Victorian Environmental Assessment Council

# Conservation values of state forests

## Assessment report

February 2017

## Victorian Environmental Assessment Council

The Victorian Environmental Assessment Council (VEAC) was established in 2001 under the *Victorian Environmental Assessment Council Act 2001*. It provides the State Government of Victoria with independent advice on protection and management of the environment and natural resources of public land.

The five Council members are:

Hon Phil Honeywood (Chairperson)
Ms Joanne Duncan
Ms Anna Kilborn
Dr Charles Meredith
Dr Geoffrey Wescott

## Contact details

Victorian Environmental Assessment Council
Level 6, 8 Nicholson St
PO Box 500
East Melbourne, Victoria 3002
Phone (03) 9637 9902 or 1800 134 803 (toll-free from landline)
Email veac@delwp.vic.gov.au

**www.veac.vic.gov.au**

# Conservation values of state forests

## Assessment report

February 2017

Published by the Victorian Environmental Assessment Council

8 Nicholson Street, East Melbourne, 3002
February 2017

Also published on www.veac.vic.gov.au



Printed by Finsbury Green
This report is printed on:
Cover: Ecostar Silk 100% recycled
Text: Ecostar uncoated 100% recycled

ISBN 978-1-76047-488-1 (print)
ISBN 978-1-76047-489-8 (pdf format)

For more information contact the Victorian Environmental Assessment Council on (03) 9637 9902 or 1800 134 803 toll free Australia-wide, or email veac@delwp.vic.gov.au

### Disclaimer

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

### Cover image

Yarra State Forest, Mel Mitchell

# Foreword

This report describes the assessment carried out by VEAC of conservation values of state forests in the four regional forest agreement areas in eastern Victoria.

The approach taken for this assessment was to add value to the substantial existing knowledge of biodiversity and ecological values in the state forests of eastern Victoria. VEAC utilised the best available biodiversity data for this assessment and commissioned additional specialist modelling and spatial analysis expertise. The results of the analyses illustrate the complexity in assessing the biodiversity and ecological values of the assessment area.

VEAC's recent stocktake of public land uses and values in its discussion paper for the Statewide Assessment of Public Land is a timely and useful adjunct to the material presented in this assessment report, particularly for the requirement in these terms of reference to report on public land use and management.

This is the first assessment we have completed under amendments to the VEAC Act in 2016 that allow the Minister to request VEAC to provide advice or conduct assessments in addition to conducting investigations. VEAC was not required to provide recommendations in this report. The assessment is an independent input to the information base for government in its consideration and decision making about native forests in eastern Victoria.

**Phil Honeywood**
Chairperson

## Acknowledgement of Country

The Victorian Environmental Assessment Council acknowledges and pays its respects to Victoria's Native Title Holders and Traditional Owners within the assessment area, and the rich cultural and intrinsic connection they have to Country. The Council also recognises and acknowledges the contribution and interest of other Aboriginal peoples and organisations in the management of land and natural resources.

# Contents



## List of appendices

## List of figures



## List of tables

# 1. Introduction

In October 2016, the Victorian Environmental Assessment Council was requested by the Minister for Energy, Environment and Climate Change, the Hon Lily D'Ambrosio MP to carry out an assessment of the conservation values of state forests in the Central Highlands, North East, Gippsland and East Gippsland regional forest agreement areas.

## 1.1 Background to the assessment

The assessment has its origins in the work of the Forest Industry Taskforce, and is undertaken under the provisions of the *Victorian Environmental Assessment Act 2001*.

### 1.1.1 Forestry Industry Taskforce

As part of implementing its 2014 election policy *Our Environment, Our Future*, the Victorian government established a Forest Industry Taskforce, made up of key stakeholders across industry, the union movement and forest conservation groups.[1] The government endorsed the terms of reference developed by representatives of the major stakeholders in November 2015, and committed to ongoing support of their work through a taskforce secretariat.[2] The membership of the Forest Industry Taskforce can be found in appendix 1. More information about the taskforce, its terms of reference and key documents can be found at http://forestindustrytaskforce.com.au/.

The purpose of the taskforce is for the major stakeholders to reach common ground on a durable, long-term set of recommendations and proposals to government, about future issues facing the industry, job protection, economic activity, protection of our unique native flora and fauna and threatened species, such as the Leadbeater's possum. The focus is on future use and management of regional forest agreement (RFA) state forests east of the Hume Highway (see figure 1.1).

In September 2016, the taskforce released its Statement of Intent, which had been provided to the Premier of Victoria. The Statement of Intent identified agreed opportunities for change relating to parks and reserves, fibre and wood supply security, and jobs and regional employment. The taskforce stated that it was working on six processes to inform its final recommendations, including the following Victorian Environmental Assessment Council (VEAC) assessments or investigations:

- an initial Victorian Environmental Assessment Council investigation of forest conservation values
- an initial Victorian Environmental Assessment Council investigation into the viability of fibre and wood supply.

In December 2016 the taskforce reported to the government. The government is considering the matters the taskforce has been working on, and has stated that the members of the taskforce will continue to play an important advisory role for government in relation to these issues.[3]

Section 1.1.3 provides details of the request to VEAC to conduct the assessment of the conservation values of state forests in the Central Highlands, North East, Gippsland and East Gippsland regional forest agreement (RFA) areas.

---

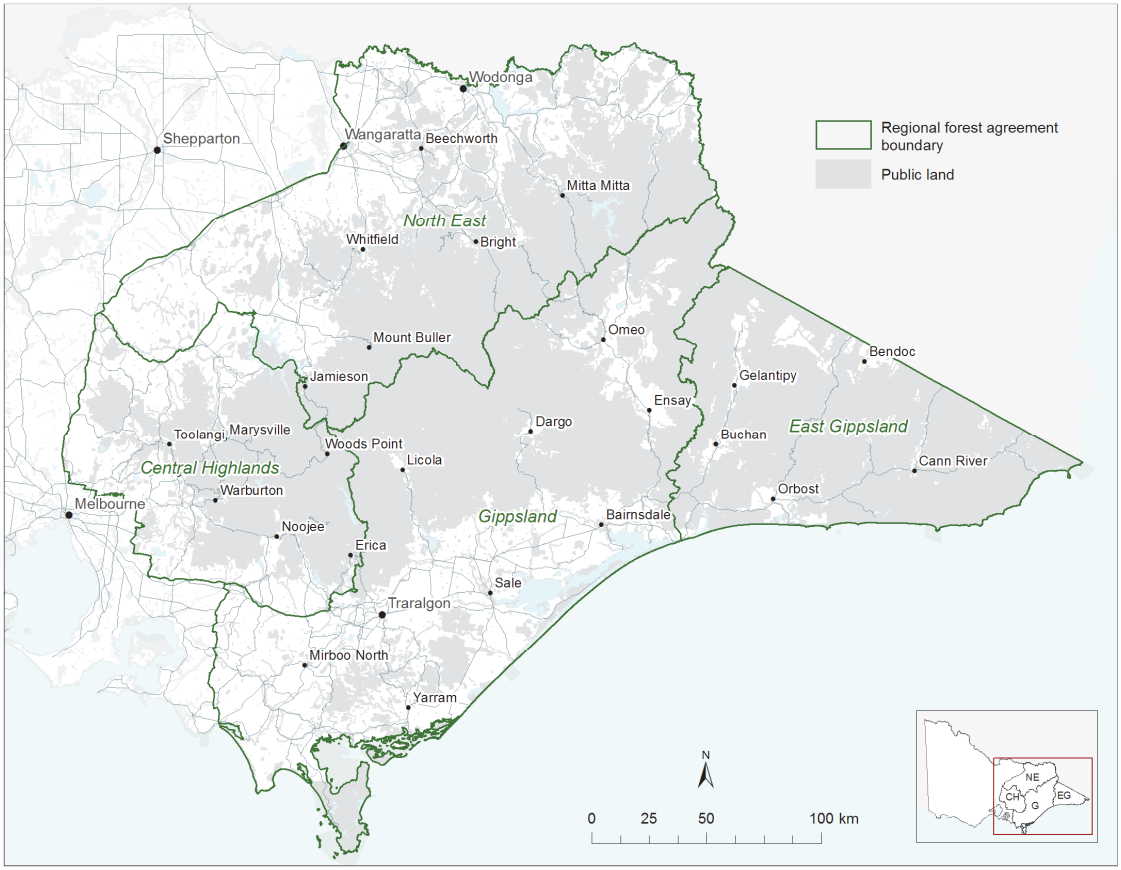
1 Victorian Labor 2014 *Our Environment, Our Future*

