DEPARTMENT OF ENVIRONMENT, LAND, WATER AND PLANNING (DELWP)
LAND MANAGEMENT POLICY DIVISION

Department of Environment, Land, Water and Planning	**CASE ASSESSMENT REPORT** Report completed by: [redacted]	**Alleged Non-compliance Reference Number:** 2015-0008 **Registry file number:** FS/20/3129 [redacted]

ATTACHED INFORMATION:

- ☒ Alleged non-compliance report submitted by source
- ☒ Photographic/video evidence
- ☒ Maps of the alleged non-compliance location
- ☐ Other

A. ALLEGED OFFENDER

Note: copy and paste box to list more than one alleged offender

Name:
Organisation (if applicable): VicForests
Single Point of Contact name (if applicable): [redacted]
Single Point of Contact position (if applicable): [redacted]
Address: [redacted]
Phone number: [redacted]
Email: n/a
Other details to identify/contact the Alleged Offender: n/a

B. LOCATION OF ALLEGED NON-COMPLIANCE

Reserve name: Bendoc State forest	**Nearest DELWP Office:** Bendoc
Forest Coupe ID: 892-508-0006 (Last Minute)	**Area (Ha):** 30 Ha
Nearest intersection (roads/rivers):	**Distance/bearing from intersection:**
Land Tenure/s: State forest.	
Forest Management Zone: General Management Zone	

C. LEGISLATION (ACT AND SECTION) / REGULATION CONTRAVENED AND PENALTY

The complainant's report relates to "illegal logging" due to the alleged presence and subsequent harvesting of:

i) old growth forest and/or
ii) cool temperate mixed forest (CTMF) within coupe 892-508-0006 (Last Minute).

Regulatory requirements for protection of "old growth" forest

The *Code of Practice for Timber Production 2014* (the Code) and incorporated *Management Standards And Procedures For Timber Harvesting Operations In Victoria's State Forests 2014* (MSPs) defines old growth as "forest which contains significant amounts of its oldest growth stage - usually senescent trees - in the upper stratum and has been subject to any disturbance, the effect of which is now negligible. For a stand to qualify as old-growth, the regrowth growth stage, if present, must be sparse (less than 10% of the total crown cover of the stand). Negligibly disturbed forest is that in which disturbance is known to have occurred, but the disturbance is unlikely to have altered the structure (growth stage and crown cover) or the usual species composition which characterises a given vegetation class; or, if the alteration did occur in the past, it is no longer measurable."

Old growth forest has been modelled and assessed by DELWP in establishing the reserve areas identified in the Forest Management Zoning Scheme. Old growth forest is generally protected from timber harvesting through the landscape-level forest planning process undertaken by DELWP. This is captured in Section 4.6.4.4 of the Planning Standards for timber harvesting operations in Victoria's State forests 2014 (Planning Standards 2014) (see below).

> 4.6.4.4 The following proportion of each old growth forest EVC should be incorporated into conservation reserves or the SPZ:
>
> (a) all viable examples of rare or depleted (generally less than 10% of the extant distribution) old growth forest EVCs wherever possible; and
>
> (b) at least 60% of the extent of all other old growth forest EVCs present in 1995.

There are no specific rules in the Code or MSPs requiring VicForests to identify and protect remnant old growth forest in East Gippsland. Section 5.4 of the MSPs does establish a related rule requiring VicForests to protect giant trees in East Gippsland noting the need to protect "all living trees equal to or greater than 4 m diameter at breast height over bark (DBHOB) from the direct effects of timber harvesting operations and regeneration burning." The circumference of such trees must reach 12.56m at breast height to qualify for such protection. The rules also note that where giant trees are detected they should also be retained within "habitat patches" (not left isolated in cleared coupes).

Regulatory requirements for protection of CTMF

The *Flora and Fauna Guarantee Act 1988* (FFG Act) defines the requirements for the conservation and management (i.e. protective requirements) of various flora. Section 46 provides capacity for the Governor in Council to declare any flora to be protected flora. CTMF is listed as "protected flora" under the list published by the Department in November 2014. (see www.depi.vic.gov.au/ data/assets/pdf file/0011/291575/Protected-Flora-List-November-2014.pdf)

Offences relating to protected flora

Section 47(1) states that a person must not take, trade in, keep, move or process protected flora without a licence or permit or unless authorised by Order of the Governor in Council published in the Government Gazette. Penalty: 50 penalty units.

An Exemption Order to the protective requirements of the FFG Act was established by the Minister for Environment at the time in August 2004 (see www.depi.vic.gov.au/ data/assets/pdf file/0020/290351/Flora-and-Fauna-Guarantee-Forest-Produce-Harvesting-Order-No.-2-2004.pdf). Under Section 7(1) of that order "A person may take protected flora as a result of, or incidental to timber or other forest produce harvesting, including roadworks, in State forest or Crown land if that person is undertaking timber harvesting operations that are authorised operations under the *Sustainable Forests (Timber) Act 2004* and that are conducted in accordance with the relevant allocation order and approved Timber Release Plan".

Offence of "unauthorised" timber harvesting

Section 45 of the *Sustainable Forests (Timber) Act 2004* (SFTA) outlines the offence of "unauthorised" timber harvesting operations. The maximum penalty for this offence in the case of a body corporate is 240 Penalty Units.

Authorised timber harvesting operations are defined under S45(2) of the SFTA. For VicForests' vested timber resources authorised means "timber harvesting operations undertaken by, or on behalf of, VicForests in accordance with an allocation order and a timber release plan that relates to that allocation order."

Paragraph 14 of the Allocation Order specifies the obligation for VicForests' to comply with the Code. Timber harvesting which is not undertaken in accordance with the Code may therefore be considered "unauthorised harvesting" and subject to consideration under this offence.

The Code and MSPs defines "mixed forest" as "a structurally complex forest community characterised by an emergent overstorey of eucalypts with a 10–50% eucalypt cover above an understorey of rainforest species. It is recognised as a distinct community from rainforest. 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 mixed forest 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 and Southern Sassafras. To the west the composition changes: Oliveberry is found in East Gippsland only, Southern Sassafras extends from East Gippsland to the Central Highlands and Myrtle Beech 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, Shining Gum and Tingaringy Gum (*Eucalyptus glaucescens*) from East Gippsland to the Central Highlands, and Mountain Ash from Gippsland to the Otway Ranges."

The Code and MSPs do not specifically define or reference CTMF. The THCU understands that CTMF is considered to be a subset of the broader category of "mixed forest". In the absence of a specific definition of CTMF in the regulatory documents, the THCU accepts that the above definition of "mixed forest" encompasses CTMF. No specific regulatory rules or guidance have been established by DELWP for the delineation, identification or protection of mixed forest or CTMF in the field.

