Australian Government
Department of Climate Change, Energy, the Environment and Water

Draft National Recovery Plan for the Grassy Eucalypt Woodland of the Victorian Volcanic Plain

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Acknowledgements

Acknowledgement of Country

We acknowledge the Traditional Custodians of Australia and their continuing connection to land and sea, waters, environment and community. We pay our respects to the Traditional Custodians of the lands on which the ecological community occurs, their culture, and their Elders past and present.

Front cover image credit

Cover page: Grassy eucalypt woodland, David Cheal.

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Grassy Eucalypt Woodland of the Victorian Volcanic Plain

Current status:

- *Environment Protection and Biodiversity Conservation Act 1999*: Category: Critically Endangered.
- State Legislation (*Flora and Fauna Guarantee Act 1988*, Victoria): Category: Threatened, listed under the name: Western Basalt Plains (River Red Gum) Grassy Woodland Floristic Community 55-04.

Distribution and habitat:

The Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEW) ecological community occurs in southwestern Victoria in the Victorian Volcanic Plain IBRA7 sub-bioregion that extends from western Melbourne to the area around Heywood in western Victoria.

Habitat critical for survival:

All patches of this ecological community that meet the minimum condition thresholds in the listing advice (TSSC 2009) are critical to its survival.

Recovery plan objectives:

This Recovery Plan guides action to secure and improve the geographic extent and integrity of the GEW ecological community. The focus is on maintaining and protecting existing patches of the GEW ecological community with the following objectives:

- Maintain and improve the condition and extent of the GEW ecological community throughout its geographic distribution.
- Protect the GEW ecological community from threatening processes, potentially incompatible land use or catastrophic loss.
- Increase knowledge of the ecology and management requirements of the GEW ecological community.
- Improve connectivity for the GEW ecological community via restoration and enhancement.
- Improve community awareness and support to conserve and to improve management of the GEW ecological community.

Acronyms

Acronym	Full form
ARI	Arthur Rylah Institute for Environmental Research (Victoria)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CFA	Country Fire Authority (Victoria)
CMA	Catchment Management Authority
CMN	Conservation Management Network
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DEECA	Department of Energy, Environment and Climate Action (Victoria)
DELWP	(former) Department of Environment, Land Water and Planning (Victoria)
DEPI	(former) Department of Environment and Primary Industries (now Agriculture Victoria)
DSE	(former) Department of Sustainability and Environment (Victoria)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FFG	*Flora and Fauna Guarantee Act 1988* (Victoria)
EVC	Native Vegetation Ecological Vegetation Class (Victoria)
GEW	Grassy Eucalypt Woodland of the Victorian Volcanic Plain
IBRA	Interim Biogeographic Regionalisation of Australia (Version 7 - National)
LGA	Local Government Authority
RAPs	Recognised Aboriginal Parties (Victoria)
TSSC	Threatened Species Scientific Committee (National)
VVP	Victorian Volcanic Plain sub-bioregion (IBRA Version 7)

1 Introduction

This National Recovery Plan for the Grassy Eucalypt Woodland of the Victorian Volcanic Plain and derived native grasslands (GEW) ecological community sets out the conservation needs of the ecological community across its range.

The GEW ecological community has a broad distribution in the southern Victorian Volcanic Plains IBRA7 sub-bioregion, from Melbourne in the east to the area around Heywood in western Victoria. The VVP bioregion is a recognised biodiversity hotspot and supports at least 25 nationally threatened flora and fauna species. The GEW ecological community provides habitat for a variety of threatened plants and animals (including mammals, birds, reptiles and insects).

The GEW ecological community has undergone a dramatic decline in both extent and condition since European arrival. The current extent (i.e. that with predominantly native understorey) cannot be accurately determined, but estimates indicate that it may be as little as 0.1% of its pre-European distribution.

Principal threats to the GEW ecological community include habitat degradation and loss, loss of key component species, invasive plants and animals, inappropriate management of biomass, low level of protection, climate change, and lack of public awareness.

1.1 Conservation status

The Grassy Eucalypt Woodland of the Victorian Volcanic Plain ecological community was listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in June 2009.

The vegetation of the GEW ecological community is also listed as Threatened under the Victorian *Flora and Fauna Guarantee Act 1988* (Amendment 2019) as 'Western Basalt Plains (River Red Gum) Grassy Woodland' (DSE 2004a).

1.2 First Nations cultural significance

The GEW ecological community occurs across the traditional lands of several First Nations peoples, including the Wurundjeri Woi-wurrung, Dja Dja Wurrung, Wadawurrung, Eastern Maar, Gunditjmara and Bunurong Nations (AIATSIS 1996; SGV 2025).

Many Traditional Owners of the lands on which the GEW ecological community occurs have expressed considerable concern about the extent of its destruction and degradation (DEPI 2014 unpublished). The loss of so much natural heritage correlates to a significant loss of First Nations cultural heritage. These landscapes and natural resources were vitally important to ancestors and were managed over countless generations to provide for physical and spiritual needs (food, medicine, materials and spiritual connection). They continue to be profoundly important today.

First Nations of the region traditionally use controlled burning methods to manage the ecology of grassy vegetation in the area. Burning of the understorey encourages new vegetative growth that attracts kangaroos and wallabies to sites. Other traditional land management techniques are linked to harvesting of plants to provide a valuable food source at different times of the year, such as the tuber roots of yam daisies (once abundant, but now scarce) and the leaves of bulbine lilies. The leaves of the dominant tree of the ecological community, river red gum, can be used medicinally in steam baths and the sap to treat burns.

The Indigenous Land Corporation (ILC) purchased several properties across the Victorian Volcanic Plain (VVP) due to their high cultural significance and the title to the land has been, or will be, granted to the

relevant First Nations community. For example, the Gunditjmara are the Traditional Owners of nine properties totalling some 3,000 ha. Some of these areas are likely to contain the GEW ecological community and/or areas where the ecological community could be restored. Some land is also managed as Indigenous Protected Areas (IPA), such as the Gunditjmara properties called Tyrendarra and Kurtonitj. These properties form part of the Budj Bim cultural landscape that is a World Heritage place and a National Heritage listed place (World heritage Places - Budj Bim Cultural Landscape - DCCEEW).

First Nations peoples across the extent of the GEW ecological community have a strong desire to be involved in its conservation and restoration. First Nations people have been involved with conservation efforts of the GEW ecological community, including in programs such as developing *A Guidebook to Grasslands and Grassy Woodlands of the VVP* (CCMA 2023), the Wiyn Murrup Monitoring Program (2020-2023) (Farmilo et al. 2021, 2023) and contributions by the Wurundjeri Woi wurrung Cultural Heritage Aboriginal Corporation to the Victorian government's Strategy for Establishing a Grassy Eucalypt Woodland Protected Area (DELWP MSA 2021).

1.3 Key Partners and other stakeholders

There is a diverse range of stakeholders and partners with responsibilities for and/or an interest in the GEW ecological community. The land on which the GEW ecological community occurs is generally fertile and productive. This land was of great importance to numerous First Nations communities. It now also supports a diversity of agricultural industries which are essential to the economic and social viability of towns and communities across the VVP.

The GEW ecological community occurs on both public and private land, under a range of tenures and land uses. Public land includes roadsides, railways, airports, utilities corridors, Crown land reserves, State forests, cemeteries and conservation reserves. Private land where the GEW ecological community is found includes agricultural land, industrial land, hobby farms, private conservation reserves and quarries.

Key partners likely to have a role in the protection and recovery of the GEW ecological community are described in more detail in **Appendix 11**.

2 Ecological community description and distribution

2.1 Description

The key defining attributes and condition thresholds for the GEW ecological community are described in detail in the listing advice for the ecological community (TSSC 2009). The GEW ecological community has affinities with other eucalypt woodlands with a grassy understorey, from the lower slopes and plains of mainland eastern Australia, but it is specifically limited to the Quaternary basalt soils of the VVP. The GEW ecological community includes derived native grasslands, where the tree layer has been removed.

The GEW ecological community exhibits a degree of natural variation in its appearance and composition across its range. This is because of variations in rainfall and landscape features such as changes in elevation, drainage patterns, the presence of rocky outcrops and land use history. The GEW ecological community also exhibits seasonal variations, characterised by a spring to early summer flowering period of the understorey. Seasonal conditions may further influence its appearance, because flowering and germination of ground layer species can vary markedly between long-term drought and a season with good rainfall. These variations can be compounded by the nature of past and ongoing land management practices.

The GEW ecological community intergrades with the *Natural Temperate Grassland of the Victorian Volcanic Plain* (NTG), another ecological community that is nationally listed as Critically endangered under the EPBC Act (TSSC 2008, 2009). The NTG is also listed as Threatened in Victoria, under the name 'Western (Basalt) Plains Grassland Community'. In some areas it may not be possible to determine whether a patch of native vegetation belongs to the grassland or grassy woodland ecological community, because of past management history and/or seasonal variables. However, this is not usually relevant to what management actions are needed, unless there are plans to restore the tree canopy.

The GEW ecological community provides habitat for a variety of threatened plants and animals (including mammal, bird, reptile, amphibian, and insect species). Numerous species that occur in this ecological community are also listed under state legislation as rare or threatened plants. Typical and characteristic flora and fauna species found with the GEW ecological community are listed in **Appendix 22.**

Other nationally listed woodland ecological communities may also extend into the range of the GEW ecological community. In particular, stands of the nationally listed Endangered 'Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia' occur around Sunbury and Melton at the eastern part of the range of GEW. However, the combination of species that occur with Eucalyptus microcarpa[1] in the canopy of those woodlands differ from those in the GEW ecological community and some are even contra-indicative.

[1] Typically, for native species scientific names (binomials - genus and species) are used throughout this document followed by the common name in brackets. This convention may not have been followed in the official name for vegetation types and ecological communities (such as the 'Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands…..'). For exotic species (weeds and other pest/feral species) the convention is reversed, using a common name (with the scientific binomial in brackets).

Canopy layer

The GEW ecological community is an open eucalypt woodland with a predominantly grassy understorey. The tree canopy is typically 15-30 m tall and dominated by *E. camaldulensis* (river red gum) with 5—30% tree canopy cover.

At higher rainfall sites of greater than 700 mm per annum, *E. ovata* (swamp gum) or *E. viminalis* (manna gum) may replace River Red Gum as the dominant species in the canopy layer. These sites tend to occur in the higher rainfall zone at the western end of the VVP, for example south of Hamilton. At sites on the VVP that receive less than 600 mm per annum, *E. microcarpa* (grey box) or *E. melliodora* (yellow box) may replace river red gum as the dominant canopy species. These sites are restricted to isolated occurrences in the rain shadow area to the west of Melbourne, for instance on the Keilor-Werribee Plain.

Other tree species (5 m or more in height) that have been depleted but may be present in the canopy layer include *Acacia implexa* (lightwood), *A. mearnsii* (black wattle), *A. melanoxylon* (blackwood), *Allocasuarina verticillata* (drooping sheoak) and *Banksia marginata* (silver banksia).

Mid layer

Typically, the mid layer is composed of various *Acacia* species (Oates and Taranto 2001), notably *A. paradoxa* (hedge wattle), but may include other genera depending on the nature of the site. At the wettest sites, the mid layer may, for example, contain a scattered *Leptospermum continentale* (prickly tea-tree), *Melaleuca gibbosa* (slender honey-myrtle) or *Ozothamnus ferrugineus* (tree everlasting). *Bursaria spinosa* (sweet Bursaria), *Melicytus angustifolius* (tree violet) and *Melicytus dentatus* (Tree Violet) are also commonly found in the mid layer.

The crown cover of shrubs underneath the tree canopy is typically less than 30% (not including regenerating native canopy trees).

Ground layer

The ground layer is dominated by native grasses and/or other herbs. Native grasses that are commonly part of the ground layer include *Rytidosperma* species (wallaby grasses), *Austrostipa* species (spear -grasses), *Microlaena stipoides* (weeping grass), *Poa* species (tussock grasses — notably *Poa labillardierei* (common tussock grass) and *Themeda triandra* (kangaroo grass) (SAC 2004). Of these, *T. triandra* is considered to have been the dominant ground layer species over much of the pre-European settlement range of the GEW ecological community (DNRE 2000). *T. triandra* and *P. labillardierei* are the dominant grass species at relatively intact sites (Oates and Taranto 2001; DSE 2004a). *Rytidosperma* species and *Austrostipa* species dominate at sites that have undergone moderate degradation such as heavy grazing.

The forb component of the ground layer is species-rich in the more intact sites and typically contains native wildflower species from the following genera: *Acaena*, *Arthropodium*, *Calocephalus*, *Chrysocephalum*, *Dianella*, *Dichondra*, *Geranium*, *Leptorhynchos* or *Solenogyne*. In swampier sites or sites with gigais, grasses, sedges and other herbs indicative of more sustained water logging may be present e.g. *Amphibromus* spp., *Carex tereticaulis*, *Lobelia* spp., *Schoenus apogon (common bog-sedge)*.

