SCA is the diversity of 11 micro bats recorded on the mountain, including three threatened species (Table 3). Nine exotic mammal species also have been recorded, namely Dog, Goat, Horse, House Mouse, Pig, Rabbit, Red Fox, Red Deer and Ship Rat.

Avifauna recorded within the SCA includes 97 native and two exotic species across 35 families and 69 genera (Table 2) from mostly opportunistic observations (Appendix 4). All are widespread species with many being permanent residents; others are migratory. Seven species recorded in the SCA are listed as Vulnerable (Table 3) and are relatively widespread species that have suffered significant population declines since European settlement. Mt Canobolas is important as one place in the highly developed landscape that still provides refuge to these species. Other species use particular niche habitats in the SCA. *Falco peregrinus* (Peregrine Falcon) uses cliff habitats around Federal Falls for nesting and hunting. The mountainous terrain attracts raptors such as *Aquila audax* (Wedge-tail Eagle) which is commonly observed hunting and soaring on thermals as well as,

Table 3. Threatened plant and animal species within the Mt Canobolas State Conservation Area. V = Vulnerable listing, E = Endangered listing and CE = Critically Endangered listing under Threatened Species Acts.

	Family Name	Scientific Name	Common Name	Conservation		Remarks and Reference
				BC Act ¹	EPBC Act ²	
Plants	Lamiaceae	<i>Prostanthera gilesii</i>	Giles' Mintbush	CE		Endemic. Only two small disjunct colonies known; (OE 2019b)
	Myrtaceae	<i>Eucalyptus canobolensis</i>	Silver-leaf Candlebark	V	E	Endemic. Common throughout SCA; (OE 2019c)
Mammals	Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat	V		Recorded 2004; (OE 2017a).
	Miniopteridae	<i>Miniopterus schreibersii</i> infrasp. <i>oceanensis</i>	Eastern Bent-wing Bat	V		Recorded 2004; (OE 2019d).
	Petauridae	<i>Petaurus australis</i>	Yellow-bellied Glider	V		No recent sighting records; (OE 2017b).
	Petauridae	<i>Petauroides volans</i>	Greater Glider		V	15 records 1997 to 2009; (Department of the Environment 2016).
	Vespertilionidae	<i>Falstrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Recorded 2018; (OE 2017c).
	Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V		Three records 2002 to 2009; (Scientific Committee 2010a).
Birds	Artamidae	<i>Artamus cyanopterus</i>	Dusky Woodswallow	V		Recorded 2001, 2019; (Scientific Committee 2016).
	Neositidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Two records 1997 to 2014; (Scientific Committee 2010b).
	Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V		Six records 1999 to 2019; (OE 2017d). 1997-09-27
	Petroicidae	<i>Petroica phoenicea</i>	Flame Robin	V		43 records 1997 to 2019; (OE 2017e).
	Psittacidae	<i>Neophema pulchella</i>	Turquoise Parrot	V		Recorded 1978; (OE 2017f).
	Strigidae	<i>Ninox strenua</i>	Powerful Owl	V		Recorded 2019; (OE 2017g).

¹Threatened Species listed under the Biodiversity Conservation Act 2016.

²Threatened Species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

but less commonly, *Hieraaetus morphnoides* (Little Eagle) and *Falco berigora* (Brown Falcon). Single records of *Acanthiza uropygialis* (Chestnut-Rumped Thornbill), *Acanthagenys rufogularis* (Spiny-cheeked Honeyeater) and *Neophema pulchella* (Turquoise Parrot) are unusual for the area and require further verification. These are likely observations of vagrants, like *Certhionyx variegatus* (Pied Honeyeater) recently sighted in the area, having ventured eastwards during drought conditions.

Currently five widespread amphibians are recorded for the area (Appendix 4). The amphibian record for the SCA is likely to be an under-estimate given that 10 species have been recorded in the Orange district (ALA 2018 and authors' pers. obs.).

Twenty reptilian species have been recorded for the SCA (Appendix 4). These records contain only one snake *Austrelaps ramsayi* (Highland Copperhead), again indicative of the lack of intensive survey. Seven snake species are recorded for inhabited areas near the SCA, along with one turtle. The 19 lizard taxa recorded for the SCA are all widespread common species, however four, along with the Highland Copperhead snake occur at their westernmost range limits (Appendix 4). The lizards are a mixture of highland south-eastern, coastal and western inland species. As with the snakes, the known lizard diversity is likely to be conservative.

One fish species is among the biota recorded near the boundary of the SCA, in Towac/Molong Creek (Appendix 4).

Invertebrates

Over 210 species of invertebrates (Table 2), have been recorded for the SCA (ALA and other database sources, 2018), notwithstanding a lack of systematic survey and published accounts. The insects range across some 14 Orders within 81 families and over 150 genera. A compilation of the invertebrates by Dr Murray Fletcher is available from the authors upon request.

A single rare species *Cephalofovea pavimenta* (Mt Canobolas Velvet Worm) is endemic to Mt Canobolas (Reid et al. 1995) and lives inside rotting logs where it hunts for other small invertebrates. In eastern Australia several Velvet Worms exist as distinct populations that have been isolated from other populations for millions of years (Tait et al. 1990), and may even date back to the breakup of the Gondwana supercontinent. Each is considered rare and vulnerable (New 1995) and hence their presence is a good indicator of environmental quality. Two fluorescent yellow Planarian Worm species occur on the mountain. One is considered

an outlying colour variant of *Fletcheria* cf. *sugdeni* isolated from its known distribution in Victoria and Tasmania (L. Winsor pers. comm.). It appears after rain and is commonly observed along walking tracks (S. Woodhall pers. comm.). The other is possibly also a colour variant of *Caenoplana* cf. *sulphurea*, a more widespread species in south eastern Australia and also at its northern range limit in the region (L. Winsor pers. comm.). These species are predatory and normally live in deep leaf litter to avoid desiccation.

A cricket, a flightless darkling beetle, several moths and leafhoppers represent unnamed taxa (M. Fletcher pers. comm.) and two named species, *Monomorium crinitum* and *Johnrehnia canoblaensis* have their type localities as Mt Canobolas. Twelve mollusc species have been observed within the SCA, five of which are endemic to NSW; *Anabellia occidentalis*, *Brevisentis atratus*, *B. jacksoniensis*, *Elsothera brazieri*, and *Galadistes molong* while *Scelidoropa sarahjaneae* is endemic to NSW and NE Victoria. Eight species are rare, regionally significant and also likely indicative of the relictual nature of the mountain.

CONCLUSION

Mount Canobolas is a prominent volcanic inselberg with a distinct relictual montane and sub-alpine flora displaying independently evolving biodiversity that is compositionally distinct from those in all other high altitude areas of the continent. It is an iconic natural remnant area located within the heavily cleared landscapes of Central Western NSW. The physiography of the MCV, its altitude, geology, soils, isolation from other high altitude areas and influence on the local weather have united to produce a biota specific to the mountain, especially within the SCA. At a landscape level, geodiversity and climate are important drivers of vegetation (Keith 2011). However, there is only tenuous evidence that the MCV geology has had an influence on the biota. No association could be discerned among the bryoflora whereas there does appear to be some substrate-specific specialisation among the lichens. Likewise the trachyte rock plate heathlands appear to be compositionally different and unique to the MCV. The endemic *E. canobolensis* also shows a strong affinity to the MCV footprint, and an *Asterolasia* shrub is suggested as a possible basaltic specialist. The heterogeneity of the core volcanic pile of the MCV, on which the SCA is centred, may be a factor precluding any strong geological associations. In other respects Mt Canobolas functions as both a

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refugium for declining species and an evolutionary nursery for new species, driven by its isolation from other high altitude areas along the GD.

This SCA is a scientifically important area containing unique components of genetic variation and irreplaceable biodiversity of high conservation value and is invaluable for biogeographical comparisons. Significantly it hosts at least 10 endemic species and 14 threatened species including 2 plant, 5 mammal and 7 bird species. Mt Canobolas hosts unique sub-alpine rock plate communities with a combination of uncommon cryptogams, including an Endangered lichen community, along with several plant species rarely recorded elsewhere.

The presence of multiple endemic species in diverse groups of flora and fauna in the SCA parallels the findings of high levels of endemism on Mt Kaputar, suggesting that similar evolutionary forces are operating on the two dormant central volcanoes. Both are geographically isolated landlocked islands of high altitude habitats that appear to provide ideal environments for speciation. After the Late Miocene, when the MCVC had ceased activity, the land surface of the eastern highlands would have been much higher with alpine and sub-alpine vegetation considerably more widespread and interconnected than it is today. A long period of erosional activity has lowered the land surfaces resulting in the contraction and fragmentation of sub-alpine habitats which ultimately led to the stranding of remnant communities and populations on Mt Canobolas. The isolation of Mt Canobolas has been in place for long enough to allow the evolution of multiple new life forms, a process known as vicariant speciation, essentially by the splitting of populations into isolated fragments that subsequently evolve independently (e.g. Crisp and Cook 2007; Rix and Harvey 2012). It is postulated that many of the endemic species with close relatives elsewhere have evolved into new species on Mt Canobolas by vicariance where exchange of genetic material has been prevented by geographical and ecological isolation.

Alternatively, Mt Canobolas could have acted as a refugium for formerly widespread species that have become extinct elsewhere (Hope et al. 2004). For these species Mt Canobolas SCA is an important refugium. The Velvet Worm and other relictual species may fit into this category.