2 Premier of Victoria media release 20 November 2015 http://www.premier.vic.gov.au/forest-industry-taskforce-terms-of-reference-released/

3 Parliament of Victoria Legislative Council Hansard Tuesday 7 February 2017 page 15

A separate assessment of fibre and wood supply from state forests in the same four RFA areas was requested in November 2016. This second assessment is to be completed by 28 April 2017.[4]

Figure 1.1 Regional Forest Agreement areas east of the Hume Highway




### 1.1.2 Victorian Environmental Assessment Council

The *Victorian Environmental Assessment Council Act 2001* (VEAC Act) came into effect on 31 December 2001. This Act established the Victorian Environmental Assessment Council (VEAC) to conduct investigations and make recommendations relating to the protection and ecologically sustainable management of the environment and natural resources of public land. VEAC is a successor organisation to the Land Conservation Council (LCC), established in 1971, and the Environment Conservation Council, which replaced the LCC in 1997.

Public land is defined in the VEAC Act and includes Crown land and land owned by state government public authorities. It excludes private freehold land, land owned by local councils and Commonwealth land. VEAC does not make recommendations for private land, local councils' freehold land or Commonwealth land.

The current five members appointed to VEAC are Hon. Phil Honeywood (Chairperson), Ms Joanne Duncan, Ms Anna Kilborn, Dr Charles Meredith and Dr Geoffrey Wescott. A brief biography of each of the current Council members can be found on VEAC's website at www.veac.vic.gov.au. The Council is supported by a small research, policy and administrative secretariat. The VEAC Act requires the Council to consult with departments and public authorities, and requires departments and public authorities to give practicable

[4] See http://www.veac.vic.gov.au/investigation/fibre-and-wood-supply-assessment

assistance to the Council in carrying out investigations. VEAC papers and reports are prepared independently.

Amendments to the VEAC Act came into operation in September 2016. The amendments established a second process by which VEAC is able to provide advice and assessments, in addition to being able to carry out investigations. The amended Act allows for VEAC to provide advice or carry out assessments on matters that, because of their limited scale or scope or their technical nature, might not require an investigation under the current provisions.

This assessment is the first to be carried out under the new provisions.

### 1.1.3 Terms of reference

On 14 September 2016, the Minister for Energy, Environment and Climate Change requested VEAC conduct an assessment of the conservation values of state forests in the Central Highlands, North East, Gippsland and East Gippsland regional forest agreement (RFA) areas. The assessment is required to be completed by 28 February 2017.

The request for the assessment was made under section 26B of the VEAC Act. The terms of reference are provided in the box below.

#### Terms of Reference

Pursuant to section 26B of the *Victorian Environmental Assessment Council Act 2001*, the Minister for Energy, Environment and Climate Change hereby requests the Council to carry out an assessment of the conservation values of state forests[1] in the Central Highlands, North East, Gippsland and East Gippsland regional forest agreement areas.

The purpose of the investigation is to:

(a) identify the biodiversity and ecological values in the specified area
(b) identify the current and likely future threats to these values
(c) report on public land use and management.

The Council is required to take into consideration landscape-wide biodiversity at the relevant state, regional and local levels, including biodiversity and ecological values in existing protected areas and other public land.

The Council must take into account the following matters:

(i) relevant agreements under the *Traditional Owner Settlement Act 2010* and the *Conservation, Forests and Lands Act 1987*
(ii) relevant Victorian government policies and strategies
(iii) relevant national and international agreements, policies and strategies
(iv) relevant regional programs, strategies and plans.

The Council is required to consult with the Forest Industry Taskforce.

In addition, as specified in section 26D of the *Victorian Environmental Assessment Council Act 2001*, the Council must confer with any Department or public authority which may be affected by the provision of the assessment including VicForests, Department of Environment, Land, Water and Planning, and Department of Economic Development, Jobs, Transport and Resources; and the departments and public authorities must give practicable assistance to the Council in preparing the assessment.

The Council must report on the completed investigation as soon as practicable but by no later than 28 February 2017.

[1] For the purposes of this assessment, state forest is defined as the areas of public land depicted as General Management Zone, Special Management Zone and Special Protection Zone in the maps accompanying the regional forest agreements as updated from time to time and expressed in the DELWP forest zoning data set (FMZ 100) as at the time of commencement of the investigation.

### 1.1.4 Assessment area

The four RFA areas east of the Hume Highway are shown in figure 1.1. While the assessment focuses on the conservation values of state forest in these areas, the Council is required to take into consideration landscape-wide biodiversity, including biodiversity and ecological values in existing protected areas and other public land. The assessment area is therefore taken broadly to be public land within the four RFA areas (see figure 1.3). The assessment area comprises four of Victoria's five RFA areas.

The terms of reference specify that, for the purposes of this assessment, state forest within the RFA areas is defined as the areas of General Management Zone (GMZ), Special Management Zone (SMZ) and Special Protection Zone (SPZ) in the forest zoning data set maintained by the Department of Environment, Land, Water and Planning (DELWP). Figure 1.4 shows the forest management zoning in the assessment area. All the maps published in this report are available on VEAC's website at http://www.veac.vic.gov.au/ where they can be viewed in more detail.

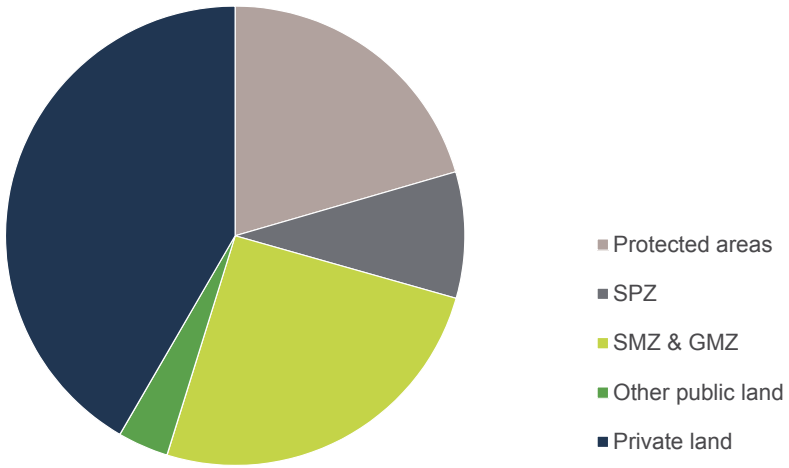
The distribution of land within the assessment area boundary is shown in table 1.1 and figure 1.2.

