



**FLORA & FAUNA
GUARANTEE**

FLORA AND FAUNA GUARANTEE - SCIENTIFIC ADVISORY COMMITTEE

FINAL RECOMMENDATION ON A NOMINATION FOR LISTING

Cool Temperate Mixed Forest Community

Date of receipt of nomination: 22 October 2010
Date of preliminary recommendation: 18 May 2012
Date of final recommendation: 29 October 2012

File No.: FF/54/3327

Validity: The nomination is for a valid item.

Prescribed Information: The prescribed information was provided.

Name of the Nominator is adequately provided.

Name of the Item is adequately provided.

The nominated community is adequately defined and described according to accepted practice, and described in such a way as to be distinguished from all other communities (see below). Cool Temperate Mixed Forest (CTMF) is effectively Cool Temperate Rainforest (CTR) with an emergent eucalypt canopy of wet or montane forest species (White et al. 2006). The Scientific Advisory Committee (SAC) believes that, while Cool Temperate Mixed Forest has characteristics that set it apart from all other communities, in the absence of fire, which is known to promote eucalypt regeneration (Ashton 1976, Attiwell 1994, Chesterfield 1996), CTMF transitions gradually into cool temperate rainforest over a lengthy period of time (200 to 400 years; Bowman and Jackson 1981) as the overstorey of eucalypts senesces and is finally lost (Gilbert 1959, Jackson 1968, Brown and Podger 1982, Ellis 1985, Rainforest Technical Committee 1986, Wood et al. 2010).

Williams (2012), in reviewing the status of such forests in Australia, noted that the term 'mixed forest' was first used by Gilbert (1959) for Tasmanian cool temperate rainforest-eucalypt forests that have a species composition characteristic of a rainforest community but with a eucalypt emergent overstorey. Gilbert's concept was widely accepted (e.g. Brown and Podger 1982). Burgman and Ferguson (1995) recommended that mixed forests in Victoria be recognised as a separate community type requiring specific management prescriptions. Williams (2012) highlighted two essentially different views of the status of these mixed forests: the first (Lynch and Neldner 2000, Neldner and Lynch 2001) preferred to recognize mixed forests as distinct vegetation types to allow maximum flexibility in their management; a second view (Kirkpatrick and DellaSella 2011) regards mixed forests as rainforests based on their similarity in species composition. Although Cool Temperate Mixed Forest was long considered a separate entity, recent studies have classified Cool Temperate Mixed Forest as a subset of Cool Temperate Rainforest (Cheal et al. 2011), a view consistent with other studies (Rainforest Technical Report 1986, Peel 1999, Cameron 2008).

This convergence of recent views about Cool Temperate Mixed Forest being a subset of Cool Temperate Rainforest supports the Scientific Advisory Committee's view that this forest association is already protected under the FFG Act. The final recommendation report for the Cool Temperate Rainforest Community listed under the Flora and Fauna Guarantee Act (FFG Act) on 30 September 1992 (SAC 1992) stated that "rainforest includes closed transitional and seral communities, with emergent eucalypts, that are of similar botanical composition to mature rainforests in which eucalypts are absent". In the SAC's view, this statement covers Cool Temperate Mixed Forest as a seral association within Cool Temperate Rainforest, a view consistent with the 1986 report of the Rainforest Technical Committee and the final rainforest definition of Lynch and Neldner (2000). However, the SAC believes that Cool Temperate Mixed Forest also warrants special recognition on its own because of its often-unrecognized critical importance as a seral stage of the already-listed Cool Temperate Rainforest Community.

The FFG Act provides for the listing of a specifically defined item, the subject of which is a subset of a more generally defined item, to be listed if it is of such significance that it warrants being listed in its own right (Criterion 6.1). The SAC believes that it does have such significance in that the long-term survival of much Cool Temperate Rainforest following a severe bushfire depends on its development from the CTMF that may develop on some sites after a fire. In such post-fire regeneration, the relative conspicuousness of eucalypts compared to the rainforest species, particularly in earlier regrowth stages, can mask the community's status as redeveloping rainforest. The SAC also recognizes that listing Cool Temperate Mixed Forest separately takes account of the differing Lynch and Neldner and Kirkpatrick and DellaSella approaches, and also that CTMF has distinctive features of its own. In addition, CTMF often forms a buffer between CTR and Wet Forest Communities, thus minimising the impact of fire on pure CTR by creating patch dynamics that are sensitive to extrinsic factors. For example, warmer, drier climate conditions are predicted (Suppiah et al. 2004) to result in increased high fire risk days (Whetton et al. 2000) with a consequent increase in fire frequency and severity. These changing climate conditions are predicted to result in

most Central Highland species being unable to regenerate in their current ecological ranges (Nitschke and Hickey 2007), with the likely replacement of CTMF by wet sclerophyll forest and the subsequent loss of a substantial part of the existing Cool Temperate Rainforest in this state.