The evidence for specialist basalt taxa being responsible for endemism is limited, but nevertheless a possibility. *Asterolasia rupestris* subsp. *rupestris* is restricted to two of the volcanoes on the Inland Hotspot Track. Relict populations of the species are endemic to the volcanic track itself. It is possible this

taxon evolved on the track as a basalt specialist and was formerly more widespread when the volcanic chain was more continuous. The *Asterolasia* has now retreated to high altitude refugia on Mt Canobolas and Mt Kaputar. However, the Mt Canobolas and Mt Kaputar populations appear to have been isolated from each other for sufficient time to have differentiated morphologically into distinct taxa (J. Bruhl and I. Telford pers. comm.). *Phebalium* populations restricted to trachyte rock outcrops in the Warrumbungles and the MCVC are possible further substrate specific specialists that are not conspecific.

Two endangered ecological plant communities exist within the SCA. In addition, Hunter (2002) noted the unique composition of the rock outcrop heathland vegetation and its susceptibility to loss owing to the small size and fragmentation of remnants. He also noted the unusual dominance of the endemic *Eucalyptus canobolensis* which confers a unique composition to the SCA's woodland and forest communities, especially Community 1, Stringybark-Peppermint Shrubby Open Forests and Woodlands. As such, the vegetation of the SCA is of considerable conservation significance. The vegetation communities on Mt Canobolas are the result of long-standing ecological and evolutionary processes. Accordingly, the Mt Canobolas SCA provides examples of the ecological responses of vegetation assemblages to isolation, longitudinal displacement and climatic gradients.

A vast and under-explored reservoir of genetic diversity resides in and around the SCA, particularly among the vascular flora (120 taxa) and fungi (46 taxa) that are disjunct, rare or at the limits of their natural geographic ranges. In all 200 species (Table 2), c. 23% of the known native biota, are at their range limit in or in close proximity to the SCA. Whilst the majority of these are among the cryptogams and vascular plants, for most of the invertebrate taxa however, there isn't sufficient information to determine their status in this context. A small number of species, five vascular plants and two fungi are northern species which occur at their southernmost range limits around or on the mountain. A larger number, (24 fungi, 20 vascular plant and 8 bryophytes) are clearly species with their distributional strongholds in southern regions, being at their northernmost range limit on or near the MCVC. Many of these have strong sub-alpine affinities. Others (93 vascular plant, 16 fungi and 5 bryophyte species) are at their westernmost distribution within the CW of NSW and comprise many coastal and Blue Mountains species. Many of these species at the edges of their ranges have become stranded outlying populations that are ecologically and geologically disconnected from occurrences elsewhere. This disconnection has

likely set them on a distinct evolutionary pathway over the millennia, potentially leading to speciation.

Range edges are known to be characterized by increased genetic isolation, genetic differentiation, and variability in individual and population performance (Sexton et al. 2009) so are highly important for conservation.

As well as offering abundant opportunities for taxonomic research, examples of ecological, refugium and evolutionary vicariance responses have been identified within the SCA. They provide many fertile avenues for research and education into landlocked island systems, longitudinal displacement and climatic gradients. These same features of the SCA, coupled with the biodiversity, species richness and unusually high representation of irreplaceable species and communities, not only amplify its fundamental scientific value but vindicate the imperative for its nature conservation, in perpetuity.

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Appendix 1. Vascular plants recorded for Mt Canobolas State Conservation Area (AVH database 2018 and authors' observations) (*Exotic species).

Family	Scientific name	Common name	Regional distribution	Range limit	Remarks
GYMNOSPERMS					
Cupressaceae	<i>Callitris endlicheri</i>	Black Cypress Pine	Widespread		Localised, Devils Hole
Pinaceae	* <i>Pinus radiata</i>	Monterey Pine	Widespread		Wilding, scattered throughout, especially perimeter areas
FERNS AND FERN ALLIES					
Aspleniaceae	<i>Asplenium flabellifolium</i>	Necklace Fern	Widespread		Common
	<i>Pleurosorus subglandulosus</i>	Blanket Fern	Widespread		Localised
Blechnaceae	<i>Blechnum nudum</i>	Fishbone Water Fern	Widespread	Westernmost	Outlier at Mingham Springs
Dennstaedtiaceae	<i>Histiopteris incisa</i>	Bat's Wing Fern	Widespread		Localised, Federal Falls
	<i>Pteridium esculentum</i>	Bracken	Widespread		Common
Dryopteridaceae	<i>Lastreopsis acuminata</i>	Creeping Shield Fern	Widespread	Westernmost	Disjunct. Localised, Federal Falls
	<i>Polystichum proliferum</i>	Mother Shield Fern	Widespread	Westernmost	Disjunct. Localised, Fern Gully, The Walls
Ophioglossaceae	<i>Ophioglossum lusitanicum</i>	Adders Tongue	Widespread		Occasional
Pteridaceae	<i>Adiantum aethiopicum</i>	Common Maidenhair	Widespread		Occasional
	<i>Cheilanthes austrotenuifolia</i>	Rock Fern	Widespread		Common
	<i>Cheilanthes distans</i>	Bristly Cloak Fern	Widespread		Uncommon
	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Poison Rock Fern	Widespread		Common
	<i>Pellaea falcata</i>	Sickle Fern	Widespread	Westernmost	Uncommon
	<i>Pellaea nana</i>	Dwarf Sickle Fern	Widespread	Westernmost	Localised, Federal Falls
MONOCOTYLEDONS					
Antheriaceae	<i>Arthropodium milleflorum</i>	Pale Vanilla-lily	Widespread		Common
	<i>Arthropodium minus</i>		Widespread		
	<i>Caesia calliantha</i>	Grass Lily	Widespread	Westernmost	Localised, Orange View Lookout area
	<i>Thysanotus tuberosus</i>	Common Fringe Lily	Widespread		Common
Asphodelaceae	<i>Bulbine bulbosa</i>	Native Leek	Widespread		Common
	<i>Bulbine</i> sp. (ms)		Restricted	Endemic	Several rocky locations in SCA
Colechicaceae	<i>Burchardia umbellata</i>	Milkmaids	Widespread	Northernmost	Fire ephemeral. Possible outliers at Wellington, Harvey Ranges
	<i>Wurmbea dioica</i> subsp. <i>dioica</i>	Early Nancy	Widespread		Occasional
Cyperaceae	<i>Carex appressa</i>	Tall Sedge	Widespread		Soaks
	<i>Carex breviculmis</i>		Widespread	Westernmost	Outlier at Warrumbungles
	<i>Carex gaudichaudiana</i>		Widespread	Westernmost	
	<i>Carex incomitata</i>		Widespread	Westernmost	Common

	<i>Carex inversa</i>	Knob Sedge	Widespread		
	<i>Carex longebrachiata</i>		Widespread	Westernmost	Rare
	<i>Cyperus flavidus</i>	Yellow Flat-sedge	Widespread	Westernmost	Outlier at Mullengudgery
	<i>Cyperus sanguinolentus</i>		Widespread		Common, damp areas
	<i>Eleocharis acuta</i>		Widespread		Uncommon, soaks
	<i>Eleocharis atricha</i>		Widespread	Westernmost	Common, damp areas
	<i>Isolepis australiensis</i>		Widespread		
	<i>Isolepis gaudichaudiana</i>	Benambra Club-sedge	Widespread	Westernmost	Outlier at Keewong Creek
	<i>Isolepis hookeriana</i>		Widespread		
	<i>Isolepis subtilissima</i>		Widespread	Westernmost	
	<i>Lipocarpus microcephala</i>	Button Rush	Widespread	Range extn	Rare. Unrecorded for CT
	<i>Lepidosperma gunnii</i>		Widespread	Westernmost	Localised, Devils Hole
	<i>Lepidosperma laterale</i>		Widespread		
	<i>Schoenus apogon</i>	Common Bog-rush	Widespread		Common, soaks
Hypoxidaceae	<i>Hypoxis hygrometrica</i> var. <i>hygrometrica</i>	Golden Weather-grass	Widespread	Westernmost	Uncommon, soaks
Iridaceae	<i>*Iris germanica</i>	Tall Bearded Iris	Widespread		
Juncus	<i>Juncus australis</i>		Widespread	Westernmost	Outlier at Cowra
	<i>Juncus bufonius</i>	Toad Rush	Widespread		
	<i>Juncus fockei</i>		Widespread	Westernmost	Outlier at Keewong Creek
	<i>Juncus homalocalis</i>		Widespread		
	<i>Juncus remotiflorus</i>		Widespread		
	<i>Juncus sarophorus</i>		Widespread		
	<i>Juncus subsecundus</i>		Widespread		
	<i>Juncus vaginatus</i>		Widespread		
	<i>Luzula densiflora</i>		Widespread		Occasional
	<i>Luzula flaccida</i>		Widespread		Common
	<i>Luzula modesta</i>		Widespread	Westernmost	
	<i>Luzula ovata</i>		Widespread	Westernmost	
Lomandraceae	<i>Lomandra confertifolia</i> subsp. <i>pallida</i>	Mat-rush	Widespread	Southernmost	
	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Wattle Mat-rush	Widespread		Common
	<i>Lomandra filiformis</i> subsp. <i>flavior</i>	Wattle Mat-rush	Widespread		New record
	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	Widespread		
	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	Many-flowered Mat-rush	Widespread		Common

