

Assessment of the Distribution, Health and Ecology of Snow Gum populations in the Macedon Ranges Shire

Prepared for Macedon Ranges Shire Council

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All photographs by Karl Just except where otherwise credited.

Field Survey software design, data storage and analysis, vegetation community modelling by Biodiversity Services and Karl Just.

Cover photo: Snow Gum (*Eucalyptus pauciflora ssp. pauciflora*) on private land near the Campaspe River, photo by Helen Scott (Newham & District Landcare Group)

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Introduction

Project context

In spring 2022, the authors were engaged by Macedon Ranges Shire Council to assess the distribution and health of Snow Gum (*Eucalyptus pauciflora* ssp. *pauciflora*) populations across the Macedon Ranges Shire. Snow Gum is scattered and rare in central and western areas of Victoria.

This project aimed to collect spatial, quantitative and qualitative data to better inform programs for the ongoing protection and management of the species across the region. The project also had a strong focus on community education with the aim of raising awareness of the significance of regional Snow Gum populations.

This report presents an overview of lowland Snow Gum ecology and details the methods and results of the project. It provides recommendations for future monitoring and management of Snow Gum populations across the region, including suggestions for how local landowners can protect and enhance populations occurring on their properties.

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Snow gum – an overview

Plate 1 Snow Gum on Camel's Hump (Photo by Helen Scott)

Taxonomy and distribution

Snow Gum, also known as White Sallee (*Eucalyptus pauciflora*), is a medium-sized tree that typically grows to 15–20m tall. The trunk and branches are smooth, often with streaks of white and grey.

The juvenile leaves are ovate or broadly falcate whilst the adult leaves are glossy green, lanceolate and grow to 16 cm long and up to 3 cm wide. A distinctive feature of the leaves is that the veins run parallel to the mid-rib. The fruit are sessile (bear no stalks) and are cup-shaped.

Snow Gum is one of over 700 *Eucalyptus* species currently described for Australia. The species has a wide distribution, ranging from eastern South Australia, across central and southern Victoria, central and eastern Tasmania, eastern NSW, extending north across the New England Tablelands plateau to near the

Queensland border. Given the relatively slow rate of spread of most eucalyptus species, this very wide distribution suggests that the species is quite ancient, possibly having evolved during the series of ice ages that affected Australia over the last 2.5 million years (the Pleistocene epoch).

In Victoria, there are six separate sub-species of *Eucalyptus pauciflora*. Four of these are restricted to higher altitudes of the eastern highlands where annual snow cover is a common occurrence (*E. pauciflora* ssp. *hedraia*, *E. pauciflora* ssp. *niphophila*, *E. pauciflora* ssp. *acerina* and *E. pauciflora* ssp. *debeuzevillei*), with one sub-species being restricted to Mount William in the Grampians (*E. pauciflora* ssp. *parvifructa*). The remaining sub-species, *Eucalyptus pauciflora* ssp. *pauciflora* is the subject of this report. The high diversity of Snow Gum sub-species is not surprising considering that during warmer inter-glacial periods, once continuous Snow Gum populations are likely to become geographically isolated from each other across scattered higher ranges.



Plate 2 Snow Gum leaves and fruit (Photo by Helen Scott)

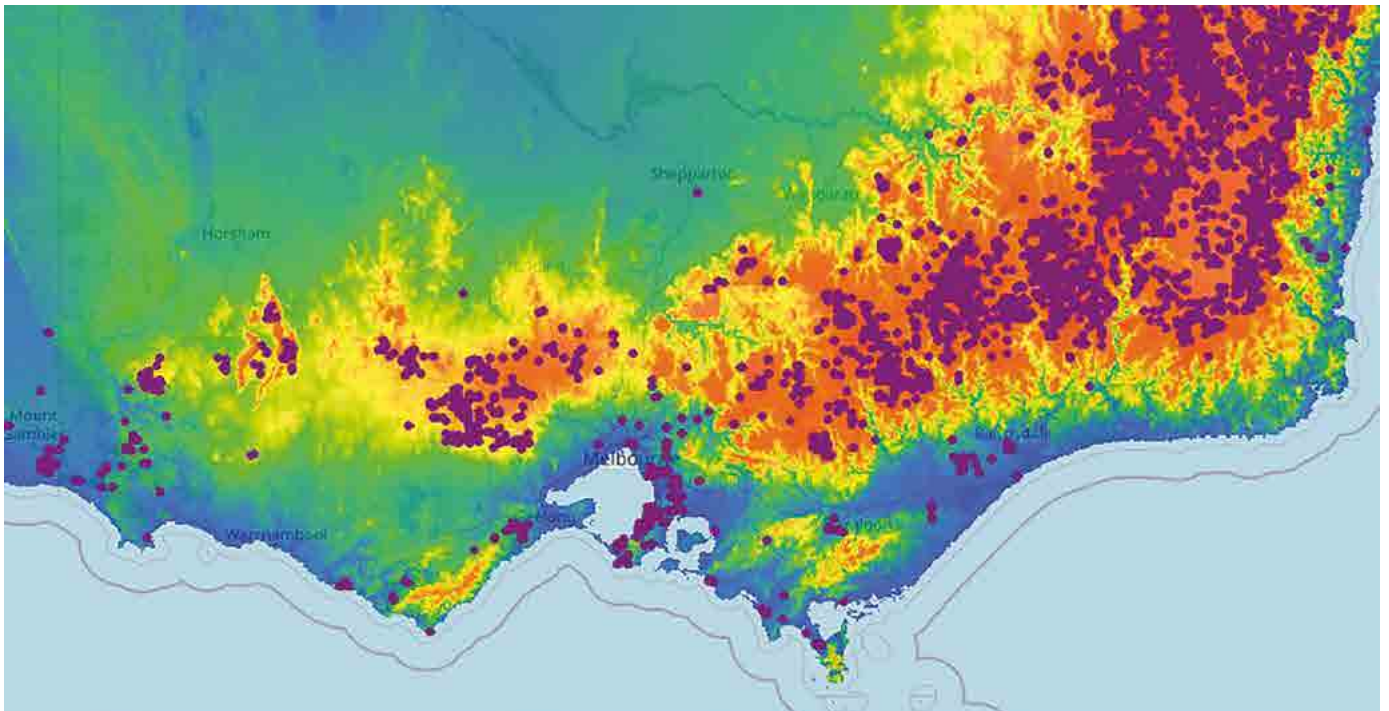


Plate 3 Elevation map for *Eucalyptus pauciflora ssp. pauciflora* (records in purple). The orange-red areas are at the highest elevation, grading into low elevation areas in blue.

Eucalyptus pauciflora ssp. pauciflora is the most widespread of the Snow Gums, with most of the Australian distribution described above being attributable to this taxon. In Victoria, *Eucalyptus pauciflora ssp. pauciflora* is found not only at higher altitudes in eastern Victoria; but is scattered across the lowlands and foothills south and north of the Great Dividing Range. This includes populations on the inland slopes north of the Divide near Beechworth, across the Gippsland Plain, in the Strathbogie, Macedon, Ballarat, Beaufort and Moriac areas, and extending across south-west Victoria. This distribution encompasses 12 separate bioregions. Most of the lowland or foothill populations are relatively small and scattered, with this distribution suggesting that they are remnants from a more continuous population that likely existing across these areas of Victoria during the last ice age (25–10,000 years ago). The lowland populations extend very close to sea level, with some populations occurring at less than 50m asl (e.g. Gippsland and south-west Victoria).

Eucalyptus pauciflora ssp. pauciflora is known to hybridise with several other closely related eucalypt species, including Broad-leaved Peppermint (*Eucalyptus dives*), Narrow-leaved Peppermint (*Eucalyptus radiata*) and Gippsland

Peppermint (*Eucalyptus croajingolensis*). These hybrids generally have intermediate characteristics between the parent species. Hybrids were recorded at a number of sites in this project.

Table 1 Victorian bioregions where *Eucalyptus pauciflora ssp. pauciflora* has been recorded outside the Alps bioregion

BIOREGION
Central Victorian Uplands
Dundas Tablelands
Gippsland Plain
Glenelg Plain
Goldfields
Greater Grampians
Highlands – Northern Fall
Highlands – Southern Fall
Northern Inland Slopes
Otway Plain
Victorian Volcanic Plain
Warrnambool Plain

Habitat

In central and western Victoria, *Eucalyptus pauciflora ssp. pauciflora* occupies a wide range of geologies and soil types. Populations are found across older and newer volcanics, colluvial and alluvial deposits and sedimentary, metamorphic and granitic formations. An analysis of the geological mapping layer for Victoria found that outside the Alps bioregion, Snow Gum has been recorded on 26 different geological units (Table 2). The soils of these geologies vary from loamy-clay to fertile loams and many populations occur on rocky sites with sparse topsoil.

Outside the Alps bioregion, *Eucalyptus pauciflora ssp. pauciflora* generally occurs in small stands, as scattered trees or rarely as the dominant species in various woodland communities. It rarely occurs in forest vegetation types as the species does not compete well with the taller eucalypts. The species prefers a temperate climate, typically growing in areas with an annual rainfall ranging between around 600–1,000mm.

Snow Gum has been recorded on 26 different geological units...

Table 2 Geological units where *Eucalyptus pauciflora ssp. pauciflora* has been recorded in central and western Victoria (number of sites in brackets)

GEOLOGICAL UNIT NAME	
Alluvial terrace deposits (Qa2): generic (9)	Incised colluvium (Nc1): generic (76)
Alluvium(Qa1): generic (60)	Newer Volcanic Group – basalt flows (Neo): generic (463)
Bacchus Marsh Formation (Pxb): generic (51)	Newer Volcanic Group – stony rises basalt (Neo2): generic (3)
Baynton Granodiorite (G284): generic (57)	Pentland Hills Volcanic Group (-Pp): generic (2)
Beauvallet Granodiorite (G285): generic (3)	Smokers Creek Volcanic Subgroup – benmoreite lava (Neab): generic (11)
Black Rock Sandstone (Nbb): generic (184)	Smokers Creek Volcanic Subgroup – basanite lava (Neaa): generic (18)
Castlemaine Group – Bendigonian (Ocb): generic (2)	Smokers Creek Volcanic Subgroup – hawaiite lava (Neah): generic (6)
Castlemaine Group – Castlemainian (Occ): generic (5)	Smokers Creek Volcanic Subgroup – trachyte lava (Neat): generic (634)
Castlemaine Group – Darriwilian (Ocd): generic (313)	Strathbogie Granite (G217): generic (14)
Castlemaine Group – Lancefieldian (Ocl): generic (21)	Swamp and lake deposits (Qm1): generic (6)
Castlemaine Group – Yapeenian (Ocy): generic (23)	White Hills Gravel (-Pxb): generic (16)
Colluvium (Qc1): generic (5)	Willimigongong Ignimbrite (Dmw): generic (191)
Duricrust (Czf): generic (35)	
Granite-derived colluvium (Qc4): generic (15)	

Source: Victoria – Seamless Geology 2014 (GeoScience Victoria),

Faunal habitat values

In common with many Victorian gum-barked eucalypts, *Eucalyptus pauciflora ssp. pauciflora* typically forms extensive hollows with age (e.g. 100 years +). These include on the main branches as well as within the trunk itself, which may form large cavities. These features provide valuable nesting habitat and shelter for various mammals and birds, many which are dependent on hollows for their survival. Trees typically flower from spring to late summer, producing large quantities of nectar and pollen-rich flowers that provide food for birds, insects and mammals.

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Threats

Eucalyptus pauciflora ssp. pauciflora is subject to a range of threatening processes.