D. DETAILS OF ALLEGED NON-COMPLIANCE

[redacted] of the Goongerah Environment Centre Office (GECO) submitted a report to DELWP on 16 April 2015 (see attached) containing a range of allegations. A number of the allegations have been previously addressed by the THCU through a separate case (reference number 2015-0006).

This case concerns the specific allegations that VicForests has illegally harvested CTMF and/or old growth forest as part of its timber harvesting operations at coupe 892-508-0006 (Last Minute). The report contains maps, photos, and other evidence in support of these allegations.

[redacted] has called on DELWP to investigate the report of illegal harvesting and to stop VicForests' harvesting operation to protect remaining unharvested forest.

Case Officer Comments (analysis):

Old growth allegation: [redacted] report contains evidence of two large tree stumps measuring 11.15m and 10m in circumference. This claim was assessed against the regulatory requirements. Whilst these stumps had been large old trees, they did not meet the definition of "giant trees," within the MSPs as the circumference was under 12.56m. As such no regulatory breach was identified.

Cool temperate mixed forest allegation: The exemption order of 3 August 2004 is of key importance to this allegation. The THCU considers that this exemption applies to VicForests' approved timber harvesting operations at coupe 892-508-0006. No regulatory breach has been identified from the complainant's report.

Issue with the definition of CTMF and mixed forest: The definition of mixed forest was also considered by the THCU officers in reviewing whether the alleged CTMF was present in the coupe.

The THCU officers attended the coupe on 16 April 2015 to investigation of the other related rainforest matters (case reference 2015-0006). The eucalypt and rainforest canopy species that were observed were consistent with those listed in the definition of CTMF. A more definitive assessment on the "structure of the forest" would be required to determine the presence/absence of CTMF. This would also require specialist botanical expertise. As it is no longer possible to assess the presence or absence of rainforest canopy in the harvested areas, the THCU see little benefit in engaging a specialist to conduct a review at this time.

The THCU officers found that the current definition of mixed forest in the MSPs is open to interpretation and does not provide sufficient guidance to allow for a definitive field assessment. The current definition does not provide sufficient guidance on how the "understory of rainforest species" should be considered (specifically with reference to whether the 70% projected foliage cover rule applied to rainforest should also apply when considering CTMF). This requires further review to tighten the definition. Additional review of work done by the department in 1999 and 2001 to define mixed forest/CTMF (see **Attachments 1 and 2**) suggests that a 70% rainforest canopy cover rule should apply. The THCU recommends further action be taken by DELWP to resolve this issue during the next review of the regulatory documents.

The LMP Planning Unit were also consulted by the THCU, which advised that mapping of mixed forest poses technical difficulties. The dual canopy composition of mixed forest (eucalypts on top of rainforest) hinders standard aerial photography interpretation and requires comprehensive ground-truthing for accurate identification of CTMF. It is therefore difficult to accurately map CTMF and provide protection through the forest management zoning scheme. It advised that the best protection for CTMF would therefore be through development of an "in-field" rule.

The high level of public interest in this case was also discussed with the LMP Planning Unit. The potential for an external (independent) review of this case assessment against the current

regulatory rules has also been raised as a possibility for further discussion following the finalisation of this case assessment report.

The THCU officers also noted other (non-regulatory) information that was recently published by DELWP about the "*Characteristics of Threatened Communities*" (see www.depi.vic.gov.au/__data/assets/pdf_file/0005/229703/Flora-and-Fauna-Guarantee-Characteristics-of-Threatened-Communities-.pdf). This information was provided by the DELWP Scientific Advisory Committee to highlight the attributes used to define those communities (when they were added to the Threatened List). The following text is relevant for the CTMF:

"***Cool Temperate Mixed Forest*** *is a structurally complex forest that has an upper canopy of eucalypts above an understorey layer of smaller trees of species that characterise Cool Temperate Rainforest communities.*

The deeply-shaded forest floor usually has insufficient light to allow eucalypt regeneration.

Given sufficient time, and if bushfires do not intervene, the eucalypts of the overstorey gradually senesce and die and the community as a whole develops into Cool Temperate Rainforest. CTMF can therefore be regarded as a seral or successional stage of Cool Temperate Rainforest that typically develops after rainforest experiences severe fire damage and persists until the community reaches a climax phase.

CTMF has a very limited distribution within Victoria. It occurs 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 cool, permanently moist valley sides, and in gullies. CTMF also occurs in the Otway Ranges and probably in the Strzeleckis. It frequently occurs immediately adjacent to Cool Temperate Rainforest, particularly in the Central Highlands where, commonly but not exclusively, ribbons of CTMF occur on either side of the narrow strips of rainforest along gully bases. The need for sufficiently moist conditions for its rainforest component coupled with the drier soils required for eucalypt establishment means that CTMF is often distributed between permanently waterlogged ground near streams and ground that dries out in summer/autumn, thus setting the boundary conditions for the lower and upper edges of the CTMF ribbons."

The THCU has concluded that because the Scientific Advisory Committee considers CTMF to be a "successional stage of Cool Temperate Rainforest," the rules established for the protection and buffering of rainforest communities would also provide a level of protection for CTMF. A rainforest canopy would therefore be required to trigger protection in both forest types.

Summary

- The FFG Act exemption order and "giant tree policy" that applies to timber harvesting conducted in East Gippsland are critical to the assessment of this case.
- As no breach of the regulatory standards that apply to VicForests' timber harvesting operations have been identified, the THCU has concluded that no regulatory action against VicForests is required.
- The current definition of mixed forest in the MSPs requires amendment to insert more guidance on the requirements for field operatives to consider the presence/absence of a rainforest canopy when trying to identify CTMF.
- There would be benefit in conducting further work to review the level of protection provided to "giant trees" and CTMF in State Forests and the adequacy of the current regulatory prescriptions.
- Further policy development work should also be explored by DELWP to clarify the current definitions and determine if any specific protective measures that should apply to CTMF.

E. DOES THIS ALLEGED NON-COMPLIANCE RELATE TO OTHER ALLEGED NON-COMPLIANCES?

☐ Yes ☒ No	There are no cases involving harvesting of CTMF in the DELWP case register.

