

**Advice to the Minister for the Environment, Heritage and the Arts from the Threatened Species Scientific Committee (the Committee) on an Amendment to the List of Threatened Ecological Communities under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**

**1 Name of the ecological community**

**Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland**

This advice follows the assessment of information provided by two public nominations to list the “*Central Gippsland Plains Grassland in the South East Coastal Plain Bioregion* and the *Forest Red Gum Grassy Woodland of Gippsland, Victoria*”. Both components were separately nominated for listing in the critically endangered category of the list.

A technical workshop and consultation with experts on the ecological community assisted with the determination of the national ecological community. Their recommendation was that both nominations be assessed as part of a single, broader ecological community for reasons outlined below (see Relevant Ecology and Biology).

The Committee recommends that the ecological community be named, as above. This name reflects the key tree species and vegetation structures included within the ecological community. Lunt (1997a) uses the term ‘anthropogenic’ to describe the grasslands in this ecological community as their floristic composition is not simply a consequence of tree removal but has been influenced by subsequent management regimes. The term ‘associated’ is used here to denote that the native grassland and woodland components are related through common origin and landscape position. The name of the national ecological community also distinguishes it from analogous communities that are listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988* or recognised under the Victorian vegetation classification system.

**2. Public Consultation**

A technical workshop was held in 2007 with experts on the ecological community. The nominations and a report on technical workshop outcomes were made available for public exhibition and comment for a minimum 30 business days. The Committee has had regard to all public and expert comment that was relevant to the consideration of the ecological community.

**3. Summary of conservation assessment by the Committee**

The Committee provides the following assessment of the appropriateness of the ecological community's inclusion in the EPBC Act list of threatened ecological communities.

- The Committee judges that the ecological community has been demonstrated to have met sufficient elements of Criterion 1 to make it **eligible** for listing as **critically endangered**.
- The Committee judges that the ecological community has been demonstrated to have met sufficient elements of Criterion 2 to make it **eligible** for listing as **critically endangered**.
- The Committee judges that the ecological community has been demonstrated to have met sufficient elements of Criterion 4 to make it **eligible** for listing as **critically endangered**.
- The highest category for which the ecological community is **eligible** to be listed is **critically endangered**.

#### 4. Description

The Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland ecological community falls within the major vegetation subgroup of *Eucalyptus* woodlands with a grassy understorey (Department of the Environment and Water Resources 2006; 2007). Temperate eucalypt woodlands with a grassy understorey were formerly widespread on slopes and plains, from southern Queensland through New South Wales and Victoria to eastern South Australia. A number of floristic associations occur within this vegetation type, many of which intergrade with each other as well as with other vegetation types.

The ecological community is disjunct from the main occurrence of grassy eucalypt woodland systems due to the Victorian Alps, which separate the Gippsland Plain from the inland slopes and plains that stretch from northern Victoria into New South Wales. The Gippsland Plain IBRA subregion extends from the Melbourne central business district to Lakes Entrance. The plain is discontinuous, being dissected by the intrusion of the Strzelecki Ranges between the highlands and the coast. The ecological community is confined to that part of the Gippsland Plain east of the Strzelecki Ranges.

##### *Physical environment*

The Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland ecological community typically occurs on undulating to flat plains less than 100 metres above sea-level (asl) with some occurrences extending onto low hills that rise up to 220 metres asl (Davies et al. 2002). The plain is composed of Pleistocene or Recent alluvial deposits with patches of overlying aeolian sand dunes and sand sheets that may overlie the alluvium. These sandy substrates support different vegetation types to the listed ecological community. The soils of the plain are usually fertile and duplex, comprising loamy topsoils over a clay or clay-loam subsoil (Lunt 1997a, b; Davies et al. 2002).

The region in which the ecological community occurs falls within a rain shadow bounded by the Strzelecki Ranges and Great Dividing Range. Mean annual rainfall lies within the 400-700 mm/year isohyets. The distribution of rainfall tends to be uniform throughout the year with a slight spring peak.

##### *Vegetation*

The ecological community occurs in two structural forms: grassland and grassy woodland. The existing remnants of both structural forms originate from a savannah woodland that formerly occupied much of the Gippsland Plain (see Relevant Biology and Ecology, below). The grassland form has been described as an anthropogenic grassland by Lunt (1997a) in recognition that its composition and structure was, and continues to be, strongly governed by the management history of these sites, notably frequent burning and infrequent to no grazing. The rationale for grouping the temperate grassland and grassy woodland into a single ecological community reflects their common origin from the same open savannah woodland that formerly covered much of the central Gippsland Plain (Lunt 1994; 1997a) and the continuing overlap in the floristic composition of the ground layer, despite long-term and divergent management histories.

##### Tree canopy

The woodland form has a tree canopy that is dominated by Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*). Other tree species may occur in the canopy with Gippsland Red Gum, including: *Allocasuarina verticillata* (Drooping Sheoak), *A. littoralis* (Black Sheoak), *Eucalyptus angophoroides* (Apple-topped Box), *E. bosistoana* (Coast Grey Box), *E. bridgesiana* (But But), *E. globoidea* (White Stringybark), *E. melliodora* (Yellow Box), *E.*

*pauciflora* subsp. *pauciflora* (Snow Gum), *E. polyanthemos* (Red Box), *E. rubida* (Candlebark), and *E. viminalis* (Manna Gum). Small pockets of the ecological community may be locally dominated by other canopy species, for instance Drooping Sheoak or Black Sheoak (Scientific Advisory Committee 1993a, b; Lunt 1995; Department of Sustainability and Environment 2004a).

The ecological community exhibits variable degrees of tree canopy cover. In the grassland structural form, the tree canopy is typically absent or only scattered trees may be present with a projective foliage cover of no more than 5%. The usual expression of the woodland structural form is a regrowth characterised by closely spaced thin trees with occasional, scattered large trees. Trees in regrowth stands have a density in the range 750 to 2200 stems/ha and a mean diameter at breast height of about 13 to 15 cm. These regrowth stands are stable and can persist for decades if there is no serious disturbance to the tree canopy (e.g. as occurs from strong windstorms felling trees). **Patches with this density of tree cover are included in the national ecological community.** The open, mature woodland structure is relatively uncommon and characterised by large, widely spaced mature trees. The benchmark for large trees specifies a density of 10 trees/ha with a diameter at breast height of 80 cm (Department of Sustainability and Environment 2004b).

#### Ground layer

The ground layer of the ecological community is dominated by a suite of native graminoids, including perennial tussock grasses (e.g., Kangaroo Grass *Themeda triandra*), sedges (e.g. Thatch Saw-sedge *Gahnia radula*), non-tufted grasses (e.g. Weeping Grass *Microlaena stipoides*) and other graminoids (e.g. Wattle Mat-rush *Lomandra filiformis*). A variety of other herbs and wildflowers, such as daisies, may occur amongst the graminoids, especially during spring. The ground layer is the dominant vegetation layer of the grassland form. There are similarities in ground layer species composition between the woodland and grassland forms. However, differences in the long-term management of these two forms of the ecological communities has resulted in a divergence of their species composition (Lunt 1995).

#### Shrub layer

Shrubs are not considered to be a defining feature of the listed ecological community in its natural state but may be present, especially in the woodland form. In the benchmark condition, the shrub layer accounts for projective foliage cover values of  $\leq 5$  to 10%.

There is an issue involving the invasion of native shrubs into the ecological community through disturbance or as part of natural plant dynamic processes, as explained under Description of Threats, below. The presence of a shrub layer with a higher cover value than 5 to 10% does not necessarily preclude the inclusion of a patch within the listed ecological community if it otherwise conforms to the description of the ecological community. In these situations, patches are included in the national ecological community if the projective foliage cover of the native shrub layer is  $\leq 50\%$  of the total area of the patch.