Table 1.1 Land tenures within the assessment area boundary (hectares)

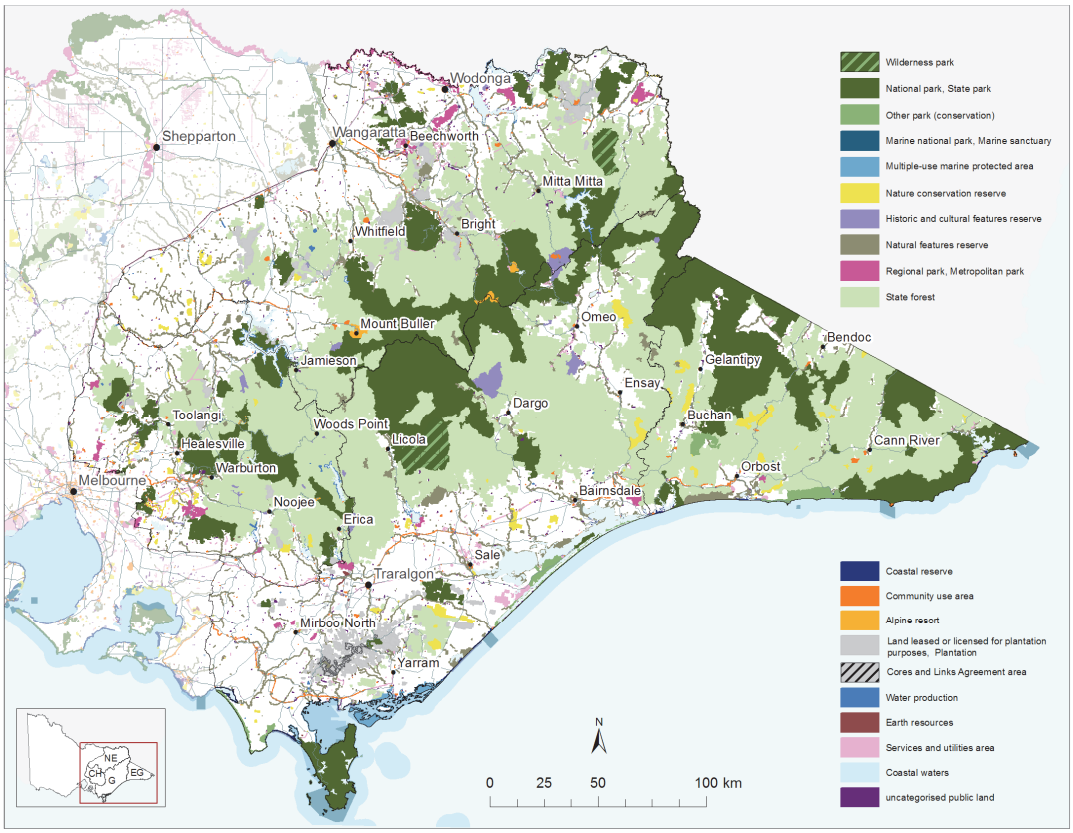
| State forest SMZ and GMZ | State forest SPZ | Protected areas* | Other public land | Private land | Total |
|---|---|---|---|---|---|
| 1,842,877 | 625,325 | 1,493,915 | 418,327 | 2,948,159 | 7,328,603 |
| State forest total: 2,468,202 | | | | | |
| Public land total: 4,380,444 | | | | | |

*'protected areas' do not include regional parks or historic areas
Source: State forest zoning from FMZ100 December 2016

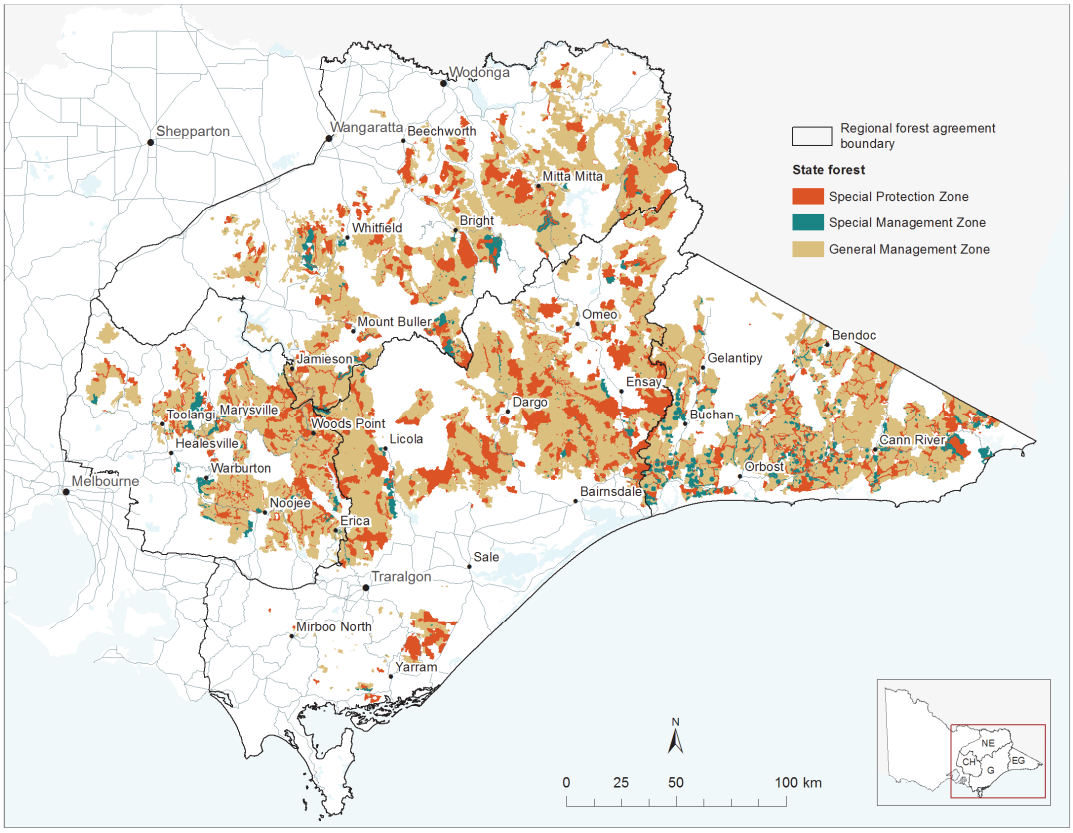
Figure 1.2 Proportion of land tenures within the assessment area boundary



## Figure 1.3 Public land in the assessment area




## Figure 1.4 Forest management zoning in the assessment area



Section 4 of this report addresses the requirement in part (c) of the terms of reference to report on public land use and management, structured as follows:

- public land in the assessment area
- legal and policy framework
- administrative arrangements
- environmental management.

## 1.2 Native forests in the eastern Victoria RFAs

For the purposes of planning, harvest and sale, VicForests groups forests into broad forest types. In the Eastern Forest Management Unit, which includes the four eastern RFA areas, the native forests are grouped into two main forest types: ash forest and mixed species forest. The mixed species forest is further classified into low elevation and high elevation mixed species forest.[5] The two main forest types are mapped in figure 1.5.