2.1.1 Stony knolls

On localised low stony or rocky rises, the canopy of *E. camaldulensis* (river red gum) may be replaced by a shrubland of *Acacia* species, *Melicytus dentatus* (tree violet) and/or *Bursaria spinosa* (sweet bursaria), or by a low woodland of *Allocasuarina verticillata* (drooping sheoak) (DSE 2004b). The understorey comprises a mix of grasses and other herbs. These low stony rises on basalt flows have

soils that are fertile and well drained but shallow, with outcropping rock, causing severe summer dryness. Stony knolls are part of the EPBC-listed GEW ecological community only where they occur within or adjacent to a larger patch of the GEW ecological community.

2.1.2 Regenerating woodland

The presence of dense, regenerating tree saplings in a patch of the GEW ecological community may temporarily increase the tree crown cover up to 70%, which is beyond that typically expected for a mature, open grassy woodland structure. This may happen because grazing has been stopped, or from fire or other disturbance that stimulates mass germination of canopy species from the soil seedbank. Regenerating areas are part of the GEW ecological community.

2.1.3 Derived grassland

Some patches of the GEW ecological community have been influenced by management history to the extent that the tree and/or shrub layers have been largely removed. These patches can closely resemble the *Natural Temperate Grassland of the Victorian Volcanic Plain*, that is also nationally listed. These are described as “derived” or “secondary” native grasslands — and they still have substantial biodiversity value. The presence of derived native grasslands as part of the GEW ecological community can generally be confirmed by evidence of tree stumps, small depressions, or fallen logs, or by using local knowledge, historical accounts and records, photographs, or reliable modelling of pre-European vegetation.

2.1.4 Fauna

The GEW ecological community comprises and supports a similar suite of ground-dwelling fauna as the Natural Temperate Grassland. It also includes arboreal species that require trees for nesting/roosting sites, or as a source of food e.g. for winter foraging.

The grassy ground layer of both the woodland and derived grassland provide habitat for a diversity of animal species that are part of the GEW ecological community, notably skinks, snakes, insects, birds of prey and ground-dwelling birds (DSE 2004a). The groups which have particularly declined in species richness across the VVP are the smaller to medium-sized mammals, such as native rodents, small macropods and bandicoots (NLWRA 2007). In addition, *Vombatus ursinus* (bare-nosed wombat) became effectively extinct on the VVP (Seebeck 1984). Those mammals that typically remain with healthy populations are either large enough e.g. *Macropus giganteus* (Eastern grey kangaroo) to escape introduced predators, are small and cryptic e.g. dunnarts, or have other ways to avoid predation e.g. echidnas and (micro-)bats.

Woodland birds and mammals such as parrots, possums and bats rely on trees and tree hollows for shelter and/or food resources. Successive bird atlas surveys undertaken in 1977—81 and 1998—2001 indicate that, across the VVP Sub-bioregion, there are 26 bird species that require temperate woodland habitat and another 107 species that occur in woodland, but do not rely solely on it for habitat (NLWRA 2007).

Many animals that are part of the GEW ecological community are nationally listed threatened species, notably: *Isoodon obesulus obesulus* (eastern subspecies of southern brown bandicoot, Endangered), *Eulamprus tympanum* subsp. *marnieae* (Corangamite water skink, Endangered), *Delma impar* (striped legless lizard, Vulnerable) and *Litoria* raniformis (growling grass frog, Vulnerable). *Pteropus poliocephalus* (grey-headed flying-fox, Vulnerable), *Lathamus discolor* (swift parrot, Critically Endangered), *Dasyurus maculatus maculatus* (spot-tailed quoll SE mainland population, Endangered) and *Calyptorhynchus banksii graptogyne* (red-tailed black cockatoo, Endangered) have also been recorded as part of the GEW ecological community (DEWR 2007; DELWP 2016; DAWE 2021a DCCEEW 2024a).

Invertebrate fauna of the GEW ecological community are relatively poorly known (Yen 1999). An exception is *Synemon plana* (golden sun moth) which is listed as Vulnerable under the EPBC Act. This moth feeds on wallaby grass tussocks in the ground layer of grasslands and grassy woodlands such as the GEW ecological community (DAWE 2021b).

2.2 Distribution

The GEW ecological community is endemic to south-western Victoria. It is limited to the Victorian Volcanic Plain Sub-bioregion (SVP1), as defined in the Interim Biogeographic Regionalisation of Australia version 7 (DCCEEW 2025). The GEW ecological community is restricted to Quaternary basalt substrates, including stony rises on basalt flows. The VVP is one of Australia's 15 National Biodiversity Hotspots.

The Victorian Ecological Vegetation Classes (EVCs) (DSE 2007) which most closely correspond to the nationally listed GEW ecological community are as follows.

- 55 Plains Grassy Woodland
- 651 Plains Swampy Woodland
- 649 Stony Knoll Shrubland (pockets in or next to GEW)
- 897 Plains Grassland/Plains Grassy Woodland Mosaic.

An estimated 2.5 — 8.2% of the original (pre-1750/pre-European) extent of the GEW ecological community remains as native vegetation and that meets the key diagnostic characteristics in the national listing advice (DEWHA 2009). However, these estimates do not account for the quality of the remnants; the amount of the GEW ecological community remaining in good condition is likely much lower than 2.5% (TSSC 2009). Latest subjective estimates from experts indicate perhaps less than 0.1% of the GEW ecological community remains.

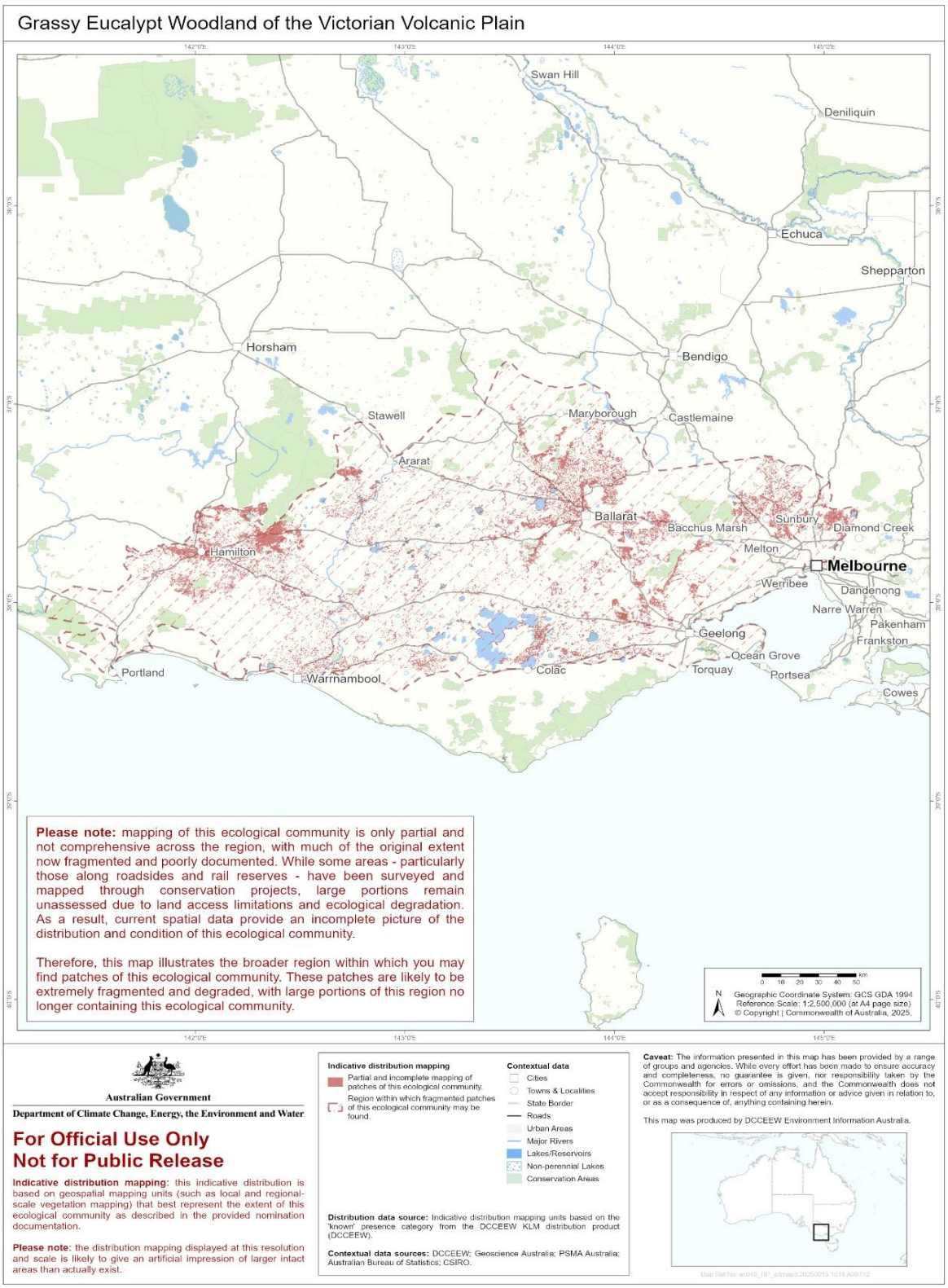

Figure 1 Map of the modelled indicative current extent of the GEW ecological community

2.3 Habitat critical to the survival of the ecological community

The GEW ecological community has been cleared, fragmented and degraded to the point where little remains, and what remains is highly fragmented across its range. Because of this, all areas of habitat which meet the description and minimum condition thresholds outlined in the Listing Advice (TSSC 2009) are critical to the survival of the GEW ecological community.

Other areas important to the survival of GEW ecological community include areas of native vegetation, within 100 m of this ecological community, particularly those that meet the national description and condition thresholds for the *Natural Temperate Grassland of the Victorian Volcanic Plain* — these areas share many of the same ground layer species, buffer and/or link patches (e.g. to allow gene flow from ground layer plant species and provide routes for movement and habitat for fauna, including pollinators and other functional species of the GEW ecological community).

Other key areas for conservation and restoration of the GEW ecological community are as follows:

- areas that formerly contained the GEW ecological community and have the correct soils/substrate and other abiotic requirements (because these areas can potentially be restored).
- sites where a native understorey is poor or absent may not meet the minimum condition thresholds but may be essential to the long-term conservation of the GEW ecological community. This is by virtue of the rarity and importance of remnant trees, their landscape setting (e.g. providing connectivity) and providing other important flora/fauna habitat features (e.g. tree hollows, fissures, and abundant flowers, insects and other resources in older trees, and/or rocky habitat).

2.3.1 High priority populations or sites under particular pressure

The following sites are high priorities for protection and recovery of the GEW ecological community:

- GEW ecological community sites that were recorded by Victoria (DEPI 2014) include 18 sites on the ABC database and 86 sites on the BioSites (Sites of biological significance) database and any that have been identified as priority sites in NatureKit.
- Roadsides and rail reserves.
- Cemeteries containing the GEW ecological community.
- Sites on private properties, including those involved with market-based incentive schemes (e.g. previous BushTender scheme, and now the EcoMarkets Initiative).

3 Threats

3.1 Causes of decline

The VVP is in one of the most intensively cleared agricultural regions of Australia. The activities and processes causing the decline of the GEW ecological community are ongoing, with impacts across its entire geographical distribution. The main historic and current ongoing threats are invasive species (particularly invasion and spread of weeds), vegetation clearance (for agriculture, urban development, road, rail, energy and other infrastructure), fragmentation, and inappropriate management regimes (e.g. fire, grazing, mowing/slashing and other regimes that are inappropriate to the long-term conservation of biodiversity, noting that these can all be beneficial to the ecological community if well planned and undertaken in a suitable manner relevant to each site and time). In addition, cessation of most Traditional management by First Nations people in the 1800s, and the extinction of digging mammals, represent two significant historic threats with ongoing effects for the ecological community.

3.2 Habitat loss and degradation

3.2.1 Clearing native vegetation

The significant decline of grassy ecosystems on the VVP is largely attributed to widespread and ongoing clearance and modification of native vegetation. Historic impacts from vegetation clearing also pose a high risk to the GEW ecological community due to habitat fragmentation and edge effects (increased exposure to other threats), loss of mature trees (including with hollows) and subsequent loss of biodiversity, including key flora and fauna.

Widespread clearing of woodland in the VVP began during European settlement. It continued throughout the 19th and 20th centuries, as the fertile and lightly timbered plains provided ideal farming land for newly arrived settlers. The site for the city of Melbourne was chosen, in part, because of the extensive grasslands to the west of the growing settlement (Presland 2009). Waves of immigration, such as the soldier settlements after both World Wars, further accelerated the loss of native grasslands and grassy woodlands.