A list of characteristic plant species present in the ecological community is at Appendix A.

#### *Fauna*

Bramwell (2004) notes that a total of 144 vertebrate fauna species are known to occur within the eastern Gippsland Plain where the ecological community occurs. Of these, 20 species are introduced. Forty-eight species of the known fauna, most of them birds, are considered to be of State significance and a smaller number are listed as nationally threatened species (Table 1). The native mammalian fauna has declined in abundance and species richness across the entire Gippsland Plain subregion. The mammalian groups that are most depleted in species richness across the region are the dasyurids, bandicoots and macropods (National Land and

Water Resources Audit 2007). With regard to the bird fauna, surveys indicate that the temperate forest and woodland avifauna in the Gippsland Plain subregion is also now highly modified with a heavy introduced species load (National Land and Water Resources Audit 2007).

**Table 1.** Nationally threatened species listed under the *Environment Protection and Biodiversity Conservation Act 1999* likely to occur in or near the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community. Known occurrences of some species may be in landscapes or vegetation communities nearby to the national ecological community. *Sources:* Bramwell (2004); Department of the Environment, Heritage, Water and the Arts (2008). Current as at June 2008.

Species name	Common name(s)	EPBC Status
<b>Birds</b>		
<i>Lathamus discolor</i>	Swift Parrot	Endangered
<b>Frogs</b>		
<i>Litoria raniformis</i>	Growling Grass Frog, Southern Bell Frog, Warty Bell Frog, Green and Golden Frog	Vulnerable
<b>Mammals</b>		
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered
<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot	Endangered
<b>Plants</b>		
<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass	Vulnerable
<i>Dianella amoena</i>	Matted Flax-lily	Endangered
<i>Glycine latrobeana</i>	Purple Glycine, Clover Glycine	Vulnerable
<i>Prasophyllum correctum</i>	Gaping Leek-orchid	Endangered
<i>Prasophyllum frenchii</i>	Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid	Endangered
<i>Rulingia prostrata</i>	Dwarf Kerrawang	Endangered
<i>Thelymitra epipactoides</i>	Metallic Sun-orchid	Endangered
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	Vulnerable
<i>Xerochrysum palustre</i>	Swamp Everlasting	Vulnerable

Only a subset of the total fauna species noted by Bramwell (2004) for the region would utilise the ecological community as habitat but little is known about the fauna specific to this ecological community. No grassland-specialist species are considered to remain in the grassland form of the ecological community, given the very small extent of grassland remaining (Department of Sustainability and Environment 2004a). However, other species of birds, reptiles, mammals and invertebrates that are not grassland-specialist are likely to occur there or use the patches as transitory habitat.

The woodland form of the ecological community provides habitat for a suite of woodland birds, ground-dwelling reptiles, mammals and invertebrates (Robertson and Fitzsimmons 2005). Large remnants and any sites that have mature trees with good quality hollows provide particularly valuable habitat for fauna. Hollows serve as nesting and shelter sites for woodland birds, birds of prey, e.g. owls, and arboreal mammals e.g. Sugar Gliders (*Petaurus*

*breviceps*). In the past, macropods, such as the Eastern Grey Kangaroo (*Macropus giganteus*), grazed on the grassy ground layer of the ecological community whilst small ground dwelling native mammals, such as bandicoots, likely exerted an influence on topsoil development and health, as was the case in other grassy systems. Some of these issues are discussed further under Relevant Biology and Ecology, below.

There is little published information about the invertebrate fauna related to the ecological community with the exception of insects associated with eucalypt dieback (Marsh and Adams 1995; Bramwell 2004). A comprehensive list of fauna that are specific to, or significant for, the ecological community is not available. Fauna species that may occur in the ecological community and are listed as threatened under the EPBC Act are included in Table 1.

#### *Key diagnostic characteristics*

The key defining attributes for the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland are:

- The ecological community occurs in two forms.
  - A grassland form in which the ground layer is the dominant vegetation layer. The tree canopy is absent or of scattered trees only (projective foliage cover of trees is 0 to 5%).
  - A woodland form in which the tree canopy layer is the dominant vegetation layer (projective foliage cover of trees is greater than 5%). The woodland form varies in appearance from a stable regrowth with mostly thin and closely spaced trees to an open, mature woodland with large and widely spaced trees.
- The ground layer is dominated by native graminoids. That is, 50% or more of the vegetation cover of the ground layer (i.e. excluding bare ground) is made up of native grasses and grass-like plants (such as sedges, rushes, lilies, *Lomandra* and similar plants).
- The tree canopy layer is typically dominated by Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*). Small, localised occurrences of Black Sheoak or Drooping Sheoak may occur within patches of the ecological community.
- The geographic distribution is limited to the eastern Gippsland Plain, generally between the Strzelecki Ranges and the Tambo River valley.

### **5. Condition Thresholds**

A condition class describes areas of an ecological community that have a similar conservation value. Significantly degraded areas will not be part of the listed ecological community. This means the protection provisions of the EPBC act will be focused on the most valuable elements of Australia's natural environment, while degraded areas, which do not trigger the "significance test" of the EPBC Act, will be largely excluded.

Many areas of the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland ecological community are now disturbed and occur as small, fragmented patches (Scientific Advisory Committee 1993a, b). Some form of ongoing management is required to maintain or enhance the biodiversity of the remaining patches.

The listed Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland ecological community comprises those patches that meet the Description, above, and the Condition thresholds, below.

- Grassland form  
Minimum patch size = 0.04 ha  
AND  
50% or more of the perennial ground layer vegetation cover comprises native species  
AND  
7 or more species of native plants are present, excluding trees and tall shrubs (over 5 metres).
- Grassy woodland form  
Minimum patch size = 0.2 ha  
AND  
50% or more of the perennial ground layer vegetation cover comprises native species.

Additional features that add value to a patch of the ecological community include:

- a high native species richness;
- large patch size or connectivity to a large native vegetation remnant;
- minimal weed invasion;
- presence of threatened plant and/or animal species; and
- diversity of habitat e.g. tree hollows, fallen logs, natural exposed rock outcrops.

Patch size and perennial ground layer vegetation cover are features that can be assessed all year round. Unless exceptional circumstances apply, to maximise the assessment of a site, native plant species diversity must be assessed during spring (September to November) and after the site has not been disturbed (e.g. by fire, overgrazing, mowing) for at least two months prior to the springtime of sampling. This approach is recommended because many plant species in the ground layer only appear above ground and flower during spring, or are sensitive to disturbance.

A patch of the listed ecological community is defined as a discrete and continuous area of the ecological community, as described, and does not include substantial elements of other ecological communities, such as woodlands dominated by other tree species. However, a patch of the listed ecological community may include small-scale disturbances, such as tracks or breaks, that do not alter its overall functionality, for instance the easy movement of wildlife or dispersal of plant propagules, and may also include small-scale variations in vegetation that are noted in the description.

## 6. National Context

### *Distribution*

The Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community is endemic to Victoria, specifically to the central Gippsland Plain between Morwell and Swan Reach. Most occurrences fall within the Gippsland Plain (IBRA subregion SCP1; Victorian bioregion GipP) with some patches extending into the immediately adjacent parts of the East Gippsland Lowlands (IBRA subregion SEC1; Victorian bioregion EGL). The general distribution of the ecological community can be defined by the distribution of Gippsland Red Gum, the key dominant tree species, which is bounded by the Strzelecki Ranges to the west, the slopes of the Great Dividing Range to the north and the Tambo River valley to the east (Brooker et al. 2002).

Some key sites in which the ecological community is known to occur are listed in Table 2.

## *Relationships to national and State vegetation classification*

The National Vegetation Information System (NVIS) is an hierarchical system for classifying vegetation across the Australian continent. It ranges from broad Major Vegetation Groups and Subgroups to more fine-scale floristic sub-associations. The classification of the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands under NVIS is detailed in Table 3.