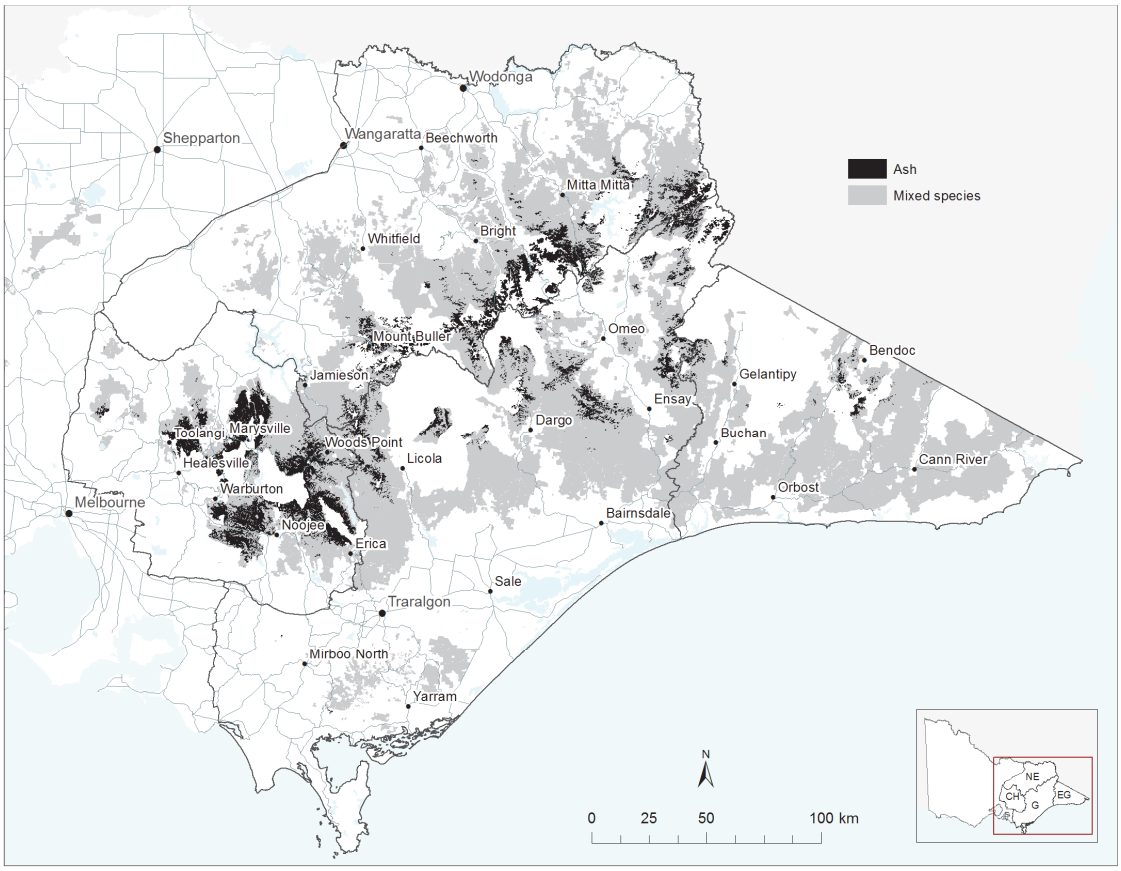
**Ash forest** is a term used by VicForests for tall open wet forests dominated by Mountain Ash (*Eucalyptus regnans*), Alpine Ash (*E. delegatensis*) and/or Shining Gum (*E. nitens*). These forests are generally naturally dominated by a single overstorey species but may be mixed with other species, most commonly Messmate (*E. obliqua*) and Manna Gum (*E. viminalis*).

**Low elevation mixed species** forests occupy extensive areas of the North East, West Gippsland and East Gippsland, and comprise much of the coastal and foothill forests of Victoria. They are generally located at elevations less than 700 metres and contain key indicator species such as Silvertop (*E. sieberi*), Mountain Grey Gum (*E. cypellocarpa)*, Messmate (*E. obliqua*), Yellow Stringybark (*E. muelleriana*) and White Stringybark (*E. globoidea*).

**High elevation mixed species** forests occupy extensive areas of East Gippsland. They are generally located at elevations greater than 700 metres and contain species mixtures of Messmate (*E. obliqua*), Cut-tail (*E. fastigata*), Errinundra Shining Gum (*E. denticulata*), Mountain Grey Gum (*E. cypellocarpa*) and/or Manna Gum (*E. viminalis*).

5 VicForests 2016 *Ecologically sustainable forest management plan* Draft version 2.0

Figure 1.5 Distribution of broad forest types in the state forests of the assessment area




Source: DELWP corporate digital dataset – FORESTS.SFRIMAP_2007

## 1.3 Broad approach to the assessment

Assessment and documentation of the biodiversity and ecological values of an area is an early step in most conservation planning exercises, and in natural resource management more generally.

The extent and nature of biodiversity assessments are shaped by the size of the assessment area, the time provided, the available data and expertise, and by whether information is sought to answer explicit questions or guide specific decisions.

A report was required for the current assessment within four to five months. The terms of reference provided to VEAC were general in nature and were not targeted to answer specific questions. In addition, the assessment area is large, comprising all public land in eastern Victoria. These three conditions shaped the broad approach to the assessment. Acquisition of new data was not feasible for the assessment area in the available time; instead VEAC decided to use the best available data and focus on enhanced or new spatial analyses of those data. As a result of the wording of the terms of reference, the information provided in this report is general in nature, and further analyses may be required to address specific questions or inform any specific actions.

### 1.3.1 Sources of information and assistance

VEAC commissioned specialist modelling and spatial analysis expertise for this assessment through DELWP's Arthur Rylah Institute for Environmental Research, and utilised the best available biodiversity data.

In Victoria, DELWP has overall responsibility for protection of biodiversity and for biodiversity information and tools.[6] The Victorian Biodiversity Atlas (VBA) is the web-based information system designed to manage information about wildlife in Victoria. The system includes species attribute information, including origin and conservation status, along with more than six million records of species distribution and abundance from systematic surveys and general observations. The VBA replaces several of the department's legacy systems. It encompasses vertebrate and invertebrate animals, fungi, vascular and non-vascular plants from terrestrial and aquatic environments, including marine waters to the three nautical mile Victorian limit. It includes both native and naturalised exotic species (including weeds and pests) but is not intended to hold data on cultivated or domesticated species.

DELWP developed and manages the Biodiversity Interactive Map, a tool to display and produce maps of Victoria's biodiversity, native vegetation, flora and fauna data.

DELWP has also developed a suite of tools called NaturePrint to integrate and analyse the best statewide information (available through DELWP databases) about biodiversity values, threatening processes and ecosystem function at the landscape scale.

NaturePrint combines:

- mathematical models of species distributions and habitats
- the condition of these habitats
- pathways for connectivity across landscapes
- connectivity potential and recoverability
- threats to species persistence.

### 1.3.2 Consultation

The provisions of the VEAC Act under which this assessment was requested do not include mandatory consultation requirements or the release of draft reports for public comment. The terms of reference for this assessment required VEAC to consult with the Forest Industry Taskforce. A meeting was held with the taskforce in November 2016 to discuss the approach to the assessment and present the results of some early analyses.

### 1.3.3 Field inspections

Council members visited sites in the Central Highlands in November 2016 to familiarise themselves with biodiversity values and forest management.

### 1.3.4 Assessment methods

The request for this assessment was to focus specifically on biodiversity and ecological values. The following values and considerations are therefore not included in the assessment:

- other natural values (scenic, geological, wilderness, ecosystem services)
- recreational values
- social and economic values
- land management considerations.

---

[6] See http://www.depi.vic.gov.au/environment-and-wildlife/biodiversity

VEAC has opted in the time available for the assessment to add value to the existing biodiversity data through the use of spatial analysis tools, rather than to exhaustively document the biodiversity and ecological values. As described in section 1.3.1 above, biodiversity information is readily available through DELWP's variety of inventories, atlases and web-based tools.

#### Addressing terms of reference (a) and (b)

To address the request in the terms of reference to identify the biodiversity and ecological values in the specified area, the following analyses were undertaken:

- initial broad analysis of 79 threatened forest-dependent species
- modelled tree age
- more focused forest-dependent species analysis
- ecosystem distribution.

To address the request in the terms of reference to identify the current and likely future threats to these values, VEAC reviewed past and current work, and conducted new analyses for the following threats:

- invasive species
- fire frequency.

The methodology for each analysis is described in detail in sections 2 and 3 of this report.

### 1.3.5 Features of the new analyses

The new analyses presented in this assessment report represent a new generation of spatial analysis of biodiversity data. Earlier approaches were based directly on records of forest flora and fauna and did not have access to contemporary analytical tools. The information presented here addresses the terms of reference which request a largely descriptive assessment. However, with further refinement, the analyses can be used to answer specific questions. Features of the current assessment includes:

- use of habitat distribution models, rather than species records
- use of new spatial data, particularly tree age
- use of zonation software to produce a hierarchical spatial prioritisation of the landscape, in this case to identify the places that support the largest range of forest-dependent values in the smallest area
- use of recent data – notably for fire and timber harvesting history – since the most recent broad analyses for RFAs in the mid-1990s.