Trees were cut down to create open paddocks for crops, and timber for building, fencing and firewood. Land was ploughed for crops, while high stocking rates of introduced domestic stock with hard hooves lead to overgrazing and trampling, especially during droughts. Numerous exotic plants were deliberately or accidentally introduced, replacing native vegetation. Sutton (1916) recorded that the plains had *"been put so thoroughly to pastoral and agricultural uses that hardly any part remains in the virgin state".* Impacts were exacerbated by fertilisers (introduced in the 1940s and early 1950s), when pasture improvement based on superphosphate and introduced clover and grasses became widespread (Stuwe 1986). Firewood collection is ongoing in some places, as more roads make areas accessible (Steve Sinclair personal communication, 24 June 2025).

Agricultural intensification still poses a threat to the GEW ecological community. Land use trends in recent decades include a shift from grazing to cropping enterprises and changes in types and numbers of livestock with fluctuating commodity prices., In addition, there has been an increase in availability of new cropping techniques such as laser levelling of paddocks, raised-bed cropping, and use of heavy machinery for rock-removal and crushing. This poses a significant threat to populations of ground-dwelling fauna that use rocky habitat, such as *Delma impar* (striped legless lizard) and *Eulamprus tympanum* subsp. *marnieae* (Corangamite water skink). Establishing olive groves, vineyards, and agroforestry, usually in the wetter south-western part of the VVP, also contributes to clearing and leads to off-site impacts involving fertiliser and pesticide use, hydrological changes, and invasion of

native vegetation by wild olives, pine seedlings or the exotic (South Australian) *Eucalyptus cladocalyx* (sugar Gum).

Over the last few decades, the economic advantages of retaining native vegetation have been acknowledged and promoted with increasing vigour (Crosthwaite 1996). Anecdotal information suggests that pastures dominated with native species have proven to be more persistent and resilient than sown annual pasture during recent persistent droughts. Native pastures demonstrate salinity tolerance, less need for fertilisers and faster recovery from fire. They are also regarded as superior to improved pastures for very fine wool production.

Clearing deep-rooted perennial trees and grasses also contributes to soil degradation processes, such as that caused by wind and water erosion, and the emergence of dryland salinity. The full extent of dryland salinity as a threat to the GEW ecological community should be further investigated. NLWRA (2001) predicted that by 2050 as much as 40% of agricultural land on the VVP could be affected by shallow saline water-tables.

Urban development also contributes to loss and degradation of the GEW ecological community, especially in the area around Melbourne and other urban growth areas. Building residential suburbs, industrial precincts and associated infrastructure (road, rail, water and power) has displaced most native vegetation. Clearing and land use actions that can seriously degrade the ecological community at small scales, but which add together to be significant, especially given the increasing importance of small remnants. Therefore, it is important that peri-urban residents are provided with advice, training and other assistance to support them to manage threats such as weeds and undertake restoration.

In addition, important roadside and rail side remnants can be further cleared for additional lanes and tracks or other linear infrastructure projects.

Under the Melbourne Strategic Assessment signed in 2009, significant areas were cleared in exchange for the Victoria Government agreeing with the Commonwealth to deliver a series of conservation outcomes for the GEW ecological community that are still in progress, including:

- The creation of the 1,200 hectares Grassy Eucalypt Woodland Protected Area outside the urban growth boundary, south-west of Whittlesea.
- The permanent protection of 341 hectares of Grassy Eucalypt Woodland: - in conservation areas identified in the Biodiversity Conservation Strategy and the Conservation Areas Declaration.
- Improved composition, structure, quality, and ecological function of protected Grassy Eucalypt Woodland.

3.2.2 Habitat fragmentation

Fragmentation in largely agricultural and urbanised landscapes is one of the greatest challenges to the GEW ecological community's long-term recovery. The majority of the GEW ecological community on public land occurs as small, sometimes linear, patches (along roadsides, railways, on cemeteries, racing tracks, or town commons). In recent decades some areas of public land have been converted into conservation reserves, but most remain unprotected, and are managed for purposes other than conservation. For example, as populations in some regional towns increase, cemeteries with natural grassy values are pressured to provide more burial sites or have cheaper, more accessible lawn plots for interring cremated remains.

Patches of GEW ecological community tend to be isolated, which impedes or prevents plants and animals from dispersing and colonising naturally. The small size and isolation of habitats eventually lead to small, disjunct populations of species with limited genetic diversity. Inbreeding depressions

further reduces the resilience of grassy ecosystem-dependent species, or their ability to reproduce fit offspring and adapt to changing conditions and thus increases their vulnerability to local extinction.

Although many high-quality grassy patches are small, linear and have a high "edge to area" ratio, a small size (or a high edge to area ratio), does not always make an ecological community more fragile and prone to extinction. Williams et al. (2006) determined that linear grassy reserves can resist weed invasion from adjacent weedy areas and retain high biodiversity values if suitably managed (generally by a regime of frequent burning). They observed that area and isolation had little effect on the probability of local extinction, but urbanisation and longer intervals between fires increased extinction risk. This assumption that "small is bad" has led to losses of small patches of the GEW ecological community, particularly on urban fringes, because they may be incorrectly regarded as not viable in the long term.

The general decline in tree health in rural areas, combined with reduced or lack of recruitment, is a serious threat to the long-term viability of the GEW ecological community. The ecological community is now typified by 'a few old, scattered trees in a paddock' across much of its former range. Isolated trees in such landscapes suffer multiple adverse threat/impacts, such as increased insect attack, altered soil nutrient profiles and hydrological regimes, compaction and root disturbance, excessive mistletoe loads and increased spray drift. These impacts are exacerbated by changing climatic conditions, conflicting grazing and browsing regimes, and weed competition. The ramifications for this ecological community are serious, if the rate of regeneration or recruitment cannot compensate for the rate of loss — of isolated trees and small patches — either through senescence or ill health (dieback).

3.2.3 Habitat degradation due to utilities maintenance

Many of the most florally diverse sites on roadsides or rail reserves have historically had a management regime of frequent burning. During the 1980s, an estimated 50% of high-quality patches on rail reserves were destroyed, as ploughing widened bare-earth firebreaks and controlling weeds with herbicide spraying began to replace burning as the typical fuel reduction method (Craigie 1999). Some local governments and Country Fire Authority brigades also historically sprayed out roadside grasslands with herbicide to "cure" them first, in attempts to ensure successful fuel reduction burns. These "cured" roadsides were invaded by weeds which led to higher fuel loads, greater fire risk and on-going weed control costs. Patch loss continued as maintenance works began to rely more heavily on larger machinery, and linear corridors were used for infrastructure development (such as piping and telecommunications). Nonetheless, roadsides as well as rail reserves (e.g. from Ballarat to Hamilton) still contain important remnants of the GEW ecological community, and linear reserves continue to be under threat from utilities upgrades and poorly managed maintenance activities.

3.3 Pest plants and animals

3.3.1 Weeds

Even very small patches of native grassy ecosystems will generally maintain their vegetation integrity and plant biodiversity, if properly managed on an ongoing basis (i.e. biomass management and weed control). Soil disturbance, from agriculture (e.g. stock) and machinery use, exacerbate invasion by fast-growing exotic weeds. Stock, camped under trees, increase soil nutrients and can introduce weeds. Invasion by grassy weeds, especially perennial grasses, leads to the native groundcovers being out-competed and smothered. In this instance, the gaps between tussocks, necessary for recruitment by native species, become occupied by weeds instead. Areas where the understorey is dominated by exotic species are characteristic of high nutrient agricultural environments. Such areas are widespread but degraded. Agricultural land has a long history of intensive grazing, fertiliser application and sowing of exotic pasture species (DELWP 2021). In these already disturbed patches of the GEW ecological community weeds change local environmental characteristics to the long-term detriment of the native

community; and they may become even worse after grazing stops (Steve Sinclair personal communication, 24 June 2025).

Across public reserves, the GEW ecological community is typically managed with herbicide application and ecological burning to reduce the threat of exotic and native environmental weeds. More recently, managers of GEW ecological community remnants (on both public reserves and private land) are exploring management regimes that incorporate cultural management practices such as cultural burning (Victorian Traditional Owner Cultural Fire Knowledge Group 2019). The primary intent of these cultural practices is to care for Country and uphold cultural values; ecological improvement, including changes in plant species composition (Farmilo and Moxham 2021).

Some threatened fauna, like *Delma impar* (striped legless lizard), *Perameles gunnii* (eastern barred bandicoots) and *Synemon plana* (golden sun moth), depend less on species composition than they do on habitat structure. They can occupy grassy habitat that is partially or almost entirely composed of exotic tussock grasses, even though it is unlikely to be optimal (Robertson and Smith 2010; Hill et al. 2010; Richter et al. 2013). However, Faithfull et al. (2010) found reductions in invertebrate species richness and population sizes in areas infested with Chilean Needle-grass[2] (*Nassella neesiana*).

Managing environmental weeds in such ecosystems is complex because many factors need to be taken into consideration and management actions have to be resourced long term, but there are excellent texts to support the development of context-specific adaptive weed management planning e.g. Sindel (2020). Rapid response to invasion by significant weed species is necessary, or the native groundcover may be outcompeted and smothered by fast-growing exotics. For example, the invasion front for Chilean Needle-grass moving into degraded grassy ecosystems has been observed to expand more than 5 m annually while reducing native vascular plant richness (Faithful et al. 2010). It should be noted that budgets and schedules for weed control can be scaled, so that more money and time is allocated to weed control initially, with costs and efforts reducing over time as weed diversity and abundance is reduced.

Numerous established and emerging weeds are threatening the GEW ecological community, (and also the Natural Temperate Grassland ecological community). These include the following:

- Exotic perennial grasses such as *Nassella* species (e.g. serrated tussock, Chilean needle-grass, Texas needle-grass, cane needle-grass), Phalaris (*Phalaris aquatica*), African love-grass (*Eragrostis curvula*), Paspalum (*Paspalum dilatatum*), sweet vernal grass (*Anthoxanthum odoratum*), cocksfoot *(Dactylis glomerata*), brown-top bent (*Agrostis capillaris*) and perennial veldt grass (*Ehrharta calycina*).
- Annual grasses such as wild oats (*Avena fatua*), bearded oats (*Avena barbata*), Wimmera rye-grass (*Lolium rigidum*) quaking grasses (*Briza minor*, *Briza maxima*), fescue (*Vulpia* spp.) and annual veldt grass (*Ehrharta longiflora*).
- Exotic woody weeds such as gorse (*Ulex europaeus*), African boxthorn (*Lycium ferocissimum*), Montpellier broom (*Genista monspessulana*), sweet briar (*Rosa rubiginosa*) and boneseed / Bitou bush (*Chrysanthemoides monilifera*).
- Herbaceous weeds such as Flatweed (*Hypochaeris radicata*), Galenia *(Aizoon pubescens*), Cape weed (*Arctotheca calendula*), fennel (*Foeniculum vulgare*), Paterson's curse (*Echium plantagineum*), onion grass (*Romulea rosea*), a South African orchid (*Disa bracteata*), horehound (*Marrubium vulgare*), plus a variety of thistles including artichoke thistle (*Cynara cardunculus*),

[2] For an exotic/introduced species (weeds and other pest/feral species) a common name is used (with the scientific binomial in brackets, when first mentioned).

common sowthistle (*Sonchus oleraceus*), spear thistle (*Cirsium vulgare*) and variegated thistle (*Silybum marianum*).

- Native weeds such as *Cassinia sifton* (sifton bush) and those associated with the over-proliferation of regenerating shrub and tree saplings that form a closed canopy layer (e.g. several *Acacia* species — such as *Acacia paradoxa* (kangaroo thorn)), to the detriment of the native ground layer.

Some of these weeds have best practice management guides (examples available at Weeds Australia).

Other weed-related threats to grassy ecosystems arise from management actions. These include the following if not carefully planned and implemented.

- Spray drift during the broad-acre application of herbicides due to using non-selective methods such as boom or aerial spraying can and do affect native plant species.
- Inappropriate selection, application and overuse of herbicides.
- Poor weed identification, particularly similar looking herbaceous species (e.g. native Poa and spear-grass tussocks accidentally killed under the guise of serrated tussock or Chilean needle-grass control).
- Widespread emergence of herbicide-resistant weeds.
- A failure to integrate weed management planning and actions into whole of community restoration programs.
- Lack of appropriate hygiene practices for vehicles, mowers, slashers, earth-moving machinery and footwear facilitates the spread of weed propagules.