F. INFORMATION SOURCE AND RELIABILITY

Has the source requested to remain anonymous? ☐ Yes ☒ No
Name: [redacted]
Organisation (if applicable): Flora and Fauna Research Collective/Goongerah Environment Centre
Address: [redacted]
Phone: n/a
Method by which information was received: email
Assessment of source reliability: [redacted]
[redacted]

G. RESPONSE TO ALLEGED NON-COMPLIANCE REPORT

Decision Point 1: Is the information sufficient to lead to a likely identification of the Alleged Offender?
☒ Yes ☐ No

Decision Point 2: Has the location of the alleged non-compliance been determined?
☒ Yes ☐ No

Decision Point 3: Has the legislation/regulation allegedly contravened been determined?
☐ Yes ☒ No

Decision Point 4: Is the alleged non-compliance within our authorising environment?
☒ Yes ☐ No

Decision Point 5: Is the evidence provided of sufficient quality to support the allegations?
☐ Yes ☒ No

Tick one of the following:

☐ If 'Yes' to each of Decision Points 1-5 (Further Action Required - complete Sections H-J)

☒ If 'No' to one or more of the Decision Points (skip to Section J)

H. ASSESSMENT CRITERIA

Impact of non-compliance	**Refer to Appendix A for guidelines** N/a
Initial Recommended Response	**Field inspection** N/a **Investigation** N/a.
Resource requirements of Initial	Field Inspection will require:

Recommended Response	N/a
Reliability of report	N/a
Likelihood of successful prosecution / other beneficial outcome	N/a
Alignment with THCU Compliance Priorities	**Refer to Appendix B for guidelines** N/a
Relative priority for investigation in current workload	N/a
Conflicts of Interest	N/a
Specialist/technical knowledge requirements	N/a

I. RECOMMENDED RESPONSE:

Advice to Complainant: A letter to inform [redacted] of the results of the case assessment and to inform [redacted] that DELWP will not be taking further regulatory action at this time.

Advice to Accused: A letter to advise VicForests of the results of the case assessment and to inform it that DELWP will not be taking further regulatory action at this time.

Outstanding Issues: A separate briefing is to be prepared for the Minister on the outcomes of this assessment. This should consider seeking additional guidance on:

1. the timing of proposed work to amend the definition of mixed forest in the MSPs; and
2. level of support for policy development work to be conducted to define and establish specific protective measures for CTMF within the regulatory framework.

J. APPROVAL

☑ **Approved**

☐ **Not Approved**

Comments

Nina Cullen
Director Land Management **Date:** 25/5/15

[redacted]
Timber Harvesting Compliance Unit

[redacted]

APPENDIX A – ESTIMATED IMPACT OF COMMONLY ALLEGED NON-COMPLIANCES

Note: this appendix is to be used as a guide only. The impact of alleged non-compliances should be considered by the Compliance Case Officer on a case-by-case basis.

Commonly Alleged Non-compliances	Estimated Impact
[redacted]	

APPENDIX B –LAND MANAGEMENT POLICY DIVISION COMPLIANCE PRIORITIES

Alleged non-compliances should be prioritised for investigation according to the following criteria:

1.	Directed by the Minister, Executive Director Land Management Policy or Director Land Management to investigate an alleged non-compliance.
2.	High level of certainty in respect to the illegal activity provided by intelligence holdings, including location of alleged non-compliance and reliability of source.
3.	Land Management Policy Division has the authority, capacity and capability to effectively respond to a particular illegal activity and ability to mount a successful prosecution.
4.	There is habitual re-offending or an emerging pattern of illegal behaviour and it is likely deterrence will be provided by successful prosecution.
5.	The estimated impact of an alleged non-compliance on the sustainability of Victoria's forests and parks is Major or Extreme.
6.	Industry and/or stakeholders are concerned about the impacts of an alleged non-compliance.
7.	There is a high cost: benefit ratio to the Victorian community of conducting an investigation.

Note: Numbering is for reference purposes only and does not denote ranking.

Attachment 1 – Prescriptions developed to define and protect Cool Temperate Mixed Forest in East Gippsland (NRE 2001).

24/08 2002 11:53 FAX 61 2 64561181 NRE BENDOC → NRE ORBOST 002

DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENT

TO: [redacted] REGIONAL FOREST MANAGER Ref:

FROM: [redacted] ACTING PRODUCTION MANAGER, EGFMA 26/8/2001

SUBJECT: AMMENDMENT TO MANAGEMENT PRESCRIPTIONS GIPPSLAND REGION
MIXED FOREST: DEFINITION AND PRESCRIPTIONS FOR EAST GIPPSLAND FOREST MANAGEMENT AREA

PURPOSE

1. To seek endorsement for an ammendment to the Management Prescriptions, East Gippsland Forest Management Area to provide for an operational definition of Mixed Forest and appropriate prescriptions to provide for protection of this EVC.

BACKGROUND

2. The East Gippsland Forest Management Plan requires that "Suitable prescriptions will be developed to ensure that at least 90% of the Mixed Forest vegetation class is protected".

3. Protection of 70% of the mapped Mixed Forest is protected in the Conservation Reserve System. The remaining 30 % of mapped area occurs in small scattered stands of less than 10 ha in the GMZ and SMZ.

4. A suitable operational definition of Mixed Forest is not given the FMA Plan that provides for the delineation in the field, of the boundary between Mixed Forest which must be protected and Eucalypt forest which may be harvested.

5. In the absence of an operational definition and complementary prescriptions, the department is exposed to criticism regarding protection of mixed forest. This needs to be resolved immediately, as it is a potential issue on a number of planned and current coupes in the Bendoc area.

DISCUSSION

Mixed Forest is transitional (seral stage) vegetation community between Wet Forest and Cool Temperate Rainforest Ecological Vegetation Classes (EVCs), where a eucalypt canopy is emergent above an understorey of rainforest species. In the absence of fire, the eucalypts will eventually decline and the vegetation will be rainforest as per our current definition. Peel (1999) describes some Mixed Forest as a distinct EVC (Cool Temperate Mixed Forest) and makes a case that the EVC can be a stable disclimax successional community, moderated by infrequent fire.

Peel (1999) defines Cool Temperate Mixed Forest but his definition (ie 'generally <70% cover of rainforest canopy trees etc – see p71 of Peel 1999) is rather more general than is useful for operational purposes. The East Gippsland Forest Management Plan does not provide an operational definition of Mixed Forest, beyond stating that it is Wet Forest where the eucalypt canopy is emergent above an understorey of rainforest species.

Radic *et al* (1985) mapped some of the Mixed Forest on the Errinundra Plateau (though their definition included Closed Scrub in the understorey) and this constitutes our current information on the extent of the community in East Gippsland.

[redacted]

Mixed Forest as defined and mapped by Radic *et al* (1985) accounts for less than 0.1% of public land in the East Gippsland FMA. The East Gippsland Forest Management Plans commits the Department to developing prescriptions to protect at least 90% of the Mixed Forest.