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Orchidaceae	<i>Caladenia carnea</i>	Pink Fingers	Widespread	Northernmost	Uncommon
	<i>Caladenia congesta</i>	Black Tongue Caladenia	Widespread	Northernmost	Uncommon, Devils Hole. Outlier in Calula Range, possibly also Mudgee
	<i>Caladenia fitzgeraldii</i>	Spider Orchid	Widespread	Westernmost	Rare
	<i>Caladenia fuscata</i>	Dusky Fingers	Widespread		Uncommon
	<i>Caladenia gracilis</i>	Musky Caladenia	Widespread		
	<i>Caladenia phaeoclavia</i>	Brown-clubbed Spider Orchid	Widespread	Westernmost	Common. Outlier at Bowan Park
	<i>Caladenia</i> sp. aff. <i>pateronii</i>		Extinct?	Endemic	Rare, possibly extinct. One plant only ever seen
	<i>Calochilus campestris</i>	Copper Beard Orchid	Widespread		Uncommon to rare
	<i>Calochilus robertsonii</i>	Purplish Beard Orchid	Widespread		Uncommon to rare
	<i>Chiloglottis trilabra</i>		Widespread	Westernmost	
	<i>Chiloglottis valida</i>	Large Bird Orchid	Widespread	Northernmost	Common
	<i>Corybas hispidus</i>	Bristly Helmet Orchid	Widespread	Westernmost	Occasional
	<i>Corybas incurvus</i>	Slaty Helmet Orchid	Widespread	Northernmost	Occasional. Outlier at Barrington Tops
	<i>Dipodium punctatum</i>	Hyacinth Orchid	Widespread	Westernmost	Occasional, localised. Outlier in Warrumbungles
	<i>Dipodium</i> sp. aff. <i>atropurpureum</i>		Unknown	?Endemic	Occasional to common
	<i>Diuris pardina</i>	Leopard Orchid	Widespread	Northernmost	Common, localised. Outliers to north
	<i>Diuris</i> sp. aff. <i>chryseopsis</i>		Restricted	Endemic?	Rare
	<i>Diuris sulphurea</i>	Tiger Orchid	Widespread		Scattered, common
	<i>Eriochilus cucullatus</i>	Parsons Bands	Widespread		Common
	<i>Gastrodia procera</i>	Potato Orchid	Widespread	Westernmost	Disjunct. Rare
	<i>Gastrodia sesamoides</i>	Cinnamon Bells	Widespread	Westernmost	Disjunct. Occasional, scattered
	<i>Genoplesium sagittiferum</i>	A Midge Orchid	Widespread	Westernmost	Disjunct. Common. Conimbla material reclassified <i>G. systemum</i>
	<i>Microtis parviflora</i>	Slender Onion Orchid	Widespread		Common
	<i>Microtis unifolia</i>	Common Onion Orchid	Widespread		Abundant
	<i>Prasophyllum brevilabre</i>	Short-lipped Leek Orchid	Widespread	Westernmost	Uncommon. Outlier in Pilliga
	<i>Prasophyllum</i> sp. aff. <i>odoratum</i>		Restricted	Endemic	Rare, localised, fire ephemeral
	<i>Pterostylis aestiva</i>	Long-tongue Summer Greenhood	Widespread	Northernmost	Disjunct. Localised, uncommon
	<i>Pterostylis decurva</i>	Summer Greenhood	Widespread	Westernmost	Rare
	<i>Pterostylis falcata</i>	Sickle Greenhood	Extinct?		Not seen in last 50 years, likely locally extinct
	<i>Pterostylis nutans</i>	Nodding Greenhood	Widespread		Uncommon, localised

<i>Pterostylis rubescens</i>	Widespread	Uncommon
<i>Pterostylis</i> sp. B	Widespread	Rare
<i>Pterostylis tenuis</i>	Restricted	Southernmost Mostly confined to CT. Outlier at Glen Elgin
<i>Thelymitra brevifolia</i>	Widespread	Northernmost Outlier at Barrington Tops
<i>Thelymitra carnea</i>	Widespread	Uncommon
<i>Thelymitra megalyptra</i>	Widespread	Uncommon
<i>Thelymitra pauciflora</i>	Widespread	Common
<i>Thelymitra peniculata</i>	Widespread	Occasional
<i>Thelymitra simulata</i>	Restricted	Westernmost Disjunct. Rare, localised, Devils Hole
<i>Thelymitra</i> sp. aff. <i>ixioides</i>	Widespread	Common
Phormiaceae		
<i>Dianella caerulea</i> var. <i>caerulea</i>	Widespread	Westernmost
<i>Dianella longifolia</i> var. <i>longifolia</i>	Widespread	
<i>Dianella revoluta</i> var. <i>revoluta</i>	Widespread	
<i>Dianella tasmanica</i>	Widespread	Westernmost
<i>Styandra glauca</i>	Widespread	Abundant after fire
* <i>Agrostis stolonifera</i>	Widespread	
* <i>Aira cupaniana</i>	Widespread	
<i>Anthosachne scabra</i>	Widespread	Occasional
<i>Aristida echinata</i>	Widespread	
<i>Austrostipa densiflora</i>	Widespread	Uncommon
<i>Austrostipa scabra</i> subsp. <i>falcata</i>	Widespread	Occasional
<i>Austrostipa scabra</i> subsp. <i>scabra</i>	Widespread	Occasional
* <i>Briza maxima</i>	Widespread	
* <i>Briza minor</i>	Widespread	
* <i>Bromus diandrus</i>	Widespread	
* <i>Bromus hordeaceus</i>	Widespread	
* <i>Bromus molliformis</i>	Widespread	
* <i>Bromus sterilis</i>	Widespread	
<i>Cymbopogon refractus</i>	Widespread	Uncommon
* <i>Dactylis glomerata</i>	Widespread	
<i>Dichelachne crinita</i>	Widespread	Occasional
<i>Dichelachne inaequiglumis</i>	Widespread	Occasional
<i>Dichelachne micrantha</i>	Widespread	Occasional
<i>Dichelachne rara</i>	Widespread	Occasional

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<i>Dichelachne sieberiana</i>		Widespread	Occasional
<i>Digitaria brownii</i>	Cotton Panic Grass	Widespread	Occasional
<i>Echinopogon caespitosus</i>	Bushy Hedgehog-grass	Widespread	Occasional
<i>Echinopogon ovatus</i>	Forest Hedgehog-grass	Widespread	Common
<i>Eragrostis brownii</i>	Brown's Lovegrass	Widespread	
<i>Festuca asperula</i>	Graceful Fescue	Widespread	Rarely seen, but proliferated after fire
* <i>Holcus lanatus</i>	Yorkshire Fog	Widespread	
* <i>Hordeum leporinum</i>	Barley Grass	Widespread	
<i>Imperata cylindrica</i>	Blady Grass	Widespread	Westernmost Uncommon
<i>Microlaena stipoides</i> var.	Weeping Grass	Widespread	Common
<i>Panicum simile</i>	Two-colour Panic	Widespread	Uncommon
* <i>Paspalum dilatatum</i>	Paspalum	Widespread	
* <i>Poa annua</i>	Winter Grass	Widespread	
<i>Poa labillardierei</i> var.	Tussock	Widespread	Occasional
<i>Poa labillardierei</i>			
<i>Poa sieberiana</i> var. <i>cyanophylla</i>		Widespread	Northernmost Occasional
<i>Poa sieberiana</i> var. <i>sieberiana</i>	Snowgrass	Widespread	Abundant
<i>Poa tenera</i>	Slender Tussock-grass	Widespread	Northernmost Occasional. Outliers at Cookamidgera, Cox's Gap, Olinda
<i>Rytidosperma erianthum</i>	Wallaby Grass	Widespread	Common
<i>Rytidosperma penicillatum</i>	Slender Wallaby Grass	Widespread	Possible outlier in Weddin Mts
<i>Rytidosperma pilosum</i>	Smooth-flower Wallaby Grass	Widespread	Occasional
<i>Rytidosperma racemosum</i> var. <i>racemosum</i>		Widespread	Common
<i>Rytidosperma setaceum</i>	Smallflower Wallaby Grass	Widespread	Occasional
* <i>Sorghum halepense</i>	Johnson Grass	Widespread	
<i>Sporobolus creber</i>	Western Rat-tail Grass	Widespread	Rare
<i>Themeda triandra</i>	Kangaroo Grass	Widespread	
<i>Tripogon loliiformis</i>	Fiveminute Grass	Widespread	Localised and uncommon
* <i>Vulpia bromoides</i>	Squirrel Tail Fescue	Widespread	
* <i>Vulpia muralis</i>		Widespread	
Xanthoraceae			
<i>Xanthorrhoea glauca</i> subsp. <i>angustifolia</i>	A Grass Tree	Widespread	Localised and uncommon
DICOTYLEDONS			
Adoxaceae			
* <i>Sambucus nigra</i>	Elderberry	Widespread	

Ameranthaceae	<i>Alternanthera</i> sp. A	Widespread	Uncommon
Apiaceae	<i>Actinotus gibbonsii</i>	Widespread	Localised, Devils Hole
	<i>Daucus glochidiatus</i> form F	Widespread	
	<i>Hydrocotyle algida</i>	Widespread	Northernmost
	<i>Hydrocotyle laxiflora</i>	Widespread	Possible outlier at Tenterfield
	<i>Hydrocotyle sibthorpioides</i>	Widespread	Common
	<i>Lilaeopsis polyantha</i>	Widespread	Occasional
	<i>Oreomyrrhis eriopoda</i>	Widespread	Disjunct
	<i>Astrotricha ledifolia</i>	Widespread	Occasional
Araliaceae		Widespread	Occasional. Outliers at Olinda, Tamworth, Tenterfield
	<i>*Hedera helix</i>	Widespread	Westernmost
	<i>Polyscias sambucifolia</i> subsp. <i>decomposita</i>	Widespread	Westernmost
	<i>*Tetrapanax papyrifer</i>	Widespread	Disjunct. Occasional along Towac Creek
Asteraceae	<i>*Bidens pilosa</i>	Widespread	
	<i>Brachyscome dissectifolia</i>	Widespread	Southernmost
	<i>Brachyscome pychocarpa</i>	Widespread	Disjunct. Devils Hole in soaks
		Widespread	Damp areas across SCA. Possible outlier at Trundle
	<i>Brachyscome spatulata</i>	Widespread	Common
	<i>Calotis scabiosifolia</i> var. <i>integrifolia</i>	Widespread	Occasional. Outliers at Taree and Manara
	<i>Cassinia aculeata</i> subsp. <i>aculeata</i>	Widespread	Common. Outliers at Mt Airly and Point Lookout
	<i>Cassinia laevis</i>	Widespread	Occasional
	<i>Cassinia longifolia</i>	Widespread	Common. Range extends sporadically to Kandos/Rylstone with rare outliers. Northern records possibly <i>C. straminea</i> .
	<i>Cassinia sifton</i>	Widespread	Common
	<i>*Centaurea calcitrapa</i>	Widespread	
	<i>*Chondrilla juncea</i>	Widespread	
	<i>Chrysocephalum apiculatum</i>	Widespread	
	<i>Chrysocephalum semipapposum</i>	Widespread	
	<i>*Cirsium vulgare</i>	Widespread	
	<i>*Conyza bonariensis</i>	Widespread	
	<i>*Conyza sumatrensis</i>	Widespread	
	<i>Coronidium scorpioides</i>	Widespread	Westernmost
	<i>Craspedia</i> sp. aff. <i>lamicola</i>	?Restricted	?Endemic
	<i>*Crepis capillaris</i>	Widespread	Mostly above 1000 m