3.3.2 Introduced predators and other pests

Threatened species on the VVP that are adversely affected by predation from foxes (*Vulpes vulpes*) and feral cats (*Felis catus*) include *Perameles gunnii* (eastern barred bandicoot) and *Delma impar* (striped legless lizard) (DEWHA 2008, DCCEEW 2024b). Rabbits (*Oryctolagus cuniculus*) and European hares (*Lepus europaeus*) selectively graze palatable groundcover species and tree seedlings and have the potential to degrade habitat for the eastern barred bandicoot, *Tympanocryptis pinguicolla* (Victorian grassland earless dragon) and *Synemon plana* (golden sun moth) (Commonwealth of Australia 2016). House mice (*Mus musculus*) can have particularly high impacts in plague years and are known, for example, to graze on orchid tubers (Murphy et al. 2008). Browsing and ringbarking by deer (Cervidae) and goats (*Capra hircus*) is an emerging threat in these grassy ecosystems, decreasing density and diversity (Steve Sinclair personal communication, 24 June 2025; Government of South Australia 2023). Careful consideration of pest control measures are needed, for example, anticoagulant rodenticides can have adverse impacts on native fauna such as owls, frogmouths, other birds of prey and reptiles (DEECA 2024a).

Less clear is the extent of the impact caused by exotic invertebrates (e.g. slugs, snails, red legged earth mites (Halotydeus destructor)). Although it is known that introduced slugs and Portuguese millipedes (*Ommatoiulus moreletii*) graze on tubers of orchids such as the critically endangered *Diuris fragrantissima* (sunshine Diuris orchid) (Murphy et al. 2008). Impacts of pest control actions on indigenous fauna and flora, such as spraying for locusts, still need to be fully investigated.

3.4 Lack of biomass management or inappropriate biomass management techniques

Managing biomass is an ongoing challenge in many grassy systems, particularly in forb rich sites. Ecological communities with a natural grassy ground cover, such as the GEW ecological community,

require some type of biomass management e.g. ecological burns, grazing or mowing/slashing. Without suitable biomass management, dominant grass species generally out-compete and smother smaller flowering herbs and/or biological soil crusts. In turn, the grass tussocks will then senesce. A senescent grass is not able to respond quickly to a change in available resources once dead biomass has been removed. This leaves gaps in the stand of grass and resources available above ground (i.e. light) and below ground (i.e. nutrients, moisture). Weed seeds in the soil profile are then able to germinate under these favourable conditions and compete with existing grasses. In this situation, native plant biodiversity continues to decline, and the weed species eventually dominate.

Another biomass-related threat is the excessive recruitment of shrub and tree saplings, especially *Acacia* species, whose dense cover then shades out the grassy understorey. This is probably due to the lack of regular burning or stopping grazing. On the other hand, restoring tree cover can assist with managing biomass and weed cover.

3.4.1 Fire regimes that cause biodiversity decline

In general, plant and animal species associated with a grassy ground cover are well adapted to natural fire regimes, particularly if fire happens after seed set (Eddy 2002), and where fauna refugia are available e.g. soil cracks in summer, under rocks. Frequent, low intensity fires are typical. So, fire is usually the preferred biomass management tool, particularly in kangaroo grass-dominated habitats on public land, where burning has been the historical form of management. Fire is important in maintaining species diversity and controlling invasion into the understorey by woody weed species. Weed infestations may alter the fire regime by increasing the intensity of fire. Too-frequent fire can also lead to degradation and loss of flora and fauna diversity.

Lack of fire in grassy ecosystems can result in increased biomass, increasing fuel loads and increased fire intensity. This increases the risk of uncontrollable fire and the resultant loss of the 'patchy burning' needed to maintain habitat heterogeneity, which is essential for fauna and flora viability. High biomass levels are also correlated with increased pest invertebrates (e.g. exotic slugs) and pest vertebrate populations (e.g. mice) (Wong and Morgan 2007). In the absence of bushfire, ecologically appropriate planned burning can be used to maintain grassy ecosystems; but take care to avoid damaging river red gums (*E. camaldulensis*) and course woody debris by restricting fire to the ground layer and during cooler seasons. High intensity fire events can kill river red gum and other trees, particularly regenerating areas and trees with hollows (including stags).

Fires also have effects on biotic interactions, such as herbivore-plant interactions (e.g. altering resource availability), predator-prey interactions (e.g. facilitating easier access for feral predators to native fauna) and abiotic interactions, such as combined drought and fire, which may have compounding effects on rates of plant mortality and regenerative capacity (DAWE 2022). Therefore, unintended consequences of fire also need to be carefully managed based on the environmental conditions and biodiversity at each site.

After past catastrophic bushfire events and the Victorian Bushfires Royal Commission (2010) there has been a government policy to increase the amount of planned burning in Victoria. Because grassy ecological communities generally respond favourably to fire, increased use of fire is not considered a threat, if conducted appropriately. It presents an opportunity to carry out more ecologically appropriate burns in locations where a native grassy ground cover persists, such as roadsides, rail reserves and cemeteries. However, increased fire treatment may be associated with ploughing or some other form of soil disturbance when creating firebreaks. This can have negative consequences for grassy ecosystems, leading to weed invasion and loss of native species. Other techniques, such as slashing fuel breaks and back burning edges, overcome the need for bare earth fuel breaks.

For any hazard reduction burning, it is best if it is planned and implemented with input from First Nations, takes into account threatened species and important functional species (particularly mature red gum trees at each location), climatic conditions, and is done at appropriate intervals and at times of year, such as avoiding times when native grasslands and grassy woodlands are flowering and setting seed, or when ground birds are nesting.

3.4.2 Grazing pressure from livestock and native macropods

Grazing by hard-hoofed domestic livestock is a major degrading activity in many Australian ecosystems (e.g. Dorrough et al. 2004; Kirkpatrick 1999; McIntyre et al. 2002; Young 2000). It impacts ecosystem function via consumption of native species, soil disturbance and compaction, destruction of biological soil crusts (lichens and bryophytes), nutrient increases, and can lead to introduction and invasion by weeds (Lunt et al. 2007, CCMA 2023).

Livestock grazing has converted open grassy ecosystem understories, originally dominated by native perennial tussock grasses (e.g. kangaroo grass), to dominance by exotic annuals (e.g. *Avena*, *Bromus, Hordeum* and *Trifolium* spp.), with losses of native herbs (e.g. Prober and Thiele 1995; Dorrough et al. 2004) when stock disturbance is introduced for the first time and/or intensity increases. Grazing in woodlands can also prevent the recruitment of new eucalypts which are needed to replace old canopy trees (CCMA 2023). Most patches of the GEW ecological community on private land, and many reserves on public land, have a history of intensive grazing (by kangaroos and livestock) and past management regimes, whether by fire or grazing, have been the conventional wisdom for biomass management.

Carefully managed grazing has a role to play in the management of grassy ecosystems and can be used to reduce plant biomass. Grazing is likely to give positive conservation outcomes in a small range of ecological circumstances (Lunt et al. 2007). For example, in some cases, removal of grazing can lead to development of regeneration thickets that may need to be thinned. Livestock grazing should be avoided at sites that have not been grazed in the past as many native plants disappear under even light grazing (CCMA 2023). Grazing by cattle in particular can result in irreversible damage e.g. to soil crusts. Cattle grazing pressure of roadside and rail reserves (i.e. linear reserves) may increase in times of drought (Jess Hill, personal communication, 9 September 2025). Many private landholders use grazing management as part of their farm plan. Several studies and reviews focus on using grazing to manage biomass and weeds (e.g. Sindel et al. 2000; Dorrough et al. 2004; Lunt 2005; Wong and Morgan 2007; Turner et al. 2008; Zimmer et al. 2010). Grazing regimes using a suitable rest period can maintain grassland diversity (Lunt et al. 2007), but set stocking encourages selective grazing and at high densities can cause damage, as cited above. Effective grazing management of weeds in the grasslands of south-east Australia are well documented in standard texts.

- Grazing at either too high stocking densities or for too long should be avoided. Targets should be set to achieve either light stocking with a rest period, or high intensity crash grazing with a rest period, depending on management objectives.
- Highly palatable native species (including many orchids, lilies and daisies) may be selectively grazed and may require individual protection.
- Stock camping, where stock congregate and sleep, results in areas of disturbed, bare soil that are susceptible to weed invasion (notably on hilly country and around water points) and leads to excessive nutrient loads.
- Grazing should be timed to reduce seed set of annual weeds, and to optimise native species flowering and reproductive cycles.

Grazing pressures from feral herbivores, notably rabbits and from native herbivores (e.g. kangaroos), also should be managed and taken into account in site management plans. For example, in closed systems such as fenced wildlife reserves, large numbers of *Macropus giganteus* (eastern grey kangaroo) can strip vegetation cover and reduce habitat for threatened species such as *Perameles gunnii* (eastern barred bandicoots). It should be noted that eastern grey kangaroo grazing can be beneficial to many native daisies.

3.4.3 Mowing and slashing

The grassy understorey or derived native grasslands of the GEW ecological community may be mowed or slashed to manage native vegetation as part of fire mitigation works, or for amenity purposes e.g. along roadsides, in cemeteries, on private peri-urban properties or urban parklands. Negative impacts from mowing and slashing, include the following:

- Spreading weed propagules — unless vehicle and machinery hygiene practices are strictly and consistently adhered to.
- Promoting weed species that are adapted to slashing (e.g. weeds with flat rosettes, Chilean needle-grass — because it can produce basal cleistogene seeds) — unless slashing is applied intermittently with other biomass control methods such as burning.
- Cutting native plants prevents them from reaching natural heights and removes, or prevents the development of, seed heads.
- Cut material smothering indigenous plants — using a catcher on a mower or flail slasher is recommended to help overcome this.
- Vehicle access causing considerable soil disturbance (especially when the ground is wet) and promoting weed invasion

3.5 Loss of key component species

Perhaps the most unquantifiable threat to temperate grassy woodlands has been the loss of key component species, also termed keystone or functionally important species. The plants and animals that comprise natural grassy ecological communities have diverse ecological roles — as pollinators, predators, mutualists or environmental engineers. They may be involved in nutrient recycling, promoting suitable vegetation disturbance, or transforming other essential elements of structural habitat or species composition. Losing certain species may lead to poor pollination and germination rates, the removal of essential host plants or animals, disruption of critical life stages, and vulnerability to stochastic events.

The effects of losing mammals from the GEW ecological community are not fully known, although a number of species are known to have become extinct or threatened at a statewide or regional level (Seebeck 1984). At least four species (believed to have been on the VVP) are extinct (DSE 2003a, 2003b). Predators such as *Dasyurus viverrinus* (eastern quoll), now extinct in the wild on the mainland, were replaced by larger and more effective exotic predators (e.g. foxes and cats) that are now abundant.

Digging and scratching (i.e. bioperturbation) by ground foraging marsupials, such as bandicoots and bettongs, had positive effects on soil fertility, structure and moisture levels. These animals were formerly common key soil engineers of grassy ecosystemssuch as this ecological community. They have markedly declined in abundance, along with their ecological roles. Their activities included the following.

- opening up inter-tussock spaces, providing a micro-topography that assisted seedling germination.

- maintaining tussock health by scratching out dead thatch for nesting material.
- dispersing seeds and beneficial soil biota such as hypogeal fungi.
- reducing fuel loads by grazing vegetation, and by incorporating leaf litter back into the soil (thus also playing positive roles in fire ecology).

Lack of seedling recruitment in a wide range of native forb species, observed in both wild and revegetated populations (Morgan 1995, 1999), could be due to the loss of pollinators or symbiotic associations with mycorrhizal fungi, or a combination of several other possible factors. Their important functional roles in the detritus cycle, nitrogen fixing, soil stabilisation, and seed germination are well recognised. Much more information about the fungal kingdom, species distribution and fungal associations is needed.

Similarly, little is known about invertebrate associations, species diversity and ecological function in grassy ecological communities. This is another major knowledge gap. Invertebrates are critical components of grassy ecological communities, as pollinators, prey and beneficial predators of exotic invertebrates (Horne et al. 1995). From the few known studies to date, invertebrates were abundant in grassy ecosystems. Twenty-six beetle families (114 morphospecies) were collected from twelve grassland sites (Yen and Kobelt 2009); and, in an unpublished survey of roadside grasslands near Shelford (A Yen personal communication, 2010 from DEPI 2014), over 150 species of wasp were found, including pollinators and parasites. The effect of broad-scale locust-spraying on other classes of invertebrates and broader grassy food-webs should be investigated.

3.6 Poor reservation status

The CAPAD protected area database (CAPAD 2024) estimates that only 1% of the total remaining extent of the GEW ecological community is in formal conservation reserves. Although more reserves are planned to be acquired on the VVP as agreed under the Melbourne Strategic Assessment, more of those acquired to date are grassland reserves, as opposed to woodland. There may still be opportunities to secure and manage areas of the GEW ecological community on private properties using covenants and agreements. It is unlikely that large areas of the GEW ecological community remain undiscovered, so the management focus needs to be protecting known patches.