### 1.3.6 Caveats

The short timeframe for the assessment means that the results should be considered to be preliminary in nature, and may contain errors.

As stated earlier in the report, the request to VEAC was for a descriptive assessment, which did not pose specific questions for which options or answers were sought. The assessment report therefore presents information and analyses as a preliminary input to government, that nonetheless forms a strong base that can be built upon for future decision-making.

# 2. Biodiversity values

## 2.1 Overall approach

In the early 1990s, the Commonwealth and state governments began to cooperatively formalise the planning for their protected area systems, seeking to develop a national network that was comprehensive, adequate and representative to more systematically protect a range of natural values. In a separate process in the mid-1990s, the Commonwealth and state governments began work to develop Regional Forest Agreements (RFAs) in an attempt to reduce conflict between natural values and timber harvesting and reach agreement on the long-term management and use of forests.

Associated with the RFAs was the development of the JANIS[7] criteria setting targets for the representation of ecosystems in a comprehensive, adequate and representative conservation reserve system. As a result, the RFA process lead to a relatively high level of ecosystem representation in conservation reserves compared to regions without RFAs, albeit with considerable reliance on informal reserves (Special Protection Zones) in state forest in some instances.

Much of the debate since then has focused on the adequacy of the reserve system for threatened species, with several forest-dependent threatened species declining over the last two decades despite the targets for ecosystem representativeness generally being met. The first step in investigating the adequacy of measures to protect threatened species is to determine their occurrence, and this task is the focus of this section of the report. The next step – determining how much of the distribution of each threatened species is required to ensure a reserve system is adequate for its conservation – is a separate exercise beyond the scope of this assessment.

In order to determine the occurrence of threatened species, this assessment has drawn on the extensive work done by DELWP for its NaturePrint program. The assessment starts at a broad level and then drills down to a result focused on the key factors in the conservation of threatened forest-dependent threatened species in the assessment area. There are three stages in this process:

**Broad forest-dependent species analysis** (section 2.2). This stage takes the standard models of the occurrence of threatened species used in the Strategic Biodiversity Values (SBV) component of NaturePrint, but instead of using all threatened species as is usually done with SBV, selects an initial subset of 79 species identified by expert biologists as forest dependent. The models for these 79 species are then overlaid to identify those areas that make the greatest contribution to biodiversity conservation. Selecting the 79 forest-dependent species avoids the analysis being distorted by species that are dependent not on forests but on other habitats such grasslands, wetlands, coasts and treeless alpine areas.

**Modelled tree age** (section 2.3). This stage generates a new input to the analysis in the form of a model of tree age across the assessment area. Old trees are difficult to replace and are valuable in their own right, but the key benefit of this information is in improving the modelled occurrence of the many threatened species for which tree age is a major factor not previously been modelled.

7 JANIS: Joint ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee

**Focused forest-dependent species analysis** (section 2.4). This stage is a more focused version of the first stage. It is more focused in that it:

- uses a smaller list of 35 species that are much more reliant on the forests of the assessment area for their conservation
- incorporates the modelled tree age output from the second stage into the models of species occurrence
- incorporates some other species-specific refinements into the models of species occurrence.

As well as the analyses of threatened species, this section of the report includes a summary of the occurrence of ecosystems in the assessment area (section 2.5).

### 2.1.1 Habitat distribution models

Previous attempts to identify the areas that make the greatest contribution to biodiversity conservation have been hampered by the patchiness of survey effort and recorded locations for a large majority of threatened species. The recent development of habitat distribution models (HDMs) for all Victoria's threatened species largely overcomes this problem. HDMs predict the suitability of a location for a particular species based on mapped presence data, systematically allocated absence data, and geographic and environmental characteristics. As part of NaturePrint, DELWP has developed HDMs for around 2,000 Victorian species, including all threatened species. HDMs for threatened species can be viewed at www.data.vic.gov.au/data/dataset.

The rationale underpinning HDMs is that the environmental characteristics favoured by a given species can be estimated based on the places where a species has and has not been recorded. It is then possible to generate a model and map of all the places where that combination of environmental characteristics occurs. Typical environmental characteristics include elevation, rainfall, soil type, aspect, and slope. These characteristics can be quite complex; rainfall, for instance could be many more measures than just the annual average. It could include averages for particular months or other periods, or the average number of days or consecutive days over a certain period without rainfall above a certain amount. Given that species can favour complex combinations of complex characteristics, generating HDMS can be an involved exercise.

The next step – interpreting the HDM map – is crucial, particularly in those areas where the habitat is modelled but the species has not been recorded. It should not be taken as a definitive statement of the distribution of a species. This is because other factors not included in the model may be at play. A pertinent example here is the forests of the Otway Ranges, around 150 kilometres southwest of the nearest parts of the assessment area. These ranges share many environmental characteristics with the Central Highlands and have similar forests to the ash and mixed species forests of the Central Highlands. However, many of the species that occur in the Central Highlands have not been reliably recorded in the Otways despite HDMs predicting that they occur there. This applies to both threatened species such as the sooty owl and other species such as the superb lyrebird. Presumably this is the result of other factors – perhaps the isolation and relatively small total forest area of the Otways, for example.

Accordingly, as explained in the previous section, the analysis for this assessment has drilled down beyond the HDMs to develop more nuanced versions for the more focused analysis. An example is presented in figure 2.1: the HDM for Leadbeater's possum incorporating modelled tree age and other species-specific modifications. In this HDM, the effect of the modelled tree age is apparent in the lower value areas (pale yellow and white) south, southeast and east of Marysville and in the isolated Murrindindi block about 15 kilometres northwest of Marysville. These areas were burnt in the 2009 bushfires when the ash trees were killed making them

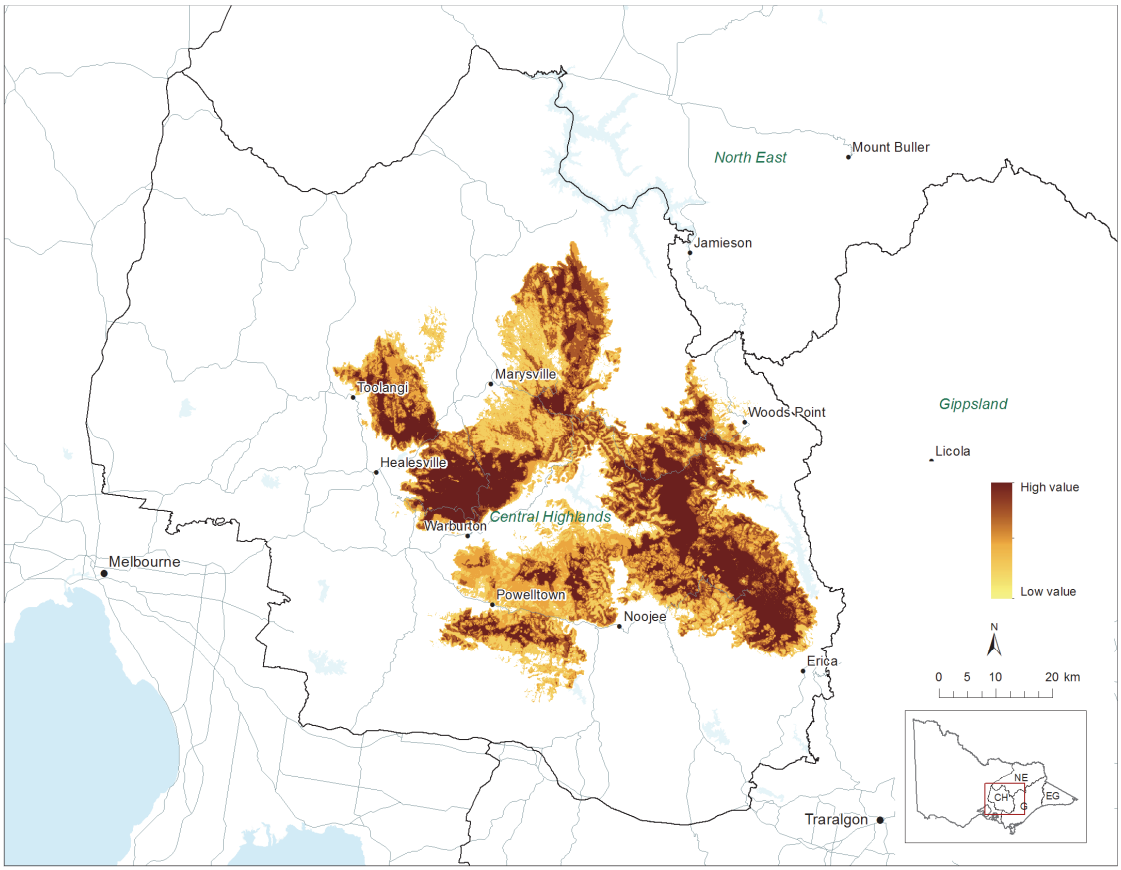
unsuitable for Leadbeater's possum for at least many years. These areas are not apparent on the unmodified Leadbeater's possum HDM.