Since European settlement, the grassy woodland habitats that *Eucalyptus pauciflora ssp. pauciflora* generally occupies in the lowlands have been heavily targeted for stock grazing and other agricultural practices, leading to clearance of many trees and general degradation and fragmentation of habitat. Many populations have often been fragmented into small isolated stands with limited genetic inter-change, leading to the risk of in-breeding depression. Remnant trees are often found in paddocks regularly grazed by stock, particularly sheep, suppressing recruitment of young trees. This eventually leads to even-aged stands dominated by old trees which may eventually senesce before a new generation of trees can be established. Isolated paddock trees are also more susceptible to insect attack (Gibbons & Boak 2002).

Young Snow Gum trees and surrounding habitat can be impacted by a range of introduced herbivores, including rabbits, hares, deer and goats. Weed invasion, particularly of larger woody weeds, can degrade Snow Gum habitat, reduce tree health and prevent recruitment.

Many stands of Snow Gum are found on roadsides which may be at risk from damage by cars, machinery and roadworks. These trees may also be targeted for illegal firewood collection.

Climatic change due to global warming is predicted to cause a reduction in rainfall, warmer temperatures and more extreme weather events (DELWP 2019). Considering that *Eucalyptus pauciflora ssp. pauciflora* does not extend into areas below 600mm annual rainfall, the general decrease in the average annual rainfall that is predicted for much of Victoria is likely to have a severe impact on populations near the taxon's climatic edge of range. More extreme weather events, including extended heatwaves and severe wind storms, are also likely to impact populations.

Methodology

Background review

Prior to conducting the field survey for Snow Gum populations across the Macedon Ranges Shire, the following information was reviewed:

- Victorian Biodiversity Atlas (VBA) and Remnant Vegetation Rapid Site Assessment (RVRSA) database.¹
- GIS layers, including: predictive EVC mapping, contours and streams.
- Spreadsheet of Snow Gum locations, provided by MRSC
- Photos and locations of Snow Gum trees, provided by Helen Scott (Newham & District Landcare Group)
- Relevant ecological reports, including:
 - Endangered Vegetation Regeneration through Promotion and Protection – Ballarat’s Snow Gums (Baker 1996)
 - Health and distribution of the Snow Gum *Eucalyptus pauciflora ssp. pauciflora* in the Ballarat region of Victoria (Monie & Turner 2008)
 - Flora Assessments of High Value Roadside Reserves in Newham, Victoria (Just 2015)

The literature review was an important first stage of the project, as it allowed the preparation of a GIS layer containing all of the known locations of Snow Gum within the Shire, taken from the VBA, RVRSA and anecdotal sources. The health and fruiting assessment adopted for this project was also selected following a review of the available literature.

Field survey

The field survey was completed across five days in October and November 2021. The survey included visiting all known Snow Gum sites within the Shire, with time also spent searching for new populations, many of which were discovered while driving between known sites. Every tree of each population was individually assessed, with the exception of the very large stands of Snow Gum on Camel’s Hump and near the summit of Mount Macedon. Due to time constraints, only a representative sample of these sub-populations were assessed (around 10–20%).

All assessments were conducted with handheld Intermec PDA devices, using VisualCE[®] software. The PDA units contain a GPS with an accuracy of less than 5m. Tailored data entry forms were created in VisualCE[®] to enable rapid collection of data using drop-down menus. A Panasonic DMC TZ40 GPS camera was used.

Each tree assessed was spatially recorded using the PDA unit. The tree was then allocated to one of ten size classes according to diameter at breast height (dbh): 0–10cm, 10–20cm, 20–30cm, 40–50cm, 50–60cm, 60–70cm, 70–80cm, 80–90cm, 90–100cm or 100+cm.

¹ The RVRSA database contains all the data from the previous studies in digital form (Baker 1996, Monie & Turner 2008) as one of the authors (TD) was involved in the fieldwork for both studies and subsequent monitoring of sites.

The tree assessment followed the methodology developed by Baker (1996) and later adopted by Monie & Turner (2008). This included a health assessment across a 5-point scale:

- very good health (<25% of crown dead)
- good health (25–50% of crown dead)
- poor health (50–75% of crown dead)
- very poor health (only epicormic growth on trunk or branches) or tree dead (completely dead with no chance of regrowth).

The fruit crop was categorised as ‘light’ (fruit or buds sporadic over tree, not easy to find), ‘moderate’ (fruit or buds distinct and common on tree, easy to find) or ‘heavy’ (fruit or buds distinct throughout crown, most possible sites are occupied). Notes were also taken on the presence of mistletoe, hollows and other incidental features. Geo-referenced photos of trees and general habitat were taken at the majority of sites.

Associated flora species were recorded at most sites by collection of geo-referenced data within a 50m radius of Snow Gum trees.

Modelling

Following the field survey, all Snow Gum records were compared against a vegetation model designed by one of the authors (TD). This model uses a combination of geological, floristic, digital elevation model and rainfall data to map all of the vegetation of Victoria into units that are at a much finer scale than the Ecological Vegetation Class (EVC) units currently utilised by the Department of Environment, Land, Water and Planning (DELWP). These fine-scale units have been named Floristic Map Units (FMUs).

By comparing the Snow Gum records against the model, a list of FMUs that Snow Gum were recorded within was compiled, including the number of records within each FMU. This layer greatly aided in mapping potential areas across the Shire where further records of Snow Gum may occur.

As the Lowland Snow Gum occurs on a wide range of geologies it follows that they are found on a range of Floristic Map Units within the Shire.

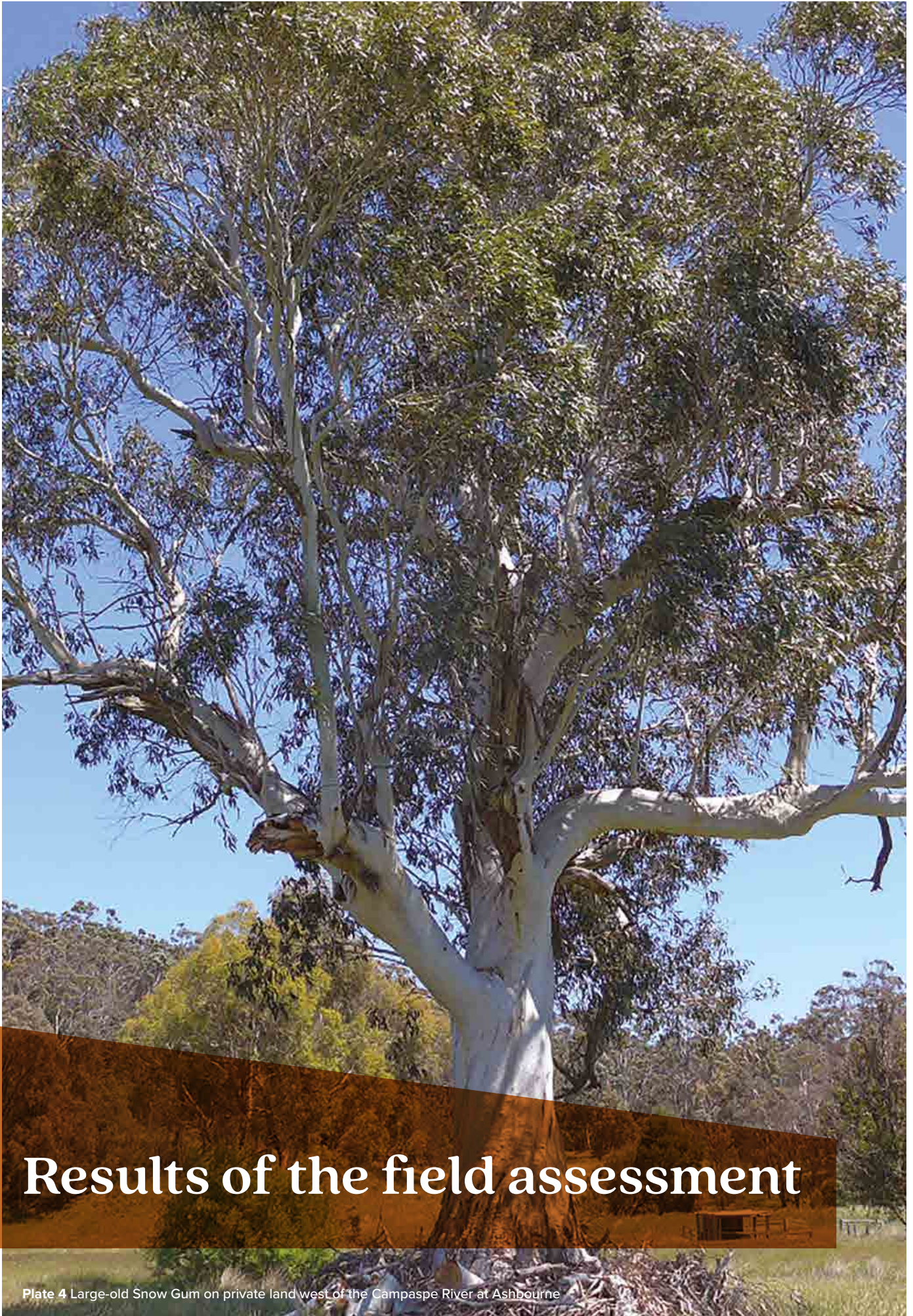
Community records

Following the October–November 2021 field survey, an information brochure was released via the MRSC website and social media, calling for landowners to report any known locations of Snow Gum across the Shire. The records that were later provided by the community were added to the overall dataset, however these were not included in the analysis for this report as this had been conducted earlier in the year. Considering that the community records represented less than 3% of the overall dataset, this did not affect the results of the analysis.

Taxonomy

Plant taxonomy presented in this report follows the Victorian Biodiversity Atlas (VBA), with consideration of the VicFlora website (Royal Botanic Gardens 2021).

Throughout this report, an asterisk (*) denotes an exotic taxon while a hash (#) denotes a non-indigenous native taxon.



Results of the field assessment

Plate 4 Large-old Snow Gum on private land west of the Campaspe River at Ashbourne

Snow Gum records

During the spring survey period, a total of 2,277 individual trees of *Eucalyptus pauciflora* ssp. *pauciflora* were recorded and assessed (see Figure 1 and Table 3). These trees were distributed over an area of approximately 900km², spanning from Riddells Creek in the south, Baynton-Sidonia in the north, Lancefield to the east and Tylden in the west. This area encompasses much of the Macedon Ranges Shire, with the exception of large portions to the south of Gisborne and to the south-east of Romsey, where no trees were recorded.

Following the release of the information brochure to the general community, records of approximately 50 additional Snow Gum trees were obtained. These were added to the database and are discussed below but were not subject to detailed analysis as this was carried out earlier in the year. This project has been structured to encourage landowners to contribute records for Snow Gum over time. It is hoped that further records will be contributed and as such this is a dynamic dataset.

The Snow Gum sites recorded over the spring period have been divided into five sub-areas, the results for which are discussed individually below.

This project has been structured to encourage landowners to contribute records for Snow Gum over time. It is hoped that further records will be contributed and as such this is a dynamic dataset.

Newham and surrounds

This area represented the largest cluster of records within the Shire, including small to large populations across 11 roadsides, as well as populations on private land and at Hanging Rock Reserve. A total of 1,401 trees were recorded across this sub-area, representing nearly half of all records collected during the project. These trees were all found within 490–710 metres elevation. The roadsides where Snow Gum were recorded included Hennerbergs Road, Three Chain Road, Saunders Road, Bolgers Lane, Rochford Road, Colwells Road, Sheltons Road, Fincher Lane, Whitebridge Road, Croziers Lane and Baynton Road. The largest population documented in the Newham area was distributed across five hectares at Hennerbergs Road, Saunders Road and Finchers Lane, where 697 trees were recorded. We believe this to be one of the largest populations of Snow Gum in the lowland areas of Victoria (i.e. below 800m elevation).