3.7 Lack of knowledge

Vegetation mapping is still insufficient in some local government areas; a spatial model of ecosystem distributions require ground-truthing, along with updated mapping. Areas mapped decades ago may no longer contain grassy values because of subsequent clearing or degradation. Incomplete or inaccurate grassy ecosystem mapping is thought to hinder identifying priorities for targeted action — as well as hindering prosecutions of illegal native vegetation clearance and protective regulations enforcement.

There are also significant gaps in ecological knowledge, such as the interaction between fire and grazing regimes as management tools (to promote native biodiversity and to reduce weed abundance). The amount of monitoring of management regimes is also inadequate, across the entire VVP- Management actions and tools that need further investigation include the following.

- Methods to control biomass and to promote regeneration.
- Weed removal using herbicide and other techniques.
- Vegetation restoration, including supplementary planting (to re-establish the near-extinct shrub layer, or to augment natural recruitment).
- Stopping fertiliser application.

- Restoring natural hydrology and preventing further alterations to natural water flow.

3.8 Lack of public awareness and limited stakeholder capacity

Raising public awareness and building stakeholder capacity is important to address the following.

- Poor compliance with legislation and planning controls, including deliberate and accidental removal/degradation of grasslands and grassy woodlands.
- Illegal collection of wildlife or flora and firewood.
- Conflicting advice given to landholders by conservation and agricultural productivity experts.
- Rubbish and green waste dumping; use of motorised recreational activities such as trail-bike riding; and vandalising fencing and signage.
- Contractors not performing due diligence or following best practice guidelines when they undertake weed control or engaged in installing or managing public infrastructure.
- Public perception that grassy ecological communities are uninteresting and unattractive, and that they are unused “wasteland”, or harbour snakes.
- Lack of uniform definitions and management advice.

Poor stakeholder capacity has also been identified as a threat to the GEW ecological community in the following ways.

- Many patches are managed by committees or agencies with limited conservation management expertise.
- Some rural shires do not have a sufficient rate-payer base to fund environmental officers to carry out management, often over a very large region.
- The large size of the VVP Sub-bioregion makes distance and travel time a difficulty for people attending meetings and events, and/or for carrying out on-ground management actions and monitoring.

3.9 Climate change

Climate change predictions suggest that the frequency of threats such as prolonged dry periods, heatwaves, and dry-lightening fires (and shorter spring flowering conditions) may increase (BOM 2024; CSIRO 2024). If this happens, it will pose an additional disturbance threat (Olivares-Rojas 2025). The number of fire danger days may also increase; and fires may become more frequent and harder to control once started (BoM 2024). As fire seasons start earlier, the window for planned burning (to reduce biomass), will narrow.

Victoria’s Climate Science Reports 2019 and 2024 (DELWP 2019; DEECA 2024b) predict that, if global emissions continue to increase, then by the 2050s Victoria may experience the following.

- Increased average annual temperature.
- Increased heat extremes (i.e., hotter hot days); they will warm faster than average temperatures.
- A decline in cool season rainfall.
- Longer fire seasons with more very high fire danger days.

Climate change predictions across Victoria suggest that dry springs and hot summers may become more common and lead to reduced recruitment of native plants. Other predictions associated with

climate change, such as trends towards more frequent and intense bushfires and for more intense storms, may also impact on biodiversity in the GEW ecological community.

The predicted increase in average temperatures, and increasing periods of extreme heat and drought, will impact plants and animals in various ways. More frequent drought in south-eastern Australia is one of the modelled predictions resulting from climate change and this may have ongoing impacts on species such as the threatened *Rutidosis leptorrhynchoides* (button wrinklewort) one of many daisy species that are part of the GEW ecological community.

The dry conditions of the Millennium Drought, particularly in spring, are believed to have affected germinant survival. Button wrinklewort flowers from mid-spring to summer, and germinants are especially vulnerable to hot, dry conditions and longer intervals between rain periods (NSW OEH 2012). This phenomenon was also implicated in early data from a PhD study on *Pimelea spinescens* subsp. *Spinescens* (spiny rice-flower) (D Reynolds personal communication, 2010 from DEPI 2014). 'Snap drought' / 'single-season droughts' (insufficient autumn rain – lack of recharge/infiltration) may stop trees recovering from prolonged drought (e.g. 13 years of the Millennium Drought in some areas) — so drought stress is a major source of decline for veteran trees (Steve Sinclair and David Cameron personal communication, 24 June 2025). This can be hard to track/perceive at first, e.g. with *E. camaldulensis* (river red gum), because of the natural cycles of dieback and regrowth that they go through.

There are anecdotal observations that numerous native grasses and wildflowers do not produce many flowers, flower-heads are prone to wilting, and that plants do not produce viable seed on extremely hot days (Stakeholder surveys and forums personal communication, 2010 from DEPI 2014).

4 Recovery program

4.1 Vision

To secure and improve the geographic extent and integrity of the GEW ecological community.

4.2 Objectives

The objectives of this Recovery Plan are to:

Objective 1 – Maintain and improve the condition and extent of the GEW ecological community throughout its geographic distribution.
All patches of the GEW ecological community should be managed for long-term maintenance of structure and diversity, particularly through biomass management and pest plant and animal control. Additional sites should be restored to meet the description and condition thresholds for the GEW ecological community (TSSC 2009).

Objective 2 – Protect the GEW ecological community from threatening processes, potentially incompatible land use or catastrophic loss.
Existing patches require ongoing protection through a variety of tools and activities, such as direct protection from particular threats (e.g. fencing), reservation, land purchase, management agreements, incentives (particularly on private land), regulation and compliance, and stakeholder engagement and provision of information.

Objective 3 – Increase knowledge of the ecology and management requirements of the GEW ecological community.
In order to identify priority areas or specific sites, and identify clear management and restoration targets and priorities across the full range of the GEW ecological community, surveys, monitoring and analysis are needed to:

- determine the location, extent and condition of patches of the GEW ecological community
- update key threats and determine the most effective management strategies for key sites.

Objective 4 - Improve connectivity via restoration and enhancement.
Enhance connectivity within the landscape by focusing on core areas of high actual and potential biodiversity value and creating links between these areas.

Objective 5 - Improve community awareness and support for the conservation and improved management of the GEW ecological community.
Engagement, education and information exchange are important ongoing elements for the recovery of the GEW ecological community.

4.3 Recovery actions and performance criteria

Recovery actions for the GEW ecological community are described in Table 1, as well as performance criteria against which success or failure can be determined.

When considering how to prioritise and implement the recovery actions in this Recovery P consideration needs to be given to:

- the landscape-scale and complexity of the GEW ecological community
- the multitude of threats impacting the ecological community, with varying priorities to address different threats at each site
- the different native taxa at each site, with actions likely to be very different between sites aiming to protect or restore threatened or rare species habitat (e.g. southern brown bandicoots, or threatened orchids/daisies) or varying taxonomic diversity (e.g. high diversity of frogs vs birds vs mature trees vs ground cover flora; or a rare combination)
- the various types of partners and other stakeholders involved with the ecological community, taking into account the high proportion of GEW occurring on private land, and
- the various end uses for the plan, including to enable or guide protection through Commonwealth, state or local regulations versus management and restoration activities by landholders, First Nations, local/regional/state agencies, and local community groups and networks.

Therefore, recovery actions are presented as a 'menu' that aligns with the main objectives of the Recovery Plan. The intention is that this menu-style of recovery actions may be used flexibly and adaptively, according to various and relevant considerations and influences at each site or location of the ecological community, such as those suggested in Table 1.

Table 1 Recovery objectives and actions

Objective 1	**Maintain and improve the condition and extent of the GEW ecological community throughout its geographic distribution**
Actions and Priorities	• Identify and prioritise "target areas" and sites for effective management and recovery actions based on both environmental and cultural importance e.g. potential risk reduction benefits. • Site management should be guided by observed conditions; for example, thickness of grass, weed cover and prevailing weather conditions, as well as knowledge of past management at the site. • Develop condition improvement targets for all existing sites/areas reserved and managed for conservation purposes. • Encourage natural regeneration of seedlings to replace old trees. Under certain conditions, dense thickets of regenerating Eucalyptus seedlings may need to be thinned to prevent them from outcompeting other native species. • Undertake appropriate, targeted pest plant (weed) and animal control. Limit herbicide and pesticide use in and near the GEW ecological community, to prevent off target impacts (including to lichen and moss). For example, avoid using rodenticides, which can be lethal for owls, frogmouths, other birds of prey and reptiles. Use non-mechanical methods (e.g. not warren ripping) for control of rabbits. Control introduced pest animals through coordinated landscape-scale control programs. Develop triggers for control programs according to each pest animal's abundance and impact. Do not stack fallen wood in piles that provide shelter for cats, foxes and rabbits. Use target specific herbicides; place a hood over the sprayer or use a weed wiper to directly apply herbicides. Other targeted methods include, basal spraying, stem injection or cutting and painting with herbicide. It is important to use the right herbicide in the right way. When managing problem weeds consider related factors such as grazing, fire and soil nutrient status.

	• Undertake appropriate forms of biomass management (e.g. ecological and cultural burning, targeted grazing, slashing to a height of at least 100 mm) to improve and/or maintain vegetation quality. • Incorporate ecological outcomes in all fire treatment programs. • Manage threats by removing and/or establishing and maintaining appropriate fencing and infrastructure. • Avoid introducing cattle grazing to areas not previously grazed by them including roadside and rail reserves. • Manage soil nutrients to support a more diverse native understorey. • Undertake active restoration at appropriate/treated sites e.g. replant canopy and understorey species, reintroduce native forbs and grasses via seed addition, reintroduce fauna, other habitat augmentation such as re-introducing hollows, logs and rocks. • Seed with local native groundcover species of the GEW ecological community, allied with ongoing weed management. Support ecological seed harvesting. Support/develop an effective regional seed and plant supply chains for revegetation. • Install and maintain markers and signs (including existing signs), to indicate the location of high -quality patches of the GEW ecological community in reserves, including linear patches (e.g. roads, tracks, rail and utility easements). • Develop and implement integrated management plans for all conservation reserves. • Restore and enhance habitat and increase habitat complexity by appropriate revegetation and enrichment planting. • For populations of threatened species, undertake re-introduction, translocation, artificial pollination, *ex-situ* conservation or captive breeding, as described in threatened species' recovery plans and conservation advices.
Performance Criteria	• Increased area and number of locations managed for conservation outcomes. • Increased number of locations with a greater extent and/or improved condition e.g. meeting minimum condition criteria or higher benchmarks for increased native cover and biodiversity and decreased cover of weeds. • Improvement in or maintenance of condition of all sites aimed at conservation and an increased proportion of sites where conservation is secondary.
Objective 2	**Protect the ecological community from threatening processes, potentially incompatible land use and loss**
Actions	• Identify gaps in current reserve and off-reserve conservation protection, in terms of representative geographic and ecological variation across sites with patches of the GEW ecological community. • Negotiate voluntary acquisition or exchange of key sites for conservation purposes (as opportunities arise). • Amend public land tenure to increase conservation reserves (as opportunities arise). • Establish long-term conservation management agreements with managers of unreserved public land. • Protect patches on private land through in-perpetuity conservation and management agreements and protective covenants. • Continue to encourage incentive and long-term stewardship schemes (e.g. Grassy Eucalypt Woodland Stewardship Program https://ccma.vic.gov.au/projects/grassy-eucalypt-stewardship-program/) that target protection of patches of the GEW ecological community, especially on private land. • Ensure that planning processes consider conserving the GEW ecological community from early stages; and amend planning schemes and overlays to incorporate conservation actions into planning, management and development controls. • Plan activities/projects to avoid the need to offset, by avoiding unacceptable and significant impacts to this ecological community (with guidance from ecological experts to help achieve this). • Offsets for impacts arising from developments should be avoided as much as possible, on the basis that only a very small proportion of the GEW ecological community remains. • Adopt a landscape -scale approach to planning and zoning decisions to protect important landscape -scale connections between areas of native vegetation of both this ecological community and adjacent vegetation types, especially Natural Temperate Grassland. Avoid cumulative impacts to the GEW ecological community, and associated ecosystem functions and cultural values.