Another example of customisation in this HDM, not obvious on the map, is in the emphasis given to maintaining populations of the possum across its range. Because of the somewhat fragmented nature of its habitat the Leadbeater's possum population could be viewed as comprising four subpopulations, of varying connectivity in the following areas:

- Toolangi-Warburton
- east and northeast of Marysville
- centred on the Baw Baw area northeast of Erica
- around Powelltown and east towards Noojee.

Given the susceptibility of this area to large intensive fires and the effects of such fires on the possum it would be prudent to attempt to conserve all of these subpopulations rather than focusing solely on populations considered to the most important. Accordingly, the algorithm building the focused HDM has been adjusted to this end.

Figure 2.1 Example of a habitat distribution model: Leadbeater's possum incorporating modelled tree age and other species-specific modifications



### 2.1.2 Spatial optimisation

This section is concerned with the ways in which multiple HDMs are brought together in order to map the overall contribution of various parts of the assessment area and ultimately to identify the areas that make the greatest contribution. Many factors preclude an approach that simply overlays them and counts the number of species modelled at each place. Examples of factors that confound the simple approach are:

- some species have a smaller distribution than others
- some species have a more fragmented distribution than others, with different levels of connectivity between different parts of the distribution and different susceptibilities to further fragmentation
- some species are in a higher threat category than others.

As a result of such factors, the places that have the most species mapped may not collectively give the most optimal coverage of values because that approach would be, to give a simple example, giving equal weight to widespread species and therefore including many places where they are found potentially at the cost of more restricted species.

This and similar problems are common in conservation biology and in recent decades there has been an explosion in research into systematic conservation planning, bringing in thinking from mathematics and computer science. As a result there are now many approaches available – often with software packages – with different emphases from those targeting highly specific problems to those designed for more general application.

The tool used by DELWP for NaturePrint, and also used in this analysis is called Zonation. Zonation produces a hierarchical prioritisation of a landscape based on the occurrence levels of biodiversity features in cells (of 75 metres by 75 metres in this assessment) by iteratively removing the least valuable remaining cell while accounting for connectivity and generalised complementarity. Zonation identifies areas important for retaining habitat quality and connectivity for multiple species, indirectly aiming at species' long-term persistence. More details about Zonation, including comparison with some other prominent approaches, can be found at https://helda.helsinki.fi/handle/10138/153485.

One of the key features of Zonation that makes it suitable for this assessment is that, rather than requiring targets to have been developed before the analysis is undertaken, Zonation can be used to inform the development of targets. Targets, for example, could be a certain percentage of the assessment area or the minimum viable population of various threatened species. Analyses with predetermined targets would identify different priority areas to those developed without such targets. Not requiring targets is important for VEAC's assessment of conservation values because the terms of reference do not give any indication of targets to be met. Developing such targets is a separate exercise beyond the scope of this assessment.

Another important feature is the options that Zonation provides to customise analyses for particular problems. Among the many options are the ability to adjust to favour the number of species (additive benefit) versus the rarity of species (core area), or to minimise the amount of edge in retained areas, or for particular variations on subpopulation connectivity.

## 2.2 Broad forest-dependent species analysis

### 2.2.1 Approach

#### Background

In VEAC's Discussion Paper for its Statewide Assessment of Public Land (2016), this analysis was used to compare the relative contribution to biodiversity conservation of all land across the state. In the following assessment, the same analysis was applied to 79 threatened species identified as 'forest-dependent' by a group of expert biologists convened by DELWP.

#### Rationale

By focusing on forest-dependent threatened species this analysis reduces the obscuring effect of habitat distribution models for species which largely occur in forests incidentally to their main occurrence in other habitats such as open woodlands or heaths. The end result is a tighter and more reliable depiction of the areas that are likely to be the most important for forest-dependent biodiversity. Here forest encompasses all native forest types including those that are not currently suitable for commercial sawlog or pulplog production.

#### Inputs

Habitat distribution models for the 79 forest-dependent species listed in appendix 1.

#### Analysis

Zonation

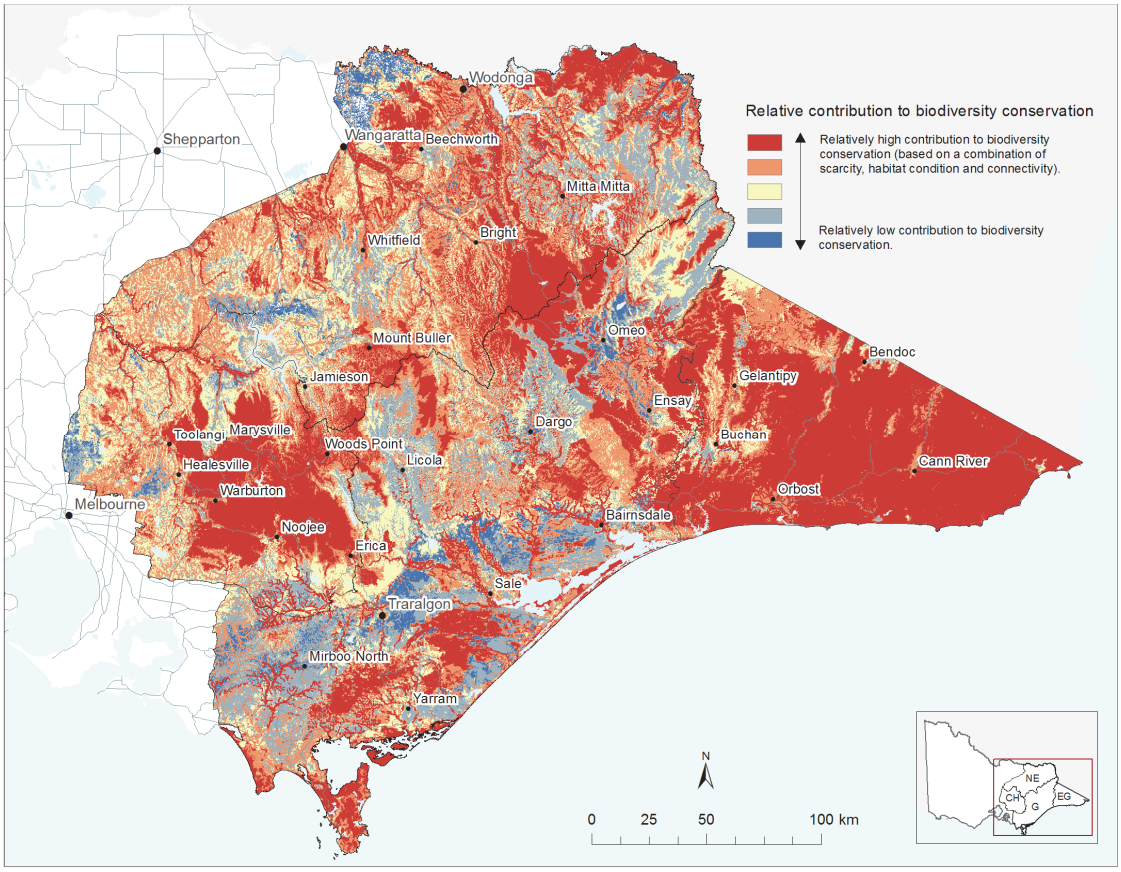
#### Interpreting the results

When interpreting these maps, the following points should be noted:

- the zoning does not indicate or imply any particular action in relation to the high or low contribution areas
- the zoning does not set or point to any thresholds or targets for any actions or failures to act. Any impression to that effect is a product of the colour scheme used and different colour schemes would create different impressions
- the main uses of these maps are in identifying general patterns to inform potential options for action and to identify general areas for more detailed investigation for options.