Description of the community

Cool Temperate Mixed Forest is a structurally complex forest community characterised by an emergent overstorey of eucalypts with a 10–50% eucalypt cover (Radic et al. 1985) above an understorey of rainforest species. Typical overstorey species are Mountain Ash (*Eucalyptus regnans*), Errinundra Shining Gum (*Eucalyptus denticulata*), Shining Gum (*Eucalyptus nitens*), Tingaringy Gum (*Eucalyptus glaucescens*) and, occasionally, *Acacia* species above an (often patchy), understorey of long-lived, fire-sensitive rainforest species, such as Myrtle Beech (*Nothofagus cunninghamii*), Southern Sassafras (*Atherosperma moschatum*), Blackwood (*Acacia melanoxylon*), Black Oliveberry (*Elaeocarpus holopetalus*) and Silver Wattle (*Acacia dealbata*) that often form a closed canopy. The composition of CTMF varies across Victoria from east to west with a change in both the rainforest species and the eucalypt overstorey. In the east the rainforest species include Oliveberry (*Elaeocarpus holopetalus*) and Southern Sassafras (*Atherosperma moschatum*) (Peel 1999). To the west the composition changes: Oliveberry is found in East Gippsland only, Southern Sassafras extends from East Gippsland to the Central Highlands and *Nothofagus cunninghamii* from the Central Highlands to the Otway Ranges. A similar pattern is seen in the eucalypt species with Cut-Tail Ash (*E. fastigata*) only in East Gippsland, Errinundra Shining Gum (*Eucalyptus denticulata*), Shining Gum (*E. nitens*) and Tingaringy Gum (*Eucalyptus glaucescens*) from East Gippsland to the Central Highlands, and Mountain Ash (*E. regnans*) from Gippsland to the Otway Ranges. Characteristic ground and epiphytic plants below the understorey include Mountain Pepper (*Tasmannia lanceolata*), Tall Sedge (*Carex appressa*) and a variety of ferns such as Soft Tree-fern (*Dicksonia antarctica*), filmy-ferns (*Hymenophyllum* spp.), water-ferns (*Blechnum* spp.) and Kangaroo Fern (*Microsorium pustulatum*), together with abundant bryophytes and lichens. Both the bryophytes and the vascular plant species of CTMF emerge from statistical analysis of quadrat data to be assemblages that are distinctive of CTMF, separating it clearly from Cool Temperate Rainforest and wet sclerophyll forests that usually occur either side of the CTMF (Worley pers. comm. 2012). These CTMF assemblages include at least one species unique to CTMF (e.g. Shiny Nematolepis *Nematolepis wilsonii*; a listed FFG Species).

Under a closed understorey canopy, low light intensities on the forest floor prevent eucalypt regeneration so that, in time, as the overstorey trees gradually senesce and die, the community may progressively develop into a Cool Temperate Rainforest (Gilbert 1959, Jackson 1968, Brown and Podger 1982, Ellis 1985, Wood et al. 2010). Until it reaches that stage, Cool Temperature Mixed Forest has, on average, 30% more understorey trees than Cool Temperate Rainforest and is depauperate in ground ferns and epiphytes compared to Cool Temperate Rainforest (Cameron 2008).