	• Avoid and mitigate potential impacts on the GEW ecological community from development or other activities. The priority is to avoid vegetation/habitat clearance and other impacts to the extent, integrity and resilience of the GEW ecological community. This includes loss of biodiversity and declines in abundance (particularly of functionally important species), loss of connectivity and barriers to movement and changes to other key natural processes. • Protect important habitat features, such as large mature trees & stags with hollows which take many decades to develop. Leave tree stumps, logs, woody debris and rocks. • Minimise the risk of indirect impacts from actions outside but near to patches of the GEW ecological community, for example avoid building fire-sensitive infrastructure in or immediately adjacent to patches of the community that will encourage fire-hazard reduction activities. • Avoid building infrastructure within or near the GEW ecological community that will impact biodiversity, connectivity between patches, and ecological function. • Apply appropriate buffer zones, particularly regarding adjacent areas of other threatened ecological communities, to minimise impacts arising 'off-site' from a particular proposed activity. Implement measures to prevent weeds spreading into the GEW ecological community. • Establish buffer zones of at least 100 m (beyond the outermost boundary of a patch of the GEW ecological community) to help protect patches from many potential adverse impacts. A larger buffer zone should be used to protect patches where particular threats may have more extensive impacts. • Undertake surveillance for new invasive species incursions and, where they are detected, control them early, as small infestations are more likely to be eradicated. • Protect soils from nutrient increase, that may help weeds to establish. Do not apply phosphorus-containing fertilisers (or nitrates), in the GEW ecological community, and avoid applying them nearby, especially when wind or sheet water flow may cause drift/washing into the ecological community. Avoid concentrating stock urine and dung by managing stocking density and timing. • Protect soils from disturbance. Avoid dense congregations of livestock and avoid trampling during wet conditions, because this compacts soil and breaks up soil crusts. Avoid using heavy machinery when soils are wet and choose tyres that minimise damage. • Retain and protect other native vegetation near patches of this GEW ecological community. In particular other threatened ecological communities and/or areas important for connectivity and diversity of habitat. Retain and protect buffer zones between this ecological community and any development areas or other threats. • Where this ecological community is regenerating, protect it to full maturity. For example, provide temporary fencing to minimise risk of damage to regrowth; ensure appropriate fire management. • Liaise with stakeholders and land managers to avoid accidental damage and breaches of legislation. • Further promote and enforce the state legislative controls over the taking of protected flora on public land and the provisions of the Native Vegetation Framework.
Performance Criteria	• An increased area and network of patches of the GEW ecological community is protected under reservation and/or conservation agreements across its geographic extent. The network incorporates ecological variation in the GEW ecological community. • No net loss in the area of and/or number of sites containing the GEW ecological community and that meet condition thresholds.
Objective 3	**Increase knowledge of the ecology and management requirements of the ecological community**
Actions	• Identify gaps in survey and mapping data across the predicted distribution of the GEW ecological community in the VVP and adjacent sub-bioregions and conduct future surveys to fill these gaps. • Ground-truth spatial data that is outdated and/or was gathered by remote sensing, noting condition changes over time and due to disturbances. • For priority locations, collect baseline data on area of occupancy, condition of patches of the GEW ecological community and presence of threatened species. • Long term monitoring of important populations/locations and responses to management actions (on a regular, ongoing basis). Identify any regional differences in the GEW ecological community's response to management. Where practical conduct monitoring consistent with the methods described by the Ecological Monitoring System Australia (EMSA) (O'Neill et al. 2023). • Assess the efficacy of incentives programs, agreements, community education and management interventions in improving the conservation and quality of patches of the GEW ecological community.

	• Promote and continue research into appropriate biomass management techniques and the impacts of various management regimes, notably burning and grazing. • Investigate proven cost-effective techniques for restoring degraded areas, to improve functionality and restoration of understorey species. • Develop methods to measure the effectiveness of management activities by developing models for priority locations for the GEW ecological community and component threatened species. • Incorporate First Nations Traditional Ecological Knowledge in on-ground management wherever possible when appropriate permission has been provided.
Performance Criteria	• Documented and appropriately published results of all research projects. Results incorporated into regional "best practice" management guidelines and distributed to land-managers. • Best practice guidelines continue to be developed, reviewed and/or modified in light of research/monitoring results. • Long-term monitoring programs in place and results show an improvement in the quality (condition) of GEW ecological community sites. • On-going improvement in the knowledge of the extent and quality of the GEW ecological community.
Objective 4	**Improve connectivity among patches of the GEW EC via restoration and enhancement.**
Actions	• Identify key sites for maintaining landscape connectivity (i.e. to manage under conservation agreements, or similar protection mechanisms). • Analyse landscape-scale opportunities and risks to identify optimised locations for restoration and enhancement of connectivity between patches of the ecological community and with other native vegetation, particularly other threatened ecological communities.
Performance Criteria	• Priority sites have been identified for improving connectivity. • Better connections between patches of the ecological community and with other native vegetation, particularly other threatened ecological communities.

Objective 5	**Improve community awareness and support for the conservation and improved management of the GEW ecological community.**
Actions	• Adopt an adaptive management approach to restoration based on co-design local partnerships using local knowledge in planning supported by cost-effective and risk based decision making. • Support the continued operation of VVP conservation management networks (CMNs) and Natural Resource Management (NRM) biodiversity networks. Improve links and information exchange with CMNs in the Gippsland and Northern Plains networks. • Continue educating private and public stakeholders to identify, manage, monitor and benefit from the GEW ecological community e.g. by distributing information material, newsletters, exhibiting at field days, running workshops and training. • Facilitate information and skills exchange between landholders, land managers, government agencies, community groups and other stakeholders to achieve best practice management. • Identify sites where current management practices are beneficial to biodiversity and promote these as models for best practice management and/or as research sites. • Continue to disseminate results of research, management and restoration programs to stakeholders via mechanisms such as VVP CMN, conferences and publications. • Raise public awareness and build stakeholder capacity to address illegal collection of firewood or flora/fauna. • Continue promoting cooperative programs such as Landcare, as well as competitive market-based programs, to provide for the differing goals of landholders. • Involve First Nations people in all aspects conservation management and restoration of GEW ecological community, on both public and private land. This includes reestablishing Traditional fire regimes with positive cultural and ecological outcomes, as well as seed collection and propagation, replanting, and invasive species management. • Ensure that extension/education material (including identification and management guides) is kept current and relevant
Performance Criteria	• All organisations involved in planning, management, development and control of land/vegetation in the region are aware of the issue of GEW ecological community conservation and have incorporated this matter into their functions. • Increasing land manager, community and First Nations involvement in conservation of the GEW ecological community and increasing numbers accessing incentive and stewardship funding for its conservation management. • An increasing number of land managers are implementing “best practice” management on GEW ecological community sites.

5 Effects on other native species and biodiversity benefits

Implementation of this Recovery Plan will benefit the diverse array of species which constitute the GEW ecological community, including listed threatened species such as *Dianella amoena* (matted flax-lily), *Delma impar* (striped legless lizard) and *Pterostylis basaltica* (basalt greenhood).

The GEW ecological community extends across the VVP, intergrading with other threatened ecological communities, such as natural temperate grasslands and seasonal herbaceous wetlands. The threats and land uses that impact the GEW ecological community apply across the entire bioregion and affect numerous species and other ecological communities. Recovery actions to ameliorate threats to the GEW ecological community will contribute to the conservation of biodiversity assets for the entire subregion.

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Appendix 1. Key recovery partners

There is a diverse range of stakeholders who have an interest in the GEW ecological community including (but not limited to those listed below).

Government
Commonwealth of Australia
Department of Climate Change Energy Environment and Water (various relevant areas)
Department of Defence (Commonwealth land)
Department of Agriculture Fisheries and Forestry
State government departments / Other Government, public authorities and bodies
Aboriginal Affairs Victoria (AAV)
Agriculture Victoria (DEECA)
Arthur Rylah Institute (DEECA)
Department of Energy, Environment and Climate Action (DEECA)
Department of Health (DH) – Cemeteries and Crematoria
Department of Transport and Planning
Royal Botanic Gardens Victoria
Melbourne Strategic Assessments (DEECA)
Municipal Association Victoria
Parks Victoria
Places Victoria (formerly VicUrban)
Public Committees of Management for Crown Land
Scientific Advisory Committee, Victoria (SAC)
State Forests (DEECA)
Trust for Nature (TfN)
Catchment Management Authorities (CMAs)
Corangamite CMA
Glenelg Hopkins CMA
Melbourne Water (formerly Port Phillip and Western Port) CMA
North Central CMA

Wimmera CMA
Local Government Areas (LGAs) — 34
Experts: Universities, Research Institutes and consultants
Abzeco
ANU Fenner School of Environment and society
Arthur Rylah Institute
Australian Research Centre for Urban Ecology (ARCUE)
Biodiversity Services
Cassinia
Charles Sturt University
CSIRO
Deakin University
Vegetation Link
Ecology Australia
Environmental Consultants Association (Victoria)
Frankston (Weeds) and Knoxfield (Insects) DEECA
Gordon TAFE
La Trobe University
Monash University
Royal Melbourne Institute of Technology
University of Ballarat
University of Melbourne
Victoria University
First Nations Groups
Victorian Recognised Aboriginal Parties (RAPs)
Barengi Gadjin Land Council Aboriginal Corporation
Bunurong Land Council Aboriginal Corporation

Dja Dja Wurrung Clans Aboriginal Corporation
Eastern Maar Aboriginal Corporation
Gunditj Mirring Traditional Owners Aboriginal Corporation
Taungurung Land and Waters Council Aboriginal Corporation
Wadawurrung Traditional Owners Aboriginal Corporation
Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation
Regional Indigenous Facilitators with DEECA, CMAs and Parks Victoria
Local Indigenous Networks (LIN)
First Nations communities and land managers
Kikkabush
Winda-mara Aboriginal Corporation (for Gunditj Mirring)
Industry\Primary producers
Rural Associations and Agricultural-based Businesses
Australian Agricultural Group
Australian Wool Innovation Limited
Grains Research and Development Corporation
Meat and Livestock Association (MLA)
National Farmers Federation (NFF)
AgriFutures Australia/Rural Industries Research and Development Corporation
Victorian Farmers Federation (VFF)
Private Landowners and local businesses
BushBroker properties
BushTender properties
Eco-tourist Attractions
Farm businesses and families
Land for Wildlife properties
Land Management Contractors
Native Vegetation Offset/ Incentive Facilitators
Peri-urban hobby farmers

Property Developers
Public land licensees
Rural Real Estate Agents
Trust for Nature Covenants
Telecommunication companies
NBN Co.
Optus
Telstra
Energy Providers
AGL
APA Group
AusNet Services (electric and gas infrastructure)
Gasnet
Origin Energy
PacificHydro
Energy Australia
Victoria Power Networks (the large electricity distribution companies are Powercor and CitiPower)
Transport
Airport managers
Road and Rail Organisations (including private rail operators and maintenance contractors)
VicRoads
V/Line
Australian Rail Track Corporation (ARTC)
VicTrack
RailTrails (Committees of Management)
Water Corporations / Authorities
Southern Rural Water
Melbourne Water
Barwon Water
Central Highlands Water

City West Water
South West Water
Wannon Water
Yarra Valley Water
Country Fire Authorities (CFAs)
Midlands CFA
Otway CFA
Far South West CFA
Wimmera CFA
Other Stakeholders (recovery teams and taskforces)
Brolga Research Group
Corangamite Water Skink National Recovery Team
Eastern Barred Bandicoot Recovery Team
Golden Sun Moth Reference Group
Striped Legless Lizard/ Grassland Earless Dragon Recovery Team
Spiny Rice Flower Recovery Team
Threatened Orchid Recovery Team (TORT)
Northern Plains TAG
Western Grassland Reserves TAG
National Chilean Needle-grass Taskforce
Serrated Tussock Taskforce
Gorse Taskforce
Potentially Threatening Process Coordinating Group (Victoria)
Non-Government Organisations (NGOs) / Environmental Organisations and Not-for-Profits
Association Native Plant Conservation (ANPC)
Australian Conservation Foundation (ACF)
Australian Native Orchid Society (ANOS)
Australian Network for Plant Conservation (ANPC)
Australian Orchid Foundation (AOF)

Australian Seed Conservation and Research (AUSCAR)
Australian Wildlife Conservancy
Biodiversity Council
Bird Observers Club of Australia (BOCA)
BirdLife Australia
Black Cockatoo Preservation Society
Borrell-a-kandelop wetlands project
Bush Heritage Australia
Victorian Conservation Council
Conservation Volunteers Australia (CVA)
Doctors for the Environment Australia
Ecological Society of Australia
Field Naturalists Club of Victoria (FNVC) chapters e.g. Ararat, Ballarat, Geelong, Hamilton, Portland
Field Naturalists Club of Victoria (FNVC) specialist groups e.g. Fungi, Botany, Fauna survey, Herpetological
Geelong Environment Council
Grassy Groundcover Research Project
Greening Australia
Grow West
Humane World for Animals (formerly Humane Society International)
Indigenous Flora and Fauna Association (IFFA)
Indigenous Plant Nurseries and Seedbanks
International Student Volunteers (ISV)
Invasive Species Council
Kanniwinka Geopark
Kororoit Creek Coordinator
Landcare Australia
Merri Creek Management Committee (MCMC)
Society for Growing Australian Plants (SGAP)
South East Australia Naturalists Association (SEANA)
Stony Rises Woodlands Recovery Project