Macedon Regional Park

Two sub-populations of Snow Gum were recorded within the Macedon Regional Park, including near the summit (215 trees) and around Camels Hump (107 trees). Due to time constraints, only a representative sample of trees in these areas were assessed and both areas support many more trees. The Mount Macedon populations of Snow Gum are the highest within the Shire, occurring between 900–1000m elevation. They are likely among the largest stands of Snow Gum outside of eastern Victoria.

Gisborne-Riddells Creek

Seven trees were recorded in this sub-area, including five old trees on the Hamilton Road at Gisborne and two trees on the railway line at Riddells Creek. Both sites are located at 450m elevation. Trees have also previously been recorded on private land to the west of Govans Lane but these trees were not observed during the survey.

Baynton-Sidonia

A total of 70 trees were recorded in this sub-area, all along the Kyneton-Baynton Road. This included some very large trees with multiple hollows. These trees are located between 450 and 500m in elevation.

Tylden-Ashbourne

A total of 297 trees were recorded in this sub-area, however 126 of these trees were located just outside the municipality within the Hepburn Shire (Evans Road and Kyneton-Trentham Road). Trees were recorded across five roadsides, with scattered trees also recorded on several private properties and within Marsh Reserve. The roadsides where Snow Gum were recorded included Tylden-Woodend Road, Chanters Lane, Ashbourne Road, Einsporns Road, Springhill Road, Evans Road and Kyneton-Trentham Road. These populations are located between 540–620m elevation.

Scattered Snow Gums are known to continue along the Kyneton-Trentham Road to the Trentham Township. The Tylden-Ashbourne remnants may represent the tip of a previously much large cluster extending westward.

Additional community records

The additional records supplied by the local community included:

- several small to large stands on private land at Newham and Kyneton, including some very old and large trees
- scattered large trees adjacent to the Campaspe River at Woodend
- an outlying record on private land north-east of Romsey.

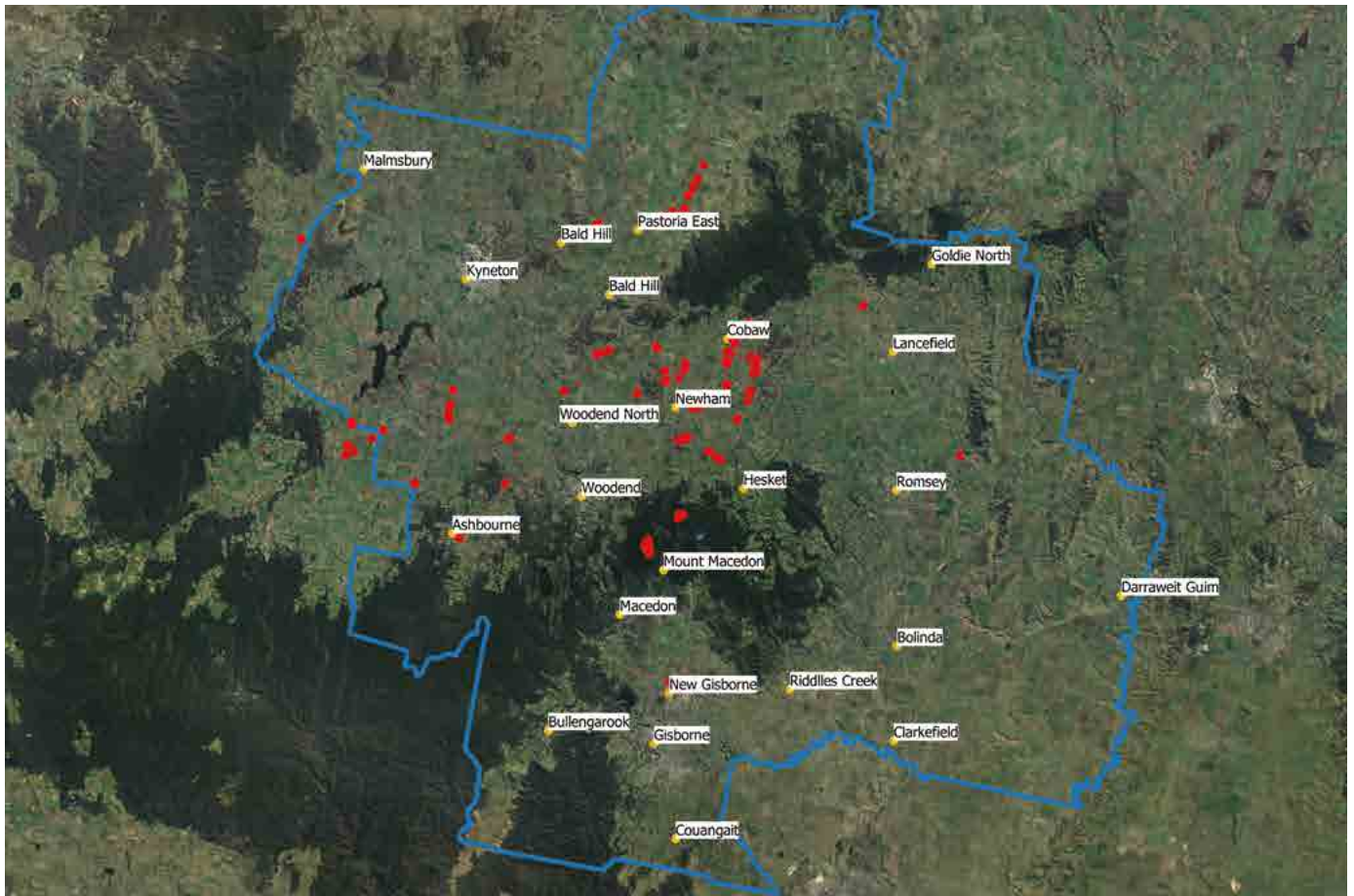


Figure 1 Snow Gum recorded in the Macedon Ranges Shire during the 2021 assessment

Table 3 Snow Gum in Central and Western Victoria by Locality (as recorded in the RVRSA database, current and past studies and incidental records. Almost all records for Macedon Ranges Shire and the Tylden locality were recorded during the 2021 assessment)

LOCALITY	NUMBER OF RECORDS	LOCALITY	NUMBER OF RECORDS
ARARAT (LGA)		SMYTHES CREEK	5
BUANGOR	1	ROSS CREEK	3
BALLARAT (LGA)		BERRINGA	2
CARDIGAN	6	HADDON	1
SCOTSBURN	5	NEWTOWN (BALLARAT)	1
LUCAS	3	HEPBURN (LGA)	
MINERS REST	2	TYLDEN	116
BROWN HILL	1	NEWLYN	36
GLENDONALD	1	CRESWICK	22
SEBASTOPOL	1	DEAN	8
CORANGAMITE (LGA)		KINGSTON	3
SOUTH PURRUMBETE	1	SPRINGMOUNT	3
KOALLAH	1	SMEATON	2
GOLDEN PLAINS (LGA)		DRUMMOND	2
GRENVILLE	98	ALLENDALE	2
DEREEL	83	EGANSTOWN	1
MEREDITH	50	DAYLESFORD	1
DURDIDWARRAH	36	BLAMPIED	1
STEIGLITZ	11	CRESWICK NORTH	1
MOUNT MERCER	10	TRENTHAM EAST	1
GARIBALDI	9	GLENLYON	1
NAPOLEONS	7	COOMOORA	1
CAMBRIAN HILL	6		

LOCALITY	NUMBER OF RECORDS
MACEDON RANGES (LGA)	
NEWHAM	539
COBAW	398
MOUNT MACEDON	294
TYLDEN	110
PASTORIA	56
WOODEND	43
ASHBOURNE	42
HESKET	19
KYNETON	13
NEW GISBORNE	11
LANCEFIELD	9
CARLSRUHE	5
PIPERS CREEK	3
CADELLO	3
FERN HILL	2
PASTORIA EAST	2
KYNETON SOUTH	1
MOORABOOL (LGA)	
ELAINE	29
GRENVILLE	20
BUNDING	10
GORDON	9
FISKVILLE	8
MORRISONS	6
BOLWARRAH	5
YENDON	3
BALLAN	2

LOCALITY	NUMBER OF RECORDS
BUNGAREE	1
COLBROOK	1
BUNINYONG	1
BEREMBOKE	1
SPRINGBANK	1
MOUNT ALEXANDER (LGA)	
SUTTON GRANGE	1
PYRENEES (LGA)	
SNAKE VALLEY	20
CHUTE	2
RAGLAN	1
WATERLOO	1
SOUTHERN GRAMPIANS (LGA)	
KONONGWOOTONG	17
WANDO VALE	7
CARAPOOK	5
MOORALLA	5
TARRENLEA	2
NAREEN	1
MIRANATWA	1
COLERAINE	1
COOJAR	1
STRATHBOGIE (LGA)	
STRATHBOGIE	7
CREEK JUNCTION	4
RUFFY	2
KITHBROOK	1

Floristic Mapping Units

Snow Gum were recorded within 28 FMUs, however 72% of the records were found in just five FMUs. The top twelve FMUs contain 95% of the Snow Gum species records. These are presented below in Table 4.

Table 4 Floristic Mapping Units (FMUs) where Snow Gum were recorded within Macedon Ranges Shire

FMU	FMU PROVISIONAL DESCRIPTIONS	TOTAL RECORDS	FMU	FMU PROVISIONAL DESCRIPTIONS	TOTAL RECORDS
707	Smokers Creek Trachyte Lava Foothill Plains Forest – High rainfall flat to gently undulating sites in the foothills contain a mixed eucalypt open forest with a grassy understorey.	291	1,442	Basalt Plains Higher Rainfall Foothill Forest – Within the basalt plain these are the tallest eucalypt forests, found on plains or gently sloping sites with high or very high rainfall. A mix of eucalypts may be present while shrubs are uncommon. The ground layer is dominated by Common Tussock-grass and Bracken.	155
7,237	Darriwilian Foothill Plains Forest – A mixed species Eucalypt forest on high rainfall Castlemaine Group sandstone with a mixed understorey of grasses, hard-leaved monocots and healthy shrubs. Found in the Macedon Ranges.	264	1,334	Smokers Creek Trachyte Lava Montane Damp Forest – The highest rocky outcrops in the Smokers Creek trachyte lava contain a Manna Gum – White Sallee open forest to woodland with mesic shrubs and ferns. Species are tolerant of snow falls.	103
712	Smokers Creek Trachyte Lava Hills Forest – Manna Gum – Candlebark – Broad-leaf Peppermint grassy forest on hills and upper slopes. Fertile volcanic soils and high rainfall. Lower slopes and flats contain similar forest, but Narrow-leaf Peppermint and Messmate replace Broad-leaved Peppermint (FMU 2444). Candlebark and White Sallee can occur throughout both. Mesic shrubs and ferns may be present, but are not prevalent (a link to the damp forests in the next rainfall category). Confined to the Macedon Ranges.	240	6,639	Incised Colluvium Foothill Plains Forest – A widespread but restricted mixed eucalypt grassy open forest or woodland across Victoria on higher rainfall, flat to gently undulating, sites and lower slopes in the foothills. Soils are formed from unconsolidated deposits washed down from higher slopes.	55
550	Willimigongong Ignimbrite Damp Forest – Foothill or montane sites with high to very high rainfall contain a mixed eucalypt forest with mesic shrubs, ferns, sedges and grasses.	156	7,135	Baynton Granodiorite Higher Rainfall Plains Forest – A mixed eucalypt forest restricted to parts of the Macedon Ranges on flat to gently undulating high rainfall sites. The ground layer is heathy.	53
			4,150	Darriwilian Foothill Plains Waterlogging Forest – A mixed Eucalypt forest on high rainfall Castlemaine Group sandstone with a grassy understorey, shrubs are rare. Found in the Macedon Ranges on lower slopes, flats and gently undulating sites. Similar to FMU 7237 but found on sites more prone to waterlogging. Contains the rare Black Gum.	44