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**Table 2.** Key sites for the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community. This list is not comprehensive and additional sites may occur on private and other land tenures.

*Sources:* (Scientific Advisory Committee 1993a, b; Department of Sustainability and Environment 2004a; Public submission).

### **Grassland component**

- Cemeteries at: Briagolong, Maffra, Rosedale, Toongabbie.
- Used and unused rail reserves/corridors at: Clyde, Dawson, Fernbank - Lindenow South, Heyfield-Maffra, Munro, Marriage Lane, Toongabbie South, Hillsdale.
- Princes Highway road reserve, Fulham.
- West Sale Aerodrome.

### **Grassy woodland component**

- Blond Bay Wildlife Reserve.
- Briagolong Forest Red Gum Reserve.
- Fernbank Recreation Reserve
- Moormung Flora & Fauna Reserve.
- Providence Ponds Flora & Fauna Reserve.
- Stratford Highway Park.
- Swallow Lagoon Nature Conservation Reserve.
- The Billabong Flora & Fauna Reserve.
- The Knob Recreation Reserve.
- Yeerung Bushland Reserve.
- Trust for Nature reserves at: Billabong West, Bush Family, Frair, Paisley Park Reserve and Stratford Woodland.

Victoria classifies its vegetation using a system of Ecological Vegetation Classes (EVC). An EVC may encompass one or more floristic communities that may be specific to a particular Victorian bioregion (Victorian bioregions broadly equate with national IBRA subregions). The Gippsland Red Gum Grassy Woodlands and Associated Native Grasslands equates with two EVC floristic communities that recognise the grassy woodland and anthropogenic grassland components of the national ecological community.

- EVC 55-03 Gippsland Plains Grassy Woodland (GipP and EGL Victorian bioregions). Department of Natural Resources and Environment (2000) and Davies et al. (2002) equate this floristic community with grassy woodlands dominated by Gippsland Red Gum. However, Oates and Taranto (2001) included grassy *Eucalyptus* woodlands around Westernport Bay and Port Philip Bay, within this floristic community, that are typically dominated by River Red Gum (*E. camaldulensis*). This area lies in the Gippsland Plain to the west of the Strzelecki Ranges. On the basis of current EVC classification, the grassy woodland component of the national ecological community only equates with part of EVC 55-03 which is dominated by Gippsland Red Gum and excludes occurrences clearly dominated by other species of eucalypt, such as River Red

Gum. The Bioregional Conservation Status for this EVC is endangered as less than 10% of the former extent remains.

- EVC 132\_61 LaTrobe Valley Plains Grassland (GipP Victorian bioregion)  
Equates to EVC 132\_01 *Gippsland Plains Grassland* (Department of Natural Resources and Environment 2000), which appears to have been superseded by the more recent EVC 132\_61 (Department of Sustainability and Environment 2004b). Both relate to the anthropogenic grasslands identified by Lunt (1994; 1997a) on the Gippsland Plain that equates with the grassland component of the listed ecological community. The Bioregional Conservation Status for this EVC is endangered as less than 10% of the former extent remains.

**Table 3.** Classification of the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands under the National Vegetation Information System (NVIS) version 3.1. *Legend: Bold text* = Dominant stratum, growth form or species. Current as at June 2008.

NVIS Category	Grassland (EVC 132_61)	Woodland (EVC 55-03)
Source Code	GipP0132_61	GipP0055 / EGL_0055
Major Vegetation Group	19 Tussock grasslands	5 Eucalypt woodlands
Major Vegetation Subgroup	36 Temperate tussock grasslands	9 <i>Eucalyptus</i> woodlands with a grassy understorey
Sub-formation (NVIS level 4)	<b><i>Themeda</i> tall tussock grassland</b>	<b><i>Eucalyptus</i> mid woodland</b> \ <i>Kunzea</i> tall open shrubland \ <i>Gahnia</i> tall sedgeland
Sub-association (NVIS level 6)	<b>Ground stratum 1 - <i>Themeda triandra</i>, <i>Austrodanthonia setacea</i>, <i>Drosera peltata</i> subsp. <i>peltata</i></b> Growth forms = <b>tussock grass</b> , forb, other grass Height class = 3 (tall, 1-2 m) Cover code = c (30-70% foliage cover)  <b>Ground stratum 2 - <i>Schoenus apogon</i>, <i>Acaena echinata</i>, <i>Leptorhynchos squamatus</i>, <i>Solenogyne dominii</i></b> Growth forms = sedge, forb	<b>Upper stratum 1 - <i>Eucalyptus tereticornis</i> subsp. <i>mediana</i></b> Growth form = <b>tree</b> Height class = 7 (mid, 10-30 m) Cover code = i (10-30% foliage cover)  Upper stratum 2 - <i>Allocasuarina littoralis</i> Growth form = tree Height class = 7 (mid, 10-30 m) Cover code = r (<10% foliage cover)  Mid stratum 1 <b><i>Kunzea ericoides</i> spp. agg.</b> Growth form = <b>shrub</b> Height class = 4 (tall, >2 m) Cover code = i (10-30% foliage cover)  Ground stratum 1 <b><i>Gahnia radula</i>, <i>Microlaena stipoides</i> var. <i>stipoides</i>, <i>Themeda triandra</i>, <i>Austrostipa rudis</i></b> Growth forms = <b>sedge</b> , other grass, tussock grass Height class = 3 (tall, 1-2 m) Cover code = c (30-70% foliage cover)

The EVC system includes mosaic units for situations where specific EVCs cannot be identified at the spatial scale used for vegetation mapping. Some mosaic units in the Gippsland Plain include the EVCs identified above: unit 259 Plains Grassy Woodland/Gilgai Wetland Mosaic, unit 687 Swamp Scrub/Plains Grassland Mosaic; unit 897 Plains Grassy Woodland/Plains Grassland Mosaic; and unit 927 Plains Grassy Woodland/Swamp Scrub/Plains Grassy Wetland Mosaic. Patches of these mosaic units are included in the ecological community where they conform to the description and condition thresholds outlined above.

Victoria also recognises benchmark conditions for each EVC based upon lists of typical native plant species and the diversity and cover of life-forms present (Department of Sustainability and Environment 2004b). Whilst these benchmarks do not equate directly to the condition thresholds for the national ecological community detailed above, it is likely that patches which meet the relevant Victorian EVC benchmarks would also be assessed as good quality patches of the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community.

#### *Relationships to State-listed threatened communities*

The national ecological community covers two threatened ecological communities listed under Victoria's *Flora and Fauna Guarantee Act 1988*. These are the "Forest Red Gum Grassy Woodland Community" and the "Central Gippsland Plains Grassland Community". The former relates to the grassy woodland component and the latter to the anthropogenic grassland component of the national ecological community.

The State-listed ecological communities and the national ecological community differ in certain respects.

- The State listings do not specify condition thresholds and, therefore, may include degraded patches that are excluded from the national ecological community.
- Department of Sustainability and Environment (2004a) notes that patches of the State-listed Central Gippsland Plains Grassland occur on the Mornington Peninsula, French Island and the head of Westernport Bay. These sites are not referred to in the final listing recommendation for the Central Gippsland Plains Grassland (Scientific Advisory Committee 1993a, b). These grassland patches on the western Gippsland Plain are excluded from the national ecological community because they occur outside the distribution of Gippsland Red Gum and, therefore, are not part of the grassy woodland/grassland complex identified by Lunt (1994).
- Protection under the *Flora and Fauna Guarantee Act 1988* currently does not extend to private tenure, but this is not the case for the EPBC Act. Additional vegetation clearance controls apply under Victoria's Native Vegetation Framework.

#### *Similar ecological communities*

The Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community is adjacent to, or may intergrade with, other ecological communities (Davies et al. 2002). These adjacent vegetation types, as identified by the Victorian EVC system, are excluded from the national ecological community.