The Errinundra National Park contains 63% of Mixed Forest (as mapped by Radic et al 1985), while 7% is included within SPZ's. The remaining 30% occurs in General Management Zone (GMZ) or Special Management Zone (SMZ). Some Mixed Forest occurs in gullies that are protected by prescription. Mixed Forest also occurs outside the area mapped by Radic *et al.* (1985)

The application of this prescription is intended to meet our commitment to protect at least 90% of Mixed Forest. Mixed Forest in GMZ and SMZ will become prescriptional Special Protection Zone once they are defined in the field.

References:

Peel W. (1999) *Rainforests and Cool Temperate Mixed Forests of Victoria.* Department of Natural Resources and Environment, East Melbourne, Victoria.

Radic, J., Runnalls, R., Weir, G. and Chesterfield, E. (1985). Vegetation of the Errinundra Plateau (map). Department of Conservation, Forest and Lands. (Map is included in the LCC report on the East Gippsland Study Area 1985)

COMMENT

6. A cross functional group involving [redacted] have been involved in the development of the attached definition and prescriptions to apply to the East Gippsland Forest Management Area..

RECOMMENDATION

7. That you endorse the attached Operational Definition of Mixed Forest and Prescriptions for protection of this EVC, to apply to current and planned harvesting areas in the EGFMA.
8. That this endorsement is provided by 9 March 2001.
9. Training will be conducted for operational field staff to provide for identification of Mixed Forest in the field in accordance with the prescription.

[redacted]

DEFINING AND PROTECTING MIXED FOREST IN THE EAST GIPPSLAND FOREST MANAGEMENT AREA.

OPERATIONAL DEFINITION AND PRESCRIPTION

Definition

Mixed Forest is Wet Forest which has an overstorey of overmature or senescent eucalypts (usually Shining Gum, Manna Gum, Messmate, Mountain Ash, Cut-tail or Alpine Ash) with crown perimeter cover of 10% or more AND a closed understorey (projected foliage cover of >70%) of which more than 50% is contributed by one or more of the following rainforest character species: Southern Sassafras, Black Olive-berry, Banyalla, Gippsland Waratah, Privet Mock Olive, Mountain Plum Pine, Errinundra Pepper, and Blackwood (provided this species comprises less than 50% of the rainforest character species contribution to the cover in this stratum).

Prescription for Protection

Stands mixed forest of 0.4 ha and linear strips at least 20m wide and at least 100m long are to be protected from harvesting and disturbance

Mixed Forest stands are to be protected by a 20 m buffer.

CHAPTER 6
COOL TEMPERATE MIXED FOREST

Introduction

The treatment in this work of Cool Temperate Mixed Forest as an entity separate to mature or primary rainforest types follows a recommendation by Burgman and Ferguson (1995) in a review of rainforest protection in Victoria. This approach is supported from a forest management perspective by Brown (1992) in his discussion of Cool Temperate Mixed Forest. There seems little doubt that, although these Mixed Forest communities contain significant elements of the rainforest flora, and indeed may be called secondary rainforests, their long-term dynamics are mediated by infrequent wildfire (Brown 1992, Hickey and Savva 1992, Burgman and Ferguson 1995). These differences in the dynamic processes responsible for the maintenance of Cool Temperate Mixed Forest compared to those for Cool Temperate Rainforest are considered to be sufficient justification for its recognition as a separate ecological vegetation class.

In Victoria, Cool Temperate Mixed Forest is widely distributed throughout the range of Cool Temperate Rainforest in the Central Highlands and East Gippsland Rainforest Region (Figure 2), where they often occur between Cool Temperate Rainforest and Wet or Montane Wet Forest in habitats which are intermediate between these two ecological vegetation classes. This zone is characterised by a fire frequency intermediate between that required by Cool Temperate Rainforest and that of the adjacent Wet Forests. In Tasmania, Cool Temperate Mixed Forest requires an interval between of fires of 100–350 years (Hickey and Savva 1992). The fire frequencies required to maintain Cool Temperate Mixed Forest on the Errinundra Plateau, however, remain unknown although it is likely that they are less than that required for this vegetation in the Tasmanian environment (Chesterfield 1996).

Topographically this vegetation occupies somewhat more fire-exposed sites in wet climate refuges, which, unlike the more strictly riparian habitats of most Cool Temperate Rainforest communities, includes saddles and sometimes substantial areas of montane plateaus and mountainous slopes (Figure 9). The floristic relationships of the Central Highlands floristic community can be seen in Table 6 (with Appendices), while those of the East Gippsland community of this ecological vegetation class are illustrated in Table 7 – Attachment 3. Brown (1992), Hickey and Savva (1992) and Burgman and Ferguson (1995) all maintain that Cool Temperate Mixed Forest is intermediate between Cool Temperate Rainforest and Wet or Montane Wet Forest. Data from this work (floristics and the life-form profiles) which are presented in Tables 2 and 8 support their contention that this ecological vegetation class forms a stable disclimax successional community between the two.

Victorian Cool Temperate Mixed Forest is structurally complex, having patchy areas with a closed canopy of rainforest species beneath an overstorey of eucalypts or, rarely, an emergent layer of acacias. The ecological vegetation class is floristically diverse, containing elements of both Wet Forest and Cool Temperate Rainforest and is likely to be stable for considerable periods of time, with fire intervals between 250 (Jackson 1968) and 300–400 years (the age of the emergent eucalypts) Burgman and Ferguson (1995). In Victoria, recent work on the Errinundra Plateau by Chesterfield (1996) indicates that intervals between fires of an unspecified intensity can be as little as 50–90 years.

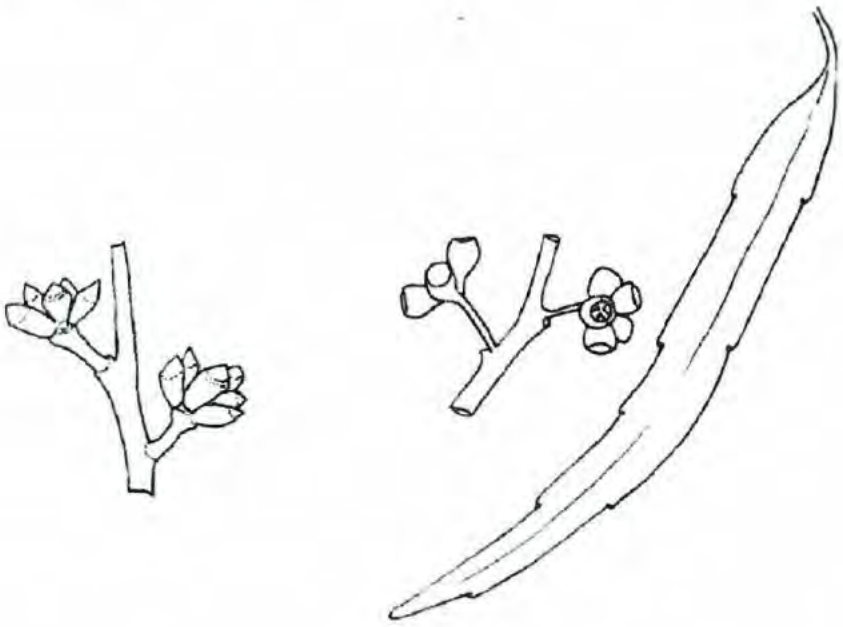
There are two Cool Temperate Mixed Forest communities recognised by this work as occurring in Victoria: *Central Highlands* Cool Temperate Mixed Forest and *East Gippsland* Cool Temperate Mixed Forest. Their floristic composition is intermediate between the adjacent sclerophyll forest floristic community and the Cool Temperate Rainforest community that occurs in each district. In terms of number of species classified into life-form categories; Cool Temperate Mixed Forest has on average