Victoria Naturally Alliance
Victorian National Parks Association (VNPA)
Weed Society of Victoria
Wilderness Society
World Wide Fund for Nature (WWF) Australia
Grassy Ecosystem Groups and Organisations
Caroline Springs on Grass (CSG)
Friends of Grasslands (FOG)
Grasslands Science Society
Grasslands Advisory Group - Southern Grampians Shire
Mt Elephant Community Management
STIPA Native Grasses Association
Southern Australia Grassland Society
Wallan Environment Group
Wannon Conservation Society - Grasslands
VVP 'Friends of' Groups
Friends of the Eastern Barred Bandicoot
Friends of the Brolga
Friends of Edgars Creek
Friends of Evans Street Grassland
Friends of Holden Reserve
Friends of Kororoit Creek
Friends of Lake Purrumbete
Friends of Malcolm Creek
Friends of Merri Creek
Friends of Mooramong
Friends of Pallisters Reserve
Friends of Organ Pipes
Friends of Taylors Creek
Friends of Wurambean
Friends of Floating Islands (to be established)

Landcare Groups (CMA affiliates) and Networks
VVP-wide
South West Integrated Flora and Fauna Team (SWIFFT)
VVP Conservation Management Network (VVP CMN)
VVP Biosphere
Grouped under Melbourne Water CMA (formerly Port Philip and Western Port CMA)
Western Melbourne Catchment Network (WMCN)
• Australian Plant Society – Wyndham
• Blackwood Barry's Reef Landcare Group
• Brisbane Ranges Landcare Group
• East Moorabool Landcare Group
• Friends of the Brisbane Ranges
• Friends of Greenwich Bay
• Friends of Iramoo
• Friends of Lollypop Creek
• Friends of Lower Kororoit Creek
• Friends of Melton Botanical Gardens
• Friends of Skeleton Creek
• Friends of Steele Creek
• Friends of Toolern Creek
• Friends of Werribee Gorge and Long Forest Mallee
• Little River Improvement Program
• Melton Environment Group
• Mount Rothwell Biodiversity Interpretation Centre Volunteers
• Pinkerton Landcare and Environment Group
• Toolern Vale Landcare
• Werribee River Association (WRIVA)
• Jackson Creek Eco-Network
• Clarkefield and District Farm Landcare Group

• Macedon and Mount Macedon Landcare Group
• Riddells Creek Landcare Group
• Sunbury Landcare Association
• Upper Deep Creek Landcare Network
• Deep Creek Landcare Group (Romsey/Lancefield)
• Upper Maribyrnong Catchment Group
• Moorabool Landcare Advisory Committee
• Bacchus Marsh and Coimadai Landcare Group
• Brisbane Ranges Landcare Group
• East Moorabool Landcare Group
• Rowsley Landcare Group
• Merriang District Landcare Group
Various independent groups in PPW region
• Arthurs Creek District Landcare Group
• Avalon Landcare Group
• Rockbank Landcare Group
• Truganina Landcare Group
• Upper Merri Plenty Landcare Group
• Whittlesea Agricultural Society Landcare Group
• Parwan Landcare Group
Grouped under Corangamite CMA
Ballarat Environment Network (BEN)
Geelong Landcare Network
• Anakie Tree Planting Group
• Barrabool Hills Landcare Group
• Batesford, Fyansford, Stonehaven Landcare Group
• Brisbane Ranges Landcare Group
• Corio Landcare Group
• Maude Landcare Group
Leigh Catchment Landcare Group
• Bamganie/Meredith Landcare Group

• Leigh District Landcare Group
• Upper Williamsons Creek Landcare Group
Lismore Land Protection Group
• Cundare Duverney Landcare Group
• Leslie Manor Landcare Group
• Mount Elephant Community Management
• Weering-Eurack Landcare Group
• Weerite Landcare Group
Surf Coast and Inland Plains
• Torquay Landcare Group
Woady Yaloak Catchment Group
• Grenville Landcare Group
• Haddon Landcare Group
• Misery Moonlight Landcare Group
• Pittong Hoyles Creek Landcare Group
• Rokewood Landcare Group
• The Dales Landcare Group
• Werneth Landcare Group
Various independent groups in Corangamite region
Alvie Tree Planting Group
Break O'Day and Forest Environmental Group
East Moorabool Landcare Group
Friends of Ballarat Skipton Rail Trail
Friends of Bannockburn Bush
Friends of Inverleigh Flora and Fauna Reserve
Friends of Sparrow Ground
Majestic Landcare Group
Mt Emu Landcare
Pirron Yallock Creek Catchment Landcare Group
Smythesdale Progress Association
Stoney Rises Landcare Group

Sutherlands Creek Reserve
Grouped under Glenelg Hopkins CMA
Ararat Landcare Group
Chatsworth Landcare Group
Coleraine to Hamilton Railway Line
Basalt to Bay Landcare Network
Elingamite -Cobrico Landcare Group
Eumeralla Landcare Group
Fiery Creek Catchment Landcare Group
Gazette Land Action Group
Glenthompson Landcare Network
Hopkins Moyne Land Management and Farm
Hopkins River Landcare Group
Karabeal Landcare Group
Knebsworth Landcare Group
Lake Bolac Land Protection Group
Lake Bookar Land Protection Group
Lake Goldsmith
Lower Mt Emu Creek Tree and Land Protection Group
Lower Mustons Landcare Group
Lyne and Camp Creek Land Management Group
Minogue Landcare Group
Mockanger Catchment Landcare Group
Mt Rouse South Land Protection Group
Mustons Catchment Landcare Group
Napier Landcare Group
Nevertire Tree Group
Pierrepoint Land Protection Group
Spring Creek Farm Tree and Land Protection Group
Surry River Landcare Group
Wattle Hill Creek Landcare Group

Wicklife Willaura Landcare Group
Woorndoo Land Protection Group
Upper Hopkins Land Management Group
The Broader Community
Local schools
Scouts, Cubs, Girl Guides
Field and Game Australia

Appendix 2. Flora and Fauna of the GEW ecological community

Flora Species

The plant species that are characteristic of the GEW ecological community are listed below. It is an indicative rather than comprehensive list of the plants in the GEW ecological community. Patches may not include all species on the list or may include other species not listed here.

Typical Flora Species of the Grassy eucalypt woodland and derived grasslands ecological community

Scientific name	**Common name**
Tree layer	
Acacia implexa	lightwood
Acacia mearnsii	black wattle
Acacia melanoxylon	blackwood
Allocasuarina verticillata	drooping sheoak
Banksia marginata	silver banksia
Eucalyptus camaldulensis	river red gum
Eucalyptus melliodora	yellow box
Eucalyptus microcarpa	grey box
Eucalyptus ovata	swamp gum
Eucalyptus pauciflora	snow gum
Eucalyptus viminalis	manna gum
Mid layer – Shrubs to Small Trees	
Acacia paradoxa	hedge wattle
Acacia pycnantha	golden wattle
Bursaria spinosa	sweet bursaria
Melicytus augustifolius	tree violet
Melicytus dentatus	tree violet
Ground layer – Small Shrubs	
Bossiaea prostrata	creeping bossiaea
Pimelea humilis	common rice-flower
Pimelea spinescens subsp *spinescens*	spiny rice-flower
Pimelea subsp.*sericea*	curved rice-flower
Styphelia humifusa	cranberry heath
Ground layer – Grasses, Grass-like Plants, Lilies and Orchids	
Anthosachne scabra	common wheat-grass
Arthropodium strictum	chocolate lily
Austrostipa bigeniculata	kneed spear-grass
Austrostipa gibbosa	spurred spear-grass
Austrostipa mollis	supple spear-grass
Austrostipa rudis	veined spear-grass
Austrostipa scabra	rough spear-grass

Scientific name	**Common name**
Bulbine bulbosa	bulbine lily
Carex breviculmis	common grass sedge
Carex tereticaulis	basket sedge
Dianella spp.	flax-lily
Dichelachne crinita	long-hair plume-grass
Diuris spp.	golden moth orchids
Lachnagrostis filiformis	common blown-grass
Lomandra filiformis	wattle mat-rush
Microlaena stipoides var. stipoides	weeping grass
Microtis spp.	onion orchid
Poa labillardierei var. *labillardierei*	common tussock-grass
Poa sieberiana	grey tussock-grass
Schoenus apogon	common bog-sedge
Rytidosperma caespitosum	common wallaby-grass
Rytidosperma duttonianum	brown-back wallaby-grass
Rytidosperma racemosum var. *racemosum*	slender wallaby-grass
Rytidosperma setaceum	bristly wallaby-grass
Thelymitra spp.	sun orchid
Themeda triandra	kangaroo grass
Ground layer –Wildflowers and Other Herbs	
Acaena echinata	sheep's burr
Acaena X ovina	Australian sheep's burr
Asperula conferta	common woodruff
Asperula scoparia	prickly woodruff
Atriplex semibaccata	berry saltbush
Brachyscome spaludicola	woodland swamp-daisy
Burchardia umbellata	milkmaids
Calocephalus citreus	lemon beauty-heads
Calocephalus lacteus	milky beauty-heads
Chrysocephalum apiculatum	common everlasting
Convolvulus angustissimus	blushing bindweed
Craspedia glauca spp. agg.	common billy-buttons
Crassula sieberiana	Sieber crassula
Dichondra repens	kidney-weed
Drosera hookeri	branched sundew
Drosera aberrans	scented sundew
Eryngium ovinum	blue devil
Gonocarpus tetragynus	rough raspwort
Goodenia paradoxa	spur Goodenia
Goodenia pinnatifida	cut-leaf goodenia

Scientific name	Common name
Haloragis heterophylla	varied raspwort
Leptorhynchos squamatus	scaly buttons
Lobelia pratioides	poison Lobelia
Maireana enchylaenoides	wingless bluebush
Microtis unifolia	common onion-orchid
Oxalis perennans	grassland wood-sorrel
Plantago gaudichaudii	narrow plantain
Rumex dumosus	wiry dock

Fauna Species

A list of the fauna which are likely to be part of the ecological community is below, noting the mix of fauna present is likely to differ at a particular place and time. The list has been generated from records from the Atlas of Victorian Wildlife submitted across the entire VVP bioregion. However, species that are predominantly reliant on other habitat types (e.g. marine, aquatic-) are not included, nor are species that are considered to be infrequent vagrants to the Grassland and Grassy Woodland.

Fauna Species of the Grassy eucalypt woodland and derived native grasslands ecological community

EPBC	Common Name	Scientific Name
	yellow-rumped thornbill	*Acanthiza chrysorrhoa*
	striated thornbill	*Acanthiza lineata*
	yellow thornbill	*Acanthiza nana*
	brown thornbill	*Acanthiza pusilla*
	buff-rumped thornbill	*Acanthiza reguloides*
	eastern spinebill	*Acanthorhynchus tenuirostris*
	collared sparrowhawk	*Accipiter cirrhocephalus*
	brown goshawk	*Accipiter fasciatus*
	grey goshawk	*Accipiter novaehollandiae*
	clamorous reed warbler	*Acrocephalus stentoreus*
	Australian owlet-nightjar	*Aegotheles cristatus*
	azure kingfisher	*Alcedo azurea*
	jacky dragon or tree dragon	*Amphibolurus muricatus*
	magpie goose	*Anseranas semipalmata*
	agile antechinus	*Antechinus agilis*
VU	swamp antechinus	*Antechinus minimus*
	dusky antechinus	*Antechinus swainsonii*
	red wattlebird	*Anthochaera carunculata*
	little wattlebird	*Anthochaera chrysoptera*
	Australasian pipit	*Anthus novaeseelandiae*
VU	southern whiteface	*Aphelocephala leucopsis*
	striped worm-lizard	*Aprasia striolata*