- EVC 132\_62 South Gippsland Plains Grassland occurs to the west and south of the central Gippsland Plain, around Traralgon and Yarram. The sparse eucalypt canopy, when present, includes species other than Gippsland Red Gum such as *Eucalyptus ovata* (Swamp Gum), *Eucalyptus viminalis* subsp. *pryoriana* (Manna Gum) or Black Sheoak (Davies et al 2002; Department of Sustainability and Environment 2004a). The *South Gippsland* Plains Grassland tends to occur on sites with a higher rainfall and heavier, poorly draining soils subject to occasional waterlogging, than does the listed ecological community (Davies et al 2002). Consequently, this grassland flora has a higher representation of species associated with wetter sites. Character species for EVC 132-62 include *Austrodanthonia laevis* (Smooth Wallaby-grass), *Hemarthria uncinata* var. *uncinata* (Mat Grass), *Poa labillardierei* (Common Tussock-grass), *Lachnagrostis*

*filiformis* and *L. aemula* (Blown-grasses) and *Juncus subsecundus* (Finger Rush) (Frood 1994; Department of Sustainability and Environment 2004b).

- EVC 3-01 Gippsland Lakes Damp Sands Herb-rich Woodland occurs on relatively well drained, deep sandy or loamy topsoils compared to the duplex loamy-clay soils of the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands (Davies et al 2002; Department of Sustainability and Environment 2004b). *Eucalyptus viminalis* subsp. *pryoriana* (Manna Gum) tends to be the typical dominant tree species and Gippsland Red Gum, when present, does not occur as a dominant. The presence of a naturally well developed shrub layer and *Pteridium esculentum* (Austral Bracken) in the ground layer also serve to distinguish EVC 3-01 from the national ecological community.

Other vegetation communities adjacent to the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community include EVC 16 Lowland Forest, EVC 61-01 *Gippsland Plains* Box Ironbark Forest and EVC 151-01 *South Gippsland Plains* Grassy Forest (Davies et al. 2002). These can be distinguished from the national ecological community by a number of features: the absence of Gippsland Red Gum in the tree canopy either completely or as a dominant, or differences in vegetation structure such as a well developed shrub layer, or altered floristic composition of the understorey; or different positions in the landscape.

Gippsland Red Gum may be present in other vegetation types in the region. In these circumstances, the species is associated with a different suite of tree canopy species, or a different vegetation structure, or on different soil substrates which serves to distinguish these occurrences of Gippsland Red Gum from the national ecological community.

The grassland component of the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands shows affinities with the Natural Temperate Grassland of the Victorian Volcanic Plain. There are common components in both grassland flora (e.g. a significant *Themeda -Austrodanthonia* component) and similarities in climate between the central Gippsland Plain and the Keilor Plain west of Melbourne (Lunt 1997b). However, there are some differences between the two grassland flora (Department of Sustainability and Environment 2004a). Species present in Gippsland but rare or absent from the Victorian Volcanic Plain include *Diuris punctata* (Purple Diuris), *Hypoxis hygrometrica* (Golden Weather-glass) and *Poa clelandii* (Noah's Ark). Conversely, species present in the Victorian Volcanic Plain but uncommon or absent in Gippsland include *Eryngium ovinum* (Blue Devil), *Swainsona* spp. and *Ptilotus* spp.

Grassy woodlands dominated by *Eucalyptus tereticornis* also occur in rainshadow areas of the NSW south coast, on undulating terrain (NSW Scientific Committee 2007). These woodlands differ from the national ecological community in a number of respects. The subspecies of *E. tereticornis* present in this community (subsp. *tereticornis*, Forest Red Gum) differs to that in Gippsland. The shrub and ground layers also differ in their floristic compositions with a number of species present in the NSW community being absent or uncommon in Victoria. These NSW woodlands are listed as an endangered ecological community in NSW under the name, Lowland Grassy Woodland in the South East Corner Bioregion (NSW Scientific Committee 2007).

## 7. Relevant Biology and Ecology

Grassland and grassy woodland communities are dynamic and inherently variable systems. Their expression is subject to the influences of seasonality, weather and land management practices (Barlow 1999; Ross 1999; Carter et al. 2003). The appearance of a grassy woodland or grassland varies markedly from that in peak springtime flowering in a good season, after rainfall, to that in late summer-autumn, after prolonged drought. The severity and frequency of fire, grazing or fertiliser regimes also markedly affects appearance, species composition and functionality in the ground layer. These practices influence the density of the native tussock sward, the diversity of the native herbs and wildflowers that occur amongst the tussocks and the capacity of the tree canopy layer to regenerate. Practices such as grazing or burning can alter floristic composition, by eliminating those species which are most sensitive to a particular regime, especially if the grazing is heavy and continuous or burning occurs at frequent intervals.

### *Grassy vegetation on the Gippsland Plain*

The indigenous inhabitants of the Gippsland Plain were hunter-gatherers who frequented the lake and river systems as reliable and abundant sources of food (Bramwell 2004). Their land management involved the frequent and extensive use of fire. This would have influenced plant diversity and maintained an open understorey in the woodlands.

Much of our understanding about European impacts on the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community is based on the studies of Lunt (1994; 1995; 1997a, b) in the central Gippsland Plain region. He examined historical botanical records and surveys, soil and land system maps for the region, and undertook surveys of native vegetation remnants. Lunt concluded that much of the region was originally occupied by an open savannah woodland dominated by Gippsland Red Gum. There were large areas of naturally treeless temperate grassland formerly present in the Sale-Maffra-Heyfield area. The distribution of these grasslands was determined by a combination of topography, soil and climate: trees appeared to be absent on flat plains with clay-loam soils in the rainshadow zone.

However, these original native grasslands have been entirely converted to irrigated farmland (Lunt 1997b). No remnants are known to be extant. The existing small grassland remnants on the central Gippsland Plain do not coincide within the predicted distribution for the original natural grassland but occur within landscapes associated with grassy woodland. Lunt (1994; 1997a, b) postulated that the origin of existing grassland remnants is anthropogenic. Particular long-term management regimes maintained a grassland vegetation structure distinct from that of the original woodland. The different management regimes relate to grazing and burning history. Grassy woodland remnants were selectively logged, rarely burnt and subject to varying grazing intensities from stock and kangaroos. In contrast, grassland remnants are mainly associated with rail lines and cemeteries and, consequently, were cleared of trees and frequently burnt. Grazing occurred rarely or not at all. The divergent long-term management histories resulted in different suites of flora species as well as varied vegetation structures.

Lunt (1995; 1997a) identified three floristic suites: species that were widespread across both grassland and grassy woodland; species common to grassland but rare in woodland; and species common to grassy woodland but rare in grassland. The original grassy woodland vegetation likely contained all these floristic suites scattered over a broader extent, perhaps as a mosaic reflecting small-scale site variation in tree density, shading and moisture. The current reality is that two of these floristic suites are now separate and dependent on the continuation of specific management regimes. Protection of both grassland and grassy

woodland remnants and their continued management as such is, therefore, necessary to preserve the remaining biodiversity of the ecological community as completely as possible.

### *Fauna*

As noted in the Description, little is known about the original faunal component of the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community. Small ground dwelling native mammals, such as bandicoots, may have played a similarly significant functional role in the ecological community as they did in grassy systems and rangelands elsewhere. Their functional roles included formation of healthy topsoils through their constant diggings which, in turn had concomitant effects on water infiltration, nutrient cycling, seed dispersal and seedling establishment (Martin 2003). *Isoodon obesulus obesulus* (Southern Brown Bandicoot) is one such species known to occur in the region. It has been found in a range of vegetation types, often coastal heathy vegetation, but also in grassland and degraded, weedy sites, so long as the habitat has a dense vegetation cover (Department of Environment, Water, Heritage and the Arts 2008; Department of Sustainability and Environment 2007). It was considered common during the 1800s but has markedly declined in numbers and range, and is now listed as a nationally endangered species (Table 1).