FMU	FMU PROVISIONAL DESCRIPTIONS	TOTAL RECORDS	FMU	FMU PROVISIONAL DESCRIPTIONS	TOTAL RECORDS
26,859	Alluvial Flats Higher Rainfall Boggy Forest – A mixed grassy forest on high rainfall alluvial soil flats and gentle slopes, widespread but restricted, in Victoria. Sites are often waterlogged and may feature Black Gum, White Sallee and any of the swamp gums (including Yarra Gum, Mountain Swamp-gum and Brooker’s Gum). Notable for containing a number of rare wet-soil herbs.	43	63	Willimigongong Ignimbrite Montane Damp Forest – Various an Alpine Ash – Manna Gum – Messmate Forest grading to Snowgum Woodland on more exposed aspects on the highest peaks of Mt Macedon. Mesic shrubs and ferns abound, while the groundlayer may be grassy or sedgy. Species present are tolerant to snow falls. Exposed rock is common	35
			23,249	Smokers Creek Basanite Lava Grassy Forest – High rainfall flat to gently sloping sites in the foothills contain a Snowgum-Manna Gum forest	18

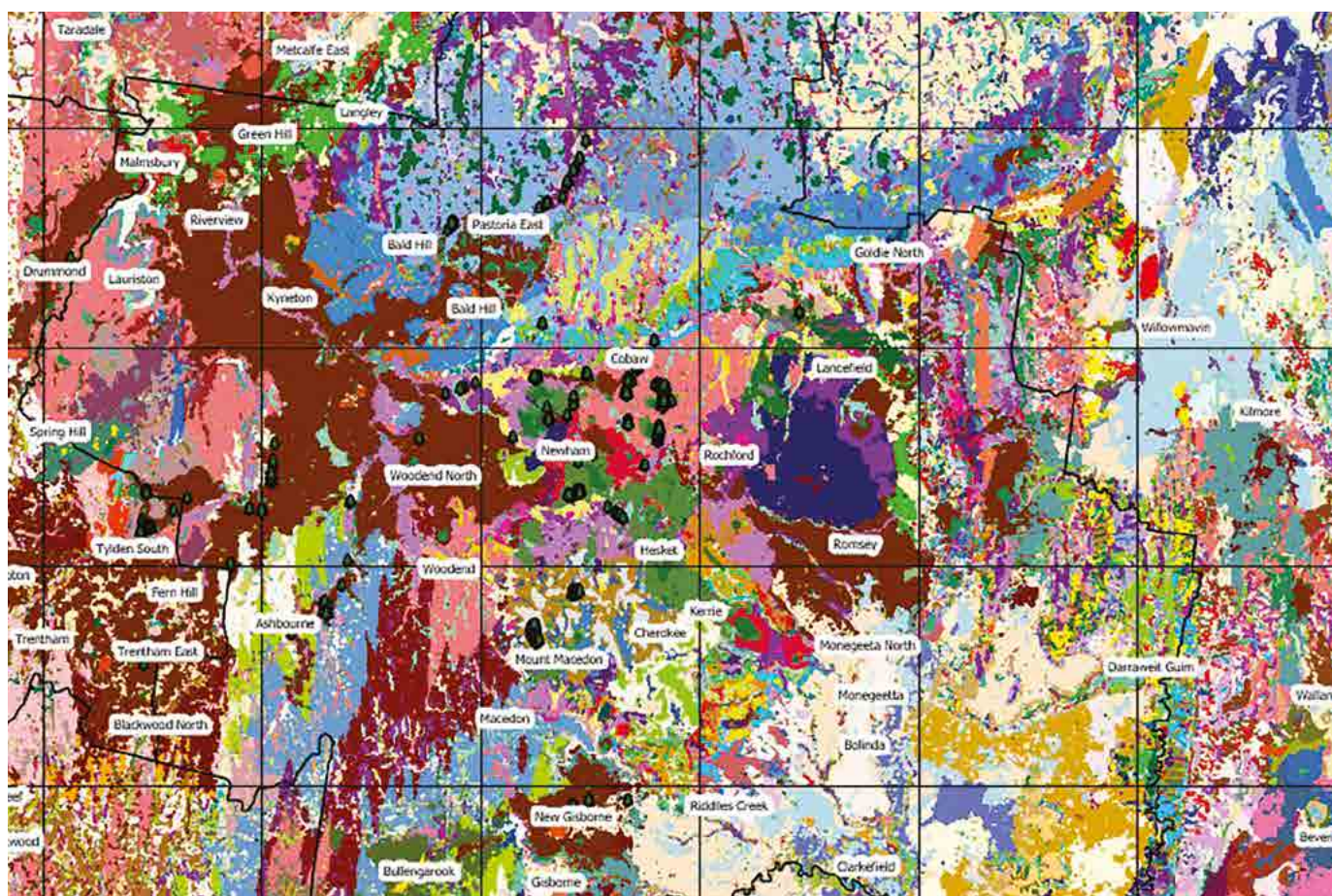


Figure 2 Preliminary map of Macedon Ranges Shire showing the pattern of FMU distribution with Snow Gum records
Source: *Vegetation of Victoria FMU Model, Biodiversity Services*

Geology and landforms

The FMUs described above are primarily divided by geological units, so the geologies that Snow Gum were recorded within are largely reflected in the discussion on FMUs. In summary, Snow Gum were found on newer and older volcanics, granite formations, sandstone and alluvial and colluvial deposits. The species was most commonly found on the Trachyte lava plains and eruption points of the newer volcanics, but was also common on the Mamelon of the older volcanics (e.g. Hanging Rock and Camels Hump) and the sandstones of the Castlemaine Group.

Across the Macedon Ranges Shire, Snow Gum were found between 450–1,000m elevation. Populations were found on all aspects, but in the more exposed lowland sites they were more commonly found on east-facing slopes and hill-tops. For example, all of the trees recorded on the Jim and along Hennerbergs Road (Newham) were on the east side of a volcanic eruption point.

Snow Gum were found on newer and older volcanics, granite formations, sandstone and alluvial and colluvial deposits.

At the higher elevation sites on Mount Macedon, many Snow Gum were recorded on the more exposed northerly and westerly aspects, as well as on the sheltered southerly and easterly aspects.

Based on field observation, Snow Gum were found a wide variety of landforms, including hill-tops, steep slopes, flat slopes and along drainage-lines, however they were most commonly found on the upper hill-slopes and only rarely near or along drainage-lines.

A more formal classification can be considered using the FMU model, which employs a Landform categorisation derived from Topographical Position Index (TPI) analysis. There are 17 classes and the Snows Gums within the Shire are shown with their respective Landform class in Table 4. Classes consider slope, altitude, curvatures and aspect.

The striking result from this analysis is the absence of Snow Gum in valleys. Sites tend to be found in open landscapes (either flat or with gentle slopes) and also on the tops of hills and ridges. Valleys in this context refers to large, medium and small V-shaped valleys and small or medium U-shaped valleys. Of the 10 valley classes, Snow Gum was only recorded in the most minor or least developed of the valley classes.

Table 5 Snow Gum recorded within Macedon Ranges Shire by Landform class

LF CLASS	LANDFORM DESCRIPTION (SLOPE IN DEGREES)	NUMBER OF RECORDS
12	Undulating plains (2–5°)	389
13	Open slopes (greater than 5°)	322
17	Large hilltops and ridges	294
11	Plains (less than 2°)	247
15	Small hilltops/ridges/flats	162
14	Medium flat top hills	84
18	Alluvial plains (VVP and Northern)	21
7	Small valleys in plain	5

Associated flora species

A total of 228 vascular plant species were recorded as associates around Snow Gum trees, including 180 that are indigenous and 48 that are introduced (see Appendix 1).

For the lowland sites (all sites excluding Mount Macedon), the most common associated eucalypt species were Candlebark (*Eucalyptus rubida*), Manna Gum (*Eucalyptus viminalis*) and Narrow-leaf Peppermint (*Eucalyptus radiata*). Swamp Gum (*Eucalyptus ovata*) and Messmate (*Eucalyptus obliqua*) were frequently found nearby, but rarely growing in the same habitat niche as Snow Gum.

Understorey trees were common, generally comprised of Silver Wattle (*Acacia dealbata*), Blackwood (*Acacia melanoxylon*) and occasional Black Wattle (*Acacia mearnsii*) and Cherry Ballart (*Exocarpos cupressiformis*). The quality and intactness of the understorey varied, however many sites supported a diverse suite of small shrubs, grasses, geophytes and forbs. Common species included Grey Parrot-pea (*Dillwynia cinerascens*), Pink Bells (*Tetratheca ciliata*), Narrow-leaf Bitter-pea (*Daviesia leptophylla*), Grey Tussock-grass (*Poa sieberiana* var. *hirtella*), Kneed Wallaby-grass (*Rytidosperma geniculatum*), Kangaroo Grass (*Themeda triandra*), Weeping-grass (*Microlaena stipoides*), Bidgee Widgee (*Acaena novae-zelandiae*), Chocolate Lily (*Arthropodium strictum*), Bulbine Lily (*Bulbine bulbosa*) and Sun-orchid (*Thelymitra* spp.). Three listed threatened plant taxa were found in association with the lowland Snow Gum populations, including Matted Flax-lily (*Dianella amoena*), Austral Crane's-bill (*Geranium solanderi* var. *solanderi*) and Floodplain Fireweed (*Senecio campylocarpus*).

The associated flora species of the Mount Macedon sites was significantly different due to the effects of the geology and montane climate. Around the summit area, Snow Gum was typically found in monotypic stands or growing with Alpine Ash (*Eucalyptus delegatensis*), another regionally significant eucalypt species. The rocky, west facing slopes supported a rare assemblage of plant species including Grey Tussock-grass (*Poa sieberiana* var. *sieberiana*), Tall Daisy (*Brachyscome diversifolia*), Rough Bed-straw (*Galium gaudichaudii*), Austral Crane's-bill (*Pelargonium australe*), Golden Bush-pea (*Pultenaea gunnii*), Prickly Tea-tree (*Leptospermum continentale*), the regionally rare Mountain Beard-heath (*Acrothamnus hookeri*) and the Victorian threatened Purple Eye-bright (*Euphrasia collina* ssp. *trichocalycina*). The rare One-flower Nancy (*Wurmbea uniflora*) has also previously been observed at this location by one of the authors (KJ). All three of these plant species are not known from any other populations in the Macedon Ranges Shire. The more sheltered forests around the Memorial Cross supported a shrubbier understorey containing Mother Shield-fern (*Polystichum proliferum*), Fireweed Groundsel (*Senecio linearifolius*), Mountain Pepper (*Tasmannia lanceolata*), Small-leaf Pomaderris (*Pomaderris elachophylla*), Bootlace Bush (*Pimelea axiflora*), Prickly Current-bush (*Coprosma quadrifida*) and the Victorian rare Dwarf Silver Wattle (*Acacia nanodealbata*).

Around Camels Hump, Snow Gum was found in either monotypic stands or growing with Manna Gum (*Eucalyptus viminalis*). The understorey included Grey Tussock-grass (*Poa sieberiana* var. *sieberiana*), Common Trigger-plant (*Stylidium armeria*), Tasman Flax-lily (*Dianella tasmanica*), Prickly Starwort (*Stellaria pungens*), Musk Daisy-bush (*Olearia argophylla*), Moth Daisy-bush (*Olearia erubescens*), Elderberry Panax (*Polyscias sambucifolia*) and Dwarf Silver Wattle (*Acacia nano-dealbata*).