Cool Temperate Mixed Forests occur in parts of the Central Highlands, the Toorongo Plateau of north Gippsland and the East Gippsland uplands (e.g. Errinundra Plateau), largely at montane elevations (900–1200 metres), often in saddles on mountain plateaus and on valley sides (Peel 1999). It also occurs in the Otway Ranges and may be present in the Strzelecki ranges. CTMF frequently occurs adjacent to Cool Temperate Rainforests where it may form ecotones with contiguous communities. This is particularly the case in the Central Highlands where, commonly but not exclusively, ribbons of CTMF occur adjacent to CTR along gully bases. The need for sufficiently moist conditions for its rainforest component coupled with the drier soil characteristics required for eucalypt establishment (i.e. not waterlogged) results in a tendency for CTMF to be distributed between permanently waterlogged ground and ground that dries out in summer/autumn, thus setting the boundary conditions for the inner and outer edges of CTMF ribbons. The SAC notes that the precise area occupied by CTMF is thus a dynamic one, varying with fire history, topographically-determined local climate and time. The extent of CTMF is largely dependent on the fire history of the area concerned, with any major high intensity fire in the last 200 years likely to reduce the area covered (Worley 2012). Historically there has been a substantial loss of Cool Temperate Mixed Forest due to fire, clearing and timber harvesting (Peel 1999). Their modification and depletion in these ways can expose mature rainforest to a greater risk of damage by fire in future (Barker 1992); Victorian rainforests are particularly vulnerable because of their small size and large boundary-to-area ratio (Read 1992). Any potential increase in fire frequency and severity that may follow from climate change would threaten the area under both CTMF and CTR.

Eligibility for listing as a community under the Flora and Fauna Guarantee

The nominated item satisfies at least one criterion of the set of criteria prepared and maintained under Section 11 of the *Flora and Fauna Guarantee Act 1988*, and stated in Schedule 1 of the *Flora and Fauna Guarantee Regulations 2011*.

Evidence that criteria are satisfied:

Sub-criterion 2.1.1 *The community is in a demonstrable state of decline which is likely to result in a significant loss of its component taxa.*

Evidence:

All communities of Cool Temperate Mixed Forest are nationally depleted while, at the state level Victorian communities of Cool Temperate Mixed Forest are small, scattered and also depleted, having less than half of their modelled pre-1750 extent remaining (Peel 1999). Severe bushfires are a particular current threat. For example, the extensive fires in 1926, 1939 and 2009 in the Central Highlands severely burnt CTR and the adjacent CTMF, producing communities that in the normal course of events take a long time to recover their full component of taxa, given no further fires. The SAC is concerned that there is a high likelihood that global rises in temperature associated with climate change will, in the future,

lead to increases in the frequency and severity of fires, ultimately reducing the area of CTMF and the number of taxa it contains.

Nematolepis wilsonii is only known from two naturally occurring populations. It occurs only in the CTMF adjacent to CTR and risks of extinction from stochastic events such as wildfire are considered high (Murphy et al. 2006).

The community of Cool Temperate Rainforest was recognised by the SAC in 1992 as a threatened community in a demonstrable state of decline likely to result in its extinction. Given the particular ecological relationship (seral, secondary, ecotonal & subclimax rainforest) between Cool Temperate Mixed Forest and Cool Temperate Rainforest, it is submitted that (*ipso facto*) CTMF presents an extinction probability of a similar or greater magnitude for at least some of its component taxa.

Sub-criterion 2.1.2 *The community's distribution has decreased markedly in a short time and the decrease is continuing.*

Evidence:

There has been a substantial relatively recent loss of Cool Temperate Mixed Forest due to fire and, in some sites, timber harvesting. Extensive areas of CTMF in the Central Highlands were burnt by the 1926, 1939 and 2009 wildfires. In East Gippsland, about 50% of the CTMF Ecological Vegetation Class mostly over the last four decades has been lost through logging on the Errinundra Plateau (mostly in the Hammonds Road Area), which was the core of its distribution and abundance in the area (Peel 1999). The few remaining areas are currently in reserves or form ribbons at the margins of rainforest gullies in stream systems.

Sub-criterion 2.1.3 *The community's composition has altered markedly in a short time and the alteration is continuing.*

Evidence:

Parts of areas such as the Toorongo Plateau, which once supported a relatively large area of Cool Temperate Mixed Forest, have been the subject of clearing (including salvage harvesting after fire), ground burns to promote eucalypt regeneration and replanting with eucalypts, resulting in their transformation to a sclerophyll-dominated community (Barker 1992). Such treatment has a significantly greater impact on the occurrence of some epiphytic ferns than does wildfire (Hickey 1994). However, harvesting practices do not have to result in a loss of CTMF. Historical logging practices in the Otway Ranges at Triplet Falls where selective logging of large eucalypts was undertaken, as opposed to clear-felling, burning and reseeded with *Eucalyptus*, has seen the recovery and redevelopment of CTMF and CTR.