Macropods, such as the *Macropus giganteus* (Eastern Grey Kangaroo) occur in the ecological community, where they selectively grazed the most palatable plants in the understorey. Their overall numbers are likely to have declined, given the extent of clearing and agriculture on the Gippsland Plain and in light of the similar history of grassy vegetation and associated fauna on the Victorian Volcanic Plain (Seebeck 1984).

Less is known about the invertebrate fauna, other than those associated with insect-mediated eucalypt dieback. The insect groups observed on the foliage of declining trees include Christmas and leaf beetles (*Anoplognathus* spp. and *Dicranosterna* spp.), lerps (*Cardiaspina* spp, *Glycaspis* spp.) and leaf-mining and skeletonising caterpillars (*Doratifera* spp, *Uraba lugens*) (Marsh and Adams 1995; Bramwell 2004).

### *Threatened species*

The Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands provides or is potential habitat for a number of plant and animal species listed as nationally threatened (Table 1). The threatened species differ between the grassland and grassy woodland forms of the ecological community commensurate with their management requirements. For instance, the nationally listed *Diuris punctata* (Purple Diuris) is associated with grassland only, as are a number of unlisted lily and daisy species that are of local significance. In addition to nationally threatened species, Bramwell (2004) lists about 61 flora species and 48 fauna species from the eastern Gippsland Plain region that have a rare or threatened status in Victoria.

## **8. Description of Threats**

The threats to the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community and to the biodiversity of the region in general are documented by Carter et al. (2003), Department of Sustainability and Environment (2004a), Bramwell (2004) and National Land and Water Resources Audit (2007). The main threats include: vegetation clearing, consequent fragmentation of native vegetation remnants, invasion by weeds and feral animals, inappropriate management regimes (grazing, mowing or fire), tree dieback and timber harvesting and firewood collection.

### *Vegetation clearance and fragmentation of remnants*

The Red Gum Plains Biodiversity Landscape Zone, which covers much of the remaining extent of the national ecological community, extends over 147,000 ha but only 12%, or 18,000 ha of the original native vegetation now remains intact (Bramwell 2004). Much of the area now comprises freehold land used for agriculture.

The region was settled from the 1840s following explorers' reports that it comprised good quality open grassy plains and fertile soils (Bramwell 2004). The initial action of pastoralists was to clear trees and woody shrubs to enhance access for stock. Agricultural practices progressively intensified leading to the complete replacement of the native understorey at most sites. Ploughing and cropping quickly led to the irreversible loss of native biodiversity. Sites used for pasture were slower to decline. Sheep grazing could allow for some retention of native ground-layer plants (depending on the nature of the grazing regime). However, the decline in native biodiversity accelerated following improved pasture practices such as planting of exotic pasture species, irrigation and the use of fertilisers. There are continuing economic pressures on farmers to convert from grazing to cropping, which could result in the further loss of native vegetation remnants whether they be woodland remnants or biodiverse paddocks.

The threat of clearing also potentially applies to remnants of the ecological community on public lands, e.g. on roadside verges and railway corridors, where patches may be cleared for maintenance works.

The net result of widespread clearing of native vegetation in the region is that remnants are typically small and fragmented with little connectivity across the entire landscape. Only 2% of native remnants in the Red Gum Plains Biodiversity Landscape Zone have an area exceeding 40 ha (Bramwell 2004). Furthermore, many sites are long, linear road or rail remnants with a high edge to area ratio. The impacts of fragmentation to biodiversity include a decrease in habitat quality for native fauna and greater susceptibility to disturbances and threats arising from the surrounding agricultural matrix, notably weed invasion, salinity and tree dieback.

### *Weeds and pest animals*

Significant environmental weeds known to occur in the region include Periwinkle (*Vinca major*), Himalayan Honeysuckle (*Leycesteria formos*), Bridal Creeper (*Asparagus asparagoides*), English Ivy (*Hedera helix*) and Pampas Grass (*Cortaderia selloana*) (Bramwell 2004; Department of Sustainability and Environment 2004a). Each of these weeds would present a serious management issue for the ecological community, given their high invasive capability and adverse impacts on biodiversity values.

Species that occur in adjacent agricultural lands, either as pasture species or weeds, also pose a serious risk of degradation where they invade the ecological community. These include Serrated Tussock-grass (*Nassella trichotoma*), Chilean Needle-grass (*Nassella neesiana*), African Lovegrass (*Eragrostis curvula*), Sweet Vernal Grass (*Anthoxanthum odoratum*), Yorkshire Fog (*Holcus lanatus*), Phalaris (*Phalaris* spp.) and St John's Wort (*Hypericum perforatum*). Again, many of these species are known to be highly invasive (Muyt 2001).

Many of these species establish within a native vegetation remnant through some form of soil disturbance (e.g. maintenance works, stock movement) and proximity to weedy sites from which propagules spread. They may also spread from deliberate dumping of garden waste. The net result of unmitigated weed invasion is a loss of native species diversity from the competitive and smothering effects of weeds.

About twenty species of introduced animals occur in the Red Gum Plains Biodiversity Landscape Zone, including the European Fox (*Vulpes vulpes*), Feral Cat (*Felis catus*), Rabbit (*Oryctolagus cuniculus*), Common Blackbird (*Turdus merula*) and Common Myna (*Sturnus tristis*) (Bramwell 2004). These species have varied impacts upon the ecological community through predation and competition with native animals, grazing of native plants and soil disturbance through burrowing and diggings.

#### *Native shrub encroachment*

An issue related to weed invasion is the encroachment of indigenous native shrub species into the ecological community. This may be a consequence of site disturbance that favours their establishment or due to natural successional processes that facilitate the encroachment of shrubs from adjacent native vegetation types. A particular case in point applies to Burgan (*Kunzea ericoides*) but is not be limited to that species. Encroachment could eventually result in structural transitions from native grassland to native shrubland or open grassy woodland to shrubby woodland, if not checked.

In the case of *Melaleuca ericifolia* and *M. parvistaminea*, the occurrence of these two species may expand during wet periods and recede in dry periods. Their encroachment is a response to naturally or artificially-induced processes such as fluctuating hydrology or altered fire regimes. They may be components of the wetter parts of the ecological community's range, e.g. where it intergrades with EVC 53\_61 Swamp Scrub. During wet periods, these species may form a conspicuous part of the shrub layer, thus affecting the integrity of the national ecological community, yet be absent during prolonged dry spells.

#### *Fire and grazing regimes*

Lunt (1997a) noted that long-term management regimes for woodland remnants of the ecological community involved intermittent grazing by stock and native herbivores but infrequent burning whilst grassland remnants of the ecological community were frequently but largely ungrazed. These land management practices are a departure from the presumed indigenous practice of frequent burning to the grassy vegetation (at least) coupled with grazing by native herbivores across the landscape (Bramwell 2004). It is the disparity in management histories since European settlement that has led to distinct differences in the floristic composition of the woodland and grassland components, despite their common origin.

It is important that appropriate management regimes continue to be applied to preserve biodiversity at different scales (site, regional, national). As the grassland and woodland components now have unique floristic elements, these should be protected by fostering those management approaches that maintain these elements. However in recent decades, some of these long-term management practices have been abandoned in favour of other alternatives. In the case of grassland remnants along roadsides and rail lines, the frequent burning used for biomass management and that promoted floristic biodiversity has been replaced by slashing and herbicide use. These changes have contributed to the degradation of these linear grassland remnants (Carter et al. 2003; Department of Sustainability and Environment 2004a; Bramwell 2004). Similarly, an intensification of the grazing regime at a site also leads to degradation through the loss of grazing-sensitive native species, limiting regeneration and adverse impacts on soil structure by trampling by domestic stock.