### 2.2.2 Broad forest-dependent species analysis – all land

Figure 2.2 Results for broad forest species analysis – all land

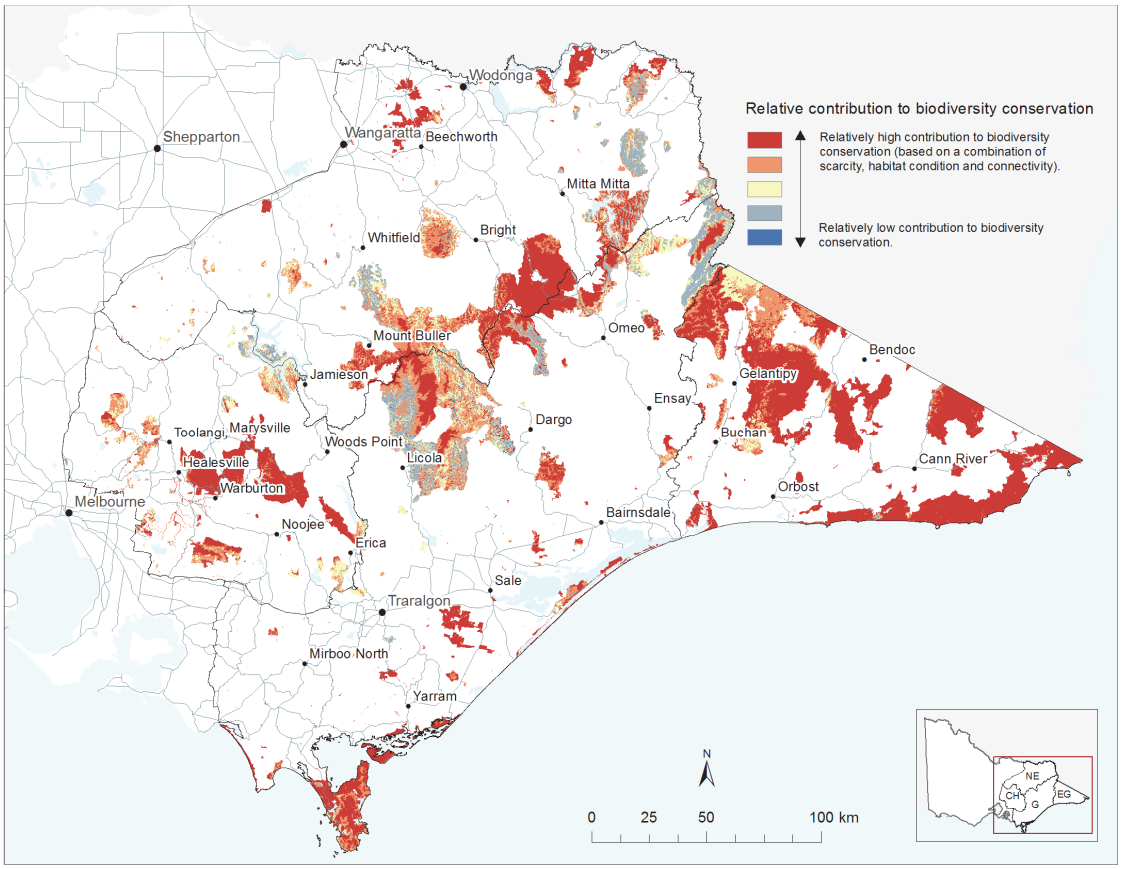



## Key points

- The largest blocks of land that make the highest relative contribution to forest biodiversity conservation (in red) are in the Central Highlands (Toolangi-Woods Point-Erica area), South Gippsland, the high country between Bright and Omeo, and nearly all of East Gippsland. There are many other smaller or less consolidated blocks of high value that may be of equal or greater importance.
- Areas making the least contribution to forest biodiversity conservation (blue) are all on plains and in valleys on private land intensively used for agriculture – near Melbourne, north of Lake Eildon (northwest of Jamieson), the plains north of Wangaratta, around Omeo and through the La Trobe Valley, South Gippsland and the Gippsland Lakes hinterland. However, in many of these areas forested bands along major waterways are typically in the highest category of contribution to biodiversity, showing as starkly contrasting ribbons of red such as in South Gippsland and the Gippsland Lakes hinterland.
- Because of the approach used in the analysis, fire impacts are not apparent on this map even though it may be many years before areas intensively burnt in recent bushfires – notably in 2003, 2007 and 2009 – provide suitable habitat for several forest-dependent species.

### 2.2.3 Broad forest-dependent species analysis – protected areas

Figure 2.3 Results for broad forest species analysis – protected areas




## Key points

- Most protected areas in the Central Highlands, South Gippsland and East Gippsland are almost completely in the highest category of contribution to forest-dependent biodiversity conservation, shown as red on the map. This is despite an historical tendency for the boundaries of these areas to be the result of compromises balancing biodiversity conservation with timber production i.e. more silviculturally productive forests have tended to remain available for timber production. Such forests are more likely to provide habitat for forest-dependent species than other forests due to their high productivity. So, for example, much of the forest in Croajingolong National Park, along the coast south of Cann River, is coastal forest that is less favourable for timber production than forests immediately inland. Nonetheless it is nearly all of high value for biodiversity conservation (red).
- Although there are some large patches of lower relative contribution (shown as blue and yellow) in protected areas, this does not mean that these areas do not make an important contribution to biodiversity conservation as a whole. Many threatened alpine species in particular have not been designated as forest-dependent and are therefore not included in the assessment.

### 2.2.4 Broad forest-dependent species analysis – state forests

Figure 2.4 Results for broad forest species analysis – special protection zones of state forest