Plate 5 Snow Gum woodland with herb-rich understorey, Hennerbergs Road, Newham

Size class assessments

For the lowland sites (all sites excluding Mount Macedon), the majority of trees assessed were less than 500mm Diameter at Breast Height (DBH). Saplings less than 100mm DBH were the most common, largely due to the presence of numerous dense thickets of saplings that have recruited following previous clearance or removal of stock grazing. Of all recorded trees, 89 were of an age class commonly considered to be old-growth – above 700mm DBH. Twenty-one of these trees were over 1,000mm DBH and are likely to be well over 200 years old.

For the sites on Mount Macedon, the majority of trees assessed were between 200–400mm DBH. This age class is likely dominant as it represents the regrowth since the 1983 Ash Wednesday bushfire (Matt White pers. comm.). Of all recorded trees, only three were of an age class commonly considered to be old-growth – above 700mm DBH. The lack of larger trees is also likely due to the effects of the 1983 Ash Wednesday bushfire, which would have burnt out the larger trunks and branches at most sites.

DGH category – Lowland sites

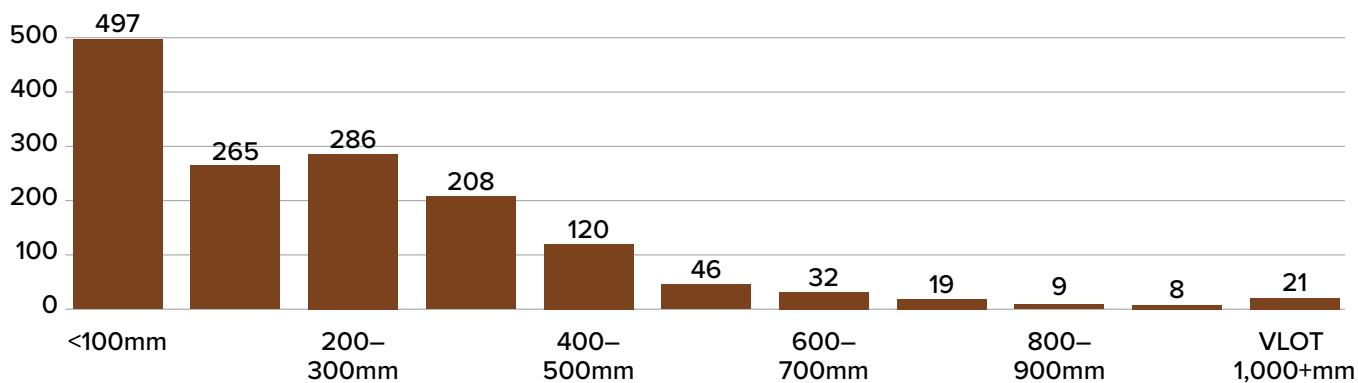


Plate 6 Snow Gum DBH assessments for lowland sites (all except Mount Macedon)

DGH category – Mt Macedon

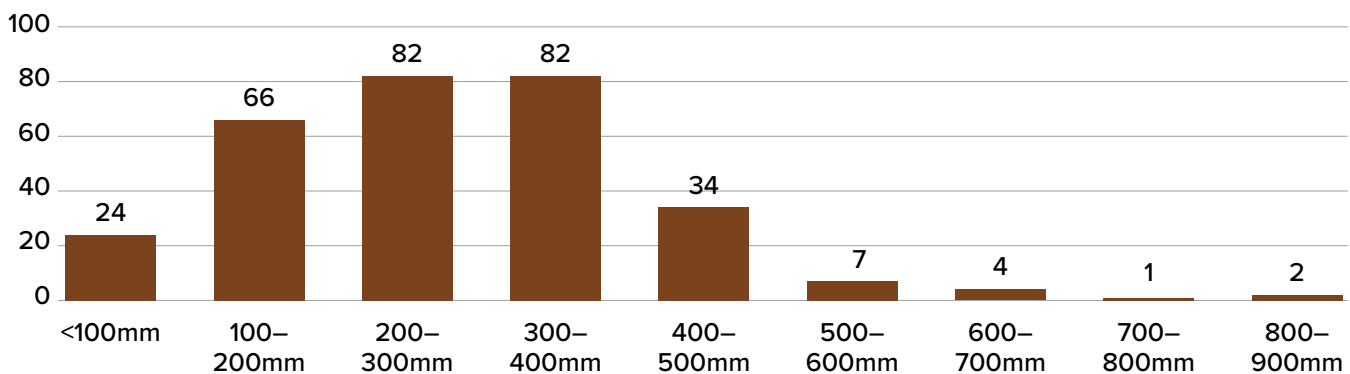


Plate 7 Snow Gum DBH assessments for Mount Macedon sites

Health assessments

For the lowland sites (all sites excluding Mount Macedon), the majority (77%) of trees were assessed as in 'good' or 'very good' health. Seven trees were assessed as 'dead', with the remainder assessed as in 'poor' or 'very poor' health.

For the Mount Macedon sites, just over 50% of the trees were assessed as in 'very good' health, with the remaining trees distributed relatively evenly across the categories of 'poor', 'very poor' or 'dead'. The higher number of dead trees were predominantly on the west facing slopes near the summit. These dead trees were likely killed by either the 1983 Ash Wednesday bushfire or drought conditions that have occurred since.

For the lowland sites... the majority (77%) of trees were assessed as in 'good' or 'very good' health.

Health category – Lowland sites

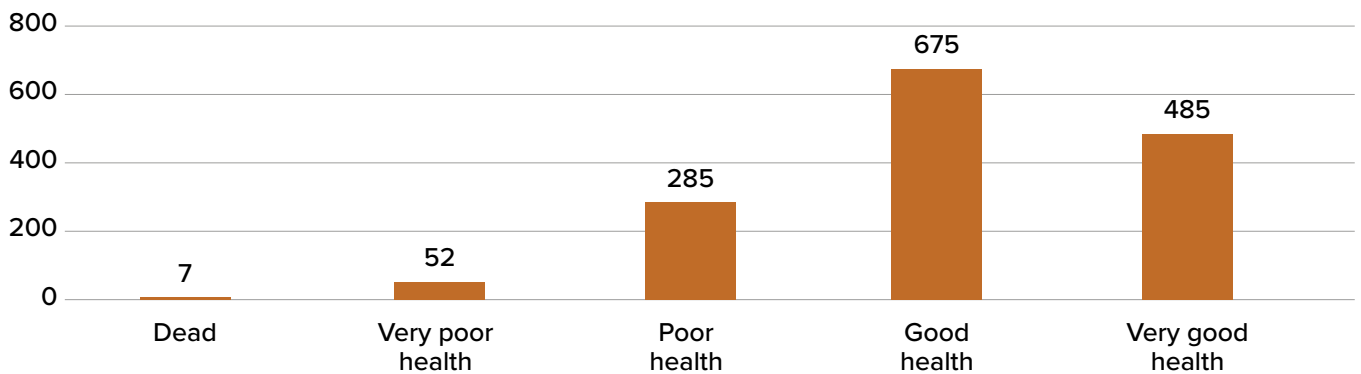


Plate 8 Snow Gum health assessments for lowland sites (all except Mount Macedon)

Health category – Mt Macedon

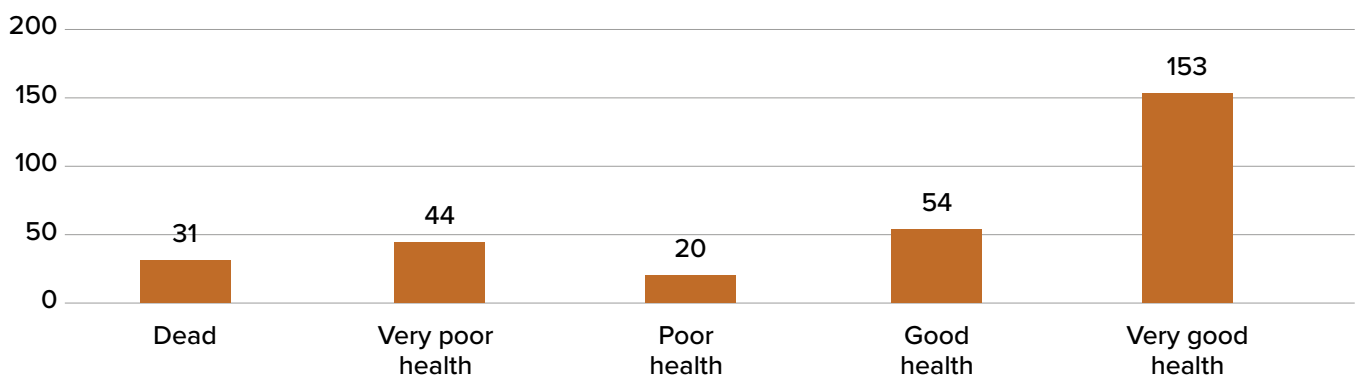


Plate 9 Snow Gum health assessments for the Mount Macedon sites

Fruiting assessment

For the lowland sites (all sites excluding Mount Macedon), the majority (60%) of trees were found to have a 'light' crop of fruit. Many (27%) trees had no fruit present, largely due to the high number of young trees that have yet to reach maturity. Trees with 'heavy' fruit crop were very uncommon.

For the Mount Macedon sites, the majority (70%) of trees were found to have a 'moderate' or 'light' crop of fruit. Similar to the lowland sites, many (29%) trees had no fruit present, largely due to the high number of young trees that have yet to reach maturity. Trees with 'heavy' fruit crop were very uncommon.

For the lowland sites... the majority (60%) of trees were found to have a 'light' crop of fruit.

Fruiting category – Lowland sites

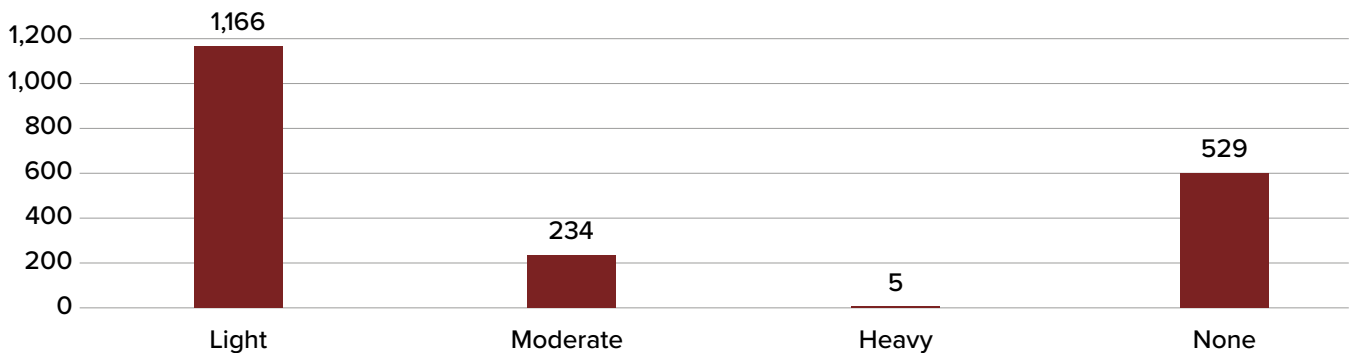


Plate 10 Snow Gum health fruit crop assessments for lowland sites (all except Mount Macedon)

Fruiting category – Mt Macedon

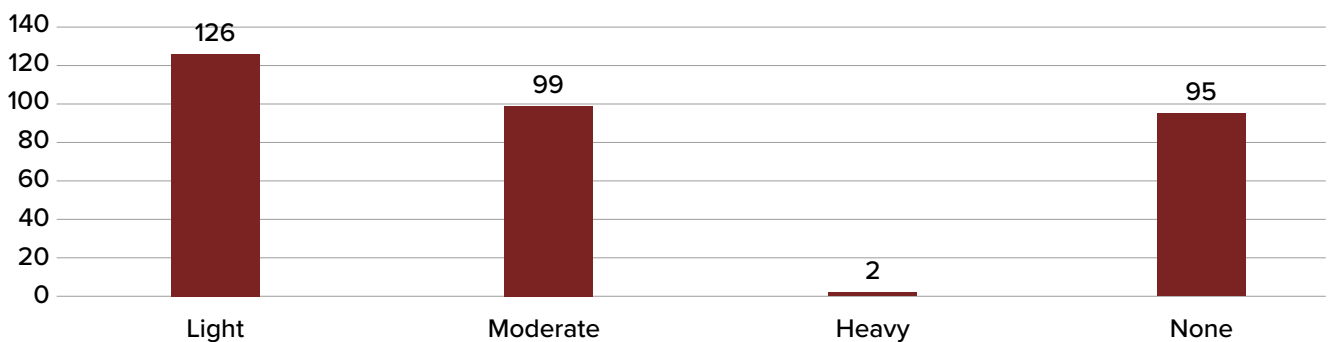


Plate 11 Snow Gum health fruit crop assessments for Mount Macedon sites



Discussion

Plate 12 This old Snow Gum at Newham has fallen over and lost much of its trunk but is growing healthily from a remaining branch.