30% more understorey trees, 40% fewer shrubs and ground ferns, 80% fewer epiphytes, 60% fewer forbs and 40% fewer graminoids than Cool Temperate Rainforest (Table 8 cf 4). The presence of mature or primary rainforest in juxtaposition to Cool Temperate Mixed Forest is not a prerequisite for its occurrence, since the disturbance sequence that initiated its establishment may have destroyed the mature rainforest that once occupied the site. In situations where mature rainforest is present, it may represent the seral expansion of mature rainforest or the recovery of the disturbed margin of a primary rainforest stand. Species lists for Victorian Cool Temperate Mixed Forest communities are presented in Appendix 3. The floristic relationships of the two communities are illustrated by the Central Highlands two-way table (Table 6 with Appendices) and the East Gippsland two-way table (Table 7 – Attachment 3). A detailed floristic key to the communities is also provided.

Table 8 Life-form profiles of Cool Temperate Mixed Forest communities in Victoria

	Central Highlands Cool Temperate Mixed Forest	*East Gippsland* Cool Temperate Mixed Forest	Cool Temperate Mixed Forest Mean (Range)	Cool Temperate Rainforest Mean (Range)
Overstorey trees	1	2	1.5 (1–2)	1 (0-2)
Emergent trees	0	1	0.5 (0–1)	0.7 (0-1)
Canopy trees	3	4	3.5 (3–4)	3.6 (1-6)
Understorey trees	2	5	3.5 (2–5)	2.4 (1-6)
Shrubs	4	3	3.5 (3–4)	5.4 (2-16)
Tree-ferns	1	1	1 (1)	1.2 (1-2)
Ground ferns	3	3	3 (3)	5.1 (3-8)
Vascular epiphytes	1	1	1 (1)	5.1 (6-11)
Climbers	1	2	1.5 (1–2)	1.4 (1-6)
Forbs	3	2	2.5 (2–3)	6.3 (0-20)
Graminoids	3	2	2.5 (2–3)	4.2 (2-9)

Figures presented in this table are derived from the species frequency data for the characteristic species lists of each community



Errinundra Shining Gum r *Eucalyptus denticulata* x 0.3

Key to the Cool Temperate Mixed Forests of Victoria

Species used in this dichotomous key are sourced from the characteristic species lists for Victorian Cool Temperate Mixed Forests (Appendix 3). The distinguishing species listed in the key consist of characteristic species for that floristic community which are not found in other rainforest communities that may co-occur with it. Characteristic species which occur in both are not listed in the key since they provide no discrimination between the communities. *Central Highlands* Cool Temperate Mixed Forest is compared to *Central Highlands* Cool Temperate Rainforest and *East Gippsland* Cool Temperate Mixed Forest is compared to *East Gippsland* Cool Temperate Rainforest.

1a The stand occurs in the Central Highlands **2**

1b The stand occurs in East Gippsland **3**

2. Generally <70% cover of rainforest canopy trees in combination with a number of species not commonly found in the adjacent rainforest community. The multi-layered canopy and overstorey generally has several of the following:

Silver Wattle *Acacia dealbata*, Southern Sassafras *Atherosperma moschatum*, Mountain Ash *Eucalyptus regnans*, Myrtle Beech *Nothofagus cunninghamii*. It often, but not always, occurs in association with Wet Forest, Montane Wet Forest and Cool Temperate Rainforest where it can occupy a topographically intermediate position between these entities.

Distinguishing species are:

Tasman Flax-lily *Dianella tasmanica*, Tall Sword-sedge *Lepidosperma elatius*, Musk Daisy-bush *Olearia argophylla*, Dusty Daisy-bush *Olearia phlogopappa*, Elderberry Panax *Polyscias sambucifolia* and Forest Starwort *Stellaria flaccida*

These stands are restricted to, but occur widely throughout the Central Highlands. Generally on the more exposed upslope side the vegetation is Wet Forest (but at higher altitudes it may be Montane Damp or Montane Wet Forest), whilst on the lower slopes it is usually *Central Highlands* Cool Temperate Rainforest or rarely *Central Highlands Montane Riparian* Cool Temperate Rainforest ..... ***Central Highlands* Cool Temperate Mixed Forest**

ACCESSIBLE EXAMPLES: Mount Donna Buang

3. Generally <70% cover of rainforest canopy trees in combination with a number of species not commonly found in the adjacent rainforest community. The multi-layered canopy and overstorey generally has several of the following:

Silver Wattle *Acacia dealbata*, Frosted Wattle *Acacia frigescens*, Southern Sassafras *Atherosperma moschatum*, Black Olivebery *Elaeocarpus holopetalus*, Errinundra Shining Gum r *Eucalyptus denticulata* and Messmate *Eucalyptus obliqua*. It often, but not always, occurs in association with Wet Forest and Cool Temperate Rainforest where it can occupy a topographically intermediate position between the two.

Distinguishing species are:

Tasman Flax-lily *Dianella tasmanica*, Messmate *Eucalyptus obliqua*, Red-fruit Saw-sedge *Gahnia sieberiana*, Tree Lomatia *Lomatia fraseri*, Privet Mock-olive *Notelaea ligustrina*, Forest Geebung r *Persoonia silvatica*, Broad-leaved Elderberry Panax *Polyscias sambucifolia* ssp. A, Victorian Christmas Bush *Prostanthera lasianthos* and Errinundra Pepper r *Tasmannia xerophila* ssp. *robusta*

These stands are almost entirely restricted to the Errinundra Plateau, with one locality known from the nearby Roger River Basin. The adjacent vegetation is Wet Forest or Cool Temperate Rainforest..... ***East Gippsland* Cool Temperate Mixed Forest**

ACCESSIBLE EXAMPLES: the Errinundra Rainforest Walk at Cobb Hill and between Hammond Road and Gunmark Road in association with the headwaters of the Errinundra River West Branch.