Sub-criterion 2.2.1 *The community is very rare in terms of the total area it covers or it has a very restricted distribution or it has been recorded from only a few localities.*

Evidence:

CTMF has a very restricted distribution in Victoria, being found in only a few localities in the Central Highlands, in north and east Gippsland, and the Otway Ranges. Although not mapped on a statewide basis, preliminary analysis suggests that the Bioregional Conservation Status would at a minimum be 'rare' (White et al. 2006).

Criterion 6.1 *A specifically defined item, the subject which is a subset or example of the subject matter of a more generally defined item which is listed, is eligible to be listed if it is of such significance that it warrants it being listed in its own right so that an action statement must be prepared specifically for the item.*

Evidence:

There is strong evidence that Cool Temperate Mixed Forest is a subtype of Cool Temperate Rainforest (see above), as described within the Cool Temperate Rainforest Community Recommendation for Listing under the Flora and Fauna Guarantee Act (SAC 1992). Dominated by rainforest species but with emergent eucalypts, the relative conspicuousness of eucalypts in this subtype compared to the rainforest species, particularly in earlier regrowth stages after fire, can mask its status as redeveloping rainforest. Cool Temperate Mixed Forest occupies some of the wettest fire refuge sites adjacent to patches of Cool Temperate Rainforest and is regarded as largely fire-intolerant. Harvesting practices such as clear-felling, windrowing and burning of the understorey and reseeded with eucalypts (e.g. Toorongo Plateau) results in the conversion of this subtype of Cool Temperate Rainforest to sclerophyll forest. The removal and conversion of the Cool Temperate Mixed Forest subtype poses a significant risk to remaining patches of Cool Temperate Rainforest because it can both prevent an evolutionary redevelopment of rainforest through seral succession and increase the risk of exposure to fire to core areas of remaining CTR.

The fact that Cool Temperate Mixed Forest can be specifically defined (Burgman and Ferguson 1995, Cheal et al. 2011, Cameron 2008), its significance as both a buffer for pure stands of Cool Temperate Rainforest, its potential to become Cool Temperate Rainforest (Peel 1999), and its distinctive composition, combined with the significant reduction in the extent of Cool Temperate Mixed Forest (estimated to be greater than 50%) and an inability amongst some land users to recognize this subtype as a seral stage of Cool Temperate Rainforest, means that this item warrants listing in its own right.

Additional information

- Errinundra Shining Gum (*Eucalyptus denticulata*) and Tingaringy Gum (*Eucalyptus glaucescens*) are both classified as 'rare' in Victoria (DSE 2005).

Documentation

The published information and research data provided to the SAC has been assessed. To the best of its knowledge, the SAC believes that the data presented are not the subject of scientific dispute and the inferences drawn are reasonable and well supported. The data presented on distribution and abundance are the result of comprehensive surveys and provide clear and strong evidence that the community is rare in terms of abundance and distribution.

Advertisement for public comment

In accordance with the requirements of Section 14 of the *Flora and Fauna Guarantee Act 1988*, the preliminary recommendation was advertised for a period of at least 30 days.

The preliminary recommendation was advertised in:

- 'The Herald Sun' - on 13 June 2012
- 'The Weekly Times' - on 13 June 2012
- Government Gazette* - on 14 June 2012

Submissions closed on 30 July 2012.

Further evidence provided:

Four submissions were received on this item but no evidence was provided to warrant a review of the Scientific Advisory Committee's preliminary recommendation that the community is eligible for listing.

Final Recommendation of the Scientific Advisory Committee

The Scientific Advisory Committee concludes that on the evidence available the nominated item is eligible for listing in accordance with Section 11(1) of the Act because criterion 6.1 and sub-criteria 2.1.1, 2.1.2, 2.1.3 and 2.2.1 have been satisfied. The Scientific Advisory Committee also concludes that no evidence exists to suggest that primary criteria 2.1 and 2.2 cannot be satisfied as a consequence of sub-criteria 2.1.1, 2.1.2, 2.1.3 and 2.2.1 being satisfied.

The Scientific Advisory Committee makes a final recommendation that the nominated item be supported for listing under the *Flora and Fauna Guarantee Act 1988*.

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Endorsement by the Convenor of the Scientific Advisory Committee

Date


Assoc. Prof David Morgan
Convenor

20.11.12