#### *Rural tree dieback*

Dieback is a syndrome whereby canopy trees show a progressive decline in their health and vigour through defoliation and death of twigs, branches and, ultimately, entire trees (Measham 2007). Eucalypts may respond to dieback by producing epicormic regrowth. In

severe dieback, the regrowth itself becomes affected until the tree lacks reserves to produce any more regrowth and the tree dies. The underlying causes of dieback are complex.

The immediate cause of much of the dieback affecting Gippsland Red Gum is repeated attack from defoliating insects (beetles, lerps and caterpillars) (Bramwell 2004; Measham 2007). The reasons why these insects erupt as outbreaks and why trees become susceptible to dieback probably relates to the wholesale change in landscape experienced by the region coupled with a rainfall decline over the past decades. Dieback appears to be most severe in sites that are further away from large intact remnants and that occur in the most highly modified landscapes (e.g. isolated paddock trees; trees in smaller, more isolated patches). These situations foster several changes conducive to dieback:

- Improved pastures provide better food for certain insect herbivores that use pasture grasses in their life-cycle e.g. scarab beetles feed on the grass roots as larvae and on eucalypt foliage as adults;
- Clearing the understorey and thinning the tree canopy discourages the natural predators of herbivores, such as insectivorous woodland birds and sugar gliders (Bramwell 2004); and
- Trees stressed by drought and landscape change physiologically react by altering their nutrient balance. Paradoxically, the imbalance can produce a higher quality food source for insect herbivores and fosters their growth. It can also make trees more susceptible to damage from insect attack.

The end result is a cycle of tree stress – herbivore response – tree regrowth that continues until the tree is sufficiently depleted of resources that it is unable to recover and dies. The solution appears to lie in addressing the issues around wholesale landscape change rather than the proximal cause of limiting insect numbers.

#### *Level of protection in reserves*

The Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community is protected within several reserves (Table 2). These protect woodland remnants but very little, if any of the grassland remnants are formally protected in reserves. The total area of the reserves is over 1,300 ha but the extent of the ecological community protected within the reserves is much less because most reserves contain a range of vegetation types other than grassy woodland. Five of the 14 reserves identified in Table 2 as containing the grassy woodland component are over 100 ha and the largest, Moormung Flora and Fauna Reserve, is 400 ha in area. Some reserves have been purchased and maintained through private tenure for conservation purposes by groups such as Trust for Nature.

Remnants of the ecological community also occur on other public land tenure, such as roadside verges, rail lines and cemeteries, as well as under private tenure.

#### *Climate Change*

Climate change is now understood to pose a serious long-term threat to our terrestrial, coastal and aquatic ecosystems and to have the potential to change the ecology of these environments. Not only does climate change directly threaten species that cannot adapt, it could also exacerbate existing threats, including loss of habitat, altered hydrological regimes, altered fire regimes and invasive species which, themselves, are not adequately managed at present. The potential large scale impacts of climate change could influence the species composition of this ecological community through their responses to disturbance and the very

nature of those disturbances. It could also possibly influence the future distribution and extent of the ecological community.

## **9. How judged by the Committee in relation to the EPBC Act criteria.**

The Committee judges the ecological community is **eligible** for listing as **critically endangered** under the EPBC Act. The assessment against the criteria is as follows.

### ***Criterion 1 - Decline in geographic distribution***

The available estimates of past and present extent relevant to the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands are summarised in Table 4.

The most reliable estimate of the pre-European extent of the ecological community is provided by Lunt's (1994; 1997a) studies of the grasslands and grassy woodlands in the central Gippsland Plain. He estimated that the original extent of the savannah woodland which formerly occupied this part of the Gippsland Plain was about 120,000 ha. Both the grassland and grassy woodland components of the national ecological community derive from this same savannah woodland. Therefore, it represents as the most reliable estimate of the original extent of the national ecological community.

Lunt (1994; 1997a, b) estimated that the central Gippsland Plain also originally had 60,000 ha of natural temperate grassland that is now entirely cleared. As this is not part of the national ecological community, it is excluded from estimates of pre-European decline. However, it remains indicative of the decline of grassy native vegetation within the region.

Estimates for the present extent of the national ecological community range from about 660 ha to 5,650 ha (Table 4). The variation in estimates may be due to several factors, notably: the difficulty in determining the extent of the ecological community on private land tenure; differences in how the ecological community is defined for each estimate; or the degree to which degraded patches are included within the estimate.

The grassland component is minor, comprising several very small remnants with a total extent of between 30 to 60 ha. The woodland component is relatively more extensive, with about 900 to 5,600 ha remaining. On the basis of these estimates, the ecological community has declined in extent from about 120,000 ha to within the range 900 to 5,600 ha. This represents a very severe decline in the order of 95.3 to 99.2%. It is consistent with the decline of about 97.2% for plains grassland and plains grassy woodland communities across the entire Gippsland Plain (Department of Sustainability and Environment 2004c; Table 4).

The Committee considers that the ecological community has undergone a very severe decline in geographic distribution. Therefore, the ecological community has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **critically endangered**.

**Table 4.** Estimates of pre-European and current extent for the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community.

Source	Component	Pre-European extent (ha)	Current extent (ha)	Notes
Nominations	Woodland Grassland	120,000 60,000	650-700 13 - 25	Sources: Lunt (1994); SAC (1993a, b). The estimate of 60,000 ha refers to a natural temperate grassland considered to be extinct. It does not apply to the listed grassland.
Lunt (1994)	Woodland & grassland	120,000	n/a	Corresponds with the national community.
Scientific Advisory Committee (1993a, b)	Woodland Grassland	n/a n/a	650 - 700 20 - 30	Corresponds with the national community. Woodland estimate may underestimate extent on private tenure.
Davies et al (2002)	Woodland & grassland	n/a	5,650	Corresponds with the national community. Based on the extent of EVC 55-03 in the defined region.
Bramwell (2004)	Woodland	n/a	3,565	Corresponds with the main, woodland component of the national community.
Dept of Sustainability & Environment (2004a)	Woodland Grassland	n/a n/a	900 60	Grassland estimate includes patches outside of the defined range for the national community.
Dept of Sustainability & Environment (2004c)	Woodland Grassland	151,008 37,326	4,850 357	Estimates based on EVCs 55 & 132 that cover the entire Gippsland Plain & include floristic communities not in the national community.
Public submissions (2006)	Woodland	n/a	(1) 1,627 (2) 2,884 – 2,934	(1) Stated to be total extant area. (2) Includes 2,234 ha of densely wooded remnants on private land additional to estimate of SAC (1993a, b). Does not account for thinly wooded native remnants.
NVIS data from Dept of Sustainability & Environment (2007)	Woodland Grassland	n/a n/a	5,034 59	Corresponds with the national community. Based on the extent of EVC 55-03 and 132_61 in the defined region. Data for patches under the minimum size thresholds were excluded.

**Criterion 2 - Small geographic distribution coupled with demonstrable threat**

The Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community originally covered about 120,000 ha of the central Gippsland Plain. As remnants are scattered across its former extent, the extent of occurrence of the ecological community is estimated to lie within the range 100,000 to 1,000,000 ha, which is indicative of a restricted geographic distribution.

However, the area of occupancy for the ecological community is significantly less, likely to be at least 1,000 ha and at most about 5,650 ha (Table 4). An area of occupancy in the range 1,000 to 10,000 ha also is indicative of a restricted geographic distribution.