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<i>Cymbonotus lawsonianus</i>	Bears-ear	Widespread	Occasional	
<i>Cymbonotus preissianus</i>	Austral Bear's Ear	Widespread	Northernmost	Outliers in Mullion Range, Barrington Tops and Yetman
<i>Euchiton involucreatus</i>	Star Cudweed	Widespread		
<i>Euchiton japonicus</i>	Creeping Cudweed	Widespread	Westernmost	Outlier in Mandagery SF
<i>Euchiton sphaericus</i>		Widespread		
* <i>Hypochaeris radicata</i>	Catsear, Flatweed	Widespread		
* <i>Lactuca serriola</i>	Prickly Lettuce	Widespread		
<i>Lagenophora stipitata</i>	Blue Bottle-daisy	Widespread	Westernmost	Occasional
* <i>Madia sativa</i>	Tarweed, Pitchweed	Widespread		
<i>Microseris lanceolata</i>	Yam Daisy	Widespread	Occasional	
<i>Olearia chrysophylla</i>		Widespread	Westernmost	Disjunct. Uncommon, upper slopes
<i>Olearia erubescens</i>		Widespread	Northernmost	Rare, Devils Hole. Outliers to north
<i>Olearia megalophylla</i>	Large-leaf Daisy Bush	Widespread	Westernmost	Disjunct. Rare, possible misidentification
<i>Olearia phlogopappa</i> subsp. <i>continentalis</i>	Dusty Daisy-bush	Widespread	Westernmost	Disjunct. Localised, common, Devils Hole
<i>Senecio bathurstianus</i>		Widespread	Common	
<i>Senecio diascidides</i>		Widespread	Westernmost	Occasional
<i>Senecio hispidulus</i>	Hill Fireweed	Widespread	Westernmost	Outliers at Condobolin, Lake Cargelligo
<i>Senecio linearifolius</i> var. <i>macrodonatus</i>	Fireweed Groundsel	Widespread	Westernmost	Uncommon
<i>Senecio minimus</i>		Widespread	Westernmost	Uncommon
<i>Senecio pinnatifolius</i> var. <i>pinnatifolius</i>	Variable Groundsel	Widespread		
<i>Senecio prenanthoides</i>		Widespread	Westernmost	Occasional
<i>Senecio quadridentatus</i>	Cotton Fireweed	Widespread	Common	
<i>Sigesbeckia australiensis</i>		Widespread	Occasional	
<i>Sigesbeckia orientalis</i> subsp. <i>orientalis</i>	Indian Weed	Widespread	Occasional	
* <i>Silybum marianum</i>	Variegated Thistle	Widespread		
<i>Solenogyne dominii</i>		Widespread	Uncommon	
* <i>Sonchus oleraceus</i>	Common Sowthistle	Widespread		
* <i>Taraxacum officinale</i>	Dandelion	Widespread		
<i>Vittadinia cuneata</i> var. <i>cuneata</i>	Fuzzweed	Widespread		
Boraginaceae				
* <i>Amsinckia calycina</i>		Widespread		
* <i>Amsinckia intermedia</i>	Common Fiddleneck	Widespread		
* <i>Anchusa arvensis</i>	Wild Bugloss	Widespread		
<i>Cynoglossum australe</i>		Widespread	Common	

<i>*Echium vulgare</i>	Vipers Bugloss	Widespread	
<i>Hackelia suaveolens</i>		Widespread	
<i>Myosotis australis</i>	Australian Forget-me-not	Widespread	Occasional
<i>*Myosotis discolor</i>	Forget-me-not	Widespread	
Brassicaceae			
<i>Cardamine gunnii</i>		Widespread	Westernmost
<i>Cardamine paucijuga</i>		Widespread	
<i>*Hirschfeldia incana</i>	Buchan Weed	Widespread	
Callitrichaceae			
<i>*Callitriche stagnalis</i>	Common Starwort	Widespread	
Campanulaceae			
<i>Isotoma fluvialis</i> subsp. <i>fluvialis</i>	Swamp Isotome	Widespread	Uncommon, soaks
<i>Lobelia gibbosa</i>	Tall Lobelia	Widespread	Occasional, fire ephemeral
<i>Lobelia pedunculata</i>	Matted Pratia	Widespread	Uncommon, soaks
<i>Wahlenbergia communis</i>	Tufted Bluebell	Widespread	Uncommon
<i>Wahlenbergia luteola</i>		Widespread	Occasional
<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell	Widespread	Occasional
<i>Wahlenbergia planiflora</i> subsp. <i>longipila</i>	Flat Bluebell	Widespread	Disjunct
<i>Wahlenbergia stricta</i> subsp. <i>stricta</i>	Tall Bluebell	Widespread	Occasional
Caprifoliaceae			
<i>Wahlenbergia victoriensis</i>		Unknown	Northernmost
<i>*Lonocera japonica</i>	Japanese Honeysuckle	Widespread	Uncommon, moist gully
Caryophyllaceae			
<i>*Cerastium balearicum</i>	Lesser Mouse-ear Chickweed	Widespread	
<i>*Cerastium glomeratum</i>	Mouse-ear Chickweed	Widespread	
<i>*Petrorhagia nanteuillii</i>		Widespread	
<i>Scleranthus</i> sp. <i>Fitzs Hill</i>	Knawel	Widespread	Southernmost
<i>*Silene coronaria</i>	Rose Campion	Widespread	Common
<i>Stellaria angustifolia</i>	Swamp Starwort	Widespread	Uncommon, damp areas
<i>Stellaria flaccida</i>		Widespread	
<i>Stellaria pungens</i>	Prickly Starwort	Widespread	Westernmost
Centrolepidaceae			
<i>Centrolepis strigosa</i> subsp. <i>strigosa</i>		Widespread	Westernmost
			Abundant. Outlier in Hervey Ranges
			Rare, in soaks
Chenopodiaceae			
<i>Dysphania pumilio</i>	Small Crumbweed	Widespread	Common
Clusiaceae			
<i>Hypericum gramineum</i>	Small St. John's Wort	Widespread	Occasional
<i>Hypericum japonicum</i>		Widespread	Damp areas
<i>*Hypericum perforatum</i>	St. John's Wort	Widespread	
Convolvulaceae			
<i>Convolvulus angustissimus</i>	Blushing Bindweed	Widespread	Occasional

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Crassulaceae	<i>Dichondra repens</i>	Kidney Weed	Widespread	Common
	<i>Crassula sieberiana</i> subsp. <i>sieberiana</i>	Australian Stonecrop	Widespread	Occasional
Dilleniaceae	<i>Hibbertia calycina</i>	Lesser Guinea Flower	Widespread	Uncommon
	<i>Hibbertia obtusifolia</i>	Hoary Guinea Flower	Widespread	Common
Droseraceae	<i>Hibbertia riparia</i>	Erect Guinea Flower	Widespread	Occasional
	<i>Drosera auriculata</i>		Widespread	
Epacridaceae	<i>Drosera peltata</i>	Sundew	Widespread	
	<i>Acrotriche serrulata</i>	Honeypots	Widespread	Outlier at Yenda
	<i>Leucopogon attenuatus</i>	Beard-heath	Widespread	Occasional
	<i>Leucopogon ericoides</i>	Pink Beard-heath	Widespread	Occasional
	<i>Leucopogon fraseri</i>		Widespread	Uncommon. Outlier in Goobang NP
	<i>Leucopogon virgatus</i>		Widespread	Occasional
	<i>Melichrus</i> Mt Canobolas	Urn-heath	?Restricted	Uncommon, scattered
	<i>Monotoca scoparia</i>	Broom-heath	Widespread	Occasional, scattered
Fabaceae	<i>Acacia brownii</i>	Heath Wattle	Widespread	
	<i>Acacia buxifolia</i> subsp. <i>buxifolia</i>	Box-Leaf Wattle	Widespread	
	<i>Acacia dealbata</i> subsp. <i>dealbata</i>	Silver Wattle	Widespread	Abundant
	<i>Acacia gunnii</i>	Ploughshare Wattle	Widespread	Occasional
	<i>Acacia lanigera</i> var. <i>lanigera</i>	Woolly Wattle	Widespread	
	<i>Acacia melanoxylon</i>	Blackwood	Widespread	Common. Possible outlier near Dubbo
	<i>Acacia ulicifolia</i>	Prickly Moses	Widespread	
	<i>Acacia verniciflua</i>	Varnish Wattle	Widespread	
	<i>Bossiaea buxifolia</i>		Widespread	Common
	* <i>Cytisus scoparius</i> subsp. <i>scoparius</i>	Scotch Broom	Widespread	
	<i>Daviesia latifolia</i>	Hop Bitter-pea	Widespread	Occasional
	<i>Daviesia leptophylla</i>		Widespread	Occasional
	<i>Desmodium gunnii</i>	Slender Tick-trefoil	Widespread	Westernmost
	<i>Desmodium varians</i>	Slender Tick-trefoil	Widespread	
	<i>Dillwynia phyllicoides</i>		Widespread	
	* <i>Genista monspessulana</i>	Montpellier Broom	Widespread	
	<i>Glycine clandestina</i>		Widespread	Common
	<i>Glycine tabacina</i>		Widespread	Occasional
	<i>Hardenbergia violacea</i>	Purple Coral Pea	Widespread	
	<i>Hovea heterophylla</i>		Widespread	Westernmost
	<i>Indigofera adesmiifolia</i>	Tick Indigo	Widespread	Outliers at Bowen Park, Bumbery
	<i>Indigofera australis</i>	Australian Indigo	Widespread	Occasional
				Common