EPBC	Common Name	Scientific Name
	fork-tailed swift	*Apus pacificus*
	wedge-tailed eagle	*Aquila audax*
	cattle egret	*Ardea ibis*
	Australian bustard	*Ardeotis australis*
	dusky woodswallow	*Artamus cyanopterus*
	white-breasted woodswallow	*Artamus leucorynchus*
	masked woodswallow	*Artamus personatus*
	white-browed woodswallow	*Artamus superciliosus*
	lowland copperhead	*Austrelaps superbus*
	eastern three-lined skink	*Bassiana duperreyi*
	bush stone-curlew	*Burhinus grallarius*
	sulphur-crested cockatoo	*Cacatua galerita*
	little corella	*Cacatua sanguinea*
	long-billed corella	*Cacatua tenuirostris*
	fan-tailed cuckoo	*Cacomantis flabelliformis*
	brush cuckoo	*Cacomantis variolosus*
	striated fieldwren	*Calamanthus fuliginosus*
EN	south-eastern red-tailed black-cockatoo	*Calyptorhynchus banksii*
	yellow-tailed black-cockatoo	*Calyptorhynchus funereus*
	cape Barren goose	*Cereopsis novaehollandiae*
	Gould's wattled bat	*Chalinolobus gouldii*
	chocolate wattled bat	*Chalinolobus morio*
	double-banded plover	*Charadrius bicinctus*
	marbled gecko	*Christinus marmoratus*
	silver gull	*Chroicocephalus novaehollandiae*
	Horsfield's bronze-cuckoo	*Chrysococcyx basalis*
	shining bronze-cuckoo	*Chrysococcyx lucidus*
	black-eared cuckoo	*Chrysococcyx osculans*
	brown songlark	*Cincloramphus cruralis*
	rufous songlark	*Cincloramphus mathewsi*
	spotted quail-thrush	*Cinclosoma punctatum*
	swamp harrier	*Circus approximans*
	spotted harrier	*Circus assimilis*
	golden-headed cisticola	*Cisticola exilis*
VU	brown treecreeper (south-eastern)	*Climacteris picumnus victoriae*
	grey shrike-thrush	*Colluricincla harmonica*
	black-faced cuckoo-shrike	*Coracina novaehollandiae*
	white-bellied cuckoo-shrike	*Coracina papuensis*
	white-winged chough	*Corcorax melanorhamphos*
	white-throated treecreeper	*Cormobates leucophaeus*

EPBC	Common Name	Scientific Name
	Australian raven	*Corvus coronoides*
	little raven	*Corvus mellori*
	king quail	*Coturnix chinensis*
	stubble quail	*Coturnix pectoralis*
	brown quail	*Coturnix ypsilophora*
	Grey Butcherbird	*Cracticus torquatus*
	plains froglet	*Crinia parinsignifera*
	common froglet	*Crinia signifera*
	large striped skink	*Ctenotus robustus*
	pallid cuckoo	*Cuculus pallidus*
	laughing kookaburra	*Dacelo novaeguineae*
	varied sittella	*Daphoenositta chrysoptera*
	rufous bristlebird	*Dasyornis broadbenti broadbenti*
EN	spot-tailed/ spotted tailed/ tiger quoll (southeastern mainland population)	*Dasyurus maculatus maculatus*
EN	eastern quoll	*Dasyurus viverrinus*
VU	striped legless lizard	*Delma impar*
	mistletoe bird	*Dicaeum hirundinaceum*
	wood gecko	*Diplodactylus vittatus*
	emu	*Dromaius novaehollandiae*
	white-lipped snake	*Drysdalia coronoides*
	swamp skink	*Egernia coventryi*
	Cunningham's skink	*Egernia cunninghami*
	black rock skink	*Egernia saxatilis intermedia*
	White's Skink	*Egernia whitii (group)*
	white-faced heron	*Egretta novaehollandiae*
	black-shouldered kite	*Elanus axillaris*
	black-fronted dotterel	*Elseyornis melanops*
	galah	*Eolophus roseicapilla*
	eastern yellow robin	*Eopsaltria australis*
	white-fronted chat	*Epthianura albifrons*
EN	Corangamite water skink	*Eulamprus tympanum marnieae*
	southern water skink	*Eulamprus tympanum tympanum*
	spotted nightjar	*Eurostopodus argus*
	dollarbird	*Eurystomus orientalis*
	brown falcon	*Falco berigora*
	Nankeen kestrel	*Falco cenchroides*
	Australian hobby	*Falco longipennis*
	peregrine falcon	*Falco peregrinus*
	black falcon	*Falco subniger*

EPBC	Common Name	Scientific Name
	crested shrike-tit	*Falcunculus frontatus*
	eastern false pipistrelle	*Falsistrellus tasmaniensis*
	Latham's snipe	*Gallinago hardwickii*
	dusky moorhen	*Gallinula tenebrosa*
	black-tailed native-hen	*Gallinula ventralis*
	buff-banded rail	*Gallirallus philippensis*
	southern smooth froglet	*Geocrinia laevis*
	victorian smooth froglet	*Geocrinia victoriana*
	diamond dove	*Geopelia cuneata*
	peaceful dove	*Geopelia striata*
	western gerygone	*Gerygone fusca*
	white-throated gerygone	*Gerygone olivacea*
	musk lorikeet	*Glossopsitta concinna*
	purple-crowned lorikeet	*Glossopsitta porphyrocephala*
	little lorikeet	*Glossopsitta pusilla*
	magpie-lark	*Grallina cyanoleuca*
VU	painted honeyeater	*Grantiella picta*
	brolga	*Grus rubicunda*
	Australian magpie	*Gymnorhina tibicen*
	whistling kite	*Haliastur sphenurus*
	three-toed skink	*Hemiergis decresiensis*
	four-toed skink	*Hemiergis peronii*
	Altona skipper	*Hesperilla flavescens flavescens*
	little eagle	*Hieraaetus morphnoides*
	white-throated needletail	*Hirundapus caudacutus*
	fairy martin	*Hirundo ariel*
	welcome swallow	*Hirundo neoxena*
	tree martin	*Hirundo nigricans*
	water rat	*Hydromys chrysogaster*
EN	southern brown bandicoot (eastern)	*Isoodon obesulus obesulus*
	white-winged triller	*Lalage sueurii*
	garden skink	*Lampropholis guichenoti*
CR	swift parrot	*Lathamus discolor*
	lewin's rail	*Lewinia pectoralis*
	yellow-faced honeyeater	*Lichenostomus chrysops*
	fuscous honeyeater	*Lichenostomus fuscus*
	yellow-tufted honeyeater	*Lichenostomus melanops*
	white-plumed honeyeater	*Lichenostomus penicillatus*
	singing honeyeater	*Lichenostomus virescens*
	southern bullform	*Limnodynastes dumerilii variegatus*

EPBC	Common Name	Scientific Name
	striped marsh frog	*Limnodynastes peronii*
	spotted marsh frog	*Limnodynastes tasmaniensis*
	southern brown tree frog	*Litoria ewingii*
VU	growling grass frog	*Litoria raniformis*
	square-tailed kite	*Lophoictinia isura*
	western grey kangaroo	*Macropus fuliginosus*
	eastern grey kangaroo	*Macropus giganteus*
	red-necked wallaby	*Macropus rufogriseus*
	superb fairy-wren	*Malurus cyaneus*
	noisy miner	*Manorina melanocephala*
	little grassbird	*Megalurus gramineus*
EN	hooded robin	*Melanodryas cucullata*
	brown-headed honeyeater	*Melithreptus brevirostris*
	black-chinned honeyeater	*Melithreptus gularis*
	white-naped honeyeater	*Melithreptus lunatus*
	rainbow bee-eater	*Merops ornatus*
	jacky winter	*Microeca fascinans*
	black kite	*Milvus migrans*
	common bent-wing bat	*Miniopterus schreibersii* (group)
	Horsfield's bushlark	*Mirafra javanica*
	Boulenger's skink	*Morethia boulengeri*
	southern freetail bat	*Mormopterus sp. 1*
	freetail bat (eastern form)	*Mormopterus sp. EG*
	satin flycatcher	*Myiagra cyanoleuca*
	restless flycatcher	*Myiagra inquieta*
	leaden flycatcher	*Myiagra rubecula*
	McCoy's skink	*Nannoscincus maccoyi*
	Neobatrachus	*Neobatrachus sp.*
	common spadefoot toad	*Neobatrachus sudelli*
	red-browed finch	*Neochmia temporalis*
VU	blue-winged parrot	*Neophema chrysostoma*
	elegant parrot	*Neophema elegans*
	barking owl	*Ninox connivens*
	southern boobook	*Ninox novaeseelandiae*
	powerful owl	*Ninox strenua*
	Coventry's skink	*Niveoscincus coventryi*
	tiger snake	*Notechis scutatus*
	Nankeen night heron	*Nycticorax caledonicus*
	lesser long-eared bat	*Nyctophilus geoffroyi*
	Gould’s long-eared bat	*Nyctophilus gouldi*

EPBC	Common Name	Scientific Name
CR	large brown azure butterfly	*Ogyris idmo halmaturia*
	olive-backed oriole	*Oriolus sagittatus*
	golden whistler	*Pachycephala pectoralis*
	rufous whistler	*Pachycephala rufiventris*
	spotted pardalote	*Pardalotus punctatus*
	striated pardalote	*Pardalotus striatus*
CR	plains-wanderer	*Pedionomus torquatus*
EN	eastern barred bandicoot (Victorian subsp.)	*Perameles gunnii*
VU	long-nosed bandicoot (southern)	*Perameles nasuta*
	sugar glider	*Petaurus breviceps*
	scarlet robin	*Petroica boodang*
	flame robin	*Petroica phoenicea*
	pink robin	*Petroica rodinogaster*
	rose robin	*Petroica rosea*
	common bronzewing	*Phaps chalcoptera*
	brush bronzewing	*Phaps elegans*
EN	brush-tailed phascogale	*Phascogale tapoatafa*
	koala	*Phascolarctos cinereus*
	noisy friarbird	*Philemon corniculatus*
	white-fronted honeyeater	*Phylidonyris albifrons*
	tawny-crowned honeyeater	*Phylidonyris melanops*
	New Holland honeyeater	*Phylidonyris novaehollandiae*
	crescent honeyeater	*Phylidonyris pyrrhoptera*
	yellow-billed spoonbill	*Platalea flavipes*
	crimson rosella	*Platycercus elegans elegans*
	eastern rosella	*Platycercus eximius*
	tawny frogmouth	*Podargus strigoides*
	bearded dragon	*Pogona barbata*
	purple swamphen	*Porphyrio porphyrio*
VU	long-nosed potoroo	*Potorous tridactylus*
	red-rumped parrot	*Psephotus haematonotus*
	southern grass skink	*Pseudemoia entrecasteauxii*
	tussock skink	*Pseudemoia pagenstecheri*
	glossy grass skink	*Pseudemoia rawlinsoni*
	spencer's skink	*Pseudemoia spenceri*
	common ringtail possum	*Pseudocheirus peregrinus*
VU	New Holland mouse	*Pseudomys novaehollandiae*
	eastern brown snake	*Pseudonaja textilis*
	brown toadlet	*Pseudophryne bibronii*
	southern toadlet	*Pseudophryne semimarmorata*

EPBC	Common Name	Scientific Name
VU	grey-headed flying-fox	*Pteropus poliocephalus*
	woodland blind snake	*Ramphotyphlops proximus*
	bush rat	*Rattus fuscipes*
	swamp rat	*Rattus lutreolus*
	grey fantail	*Rhipidura albiscarpa*
	willie wagtail	*Rhipidura leucophrys*
	rufous fantail	*Rhipidura rufifrons*
	yellow-bellied sheathtail bat	*Saccolaimus flaviventris*
	inland broad-nosed bat	*Scotorepens balstoni*
	white-browed scrubwren	*Sericornis frontalis*
	weebill	*Smicrornis brevirostris*
	fat-tailed dunnart	*Sminthopsis crassicaudata*
	white-footed dunnart	*Sminthopsis leucopus*
	common dunnart	*Sminthopsis murina*
	beautiful firetail	*Stagonopleura bella*
VU	diamond firetail	*Stagonopleura guttata*
	southern emu-wren	*Stipiturus malachurus*
	grey currawong	*Strepera versicolor*
	little whip snake	*Suta flagellum*
CR	golden sun moth	*Synemon plana*
	short-beaked echidna	*Tachyglossus aculeatus*
	white-striped freetail bat	*Tadarida australis*
	zebra finch	*Taeniopygia guttata*
	Australian white ibis	*Threskiornis molucca*
	straw-necked ibis	*Threskiornis spinicollis*
	rufous-bellied pademelon	*Thylogale billardierii*
	blotched blue-tongued lizard	*Tiliqua nigrolutea*
	stumpy-tailed lizard	*Tiliqua rugosa*
	common blue-tongued lizard	*Tiliqua scincoides*
	sacred kingfisher	*Todiramphus sanctus*
	rainbow lorikeet	*Trichoglossus haematodus*
	common brushtail possum	*Trichosurus vulpecula*
EN	painted button-quail	*Turnix varia*
	little button-quail	*Turnix velox*
	Pacific barn owl	*Tyto javanica*
	masked owl	*Tyto novaehollandiae*
	masked lapwing	*Vanellus miles*
	banded lapwing	*Vanellus tricolor*
	large forest bat	*Vespadelus darlingtoni*
	southern forest bat	*Vespadelus regulus*

EPBC	Common Name	Scientific Name
	little forest bat	*Vespadelus vulturnus*
	bare-nosed wombat	*Vombatus ursinus*
	swamp/black wallaby	*Wallabia bicolor*
	silvereye	*Zosterops lateralis*

National (EPBC) status: X – Extinct, CR – Critically endangered, EN – Endangered, VU – Vulnerable.