The size of individual patches varies markedly between the grassland and woodland components. The known grassland patches are typically small and total about 60 ha. However, small patches of grassland can retain conservation value despite their size (McCarthy et al. 2006). Woodland remnants tend to be larger with about 10 remnants being over 100 ha in size. An analysis of patch sizes, based on data supplied to NVIS, indicates an average patch size of about 9 ha for the ecological community. Most patches (about 83%) are under 10 ha in size and almost all (over 98%) are under 100 ha. These data reflect the known, mapped situation and it is possible it may underestimate occurrences on private land. However, the distribution of patch sizes is indicative of a high degree of fragmentation and a very restricted geographic distribution.

There have been, and continue to be, demonstrable threats to the ecological community, as detailed in the Description of Threats, above. These are unlikely to diminish in the foreseeable future (Carter et al. 2003; Department of Sustainability and Environment 2004a).

The Committee considers that the ecological community has a very restricted geographic distribution, as evidenced by data on patch sizes, and is under ongoing threats. The nature of its very restricted distribution make it likely that a threatening process could cause it to be lost in the near future. Therefore, the ecological community is **eligible** for listing under Criterion 2 as **critically endangered**.

### ***Criterion 3 - Loss or decline of functionally important species***

Very little is known about the functional roles and importance of the key flora and fauna species in the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community.

The dominant flora species in each vegetation layer (Gippsland Red Gum in the tree canopy, and perennial tussock grasses in the ground layer) provide structure to the vegetation and their presence and cover may influence the dynamics of other vegetative components. For example, the density and shading of the tree canopy influences the nature of the understorey whilst the degree of closure of the tussock grass canopy affects the capacity of wildflowers and other herbs to establish and spread. However, these dominant species are not yet considered to be threatened, despite factors such as rural dieback causing local decline of Gippsland Red Gum trees (Bramwell 2004; Measham 2007). The incidence of tree dieback appears to be higher along roadsides and in paddocks and is low for trees in or near intact native vegetation remnants (Measham 2007). Some cases in which dieback occurs (e.g. paddock trees devoid of native understorey) would be too degraded for inclusion in the national ecological community.

There are insufficient data available to determine the loss or decline of functionally important species within the ecological community. Therefore, it is **not eligible** for listing in any category under this criterion.

### ***Criterion 4 - Reduction in community integrity***

A reduction in the integrity of the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community is evident from observations of fragmentation, rural tree dieback and weed invasion, and the inferred decline of fauna within the ecological community.

### *Fragmentation of remnants and rural tree dieback*

The Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community has been extensively cleared across its range. Those remnants which remain are generally small and isolated, as indicated by the patch size data shown at Criterion 2, above. The small remnants that comprise the grassland component of the ecological community collectively total about 60 ha in extent, mainly in cemeteries and along roadsides and rail lines. Woodland remnants tend to be larger but, again, many are long and linear fragments along roadsides. Large remnants are relatively scarce, being confined to the few large reserves in the region such as Moormung Flora and Fauna Reserve and Providence Ponds Flora and Fauna Reserve. This pattern is reflected throughout the region where only 2% of all patches of remnant native vegetation are greater than 40 ha in size (Bramwell 2004).

There are indications that rural tree dieback of Gippsland Red Gum is tied to extensive fragmentation and wholesale landscape change across the region. Surveys of dieback show that the incidence of tree decline is least for larger, intact native vegetation remnants and highest for trees that are isolated, whether as paddock trees or in small, unconnected pockets of native vegetation surrounded by agricultural, or otherwise disturbed, lands (Bramwell 2004). Rural tree dieback is an ongoing issue of concern to landholders (Measham 2007) and a complex issue to address. Fragmentation can be regarded as one cause, and tree dieback as one symptom that the Gippsland Red Gum Grassy Woodlands and Associated Native Grassland ecological community has undergone a reduction in community integrity.

### *Weed and native shrub invasion*

Weeds are a serious issue for the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community. The fertile soils, the widespread disturbance and fragmentation of native vegetation remnants and the surrounding matrix of agricultural and developed lands are conducive to the invasion and establishment of weeds. Consequently, Davies et al (2002) and Department of Sustainability and Environment (2004b) list about 30 weed species as present in the ecological community. Most species identified are grasses and rosette herbs. A few are considered to have high impact upon the ecological community, notably Sweet Vernal-grass (*Anthoxanthium odoratum*), Yorkshire Fog (*Holcus lanatus*) and Spear thistle (*Cirsium vulgare*). The list of established weeds is likely to expand. Bramwell (2004) notes that a range of serious environmental weeds occur in the region, such as Bridal Creeper (*Asparagus asparagoides*), Chilean Needle-grass (*Nassella neesiana*) and African Lovegrass (*Eragrostis curvula*), and that others, e.g. Patterson's Curse (*Echium plantagineum*), are being continually introduced or re-introduced through sources such as contaminated stock feed. Department of Sustainability and Environment (2004a) also notes Bridal Creeper to be an existing threat to the woodland component of the ecological community.

The high impact weeds are seriously invasive and problematic to manage. Bridal Creeper, for instance, produces a dense mat of underground tubers that serve as perennating organs, from which shoots resprout, and are difficult to eradicate from the soil (Muyt 2001). The extensive twining shoots can smother understorey plants whilst the tuberous mat reduces opportunities for native plants to regenerate or spread. Whilst the manner of competitive effects may vary with the biology of the weed species involved, they all show a high capacity to disrupt functional processes and, hence, community integrity.

### *Decline of faunal components*

Whilst the functional roles of most fauna occurring in the national ecological community remains largely unknown, it can be inferred in some cases. Small, ground-dwelling mammals, such as bandicoots, are known to have an important role in maintaining topsoil structure and function in grassy ecosystems through their continual digging (Martin 2003). Their digging actions enhance the microbial, aeration, water infiltration and nutrient cycling functions of the soil which, in turn, influences the composition and function of the ground layer vegetation. However, the diversity of small ground-dwelling mammals across the Gippsland Plain has markedly declined (National Land and Water Resources Audit 2007).

Large mammalian herbivores such as the Eastern Grey Kangaroos graze the understorey and, through selective grazing, exert an influence on the floristic composition of the grassy ground layer. Kangaroo abundance can fluctuate markedly but is likely to have declined overall in Gippsland since European settlement, given the extent of clearing and agriculture in the region and in light of the similar history of grassy vegetation and associated fauna on the Victorian Volcanic Plain (Seebeck 1984). The grazing role of macropods across much of the former range for the ecological community has been supplanted by domestic stock, notably sheep, and feral herbivores, notably rabbits. These introduced species graze in a very different manner to native mammals, in terms of selectivity, browse strategy and intensity, and often with detriment impact to plant biodiversity.

Important functional roles also were played by insectivorous woodland birds and arboreal mammals, e.g. Sugar Glider (*Petaurus breviceps*), both of which would have fed on herbivorous insects frequenting the tree canopy. The woodland bird fauna in the Gippsland Plain bioregion is now considered to be highly modified (National Land and Water Resources Audit 2007) and is likely to have declined in many small remnants. The decline in woodland fauna may be another factor contributing to tree dieback associated with outbreaks of herbivorous insects (Bramwell 2004). Whilst the causes of insect outbreaks are undoubtedly complex, a sharp decline in the abundance of predators that normally feed on herbivorous insects would preclude any possibility of regulating insect outbreaks.

The Committee considers that the change in integrity experienced by the ecological community through fragmentation, weed invasion and the inferred loss of key faunal components and fragmentation is very severe. It is also indicated by the incidence of dieback of Gippsland Red Gum trees across the region, especially the higher incidence of dieback in isolated and highly modified fragments. Therefore, the ecological community is **eligible** for listing as **critically endangered** under this criterion.