	<i>Lotus australis</i>	Australian Trefoil	Widespread	Uncommon
	* <i>Medicago polymorpha</i>	Burr Medic	Widespread	
	<i>Mirbelia oxycloboioides</i>	Mountain Mirbelia	Widespread	Northernmost Disjunct. A southern species, outliers north of Lees Pinch and at Mt Kaputar, Pilliga
	<i>Pultenaea polifolia</i>	Dusky Bush-pea	Widespread	Westernmost Uncommon. Outlier in Goobang NP
	<i>Pultenaea setulosa</i>	Stony Bush-pea	Widespread	
	<i>Pultenaea spinosa</i>	Spiny Bush-pea	Widespread	Occasional
	<i>Pultenaea subternata</i>		Widespread	Westernmost Scattered on slopes to west
	* <i>Trifolium arvense</i>	Haresfoot Clover	Widespread	
	* <i>Trifolium campestre</i>	Hop Clover	Widespread	
	* <i>Trifolium dubium</i>	Yellow Suckling Clover	Widespread	
	* <i>Trifolium repens</i>	White Clover	Widespread	
	* <i>Ulex europaeus</i>	Gorse	Widespread	
Gentianaceae	* <i>Vicia villosa</i> subsp. <i>villosa</i>	Russian Vetch	Widespread	
	* <i>Centaurium erythraea</i>	Common Centaury	Widespread	
	* <i>Centaurium tenuiflorum</i>		Widespread	
Geraniaceae	<i>Geranium homeanum</i>		Widespread	Westernmost
	* <i>Geranium molle</i> subsp. <i>molle</i>	Cranesbill Geranium	Widespread	
	<i>Geranium potentilloides</i> var. <i>potentilloides</i>		Widespread	Westernmost
	<i>Geranium solanderi</i> var. <i>solanderi</i>	Native Geranium	Widespread	Common
	<i>Pelargonium australe</i>	Native Storksbill	Widespread	Prolific fire ephemeral
Goodeniaceae	<i>Goodenia hederacea</i> subsp. <i>hederacea</i>	Forest Goodenia	Widespread	
Haloragaceae	<i>Gonocarpus elatus</i>		Widespread	Occasional
	<i>Gonocarpus tetragynus</i>	Raspwort	Widespread	Common
	<i>Haloragis heterophylla</i>	Rough Raspwort	Widespread	
	<i>Haloragis serra</i>		Widespread	Occasional
Lamiaceae	<i>Ajuga australis</i>	Austral Bugle	Widespread	
	* <i>Marrubium vulgare</i>	White Horehound	Widespread	
	<i>Mentha satereioides</i>	Native Pennyroyal	Widespread	Uncommon
	* <i>Mentha spicata</i>	Spearmint	Widespread	Towac Creek
	<i>Prostanthera gilesii</i>		Restricted	Endemic Critically endangered
	* <i>Prunella vulgaris</i>	Self-heal	Widespread	
	<i>Scutellaria humilis</i>	Dwarf Skullcap	Widespread	Occasional
Lauraceae	<i>Cassytha pubescens</i>		Widespread	
Loranthaceae	<i>Anyema miquelii</i>		Widespread	

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[illegible]

<i>Veronica derwentiana</i> subsp. <i>derwentiana</i>		Widespread	Westernmost	Westernmost	Specimen in RBG needs verification
<i>Veronica derwentiana</i> subsp. <i>subglauca</i>		Widespread	Widespread	Widespread	Specimen in RBG needs verification
Polemoniaceae	<i>Veronica gracilis</i>	Widespread	Slender Speedwell	Westernmost	Possible outlier near Barmedman
	* <i>Navarretia squarrosa</i>	Widespread	Californian Stinkweed	Westernmost	
Polygonaceae	* <i>Acetosella vulgaris</i>	Widespread	Sorrel	Westernmost	
	<i>Rumex brownii</i>	Widespread	Swamp Dock	Westernmost	Occasional
Portulacaceae	<i>Neopaxia australasica</i>	Widespread		Westernmost	Soaks
	<i>Montia fontana</i> subsp. <i>chondrosperma</i>	Widespread		Northernmost	A southern species
Primulaceae	* <i>Lysimachia arvensis</i>	Widespread	Scarlet Pimpernel		
Proteaceae	<i>Hakea decurrens</i> subsp. <i>decurrens</i>	Widespread			Uncommon
	<i>Persoonia rigida</i>	Widespread			
Ranunculaceae	<i>Ranunculus amphitrichus</i>	Widespread	Small River Buttercup	Northernmost	A southern species. Outliers at Moonan Brook, Uralla, Walcha
	<i>Ranunculus inundatus</i>	Widespread	River Buttercup	Westernmost	
	<i>Ranunculus lappaceus</i>	Widespread	Common Buttercup		Common
	<i>Ranunculus pumilio</i> var. <i>polius</i>	Widespread	Ferny Buttercup	Easternmost	Outlier Richmond
	<i>Ranunculus pumilio</i> var. <i>pumilio</i>	Widespread	Ferny Buttercup		
Rhamnaceae	<i>Cryptandra amara</i> var. <i>amara</i>	Widespread	Bitter Cryptandra		
	<i>Pomaderris aspera</i>	Widespread	Hazel Pomaderris	Westernmost	Disjunct. Rare
Rosaceae	<i>Acaena novae-zelandiae</i>	Widespread	Bidgee-widgee	Westernmost	Common
	<i>Acaena ovina</i>	Widespread	Sheep's Burr		
	<i>Aphanes australiana</i>	Widespread			
	* <i>Prunus laurocerasus</i>	Widespread	Cherry Laurel		
Rubiaceae	* <i>Rosa rubiginosa</i>	Widespread	Sweet Briar		
	* <i>Rubus anglocandicans</i>	Widespread	Blackberry		
	<i>Rubus parvifolius</i>	Widespread	Native Raspberry		
	* <i>Rubus ulmifolius</i>	Widespread	Blackberry		
	* <i>Sanguisorba minor</i>	Widespread	Salad Burnet		
	<i>Asperula conferta</i>	Widespread	Common Woodruff		Common
	<i>Asperula scoparia</i>	Widespread	Prickly Woodruff	Westernmost	
	<i>Coprosma quadrifida</i>	Widespread	Prickly Currant Bush	Westernmost	Disjunct. Rare
	* <i>Galium aparine</i>	Widespread	Cleavers		
	* <i>Galium divaricatum</i>	Widespread	Slender Bedstraw		
	<i>Galium gaudichaudii</i>	Widespread	Rough Bedstraw		

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	<i>Galium leptogonium</i>		Widespread	
	* <i>Galium murale</i>	Small Bedstraw	Widespread	
	<i>Opercularia aspera</i>	Coarse Stinkweed	Widespread	Occasional
	<i>Opercularia hispida</i>	Hairy Stinkweed	Widespread	Occasional
	<i>Pomax umbellata</i>	Skullicaps	Widespread	Common
Rutaceae	<i>Asterolasia rupestris</i> subsp. <i>rupestris</i>		Restricted	?Endemic Localised to one area, rare
	<i>Phebalium squamulosum</i> complex	Scaly Phebalium	Restricted	?Endemic Localised in disparate colonies
Salicaceae	* <i>Salix x fragilis</i> nothovar. <i>fragilis</i>	Crack Willow	Widespread	
Santalaceae	<i>Exocarpos cupressiformis</i>	Native Cherry	Widespread	Common
	<i>Exocarpos strictus</i>	Dwarf Cherry	Widespread	
Sapindaceae	<i>Dodonaea boroniifolia</i>	Fern-leaf Hop-bush	Widespread	Common
	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>	Narrow-leaved Hopbush	Widespread	Common
Scrophulariaceae	* <i>Verbascum thapsus</i> subsp. <i>thapsus</i>	Great Mullein	Widespread	
	* <i>Verbascum virgatum</i>	Twiggy Mullein	Widespread	
Solanaceae	* <i>Datura stramonium</i>	Common Thornapple	Widespread	
	* <i>Solanum chenopodioides</i>	Whitewort Nightshade	Widespread	
	* <i>Solanum nigrum</i>	Black-berry Nightshade	Widespread	
	* <i>Solanum triflorum</i>	Three-flowered Nightshade	Widespread	
Stackhousiaceae	<i>Stackhousia monogyna</i>	Creamy Candles	Widespread	Occasional
Stylidiaceae	<i>Stylidium graminifolium</i>	Grass Trigger-plant	Widespread	Occasional
Thymelacaceae	<i>Pimelea curviflora</i> var. <i>gracilis</i>	Rice Flower	Widespread	Westernmost
	<i>Pimelea latifolia</i> subsp. <i>hirsuta</i>	Rice Flower	Widespread	Westernmost
	<i>Pimelea ligustrina</i> subsp. <i>ligustrina</i>	Tall Rice Flower	Widespread	Westernmost
Urticaceae	<i>Pimelea linifolia</i> subsp. <i>caesia</i>	Slender Rice-flower	Widespread	Westernmost
	<i>Urtica incisa</i>	Stinging Nettle	Widespread	Occasional
Valerianaceae	* <i>Centranthus ruber</i> subsp. <i>ruber</i>	Red Valerian	Widespread	
Verbenaceae	* <i>Verbena bonariensis</i>	Purpletop	Widespread	
Violaceae	<i>Viola betonicifolia</i>	Native Violet	Widespread	Common
	<i>Viola hederacea</i>	Ivy-leaved Violet	Widespread	Occasional

Appendix 2. Summary of conservation reserves in the near (eastern) Central West indicating year gazetted, area, along with native and exotic vascular plant species recorded in Bionet (2018a).