The 2021 assessment confirmed that the Macedon Ranges Shire supports extensive populations of Snow Gum. A total of 2,277 Snow Gum trees were assessed across an area of over 900km², including numerous stands that are very large when compared to other known sites outside the Alps region.

... we consider the Macedon Ranges Shire to support the largest known concentrations of Snow Gum in central and western Victoria.

We are only aware of two other studies that have documented lowland Snow Gum distribution in similar detail, which are the studies of Baker (1996) and (Monie & Turner 2008). Both of these studies were completed in the Ballarat region, which is known to be one of the hotspots for Snow Gum in the lowland areas of Victoria. In comparison, those studies documented 1,052 Snow Gum across 53 sites. These were all found in scattered small stands less than 20 trees each, on average occupying an area of 0.06 hectares and the largest occupying 0.6 hectares. For comparison, the largest lowland stand documented in the current study was distributed across Hennerbergs Road, Saunders Road and Finchers Lane, where 697 trees were recorded across five hectares of land. Another stand along Hennerbergs Road 1km to the south consisted of 121 trees across 1.5 hectares. Additionally, although the Mount Macedon populations are not considered 'lowland' due to their occurrence at higher altitudes (e.g. above 800m), this area supports several thousand more Snow Gum trees, only a portion which were assessed for this project. Based on these results and our experience surveying other lowland Snow Gum sites, we consider the Macedon Ranges Shire to support the largest known concentrations of Snow Gum in central and western Victoria.

Significantly, Snow Gum has not been recorded in the altitude band between the Mt Macedon population approaching 1,000m a.s.l. and the lowland populations which are typically below 600m a.s.l. (Plate 9). This is possibly explained by geology, as the volcanic landforms that support open grassy vegetation communities favoured by Snow Gum are generally found below 700m a.s.l. The higher altitudes tend to be dominated by sedimentary foothills that support denser Messmate-Peppermint forests that are not suitable for Snow Gum. The exceptions are Camel's Hump and Mount Macedon, which if not comprised of rocky volcanic geologies and exposed to colder conditions, would likely be dominated by similar Messmate-Peppermint forests rather than Snow Gum woodlands.

Altitude range for species records from DEM

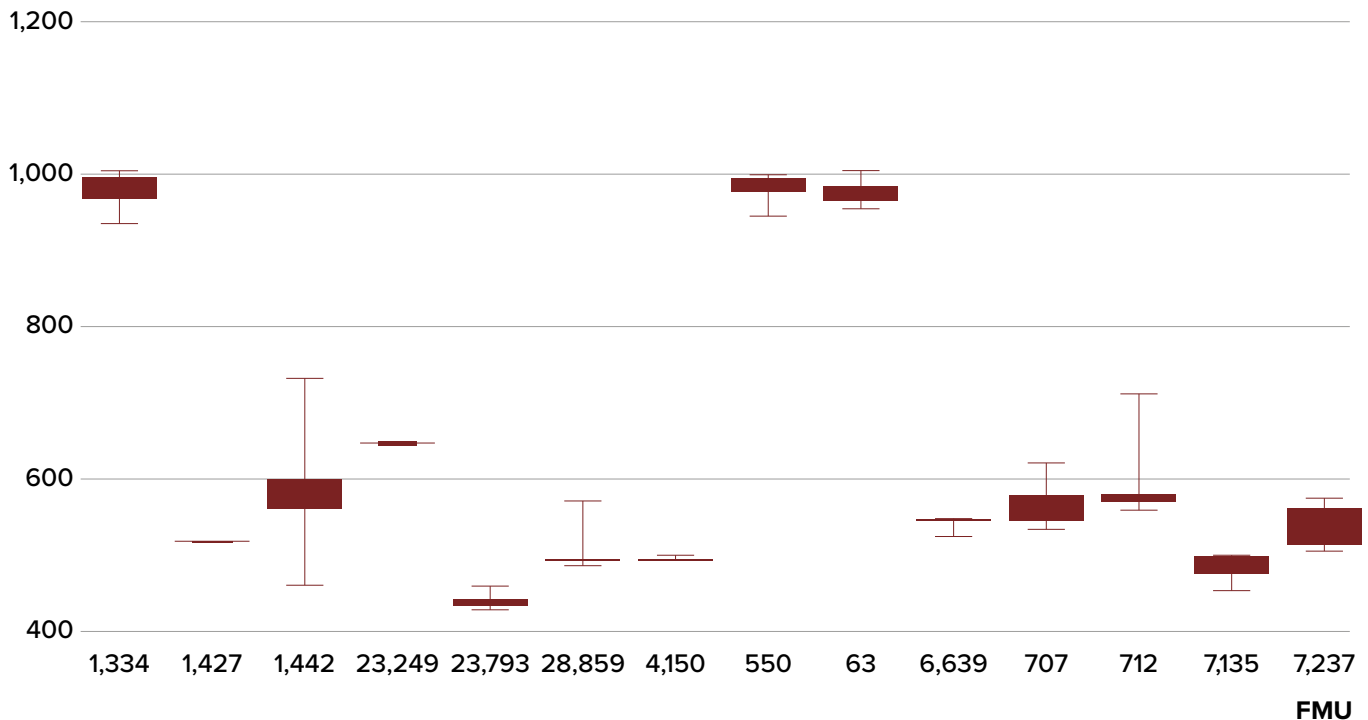


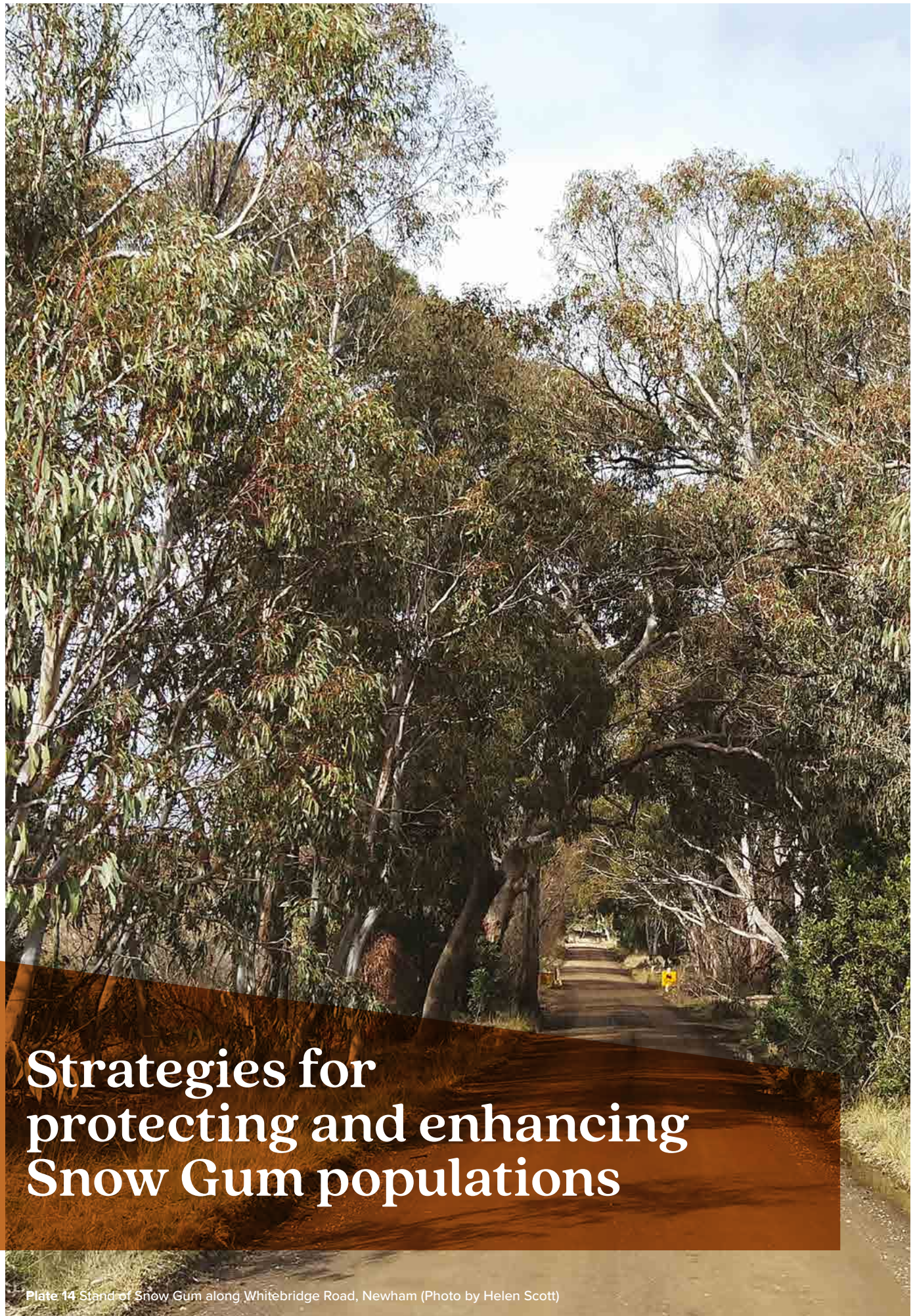
Plate 13 Snow Gum records by FMU and Altitude

The health and DBH assessments both received positive results. Overall, the Snow Gum populations were in ‘Good’ to ‘Very Good’ Health. Even trees which had experienced significant die-back in the past (and therefore assessed as ‘Poor’ or ‘Very Poor’ health) had generally recovered, with substantial fresh growth. Our observations suggest that Snow Gum is a very hardy tree, most likely the result of evolving in habitats subject to extreme conditions such as cold, snow and drought. Trees were observed during this study which had either lost numerous branches, fallen over or contained extensive hollow trunks, but which nevertheless contained healthy regrowing canopy. In contrast, we observed stands of Broad-leaf Peppermint (*Eucalyptus dives*) which appeared to have

completely died due to the effects of one unfavourable season (e.g. Sheltons Road).² Despite these encouraging signs of resilience, Snow Gum is still at threat from the effects of global climate change, which is discussed in the following chapter.

The dominance of young trees across the study area is considered a healthy demographic. Although old trees provide better habitat and food sources, a population dominated by old trees with few young trees is at serious risk of extinction. The observation of hundreds of young trees during the current assessment shows that local conditions are still suitable for recruitment, and that adequate numbers of saplings are reaching maturity.

² The cause of this die back is currently unknown, and could be due to either drought, wetter than average conditions, insect or fungal attack, or a combination of these processes. Large areas of tree die-back were observed across parts of Victoria during wet spells between 2020–2021. This could be due to the fact that during drought periods, trees put roots down to seek moisture, which are later drowned due to waterlogging following wet periods (Matt White pers. comm.).