### ***Criterion 5 - Rate of continuing detrimental change***

It is evident that the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community has undergone a very severe decline in the past and continues to be subject to ongoing threats. There is qualitative information from landholder surveys about perceptions of eucalypt dieback in Gippsland (Measham 2007). Eucalypt dieback in the Gippsland Plain appears to be patchy with some sites experiencing moderate to high incidence (Bramwell 2004; Measham 2007; see Description of Threats, above). Most landholders first noticed dieback from the 1970s (Measham 2007) though there are reports of it as early as the 1890s (Bramwell 2004). The perception of most landholders was that the number of affected trees and the degree of impact due to dieback has been about the same for, at least, the previous 5-10 years. However, there

are no quantitative data available about the rate at which the ecological community has declined over the immediate past or is projected to decline for the immediate future.

There is insufficient information available to the Committee to judge the rate of continuing detrimental change experienced by the ecological community. Therefore, as the ecological community has not been demonstrated to have met any of the required elements of Criterion 5, it is **not eligible** for listing in any category under this criterion.

#### ***Criterion 6 - Quantitative analysis showing probability of extinction***

There are no quantitative data available to assess this ecological community under this criterion. Therefore, it is **not eligible** for listing under this criterion.

## **10. Conclusions**

### *Conservation status*

This advice follows the assessment of information to include the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands in the list of threatened ecological communities referred to in Section 181 of the EPBC Act. The **Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands** ecological community meets:

- Criterion 1 as **critically endangered** because its decline in geographic distribution is very severe;
- Criterion 2 as **critically endangered** because its geographic distribution is very restricted and the nature of its distribution makes it likely that the action of a threatening process could cause it to be lost in the near future; and
- Criterion 4 as **critically endangered** because the reduction in integrity across most its range is very severe as indicated by degradation of the community.

The highest category for which the ecological community is **eligible** to be listed is **critically endangered**.

### *Recovery Plan*

The Committee considers that there should be a recovery plan for this ecological community.

The Committee acknowledges that a State Government Action Statement covering this ecological community is available and that there is some effective conservation work in the region, e.g. through the Australian Landscape Trust, Gippsland Plain Conservation Management Network and Landcare groups. However, the Committee recognises the ecological community to be critically endangered and that threats to the community are ongoing and complex in nature. Considerable work is needed to ensure continued protection for this ecological community. It is expected that all existing management plans and conservation initiatives would be taken into account for future plans.

## 11. Recommendation

- (i) The Committee recommends that the list referred to in section 181 of the EPBC Act be amended by **including** in the list in the *critically endangered* category:  
**Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands.**
- (ii) The Committee recommends that the Minister decide to have a recovery plan for this ecological community.
- (iii) The Committee recommends that the Minister provide the following reason for his decision: The actions required to conserve and promote recovery of the ecological community include short and longer term activities that need to be evaluated and prioritised through the preparation of a recovery plan. A recovery plan would promote a coordinated approach to recover the ecological community and provide guidance to land managers.

Associate Professor Robert J.S. Beeton

Chair

Threatened Species Scientific Committee

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## Appendix A.

List of plant species characteristic of the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodlands and Associated Native Grasslands ecological community. This is an indicative rather than comprehensive list of the plant species common to the ecological community. Patches may not include all species on the list, or may include other species not listed.

*Legend:* G = common in ground layer<sup>1</sup> of grassland component but infrequent in woodland component;

W = common in ground layer<sup>1</sup> of woodland component but infrequent in grassland component.

Blank = widespread in ground layer<sup>1</sup> of both components.

Species name	Common name	
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### UPPER LAYER – DOMINANT TREE

<i>Eucalyptus tereticornis</i> subsp. <i>mediana</i>	Gippsland Red-gum	
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### UPPER LAYER - OTHER TREES PRESENT <sup>2</sup>

<i>Eucalyptus angophoroides</i>	Appled-top Box	
<i>Eucalyptus bridgesiana</i>	But But	
<i>Eucalyptus camaldulensis</i>	River Red-gum	
<i>Eucalyptus globoidea</i>	White Stringybark	
<i>Eucalyptus melliodora</i>	Yellow Box	
<i>Eucalyptus pauciflora</i> subsp. <i>pauciflora</i>	Snow Gum	
<i>Eucalyptus polyanthemos</i>	Red Box	
<i>Eucalyptus viminalis</i>	Manna Gum	

### MID LAYER - SMALL TREES & TALL SHRUBS <sup>3</sup>

<i>Allocasuarina littoralis</i>	Black Sheoak	
<i>Allocasuarina verticillata</i>	Drooping Sheoke	
<i>Acacia implexa</i>	Lightwood	
<i>Acacia mearnsii</i>	Black Wattle	
<i>Acacia melanoxylon</i>	Blackwood	
<i>Kunzea ericoides</i>	Burgan	

### GROUND LAYER - SMALL SHRUBS

<i>Bossiaea prostrata</i>	Creeping Bossiaea	
<i>Pimelea humilis</i>	Common Rice-flower	

### GROUND LAYER - GRASSES, GRASS-LIKE PLANTS & LILIES

<i>Arthropodium strictum</i>	Chocolate-lily	
<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>	Stiped Wallaby-grass	W
<i>Austrodanthonia setacea</i>	Bristly Wallaby-grass	
<i>Austrodanthonia tenuior</i>	Purplish Wallaby-grass	
<i>Austrostipa rudis</i>	Veined Spear-grass	W
<i>Carex breviculmis</i>	Common Grass-sedge	
<i>Gahnia radula</i>	Thatch Saw-sedge	W
<i>Lomandra filiformis</i>	Wattle Mat-rush	
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass	W
<i>Poa clelandii</i>	Tussock Grass	G
<i>Poa sieberiana</i>	Tussock Grass	W
<i>Schoenus apogon</i>	Common Bog-sedge	
<i>Themeda triandra</i>	Kangaroo Grass	
<i>Thysanotus patersonii</i>	Twining Fringe-lily	
<i>Tricoryne elatior</i>	Yellow Rush-lily	
<i>Wurmbea dioica</i>	Common Early Nancy	

### GROUND LAYER - HERBS & WILDFLOWERS

<i>Acaena echinata</i>	Sheep's Burr	
<i>Cotula australis</i>	Common Cotula	W
<i>Crassula sieberiana</i>	Australian Stonecrop	
<i>Dichondra repens</i>	Kidney-weed	W
<i>Drosera peltata</i> subsp. <i>peltata</i>	Pale Sundew	G
<i>Euchiton involucratus</i>	Star Cudweed	
<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	
<i>Hypericum gramineum</i>	Small St John's Wort	
<i>Lagenophora gracilis</i>	Slender Bottle Daisy	W
<i>Leptorhynchus squamatus</i>	Scaly Buttons	
<i>Oxalis perennans</i>	Grassland Wood-sorrel	
<i>Poranthera microphylla</i>	Small Poranthera	W
<i>Solenogyne dominii</i>	Smooth Solenogyne	W
<i>Veronica plebeia</i>	Trailing Speedwell	W
<i>Wahlenbergia gracilis</i>	Sprawling Bluebell	W

<sup>1</sup> The upper and mid vegetation layers are typically absent for the grassland component. However, scattered trees and shrubs may be present in or near some grassland patches. The amount of woody vegetation cover varies with site and degree of degradation. Note that Lunt (1995) identifies pockets of *Allocasuarina verticillata* as associated with some grassland patches rather than woodland sites.

<sup>2</sup> The tree species present and their extent to which they occur varies from site to site. Some species may be more locally common in certain parts of the ecological community's range.

<sup>3</sup> The typical state of the ecological community does not have a well-developed mid-layer. However, some patches occur in a transitional state whereby a mid-layer is developing either through natural processes or as a consequence of disturbance.

*Sources:* Lunt (1995) Table 1 - list of grassland, grassy woodland and widespread plant species; Davies et al. (2002) Species highlighted as most frequent and important for EVC 55-03; and Department of Sustainability and Environment (2004b) Benchmarks for EVCs 55 and 132\_61 in the Gippsland Plain and East Gippsland Lowland regions of Victoria.