Conservation Reserve	Year Gazetted	Area (ha)	Total Flora (No Species)	Native Flora (No Species)	Exotic Flora (No Species)	Exotic species (%)
Abercrombie KCR	1997	1,434	206	178	28	13.6
Abercrombie River NP	1995	19,402	491	384	107	21.8
Barton NR	1972	529	125	99	26	20.8
Borenore KCR	1997	136	140	85	55	39.2
Burwood Creek NR	?	34	85	66	19	22.3
Copperhannia NR	1972	3,497	212	193	19	8.9
Eusdale NR	2006	1,238	130	111	19	14.6
Evans Crown NR	1975	424	185	145	40	21.6
Freemantle NR	1973	361	136	111	25	18.4
Gillindich NR	2010	1,225	111	105	6	5.4
Girralang NR	1999	640	207	175	32	15.4
Hill End HS	1967	133	98	68	30	30.6
Keverstone SCA	2011	1,164	51	47	4	7.8
Keverstone NP	1979 to 2011	1,860	198	165	33	16.7
Mount Canobolas SCA	1997	1,672	425	337	88	20.7
Mullion Range SCA	1999	1,025	200	151	49	24.5
Nuggetty SCA	2010	1,146	156	116	40	25.6
Razorback NR	1988	2,647	243	222	21	8.6
Turon NP	2002	3,059	254	215	39	15.4
Wambool NR	1987	194	245	226	19	7.8
Wiarborough NR	2010	2,024	183	164	19	10.4
Winburndale NR	1967	10,718	339	297	42	12.4
Mean			200	166	34	17.4

Appendix 3. Fungi recorded for Mt Canobolas SCA (ALA and other database sources 2018) (*exotic species).

Family	Scientific name	Regional distribution	Range limit	Remarks
Phylum Ascomycota				
Acarosporaceae	<i>Acarospora citrina</i>	Widespread		Volcanic rock. Northern slopes below summit
	<i>Acarospora fuscata</i>	Restricted	Northernmost	Volcanic rock around summit; restricted to SE mainland
	<i>Acarospora nodulosa</i>	Widespread	Easternmost	An inland species
	<i>Sarcogyne sekikaica</i>	Restricted	Endemic	Volcanic rock around summit
Candelariaceae	<i>Candelariella</i> cf. <i>coralliza</i>	Widespread		Volcanic rock around summit
Cladoniaceae	<i>Cladia aggregata</i>	Widespread		On soil between boulders, summit
	<i>Cladia corallaizon</i>	Widespread		On soil, NE forest slopes
	<i>Cladia fuliginosa</i>	Restricted	Northernmost	Scattered small loose colonies, NE forest slopes and grasslands; restricted to SE Australia
	<i>Cladia muelleri</i>	Widespread		On soil, NE forest slopes
	<i>Cladonia chlorophaea</i>	Widespread		On soil, W face of mountain
	<i>Cladonia corniculata</i>	Widespread	Westernmost	On damp soils and crevices among rocks, W face of mountain
	<i>Cladonia fimbriata</i>	Widespread	Westernmost	On soil, slopes and rocky outcrops with stunted trees
	<i>Cladonia glebosa</i>	Widespread		On charred wood, W face of mountain
	<i>Cladonia sarmentosa</i>	Widespread	Westernmost	On shaded, moist earth bank, W face of mountain
	<i>Cladonia sulcata</i> var. <i>striata</i>	Widespread	Westernmost	On soil, NE forest slopes
Collemataceae	<i>Collema leucocarpum</i>	Widespread		On mossy volcanic rocks and on <i>Acacia melanoxylon</i> , W face of mountain
	<i>Lathagrium durietzii</i>	Widespread		On soil and rock, stunted forest on rocky outcrops, W face of mountain
Gomphillaceae	<i>Gyalideopsis halocarpa</i>	Restricted	Endemic	Near summit, exposed heath
Lecanoraceae	<i>Lecanora bicincta</i>	Restricted	Northernmost	Volcanic rocks around summit and grassy frost pockets in sub-alpine Snow Gum woodland; restricted to Alpine areas
	<i>Lecanora farinacea</i>	Widespread	Westernmost	Weathered volcanic rocks around summit, woodland
	<i>Lecanora galactiniza</i>	Widespread		Volcanic rocks and scree around summit, woodland
	<i>Lecanora oreinoides</i>	Widespread		Weathered trachyte rocks, heathlands on W face of mountain
	<i>Lecanora pseudistera</i>	Widespread		Volcanic rocks around summit and grassy frost pockets in sub-alpine Snow Gum woodland
	<i>Lecanora rupicola</i>	Widespread	Northernmost	Rocky outcrops

<i>Lecidella stigmata</i>	Widespread		Volcanic rocks around summit
<i>Ramboldia petraeoides</i>	Widespread		Volcanic rocks around summit and dead tree trunks
<i>Ramboldia sanguinolenta</i>	Widespread	Southernmost	Weathered rocks, woodlands on NW slopes of mountain; outlier recorded near Nimmitabel
<i>Scoliciosporum umbrinum</i>	Restricted	Northernmost	Volcanic rocks around summit; only mainland record, elsewhere Kangaroo Island and Tasmania
<i>Lecidea atrobrunnea</i>	Restricted	Northernmost	Volcanic rocks, summit grassy Snow Gum woodland; rare with few records for Vic. alps and WA
<i>Lecidea capensis</i>	Widespread		Weathered rocks, heath and woodlands, W face of mountain
<i>Lecidea ochroleuca</i>	Widespread		On rocks, NE forest slopes
<i>Pseudocyphellaria neglecta</i>	Widespread	Westernmost	Shaded rocks amongst mosses, NE forest slopes
<i>Megalaria montana</i>	Restricted	Endemic	
<i>Aspicilia contorta</i>	Widespread	Easternmost	Summit and rock ledge, W slopes of mountain
<i>Cercospora</i> sp.	Unknown		Isolated from <i>Hardenbergia violaceae</i>
<i>Mycosphaerella</i> sp.	Unknown		Isolated from <i>Styandra glauca</i>
<i>Fuscopannaria submixta</i>	Widespread		Soil over rocks, Federal Falls
<i>Psoroma hypnorum</i>	Widespread	Northernmost	Mossy rocks, W face of mountain
<i>Austroparmelia labrosa</i>	Widespread	Westernmost	On tree trunks and branches of shrubs, summit and W slopes
<i>Austroparmelia pruinata</i>	Widespread		On tree trunks and branches of shrubs, summit and W slopes
<i>Austroparmelia pseudorelicina</i>	Widespread		On tree trunks and branches of shrubs, summit and W slopes
<i>Flavoparmelia haysonii</i>	Widespread	Westernmost	On volcanic rocks, W face of mountain
<i>Hypogymnia billardieri</i>	Widespread		On <i>Leptospermum</i> twigs
<i>Hypogymnia pulverata</i>	Widespread	Westernmost	On dead wood, rocky heath and woodlands, W face of mountain
<i>Hypogymnia subphysodes</i> var. <i>subphysodes</i>	Widespread	Westernmost	On dead wood, woodlands, W face of mountain
<i>Notoparmelia signifera</i>	Widespread		On volcanic rocks, W face of mountain
<i>Parmotrema reticulatum</i>	Widespread		On volcanic rocks, W face of mountain
<i>Punctelia borrieri</i>	Widespread	Westernmost	On volcanic rocks, W face of mountain
<i>Usnea inermis</i>	Widespread		On dead <i>Acacia</i> branch and bark, rocks in woodland
<i>Xanthoparmelia atrocapnodes</i>	Widespread		Weathered rock, summit and woodlands on W slopes
<i>Xanthoparmelia canobolasensis</i>	Restricted	Northernmost	On rocks, woodland NE slopes; only mainland record, elsewhere one location in Tasmania