Strategies for protecting and enhancing Snow Gum populations

Plate 14 Stand of Snow Gum along Whitebridge Road, Newham (Photo by Helen Scott)

Protection and management of regional Snow Gum sites is essential to prevent decline and increase their resilience in the face of global climate change. Below we discuss potential management strategies for landowners and government agencies.

Revegetation of previously cleared paddocks should also be considered using Snow Gum of local provenance.

What landowners can do

Many populations of Snow Gum in the Macedon Ranges Shire occur either on or adjacent to private land. In many cases these lands are utilised for stock grazing, which may be suppressing recruitment of Snow Gum. If landowners are interested in protecting Snow Gum populations, they could consider fencing isolated trees or groups of trees off from stock to encourage natural recruitment. Such a fence does not have to be extensive, it could be as small as a 20 x 20m area around a single paddock tree. During the current project it was also observed that large stands of Snow Gum occur on roadsides adjacent to treeless paddocks subject to grazing. Fencing a narrow strip adjacent to the roadside would allow these trees to seed into the area and allow recruitment, which over time would increase the overall patch size of the Snow Gum stand. In general, the larger the fenced area the better, however young trees are only likely to naturally recruit within 30–50m from a mature tree.

Revegetation of previously cleared paddocks should also be considered using Snow Gum of local provenance. Large areas of the Shire are suitable for planting Snow Gum, particularly the more fertile paddocks, however Snow Gum will not grow well in drier habitats near box and stringybark eucalypts, or on flats that become waterlogged for many months of the year. Landowners should consult their local Landcare Group or MRSC to determine if Snow Gum are suitable for their property.

Management of roadsides

The majority of the region's Snow Gum populations are confined to roadsides, further highlighting the importance of these areas for local biodiversity. Management of the roadsides is the responsibility of MRSC, who have made a firm commitment to protect and manage the environmental assets of these areas in the recently prepared Roadside Conservation Management Plan (MRSC 2021).

MRSC have also been aided by local landcare groups such as the Newham & District Landcare Group, who have long advocated for the protection and management of roadsides. There are a number of actions required for the protection of roadside Snow Gum populations:

- Control of weeds near Snow Gum trees, particularly woody weeds such as Gorse (*Ulex europaeus*) and Hawthorn (*Crataegus monogyna*).
- Preventing disturbance from cars, machinery and roadworks. This may require installing signs to alert contractors to the presence of important Snow Gum stands.
- Policing illegal firewood collection, which may target Snow Gum trees or important habitat logs around Snow Gum trees.

Special protection of large trees

Less than 25 Snow Gum trees larger than 1,000mm DBH were recorded across the Shire. These trees are of added significance due to their age, as they are likely to be well over 200 years old. These larger trees also support extensive habitat features such as hollows, spouts and fissures. Special effort should be taken to ensure these trees are protected during any roadworks, which could be aided by installing significant tree signage. These trees could also be subject to more regular monitoring, which would be an ideal activity for volunteers who may want to adopt an old tree or several old trees to keep an eye on (Snow Gum guardians).



Plate 15 Old growth Snow Gum on private land at Newham

The Mount Macedon populations

The Mount Macedon Snow Gum populations are located within the Macedon Regional Park and so have some of the greatest protection. However, these sites still require management to ensure their long-term viability. During the field survey, a group of feral goat (*Capra hircus*) were observed on the west-facing slopes to the west of the Memorial Cross and these animals appeared to be frequenting this area. All goats require control to prevent browsing of the significant understorey vegetation in this area and potentially preventing Snow Gum recruitment.

Approximately five years ago, the author (KJ) observed that Parks Victoria had cleared a number of Snow Gum to the west of the café area. Although clearance of some trees may occasionally be required for fire prevention purposes, this should only be undertaken if absolutely necessary. In general, Snow Gum have smooth bark and a light canopy and so do not pose a high fire risk unless located very close to assets.

There is ongoing pressure to conduct fuel reduction burns across the Macedon Regional Park. This should exclude all stands of Snow Gum due to their low fuel loads, absence of stringybarks (which can cause spot fires) and the high significance and sensitivity of the trees and associated understorey.

The Camels Hump is a popular rock climbing area. In general, climbers appear to be respecting the bushland in these areas and not causing damage to Snow Gum trees. However, this area should be regularly monitored and some limited areas may occasionally need to be temporarily closed off if heavy traffic of climbers is causing damage to trees or understorey.

Monitoring

The 2021 assessment established a baseline dataset from which the regional Snow Gum populations can be measured against across time. It is recommended that the same assessment and methodology is repeated every five years in order to determine the trajectory and health of populations. Alternatively, individual stands or groups of stands could be monitored periodically as funding and volunteer resources allow. As discussed above, there is also potential for citizen science programs to allow local volunteers to adopt particularly large trees or individual stands to monitor and report back to Council when any decline in health or other issues arise.

In addition to the species survey data, a large number of georeferenced photo points were prepared during the field survey component (in effect a visual snapshot of the health and size of selected Snow gums and Snow Gum woodlands at a point in time). These have been incorporated into the RVRSA database along with the records from all three studies and are available on request.

Photographs submitted by the community are an invaluable reference and insight into Snow Gum condition over time.



Conclusion

Plate 16 Old growth Snow Gum on private land at Newham (Photo by Helen Scott)

The 2021 assessment surveyed all stands of Snow Gum known to occur in the Macedon Ranges Shire. This confirmed that the Macedon Ranges Shire supports the largest number of individuals and sub-populations of Snow Gum known to occur outside of the Alps region. The assessment also found that most populations are in relatively good health and that adequate natural recruitment is occurring. Despite these generally positive findings, Snow Gum is at risk from a range of threatening processes, including predicted global climate change, and there are a range of management actions that landowners and management agencies can adopt to further protect and enhance regional populations.

...there are a range of management actions that landowners and management agencies can adopt to further protect and enhance regional populations.

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The 'Vegetation of Victoria' FMU Model and associated handbooks referred to in this report will be published for the Corangamite CMA region in June 2022. Data included in this report from the Port Phillip and Western Port and North-Central CMA regions remains provisional at this stage and was developed specifically for the Snow Gum project.

Appendix

Flora species found in association with Snow Gum within the Macedon Ranges Shire

Key to symbols

- * Introduced species
- # Non-indigenous native species
- EN** Listed as Endangered under the *EPBC Act 1999*
- FFG** Listed as threatened under the *FFG Act 1988*

STATUS	SCIENTIFIC NAME	COMMON NAME	STATUS
	<i>Acacia dealbata</i> subsp. <i>dealbata</i>	Silver Wattle	
#	<i>Acacia floribunda</i>	White Sallow-wattle	
	<i>Acacia mearnsii</i>	Black Wattle	
	<i>Acacia melanoxylon</i>	Blackwood	
	<i>Acacia nanodealbata</i>	Dwarf Silver-wattle	FFG
	<i>Acacia paradoxa</i>	Hedge Wattle	
	<i>Acacia verticillata</i> subsp. <i>verticillata</i>	Prickly Moses	
	<i>Acaena echinata</i>	Sheep's Burr	
	<i>Acaena novae-zelandiae</i>	Bidgee-widgee	
	<i>Acaena</i> spp.	Sheep's Burr	
*	<i>Acetosella vulgaris</i>	Sheep Sorrel	
	<i>Acrothamnus hookeri</i>	Mountain Beard-heath	
	<i>Acrotriche prostrata</i>	Trailing Ground-berry	
	<i>Acrotriche serrulata</i>	Honey-pots	
*	<i>Agrostis capillaris</i>	Brown-top Bent	
	<i>Alisma plantago-aquatica</i>	Water Plantain	
	<i>Amyema pendula</i>	Drooping Mistletoe	
	<i>Amyema pendula</i> subsp. <i>pendula</i>	Drooping Mistletoe	
	<i>Amyema quandang</i> var. <i>quandang</i>	Grey Mistletoe	
	<i>Anthosachne scabra</i>	Common Wheat-grass	
*	<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass	
*	<i>Arctotheca calendula</i>	Cape weed	
	<i>Arthropodium milleflorum</i>	Pale Vanilla-lily	

STATUS	SCIENTIFIC NAME	COMMON NAME	STATUS
	<i>Arthropodium strictum</i>	Chocolate Lily	
	<i>Arthropodium strictum s.l.</i>	Chocolate Lily	
	<i>Asperula conferta</i>	Common Woodruff	
	<i>Asperula scoparia subsp. scoparia</i>	Prickly Woodruff	
	<i>Asplenium flabellifolium</i>	Necklace Fern	
	<i>Asplenium flaccidum subsp. flaccidum</i>	Weeping Spleenwort	
	<i>Austrostipa pubinodis</i>	Tall Spear-grass	
	<i>Austrostipa spp.</i>	Spear Grass	
	<i>Banksia marginata</i>	Silver Banksia	
	<i>Blechnum nudum</i>	Fishbone Water-fern	
	<i>Bossiaea prostrata</i>	Creeping Bossiaea	
	<i>Brachyscome diversifolia</i>	Tall Daisy	
	<i>Brachyscome multifida</i>	Cut-leaf Daisy	
	<i>Bulbine bulbosa</i>	Bulbine Lily	
	<i>Burchardia umbellata</i>	Milkmaids	
	<i>Caesia calliantha</i>	Blue Grass-lily	
	<i>Calytrix tetragona</i>	Common Fringe-myrtle	
	<i>Carex inversa</i>	Knob Sedge	
	<i>Carex iynx</i>	Tussock Sedge	
	<i>Cassinia aculeata subsp. aculeata</i>	Common Cassinia	
	<i>Cassinia longifolia</i>	Shiny Cassinia	
#	<i>Cassinia sifton</i>	Drooping Cassinia	
*	<i>Centaurium erythraea</i>	Common Centaury	
	<i>Centella cordifolia</i>	Centella	
	<i>Centipeda elatinoides</i>	Elatine Sneezeweed	
*	<i>Cerastium glomeratum</i>	Chickweed	
*	<i>Chamaecytisus palmensis</i>	Tree Lucerne	
	<i>Chiloglottis valida</i>	Common Bird-orchid	
	<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	
*	<i>Cirsium vulgare</i>	Spear Thistle	
*	<i>Claytonia perfoliata subsp. perfoliata</i>	Miner's Lettuce	
	<i>Clematis aristata</i>	Mountain Clematis	
	<i>Clematis microphylla</i>	Small-leaved Clematis	
	<i>Convolvulus angustissimus subsp. angustissimus</i>	Blushing Bindweed	
	<i>Coprosma quadrifida</i>	Prickly Currant-bush	