Central Highlands Cool Temperate Mixed Forest

Distribution

Central Highlands Cool Temperate Mixed Forest is restricted to the Central Highlands of Victoria, which is part of the South East Highlands biogeographic region of Thackway and Cresswell (1995) and occurs widely across the area. The major occurrences of the community are geographically restricted to a sweep south-east and north-east of Healesville, associated with the Mount Donna Buang and Lake Mountain massifs and then due south in three separate localities, based around Spion Kopjie, the Toorongo Plateau and the Baw Baw Plateau. Although this community has some structural and floristic affinity with the Thamnic and Callidendrous Rainforests of Tasmania (Jarman *et al.* 1991), it is likely to be sufficiently different at the non-vascular cryptogam level to be considered to be a uniquely Victorian community (Table 3). This community is synonymous with the 'ecological community VRF 5 Central Highlands Cool Temperate Mixed Forest CHCTMF' of Cameron (1992c). It is also structurally and floristically distinct from any of the Mixed Forest types of New South Wales. As a consequence, this community is considered to be endemic to Victoria.

Habitat and climate

Central Highlands Cool Temperate Mixed Forest can develop in a number of situations. These can include relatively exposed positions in old eucalypt forest that have a substantial 'understory' canopy of rainforest species, in areas of rainforest that have been previously disturbed (by the 1926 and 1939 wildfires, or by logging) or it can form the outer edge of the 'ecotone' between Cool Temperate Rainforest and the adjacent Wet or Montane Wet Forests. Lithologically it occurs on the granite and acid volcanic massifs that form the montane plateaus and the major divides in the region. Topographically these fall into three categories. The bulk of stands are linked to the headwater gullies of the montane escarpments associated with these massifs. The community also occurs in the more gentle topography associated with saddles between the Watts, O'Shannassy and Acheron rivers, while the remainder of its occurrence's are on small montane plateaus such as the Toorongo Plateau. The elevation range is 240–1240m with a mean elevation of 840m. The climate is at the colder end of cool temperate with frequent winter snowfalls, although these do not remain on the ground for more than a few weeks at a time. Mean winter maxima do not exceed 9°C in July and the mean maximum for January is less than 21°C (Bureau of Meteorology 1989). Rainfall exceeds 1400mm (Bureau of Meteorology and Walsh 1993, Bureau of Meteorology 1995). This rainfall figure is considerably enhanced by fog-drip at these altitudes. There are more than 300 frosts per year (Table 1).

The surrounding vegetation is usually Wet Forest, Montane Wet Forest or Sub-alpine Woodland (*sensu* LCC 1991) on the upslope margins and *Central Highlands* Cool Temperate Rainforest on the downslope side. Examples of this community can be seen at Acheron Gap on the Acheron Way and on the south face of Mount Donna Buang on the Donna Buang Road between Cement Creek and Ben Cairn.

Soils

Soils are deep reddish-brown krasnozems derived from granites, granodiorites and acid volcanics that have an organically enriched A horizon.

Structure and floristics

In the following description, the underlined taxa are both disclimax species (disturbance dependent for regeneration) and not found as characteristic species in *Central Highlands* Cool Temperate Rainforest, being more common in the adjacent Wet Forest. The overstorey of the community is dominated by Myrtle Beech *Nothofagus cunninghamii* at nearly all sites (93% of sites, 25–50% cover) with Southern Sassafras *Atherosperma moschatum* at about 50% of sites with <5% cover. At about three-quarters of

sites sampled, the emergent eucalypt is Mountain Ash *Eucalyptus regnans* (75% of sites 5–25% cover) with Shining Gum *Eucalyptus nitens* and Alpine Ash *Eucalyptus delegatensis* the next most common species. On the southern face of the Baw Baws the community may be over-topped by an unusual tree-form of Tingaringy Gum r *Eucalyptus glaucescens*, which in other areas of the State is only found as a mallee shrub of rocky outcrops. Silver Wattle *Acacia dealbata* is also common and occurs as a canopy species in this community. The understorey shrub layer is characterised by a scattering of broad-leaved shrubs such as Austral Mulberry *Hedycarya angustifolia*, Musk Daisy-bush *Olearia argophylla*, Elderberry Panax *Polyscias sambucifolia* and Mountain Pepper *Tasmannia lanceolata*.

The understorey typically has:

Soft Tree-fern *Dicksonia antarctica*, Tasman Flax-lily *Dianella tasmanica*, White Elderberry *Sambucus gaudichaudiana*, Forest Starwort *Stellaria flaccida* and Tall Sword-sedge *Lepidosperma elatius*. The ground layer is depauperate in ground ferns and epiphytic ferns are low in diversity and are not common when compared to the adjacent Cool Temperate Rainforest. The only characteristic ferns are Hard Water-fern *Blechnum wattsii*, Bat's Wing-fern *Histiopteris incisa* and Mother Shield-fern *Polystichum proliferum*, with the only epiphyte being Common Finger-fern *Grammitis billardieri*.

In gaps of the rainforest canopy there is likely to be a scattering of Dusty Daisy-bush *Olearia phlogopappa* and often dense thickets of Forest Wire-grass *Tetrarrhena juncea* and Mountain Correa *Correa lawrenciana*. Mountain Clematis *Clematis aristata* is the only liane consistently recorded in this community.

Species characteristic of Cool Temperate Rainforest that are not found as such in *Central Highlands* Cool Temperate Mixed Forest are generally the more moisture dependent species such as the herbs, ferns and the rainforest-dependent flora, particularly epiphytes.

These species are:

Blackwood *Acacia melanoxylon*, Weeping Spleenwort *Asplenium flaccidum* ssp. *flaccidum*, Lance Water-fern *Blechnum chambersii*, Ray Water-fern *Blechnum fluviatile*, Fishbone Water-fern *Blechnum nudum*, Tall Sedge *Carex appressa*, Prickly Currant-bush *Coprosma quadrifida*, Rough Tree-fern *Cyathea australis*, Hairy Pennywort *Hydrocotyle hirta*, Austral Filmy-fern *Hymenophyllum australe*, Common Filmy-fern *Hymenophyllum cupressiforme*, Shiny Filmy-fern *Hymenophyllum flabellatum*, Kangaroo Fern *Microsorum pustulatum*, Twining Silkpod *Parsonsia brownii*, Veined Bristle-fern *Polyphlebium venosum*, Leathery Shield-fern *Rumohra adiantiformis*, Delicate Hook-sedge *Uncinia tenella* and Ivy-leaf Violet *Viola hederacea*.