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<i>Xanthoparmelia congesta</i>	Widespread	Northernmost	Weathered rock, summit and woodlands on W slopes
<i>Xanthoparmelia dichotoma</i>	Widespread	Northernmost	On soil, NE woodlands; outliers at Tenterfield and Mt Cordeaux Qld.
<i>Xanthoparmelia digitiformis</i>	Widespread		Shaded rock face, summit areas, Snow Gum woodland
<i>Xanthoparmelia elixii</i>	Widespread		Exposed rocky outcrops and stunted forests
<i>Xanthoparmelia flavescentireagens</i>	Widespread		Weathered rock, The Walls, summit areas and woodlands on W slopes
<i>Xanthoparmelia furcata</i>	Widespread		Rock outcrops, The Walls
<i>Xanthoparmelia loxodella</i>	Widespread		Volcanic rocks summit and grassy frost pockets in sub-alpine Snow Gum woodland, W slopes
<i>Xanthoparmelia metachystoides</i>	Widespread		Weathered rock, NW slopes
<i>Xanthoparmelia metamorphosa</i>	Widespread		On soil and pebbles, The Walls woodland
<i>Xanthoparmelia metastrigosa</i>	Restricted	Endemic	Weathered rock and soil, summit and woodlands NE slopes
<i>Xanthoparmelia mexicana</i>	Widespread		Dead tree trunk among rock outcrops
<i>Xanthoparmelia multipartita</i>	Restricted	Northernmost	Recorded as a component of Mt Canobolas <i>Xanthoparmelia</i> Endangered Ecological Community
<i>Xanthoparmelia neorimalis</i>	Widespread		Recorded as a component of Mt Canobolas <i>Xanthoparmelia</i> Endangered Ecological Community
<i>Xanthoparmelia oleosa</i>	Widespread		Weathered rocks, summit woodlands
<i>Xanthoparmelia parviloba</i>	Widespread		
<i>Xanthoparmelia pulla</i>	Widespread		On rock, summit woodlands
<i>Xanthoparmelia scabrosa</i>	Widespread		Rock outcrop N slope from summit, Snow Gum woodland
<i>Xanthoparmelia semiviridis</i>	Widespread		On soil, summit woodlands
<i>Xanthoparmelia substrigosa</i>	Widespread		On soil and pebbles, The Walls woodland
<i>Xanthoparmelia sulcifera</i>	Restricted	Westernmost	On soil and pebbles, grasslands around summit; restricted to SE mainland
<i>Xanthoparmelia willisii</i>	Widespread	Southernmost	On soil, grasslands around summit; outliers in Tasmania
<i>Pertusaria lophocarpa</i>	Widespread	Westernmost	Weathered rock, summit area woodlands
<i>Buellia aethalia</i>	Widespread		Summit area
<i>Buellia canobolasensis</i>	Restricted	Northernmost	Known only from the summit area and another mountain top in the ACT
<i>Buellia homophylla</i>	Widespread		Volcanic rock, summit area woodlands
<i>Buellia maficola</i>	Widespread		Type specimen from summit area
<i>Buellia ocellata</i>	Restricted	Northernmost	Volcanic rock, summit area woodlands; restricted to SE Australia
<i>Physcia adscendens</i>	Widespread	Northernmost	Shaded rocks, but usually on wood; outliers at Guyra and Lamington NP

	<i>Physcia austrocaesia</i>	Widespread	Northernmost	Dead twigs, woodlands W face; outlier on rock at Stanthorpe
	<i>Physcia jackii</i>	Widespread		On dead <i>Acacia</i> , summit and W slopes
	<i>Physcia poncinsii</i>	Widespread	Westernmost	Volcanic rock, summit area woodlands
Porpidiaceae	<i>Paraporphidia leptocarpa</i>	Widespread		Amongst rock outcrops in stunted woodlands
Pyronemataceae	<i>Pyronema omphalodes</i>	Widespread		
Rhizocarpaceae	<i>Rhizocarpon distinctum</i>	Restricted	Northernmost	Weathered rock, heathlands on W face; restricted to SE Australia
	<i>Rhizocarpon geminatum</i>	Restricted	Northernmost	Weathered rock, heathlands on W face; restricted to SE Australia
	<i>Rhizocarpon geographicum</i>	Widespread		On rock, summit and woodlands on W slopes
	<i>Rhizocarpon reductum</i>	Widespread		On rock, summit and woodlands on W slopes
Stereocaulaceae	<i>Stereocaulon corticatum</i>	Widespread	Northernmost	On rock amongst other lichens; outliers at Barrington Tops and Point Lookout
Teloschistaceae	<i>Caloplaca crenulatella</i>	Widespread	Rare in NSW	Summit, on scree NW slopes
	<i>Caloplaca rexfilsonii</i>	Widespread		Rock outcrops around summit
	<i>Caloplaca rubelliana</i>	Widespread		Rock outcrops around summit
Thelotremaataceae	<i>Diploschistes scruposus</i>	Widespread		Volcanic rocks around summit and grassy frost pockets in sub-alpine Snow Gum woodland
	<i>Diploschistes sticticus</i>	Widespread		On rock, summit and woodlands on W slopes
	<i>Ingvieriella bispura</i>	Restricted	Northernmost	On rock, summit and heath on W slopes; restricted to SE Australia
Trapeliaceae	<i>Placopsis perrugosa</i>	Widespread	Northernmost	Shaded rock, woodlands W face; outliers at Barrington Tops and Ingham Qld
	<i>Rimularia insularis</i>	Restricted	Northernmost	On rock, open woodland; restricted to SE mainland
Phylum				
<i>Basidiomycota</i>				
Phragmidiaceae	* <i>Phragmidium violaceum</i>	Widespread	Northernmost	Isolated from blackberry
Pileolariaceae	<i>Uromycladium robinsonii</i>	Unknown	Northernmost	Isolated from <i>Acacia melanoxylon</i> . Only known record for NSW; also recorded for ACT, Vic. and NZ
Pucciniaceae	<i>Puccinia lagenophorae</i>	Widespread		Isolated from <i>Senecio quadridentatus</i> .
Raveneliaceae	<i>Bibulocystis pulcherrima</i> var. <i>monticola</i>	Unknown		Isolated from a <i>Daviesia</i> sp.
Russulaceae	<i>Cystangium seminudum</i>	Widespread	Westernmost	Grassy woodland, Orange View
	<i>Cystangium sessile</i>	Widespread	Westernmost	Grassy woodland, Orange View
	<i>Cystangium shultzei</i>	Widespread	Northernmost	Grassy woodland, Orange View
Ustilaginaceae	<i>Ustilago comburens</i>	Widespread	Northernmost	Only known record for NSW; also recorded for ACT, Vic., WA and NZ

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Appendix 4. Vertebrates recorded for Mt Canobolas State Conservation Area (ALA and other database sources 2018) (*exotic species).

Order	Family	Scientific name	Common name	Regional distribution	Range limit
ACTINOPTERYGII					
<i>Salmoniformes</i>	Galaxiidae	<i>Galaxias olidus</i>	Inland or Mountain Galaxia	Widespread	
AMPHIBIA					
Anura	Hylidae	<i>Litoria verreauxii</i>	Whistling Tree Frog	Widespread	
	Limnodynastidae	<i>Limnodynastes dumerilii dumerilii</i>	Eastern Banjo Frog	Widespread	
	Myobatrachidae	<i>Crinia parinsignifera</i>	Eastern Sign-bearing Froglet	Widespread	
		<i>Crinia signifera</i>	Common Froglet	Widespread	
		<i>Uperoleia laevigata</i>	Smooth Toadlet	Widespread	
AVES					
Anseriformes	Anatidae	<i>Anas gracilis</i>	Grey Teal	Widespread	
		<i>Anas superciliosa</i>	Pacific Black Duck	Widespread	
		<i>Aythya australis</i>	White-eyed Duck, Hardhead	Widespread	
		<i>Chenonetta jubata</i>	Australian Wood Duck	Widespread	
Caprimulgiformes	Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth	Widespread	
Ciconiiformes	Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron	Widespread	
	Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked Ibis	Widespread	
Columbiformes	Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing	Widespread	
Coraciiformes	Coraciidae	<i>Eurystomus orientalis</i>	Dollarbird	Widespread	
	Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	Widespread	
		<i>Todiramphus sanctus</i>	Sacred Kingfisher	Widespread	
Cuculiformes	Cuculidae	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo	Widespread	
		<i>Cacomantis pallidus</i>	Pallid Cuckoo	Widespread	
		<i>Chalcites osculans</i>	Black-eared Cuckoo	Widespread	
		<i>Chrysococcyx basalis</i>	Horsfield's Bronze-cuckoo	Widespread	
		<i>Chrysococcyx lucidus</i>	Shining Bronze-cuckoo	Widespread	
		<i>Eudynamys orientalis</i>	Common Koel, Pacific Koel	Widespread	
Falconiformes	Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk	Widespread	
		<i>Accipiter fasciatus</i>	Brown Goshawk	Widespread	

		<i>Aquila audax</i>	Wedge-tailed Eagle	Widespread	
		<i>Hieraaetus morphnoides</i>	Little Eagle	Widespread	
	Falconidae	<i>Falco berigora</i>	Brown Falcon	Widespread	
		<i>Falco cenchroides</i>	Nankeen Kestrel	Widespread	
		<i>Falco peregrinus</i>	Peregrine Falcon	Widespread	
Gruiformes	Rallidae	<i>Fulica atra</i>	Eurasian Coot	Widespread	
		<i>Gallinula tenebrosa tenebrosa</i>	Dusky Moorhen	Widespread	
Passeriformes	Acanthizidae	<i>Acanthiza tenebrosa chrysorrhoea</i>	Yellow-rumped Thornbill	Widespread	
		<i>Acanthiza lineata</i>	Striated Thornbill	Widespread	
		<i>Acanthiza nana</i>	Yellow Thornbill	Widespread	
		<i>Acanthiza pusilla</i>	Brown Thornbill	Widespread	
		<i>Acanthiza reguloides</i>	Buff-rumped Thornbill	Widespread	
		<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	Widespread	
		<i>Gerygone fusca</i>	Western Gerygone	Widespread	
		<i>Gerygone olivacea</i>	White-throated Gerygone	Widespread	
		<i>Sericornis frontalis</i>	White-browed Scrubwren	Widespread	
		<i>Smicrornis brevirostris</i>	Weebill	Widespread	
	Artamidae	<i>Artamus cyanopterus</i>	Dusky Woodswallow	Widespread	
		<i>Artamus superciliosus</i>	White-browed Woodswallow	Widespread	
		<i>Cracticus nigrogularis</i>	Pied Butcherbird	Widespread	
		<i>Cracticus tibicen</i>	Australian Magpie	Widespread	
		<i>Cracticus torquatus</i>	Grey Butcherbird	Widespread	
		<i>Strepera graculina</i>	Pied Currawong	Widespread	
		<i>Strepera versicolor</i>	Grey Currawong	Widespread	
	Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-Shrike	Widespread	
	Climacteridae	<i>Climacteris erythrops</i>	Red-browed Treecreeper	Widespread	
		<i>Cormobates leucophaea</i>	White-throated Treecreeper	Widespread	
	Corcoracidae	<i>Corcorax melanorhamphos</i>	White-winged Chough	Widespread	
	Corvidae	<i>Corvus coronoides coronoides</i>	Australian Raven	Widespread	
		<i>Corvus mellori</i>	Little Raven	Widespread	