STATUS	SCIENTIFIC NAME	COMMON NAME	STATUS
	<i>Coronidium scorpioides</i>	Button Everlasting	
	<i>Crassula decumbens</i> var. <i>decumbens</i>	Spreading Crassula	
	<i>Crassula peduncularis</i>	Purple Crassula	
	<i>Crassula sieberiana</i>	Sieber Crassula	
*	<i>Crataegus monogyna</i>	Hawthorn	
	<i>Cycnogeton procerum</i>	Common Water-ribbons	
*	<i>Cynosurus echinatus</i>	Rough Dog's-tail	
*	<i>Cytisus scoparius</i>	English Broom	
*	<i>Dactylis glomerata</i>	Cocksfoot	
	<i>Daviesia leptophylla</i>	Narrow-leaf Bitter-pea	
	<i>Dianella amoena</i>	Matted Flax-lily	EN, FFG
	<i>Dianella revoluta</i> var. <i>revoluta</i>	Black-anther Flax-lily	
	<i>Dianella tasmanica</i>	Tasman Flax-lily	
	<i>Dicksonia antarctica</i>	Soft Tree-fern	
	<i>Dillwynia cinerascens</i> s.l.	Grey Parrot-pea	
	<i>Diuris chryseopsis</i>	Golden Moths	
	<i>Drosera auriculata</i>	Tall Sundew	
	<i>Drosera peltata</i>	Bog Sundew	
	<i>Eucalyptus delegatensis</i> subsp. <i>delegatensis</i>	Alpine Ash	
	<i>Eucalyptus dives</i>	Broad-leaf Peppermint	
	<i>Eucalyptus dives</i> x <i>pauciflora</i>	Broad-leaved Peppermint x Snow Gum hybrid	
*	<i>Eucalyptus globulus</i>	Southern Blue-gum	
	<i>Eucalyptus goniocalyx</i> subsp. <i>goniocalyx</i>	Bundy	
	<i>Eucalyptus melliodora</i>	Yellow Box	
	<i>Eucalyptus obliqua</i>	Messmate Stringybark	
	<i>Eucalyptus ovata</i> subsp. <i>ovata</i>	Swamp Gum	
	<i>Eucalyptus pauciflora</i> subsp. <i>pauciflora</i>	White Sallee	
	<i>Eucalyptus pauciflora</i> X <i>radiata</i> hybrid	N/L Peppermint/Snow Gum Hybrid	
	<i>Eucalyptus polyanthemos</i> subsp. <i>vestita</i>	Red Box	
	<i>Eucalyptus radiata</i> subsp. <i>radiata</i>	Narrow-leaf Peppermint	
	<i>Eucalyptus rubida</i>	Candlebark	
	<i>Eucalyptus</i> spp.	Eucalypt spp.	
	<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	Manna Gum	
	<i>Euchiton japonicus</i>	Creeping Cudweed	
	<i>Euchiton sphaericus</i>	Annual Cudweed	

STATUS	SCIENTIFIC NAME	COMMON NAME	STATUS
*	<i>Euphorbia lathyris</i>	Caper Spurge	
	<i>Euphrasia collina</i> subsp. <i>trichocalycina</i>	Purple Eyebright	FFG
	<i>Exocarpos cupressiformis</i>	Cherry Ballart	
*	<i>Festuca arundinacea</i>	Tall Fescue	
	<i>Gahnia sieberiana</i>	Red-fruit Saw-sedge	
*	<i>Galium aparine</i>	Cleavers	
	<i>Galium gaudichaudii</i>	Rough Bedstraw	
*	<i>Genista monspessulana</i>	Montpellier Broom	
	<i>Geranium gardneri</i>	Rough Crane's-bill	
	<i>Geranium potentilloides</i>	Soft Crane's-bill	
	<i>Geranium solanderi</i> var. <i>solanderi</i>	TBA	
	<i>Geranium</i> sp. 2	Variable Crane's-bill	
	<i>Geranium</i> sp. 3	Pale-flower Crane's-bill	FFG
	<i>Geranium</i> spp.	Crane's Bill	
	<i>Glycine clandestina</i>	Twining Glycine	
	<i>Gonocarpus tetragynus</i>	Common Raspwort	
	<i>Goodenia ovata</i>	Hop Goodenia	
	<i>Hackelia suaveolens</i>	Sweet Hound's-tongue	
*	<i>Hedera helix</i>	English Ivy	
	<i>Hemarthria uncinata</i>	Mat Grass	
	<i>Histiopteris incisa</i>	Bat's Wing Fern	
*	<i>Holcus lanatus</i>	Yorkshire Fog	
	<i>Hydrocotyle foveolata</i>	Yellow Pennywort	
	<i>Hydrocotyle hirta</i>	Hairy Pennywort	
	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	
*	<i>Hypericum perforatum</i> subsp. <i>veronense</i>	St John's Wort	
*	<i>Hypochaeris radicata</i>	Flatweed	
*	<i>Ilex aquifolium</i>	English Holly	
	<i>Indigofera australis</i> subsp. <i>australis</i>	Austral Indigo	
	<i>Juncus flavidus</i>	Gold Rush	
	<i>Juncus pallidus</i>	Pale Rush	
	<i>Juncus subsecundus</i>	Finger Rush	
	<i>Kennedia prostrata</i>	Running Postman	
*	<i>Lathyrus tingitanus</i>	Tangier Pea	
	<i>Leptinella filicula</i>	Mountain Cotula	

STATUS	SCIENTIFIC NAME	COMMON NAME	STATUS
	<i>Leptorhynchos squamatus subsp. squamatus</i>	Scaly Buttons	
	<i>Leptospermum continentale</i>	Prickly Tea-tree	
	<i>Leptospermum lanigerum</i>	Woolly Tea-tree	
	<i>Leptospermum obovatum</i>	River Tea-tree	
	<i>Leucopogon virgatus</i>	Common Beard-heath	
	<i>Leucopogon virgatus var. virgatus</i>	Common Beard-heath	
	<i>Lomandra filiformis subsp. coriacea</i>	Wattle Mat-rush	
	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	
	<i>Lomandra longifolia subsp. longifolia</i>	Spiny-headed Mat-rush	
	<i>Lomandra nana</i>	Dwarf Mat-rush	
	<i>Luzula meridionalis var. flaccida</i>	Common Woodrush	
*	<i>Malus spp.</i>	Apple	
	<i>Melicytus dentatus</i>	Tree Violet	
	<i>Melicytus dentatus s.l.</i>	Tree Violet	
	<i>Mentha laxiflora</i>	Forest Mint	
	<i>Microlaena stipoides var. stipoides</i>	Weeping Grass	
	<i>Microseris walteri</i>	Yam Daisy	
	<i>Montia australasica</i>	White Purslane	
	<i>Montia fontana</i>	Water Blinks	
*	<i>Myosotis sylvatica</i>	Wood Forget-me-not	
*	<i>Narcissus pseudonarcissus</i>	Daffodil	
*	<i>Nassella neesiana</i>	Chilean Needle-grass	
	<i>Olearia argophylla</i>	Musk Daisy-bush	
	<i>Olearia erubescens</i>	Moth Daisy-bush	
	<i>Olearia lirata</i>	Snowy Daisy-bush	
	<i>Olearia myrsinoides</i>	Silky Daisy-bush	
	<i>Oxalis perennans</i>	Grassland Wood-sorrel	
	<i>Pelargonium australe</i>	Austral Stork's-bill	
	<i>Pelargonium rodneyanum</i>	Magenta Stork's-bill	
*	<i>Pentaglottis sempervirens</i>	Alkanet	
*	<i>Phalaris aquatica</i>	Toowoomba Canary-grass	
	<i>Phragmites australis</i>	Common Reed	
	<i>Pimelea axiflora</i>	Bootlace Bush	
	<i>Pimelea curviflora s.l.</i>	Curved Rice-flower	
	<i>Pimelea humilis</i>	Common Rice-flower	

STATUS	SCIENTIFIC NAME	COMMON NAME	STATUS
*	<i>Pinus radiata</i>	Radiata Pine	
	<i>Plantago gaudichaudii</i>	Narrow Plantain	
*	<i>Plantago lanceolata</i>	Ribwort	
	<i>Plantago varia</i>	Variable Plantain	
	<i>Poa labillardierei</i> var. <i>labillardierei</i>	Common Tussock-grass	
	<i>Poa morrisii</i>	Soft Tussock-grass	
	<i>Poa sieberiana</i> var. <i>hirtella</i>	Grey Tussock-grass	
	<i>Poa sieberiana</i> var. <i>sieberiana</i>	Grey Tussock-grass	
	<i>Polyscias sambucifolia</i>	Elderberry Panax	
	<i>Polystichum proliferum</i>	Mother Shield-fern	
	<i>Pomaderris elachophylla</i>	Lacy Pomaderris	
	<i>Poranthera microphylla</i>	Small Poranthera	
	<i>Prostanthera lasianthos</i>	Victorian Christmas-bush	
*	<i>Prunella vulgaris</i>	Self-heal	
*	<i>Prunus cerasifera</i>	Cherry Plum	
	<i>Pteridium esculentum</i> subsp. <i>esculentum</i>	Austral Bracken	
	<i>Pultenaea daphnoides</i>	Large-leaf Bush-pea	
	<i>Pultenaea gunnii</i>	Golden Bush-pea	
	<i>Pultenaea gunnii</i> subsp. <i>gunnii</i>	Golden Bush-pea	
	<i>Ranunculus glabrifolius</i>	Shining Buttercup	
	<i>Ranunculus lappaceus</i>	Australian Buttercup	
	<i>Ranunculus plebeius</i>	Forest Buttercup	
*	<i>Romulea rosea</i> var. <i>australis</i>	Common Onion-grass	
*	<i>Rosa rubiginosa</i>	Sweet Briar	
*	<i>Rubus anglocandicans</i>	Common Blackberry	
*	<i>Rubus laciniatus</i>	Cut-leaf Bramble	
*	<i>Rumex crispus</i>	Curled Dock	
	<i>Rytidosperma geniculatum</i>	Kneed Wallaby-grass	
	<i>Rytidosperma racemosum</i> var. <i>racemosum</i>	Slender Wallaby-grass	
*	<i>Salix fragilis</i> nothovar. <i>Fragilis</i>	Basket Willow	
	<i>Sambucus gaudichaudiana</i>	White Elderberry	
*	<i>Sanguisorba minor</i>	Salad Burnet	
	<i>Schoenus apogon</i>	Common Bog-sedge	
	<i>Senecio bathurstianus</i>	Dissected Fireweed	
	<i>Senecio campylocarpus</i>	Floodplain Fireweed	FFG

STATUS	SCIENTIFIC NAME	COMMON NAME	STATUS
	<i>Senecio glomeratus</i> subsp. <i>glomeratus</i>	Annual Fireweed	
	<i>Senecio linearifolius</i> var. <i>denticulatus</i>	Fireweed Groundsel (eastern variant)	
	<i>Senecio linearifolius</i> var. <i>linearifolius</i>	Fireweed Groundsel (type variant)	
	<i>Senecio minimus</i>	Shrubby Fireweed	
	<i>Senecio phelleus</i>	Stony Fireweed	
	<i>Senecio quadridentatus</i>	Cotton Fireweed	
	<i>Solanum laciniatum</i>	Large Kangaroo Apple	
	<i>Stackhousia monogyna</i>	Creamy Candles	
	<i>Stellaria pungens</i>	Prickly Starwort	
	<i>Stylidium armeria</i>	Common Triggerplant	
	<i>Styphelia humifusa</i>	Cranberry Heath	
*	<i>Taraxacum</i> Sect. <i>Hamata</i>	European Dandelion	
	<i>Tasmannia lanceolata</i>	Mountain Pepper	
	<i>Tetrarrhena juncea</i>	Forest Wire-grass	
	<i>Tetraloche ciliata</i>	Pink-bells	
	<i>Themeda triandra</i>	Kangaroo Grass	
	<i>Thysanotus tuberosus</i>	Common Fringe-lily	
	<i>Tricoryne elatior</i>	Yellow Rush-lily	
*	<i>Trifolium dubium</i>	Suckling Clover	
*	<i>Ulex europaeus</i>	Gorse	
	<i>Veronica calycina</i>	Hairy Speedwell	
	<i>Veronica gracilis</i>	Slender Speedwell	
	<i>Viola betonicifolia</i> subsp. <i>betonicifolia</i>	Showy Violet	
	<i>Viola hederacea</i>	Native Violet	
*	<i>Viola odorata</i>	Common Violet	
*	<i>Vulpia bromoides</i>	Squirrel-tail Fescue	
	<i>Wahlenbergia stricta</i> subsp. <i>stricta</i>	Tall Bluebell	
	<i>Wurmbea dioica</i> subsp. <i>dioica</i>	Common Early Nancy	
	<i>Xerochrysum viscosum</i>	Shiny Everlasting	