Significant species

There are eight VROTS in the community (one of which is also an AROTS). These species are one record of:

Ground Spleenwort r *Asplenium bulbiferum* ssp. *terrestre* and Forest Sedge r *Carex alsophila* which are relatively uncommon in the community compared with some adjacent rainforest types. Other species include Long Club-moss v *Huperzia varia*, which is rare in this community, Snowdrop Wood-sorrel r *Oxalis magellanica* a small herb of streams-side rocks and Baw Baw Berry r *Wittsteinia vacciniacea* which is a small trailing shrub. Two species (both Central Highlands endemics), Tree Geebung v *Persoonia arborea* (20% of the sites sampled, cf 9% for rainforest) and Shiny Rv Phebalium *Phebalium wilsonii*, (2% of sites and not recorded from rainforest), appear in this context to be disturbance-dependent. The former species occupies rainforest gaps and margins, while the latter is not recorded from rainforest at all. The tree growth-form of Tingaringy Gum r *Eucalyptus glaucescens* is significant.

Depletion

Restocking sites that once had *Central Highlands* Cool Temperate Mixed Forest burnt by wildfire will in all likelihood cause the loss of the community from these areas. Substantial areas on the Toorongo Plateau, which were Mixed Forest before the 1939 fires, are being restocked with eucalypts. *Central Highlands* Cool Temperate Mixed Forest will not re-establish under this management regime.

Threatening processes

Clearfell logging is likely to have had significant impacts on this community. These likely impacts are two-fold. First, this harvesting method significantly disadvantages resprouting and obligate seeding species (those without a soil-stored seed bank) (Ough and Ross 1992, Ough and Murphy in prep, Murphy and Ough in prep). The species which are most vulnerable are the rainforest overstorey structural dominants, Myrtle Beech *Nothofagus cunninghamii*, Southern Sassafras *Atherosperma moschatum* and the understorey dominant, Soft Tree-fern *Dicksonia antarctica*. If left *in situ*, some of the individuals of these species can survive the initial mechanical disturbance of clearfelling, when resprouting and seedling germination begins, only to be killed by the coupe's regeneration burn (Cameron 1992d). This method of harvesting significantly alters the structure and floristics of this ecological vegetation class (Burgman and Ferguson 1995), particularly with respect to epiphytic species (Hickey and Savva 1992).

In addition, the nominal harvesting rotations of 80–120 years (CFL 1989) are insufficient to allow its re-establishment, given that Cool Temperate Mixed Forest is reliant on a fire disturbance frequency of 250–400 years (Jackson 1968, Hickey and Savva 1992, Burgman and Ferguson 1995, Chesterfield 1996). There is, however, a commitment by the Forests Service that stands of Cool Temperate Mixed Forest (Central Highlands) that occur in State forest will be protected by undisturbed buffers or subcatchment reserves (NRE 1996).

Substantial areas on the Toorongo Plateau are being restocked with eucalypts (NRE 1996). Prior to the 1939 fires much of this area may have been regenerating Cool Temperate Mixed Forest. Reforestation of sites that once had Central Highlands Cool Temperate Mixed Forest would cause the loss of substantial areas of potential habitat for this community.

East Gippsland Cool Temperate Mixed Forest

Distribution

The principal sites for *East Gippsland* Cool Temperate Mixed Forest are on the Errinundra Plateau, with a small outlier in the Roger River basin to the west. Both of these localities are in the South East Corner biogeographic region of Thackway and Cresswell (1995). Vegetation mapping on the Errinundra Plateau by Radic *et al.* (1985) recorded the most extensive stands as occurring in the Hammonds Road area (headwaters of the Errinundra River West Branch), with minor occurrences in the Gunmark Road area (headwaters of the Delegate River Main Branch), and in the headwaters of First Creek, which is a tributary of the Errinundra River East Branch. *East Gippsland* Cool Temperate Mixed Forest is analogous to the 'ecological community VRF 8 East Gippsland Cool Temperate Mixed Forest EGCTMF' of Cameron (1992c). Although this community has some structural and floristic affinity with the Thamnic and Callidendrous Rainforests of Tasmania (Jarman *et al.* 1991), it is likely to be sufficiently different at both the vascular and the non-vascular cryptogam level to be considered different from these Tasmanian communities (Table 3). Given the well surveyed nature of southern New South Wales and the absence of any reports of this rainforest type, it is likely that there would only be minor, if any, examples in that State (Table 3). As a consequence, *East Gippsland* Cool Temperate Mixed Forest is believed to be endemic to East Gippsland. The best examples of this community can be seen from the Errinundra Rainforest Walk at Cobb Hill and between Hammond Road and Gunmark Road in association with the headwaters of the Errinundra River West Branch.

Habitat and climate

This community is largely restricted to gently undulating country on the Errinundra Plateau, where it occurs on a variety of landforms but generally on or near the gentle divides on the plateau proper. This is in contrast to its distribution in montane river basins of the Roger River, where it is largely restricted to near stream environments. At both localities it grows at elevations greater than 1000m. The elevation range is 650–1270m with the mean being 980m. Mean annual rainfall varies from 1341 to 1725mm (based on limited data, Bureau of Meteorology 1995). The surrounding vegetation is generally Wet Forest—rarely Tableland Damp Forest *sensu* Woodgate *et al.* (1994)—irrespective of aspect, but grades into *East Gippsland* Cool Temperate Rainforest on lower slopes and along gullies.

Woodgate (Woodgate *et al.* 1994) conducted a study of the ages of species from representative stands of Cool Temperate Mixed Forest on the Errinundra Plateau. The study was based on 21 trees from four sites. The overstorey eucalypt was Errinundra Shining Gums r *Eucalyptus denticulata*, which ranged in age from 225 years (55m, 147 cm dboh) to 252 years (53 m tall, 231 cm dboh) (Woodgate *et al.* 1994).

Woodgate's study (Woodgate *et al.* 1994) leaves the question of fire interval somewhat open. One arborescent shrub (an Elderberry Panax *Polyscias sambucifolia* ssp. A, 9 m tall, 15 cm dboh) was dated at only 40 years. This shrub is a bird dispersal secondary species able to regenerate in the absence of fire. The rainforest canopy species Black Oliveberry *Elaeocarpus holopetalus* (19 m, 62 dboh) at 207 years of age, and Southern Sassafras *Atherosperma moschatum* (25m, 62 dboh) at 208 years of age, were both younger than the overstorey eucalypts, but not significantly so, leaving their mode of regeneration open to speculation. Two main distubance events seems to have occurred at about 200 and 250 years ago.