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Dicaeidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird	Widespread
Dicruridae	<i>Grallina cyanoleuca</i>	Magpie-lark	Widespread
	<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Widespread
	<i>Myiagra inquieta</i>	Restless Flycatcher	Widespread
	<i>Myiagra rubecula</i>	Leaden Flycatcher	Widespread
	<i>Rhipidura albiscapa alisteri</i>	Grey Fantail	Widespread
	<i>Rhipidura leucophrys</i>	Willie Wagtail	Widespread
	<i>Rhipidura rufifrons</i>	Rufous Fantail	Widespread
Estrildidae	<i>Neochmia temporalis</i>	Red-browed Finch	Widespread
Hirundinidae	<i>Petrochelidon nigricans</i>	Tree Martin	Widespread
Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren	Widespread
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	Widespread
	<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	Widespread
	<i>Anthochaera carunculata</i>	Red Wattlebird	Widespread
	<i>Caligavis chrysops</i>	Yellow-faced Honeyeater	Widespread
	<i>Certhionyx variegatus</i>	Pied Honeyeater	Widespread
	<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	Widespread
	<i>Manorina melanocephala</i>	Noisy Miner	Widespread
	<i>Melithreptus lunatus</i>	White-naped Honeyeater	Widespread
	<i>Nesoptilotis leucotis</i>	White-eared Honeyeater	Widespread
	<i>Philemon citreogularis</i>	Little Friarbird	Widespread
	<i>Philemon corniculatus</i>	Noisy Friarbird	Widespread
	<i>Ptilotula penicillata</i>	White-plumed Honeyeater	Widespread
Motacillidae	<i>Anthus novaeseelandiae</i>	Australian Pipit	Widespread
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	Widespread
Oriolidae	<i>Oriolus sagittatus</i>	Olive-Backed Oriole	Widespread
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-Thrush	Widespread
	<i>Falcunculus frontatus frontatus</i>	Eastern Shrike-tit	Widespread
	<i>Pachycephala pectoralis</i>	Golden Whistler	Widespread
	<i>Pachycephala rufiventris</i>	Rufous Whistler	Widespread

	Pardalotinae	<i>Pardalotus punctatus</i>	Spotted Pardalote	Widespread	
		<i>Pardalotus striatus</i>	Striated Pardalote	Widespread	
	Petroicidae	<i>Eopsaltria australis</i>	Eastern Yellow Robin	Widespread	
		<i>Petroica boodang</i>	Scarlet Robin	Widespread	
		<i>Petroica goodenovii</i>	Red-capped Robin	Widespread	
		<i>Petroica phoenicea</i>	Flame Robin	Widespread	
		<i>Petroica rosea</i>	Rose Robin	Widespread	
	Sturnidae	* <i>Sturnus vulgaris</i>	Common Starling	Widespread	
	Turdidae	* <i>Turdus merula</i>	Common Blackbird	Widespread	
	Zosteropidae	<i>Zosterops lateralis</i>	Silvereye	Widespread	
Psittaciformes	Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	Widespread	
		<i>Calyptrorhynchus funereus</i>	Yellow-tailed Black-cockatoo	Widespread	
		<i>Eolophus roseicapillus</i>	Galah	Widespread	
	Psittacidae	<i>Alisterus scapularis</i>	Australian King-Parrot	Widespread	
		<i>Glossopsitta concinna</i>	Musk Lorikeet	Widespread	
		<i>Neophema pulchella</i>	Turquoise Parrot	Widespread	
		<i>Platycercus elegans</i>	Crimson Rosella	Widespread	
		<i>Platycercus eximius</i>	Eastern Rosella	Widespread	
Strigiformes	Strigidae	<i>Ninox novaeseelandiae</i>	Southern Boobook, Morepork	Widespread	
		<i>Ninox (Rhabdoglaux) strenua</i>	Powerful Owl	Widespread	
MAMMALIA					
Artiodactyla	Bovidae	* <i>Capra hircus</i>	Goat	Widespread	
	Cervidae	* <i>Cervus elaphus</i>	Red Deer	Widespread	
	Suidae	* <i>Sus scrofa</i>	Pig	Widespread	
Carnivora	Canidae	* <i>Canis lupus familiaris</i>	Dog	Widespread	
		* <i>Vulpes vulpes</i>	Red Fox	Widespread	
Chiroptera	Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Widespread	
	Miniopteridae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-wing Bat	Widespread	Westernmost [outliers Balranald & Narabri]

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	Molossidae	<i>Austronomus australis</i>	White-striped Freetail-bat	Widespread	
		<i>Mormopterus (Ozimops) planiceps</i>	Little Mastiff-bat	Widespread	
		<i>Mormopterus (Ozimops) ridei</i>	Ride's Free-tailed Bat	Widespread	
	Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	Widespread	
		<i>Chalinolobus morio</i>	Chocolate Wattled Bat	Widespread	
		<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Widespread	
		<i>Nyctophilus geoffroyi geoffroyi</i>	Lesser Long-eared Bat	Widespread	
		<i>Scotorepens orion</i>	Eastern Broad-nosed Bat	Widespread	
		<i>Vespadelus darlingtoni</i>	Large Forest Bat	Widespread	
		<i>Vespadelus regulus</i>	Southern Forest Bat	Widespread	
		<i>Vespadelus vulturnus</i>	Little Forest Bat	Widespread	
Dasyuromorphia	Dasyuridae	<i>Antechinus agilis</i>	Agile Antechinus	Widespread	Northernmost
		<i>Antechinus stuartii</i>	Brown Antechinus	Widespread	Westernmost
	Acrobatidae	<i>Acrobates pygmaeus</i>	Feathertail Glider	Widespread	
	Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	Widespread	
		<i>Macropus rufogriseus</i>	Red-necked Wallaby	Widespread	
		<i>Osphranter robustus robustus</i>	Wallaroo	Widespread	
		<i>Wallabia bicolor</i>	Swamp Wallaby	Widespread	
	Petauridae	<i>Petaurus australis</i>	Yellow-bellied Glider	Widespread	Westernmost
		<i>Petaurus breviceps breviceps</i>	Sugar Glider	Widespread	
	Phalangeridae	<i>Trichosurus vulpecula</i>	Australian Brushtail Possum	Widespread	
	Pseudocheiridae	<i>Petauroides volans</i>	Greater Glider	Widespread	Westernmost
		<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum	Widespread	
	Vombatidae	<i>Vombatus ursinus</i>	Bare-nosed Wombat	Widespread	
Lagomorpha	Leporidae	<i>*Oryctolagus cuniculus</i>	Rabbit	Widespread	
Monotremata	Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	Widespread	
Perissodactyla	Equidae	<i>*Equus caballus</i>	Horse	Widespread	

Rodentia	Muridae	<i>*Mus musculus</i>	House Mouse	Widespread	
		<i>Rattus fuscipes</i>	Southern Bush Rat	Widespread	
		<i>*Rattus rattus</i>	Ship Rat	Widespread	
REPTILIA					
Squamata	Agamidae	<i>Amphibolurus muricatus</i>	Jacky Lizard	Widespread	
		<i>Rankinia diemensis</i>	Mountain Dragon	Widespread	Westernmost
	Elapidae	<i>Austrelaps ramsayi</i>	Highland Copperhead	Widespread	Westernmost
	Scincidae	<i>Acritoscincus platynotus</i>	Red-throated Skink	Widespread	
		<i>Ctenotus robustus</i>	Robust Ctenotus	Widespread	
		<i>Ctenotus taeniolatus</i>	Copper-tailed Skink	Widespread	
		<i>Egernia cunninghami</i>	Cunningham's Skink	Widespread	
		<i>Egernia striolata</i>	Tree Skink	Widespread	
		<i>Eulamprus heatwolei</i>	Yellow-bellied Water Skink	Widespread	Westernmost
		<i>Eulamprus quoyii</i>	Eastern Water-skink	Widespread	
		<i>Hemiergis decresiensis</i>	Three-toed Earless Skink	Widespread	
		<i>Lampropholis delicata</i>	Dark-flecked Garden Skink	Widespread	
		<i>Lampropholis guichenoti</i>	Pale-flecked Garden Sunskink	Widespread	
		<i>Liopholis whitii</i>	White's Skink	Widespread	
		<i>Menetia greyii</i>	Common Dwarf Skink	Widespread	
		<i>Pseudemoia entrecasteauxii</i>	Tussock Cool-skink	Widespread	Westernmost
		<i>Saproscincus mustelinus</i>	Weasel Skink	Widespread	Westernmost
		<i>Tiliqua rugosa</i>	Shingle-back	Widespread	
		<i>Tiliqua scincoides</i>	Eastern Blue-tongue	Widespread	
	Varanidae	<i>Varanus gouldii</i>	Gould's Goanna	Widespread	