Both rainforest canopy species usually regenerate in the absence of fire and are able to do so through coppice or seed. In the event of a fire, the mode of regeneration is dependent on the intensity of the fire that triggered the regeneration event for the overstorey eucalypts. There are, however, substantial areas of multi-stemmed Southern Sassafras *Atherosperma moschatum* and Black Oliveberry *Elaeocarpus holopetalus* in Mixed Forest on the Plateau, which would suggest that these species have regenerated from coppice following the fire which regenerated the eucalypt overstorey. In any event, the patchy nature of fire on the Plateau prior to European arrival has meant that a patch disturbance mosaic, in combination with the efficient wind and bird dispersal mechanisms of rainforest species, has accomplished quick re-establishment of the rainforest flora.

Soils

Soils are kraznosems derived from regionally metamorphosed marine sediments. The A horizon is humus-rich and the B horizon consists of chocolate-brown coloured clay loams.

Structure and floristics

In the following description, those taxa which are underlined are disclimax species (disturbance dependent for regeneration) that are not characteristic species in East Gippsland Cool Temperate Rainforest, but are more common in the adjacent Wet Forest.

The overstorey is dominated by a suite of eucalypts, the most common of which are:

Errinundra Shining Gum r *Eucalyptus denticulata* (59% of sites, 5-25% cover) and Messmate *Eucalyptus obliqua*. Other species recorded are Mountain Gum *Eucalyptus dalrympleana*, Cut tail *Eucalyptus fastigata*, Gippsland Peppermint *Eucalyptus croajingolensis*, Mountain Ash *Eucalyptus regnans* and Manna Gum *Eucalyptus viminalis*.

The emergent canopy is dominated by Frosted Wattle *Acacia frigescens*, beneath which there is a closed canopy of Southern Sassafras *Atherosperma moschatum* (84% of sites, 5–25% of cover) and Black Oliveberry *Elaeocarpus holopetalus* (87% of sites, 5–25% of cover) and Silver Wattle *Acacia dealbata*. Interspersed with this closed canopy there is a scattering of very large specimens of small trees or arborescent shrubs which include:

Tree Lomatia *Lomatia fraseri*, Forest Geebung r *Persoonia silvatica*, Broad-leaved Panax *Polyscias sambucifolia* ssp. A, Banyalla *Pittosporum bicolor* and Gippsland Waratah *Telopea oreades*. Some of these species may occur beneath the canopy or participate in the closed canopy at other sites. Others which occur less commonly are Austral Mulberry *Hedycarya angustifolia*, the tree-form of Burgan *Kunzea ericoides* (otherwise restricted to Gallery Rainforest in the lowland river valleys of East Gippsland), Mountain Tea-tree *Leptospermum grandifolium* and Privet Mock-olive *Notelaea ligustrina*.

Rough Coprosma *Coprosma hirtella*, Sub-alpine Beard-heath, *Leucopogon maccraei*, Bootlace Bush *Pimelea axiflora*, Victorian Christmas-bush *Prostanthera lasianthos*, and Errinundra Pepper r *Tasmannia xerophila* ssp. *robusta* are the most common understorey shrubs, with all the underlined species showing a preference for gaps.

The understorey is dominated by Soft Tree-fern *Dicksonia antarctica*, from which many of the understorey trees and a significant number of Southern Sassafras *Atherosperma moschatum* begin life as epiphytes. The ground-layer is dominated by ferns, the most common of which are:

Hard Water-fern *Blechnum wattsii* and Bat's Wing Fern *Histiopteris incisa*. The other characteristic water-ferns of the adjacent *East Gippsland* Cool Temperate Rainforest are noticeably less common in this ecological vegetation class and, together with the presence of Bracken *Pteridium esculentum*, are indicative of a somewhat drier and less shaded environment for Cool Temperate Mixed Forest compared to that of Cool Temperate Rainforest.

Light-dependent species are noticeably more common, particularly:

Mountain Cotula *Leptinella filicula* (19% of sites), Fireweed Groundsel *Senecio linearifolius* (15% of sites), Saw-sedges *Gahnia clarkei*/*sieberiana* (16% of sites), Forest Wire-grass *Tetrarrhena juncea* (22% of sites) and Tussock Grasses *Poa* spp. (25% of sites), probably because of the patchy nature of the closed canopy, compared to Cool Temperate Rainforest.

Significant species

There are seven significant species recorded from this community:

Errinundra Shining Gum r *Eucalyptus denticulata*, Mountain Ash *Eucalyptus regnans*, which is at the eastern and northern limit of its range, Robust Willow-herb d *Epilobium pallidiflorum*, a species of damp ground, the shrub Smooth Tea-tree K *Leptospermum glabrescens* s. l., Forest Geebung r *Persoonia silvatica*, Monkey Mint-bush Rr *Prostanthera walteri*, which is a prostrate shrub, and River Hook-sedge r *Uncinia nemoralis*, a species of damp sites.

Depletion

About 50% of this ecological vegetation class has been lost through logging on the Errinundra Plateau (mostly in the Hammonds Road area), which was the core of its distribution and abundance. Substantial stands of *East Gippsland* Cool Temperate Mixed Forest also once occurred immediately to the north of Gunmark Road in the headwaters of the Delegate River (Main Branch) but were clearfelled in the 1970s (Morris pers. comm.).

Threatening processes

Clearfell logging has had a significant impact on this community. First, this harvesting method significantly disadvantages resprouting and obligate seeding species (those without a soil-stored seed bank) (Ough and Ross 1992, Ough and Murphy in press, Murphy and Ough in press). The species most affected are the primary rainforest canopy species Black Oliveberry *Elaeocapus holopetalus* and Southern Sassafras *Atherosperma moschatum* as are Soft Tree-fern *Dicksonia antarctica* and Gippsland Waratah *Telopea oreades*. If left *in situ* some of the individuals of these species can survive the initial mechanical disturbance of clearfelling when resprouting and seedling germination begins, only to be killed by the coupe's regeneration burn (Cameron 1992d). This method of harvesting significantly alters the structure and floristics of this ecological vegetation class (Burgman and Ferguson 1995), particularly with respect to epiphytic species (Hickey and Savva 1992) and obligate resprouting species (Chesterfield 1996). The second factor is the depletion of the community itself, through harvesting which is detailed under the preceding section on depletion.

While the harvesting method affects regeneration of *East Gippsland* Cool Temperate Mixed Forest, the nominal harvesting rotation period of 80–120 years (CFL 1989) is insufficient to allow its re-establishment. This is because the community requires a fire/disturbance-free interval of 250–400 years (Jackson 1968, Hickey and Savva 1992, Burgman and Ferguson 1995, Chesterfield 1996).

Tree Lomatia *Lomatia fraseri* x 0.3