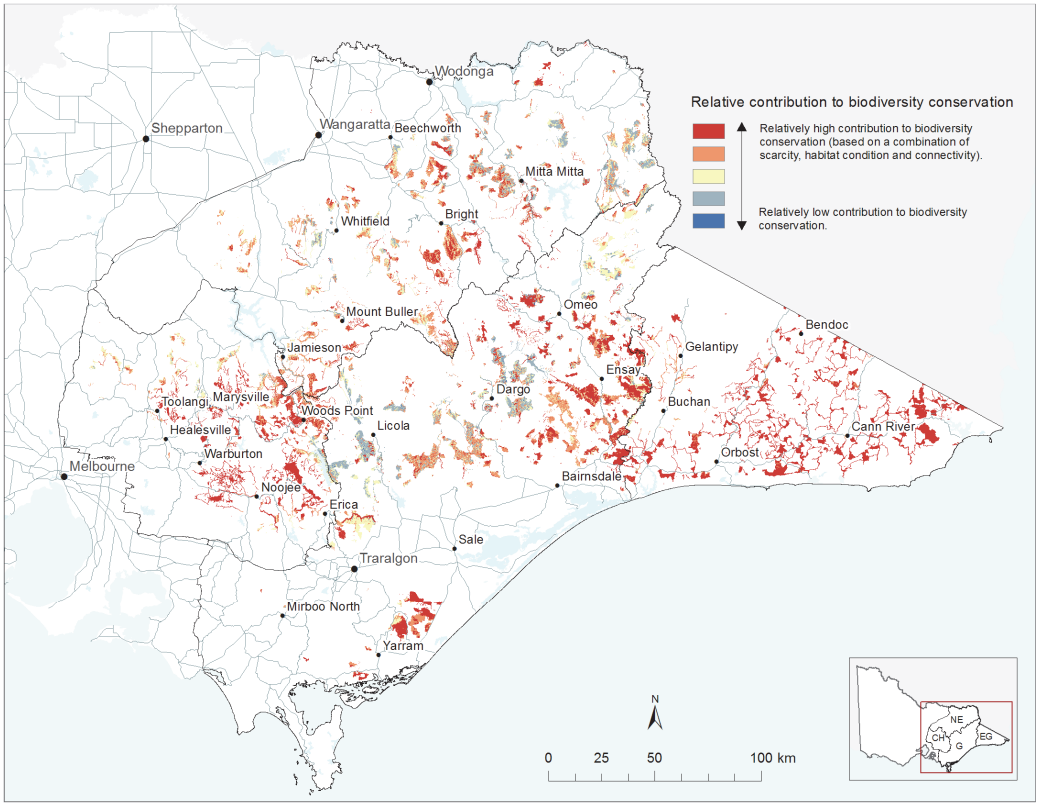
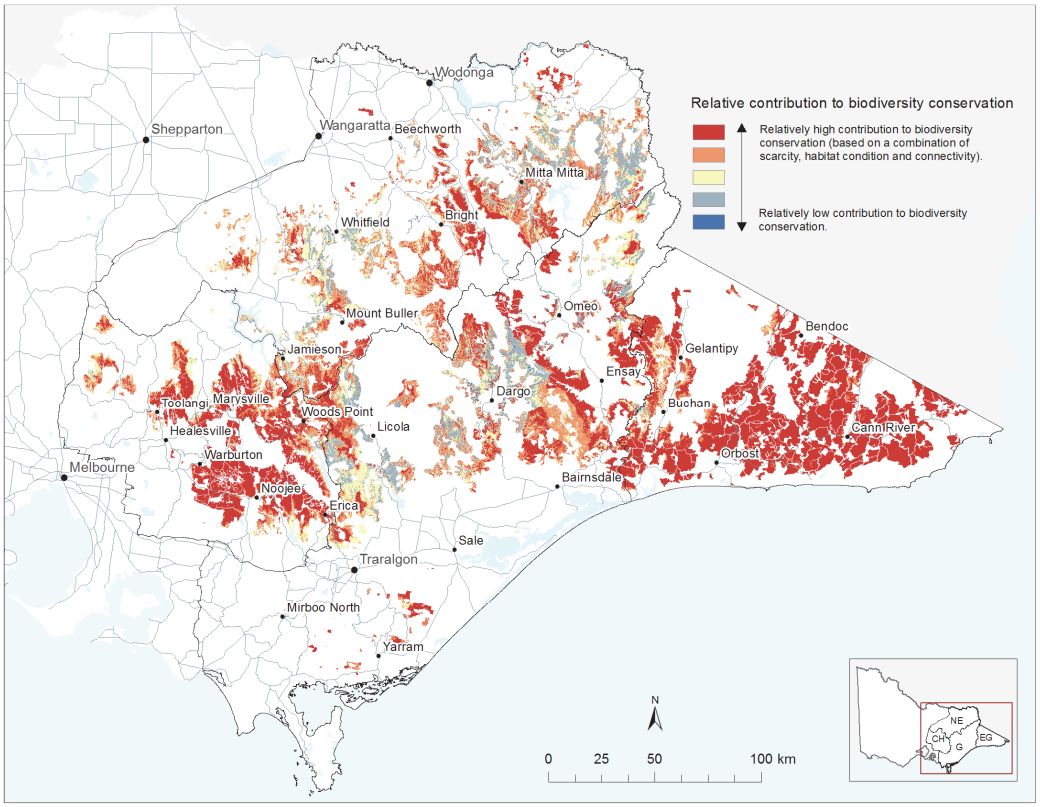


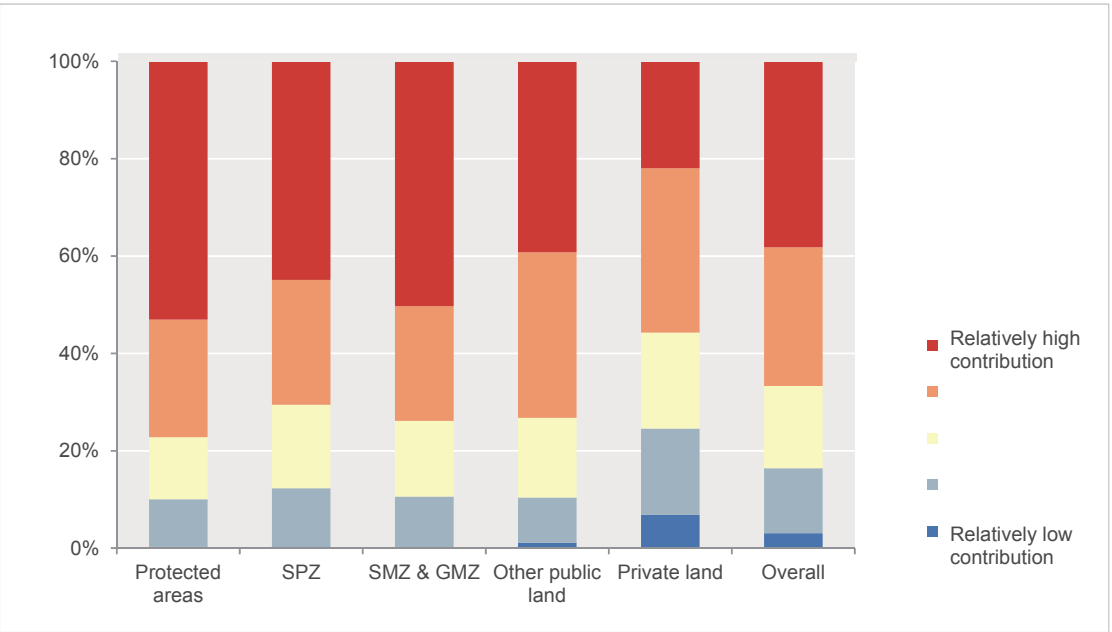

Figure 2.5 Results for broad forest species analysis – general and special management zones of state forest



## Key points

- As with protected areas, state forests in the Central Highlands, South Gippsland and East Gippsland almost completely comprise land in the highest category of contribution to forest biodiversity conservation, shown as red on the maps.
- Most of the state forest northeast of Yarram is in special protection zones and nearly all state forest in this area makes a high relative contribution to forest biodiversity conservation.
- Other large high-contribution patches are found east of Woods Point, northeast of Bright and on the eastern side of the large block of forest between Dargo and Ensay.
- As shown more clearly in figure 2.6, special protection zones do not have higher representation of high contribution areas than other state forest zones (GMZ and SMZ), even though some SPZs are specifically established for particular threatened species. While there are some large patches of high contribution areas in SPZs – around Ensay, for example – the overwhelming majority of such patches are in other state forest areas. The profile of conservation values in the GMZ and SMZ areas overall is comparable to that in protected areas.

Figure 2.6 Proportion of various land types in the five nominal categories of relative contribution to forest biodiversity conservation



## 2.3 Modelled tree age

### 2.3.1 Approach

#### Background

As noted, the analysis in the previous section did not incorporate any information pertaining to forest age, such as fire or logging history. The availability of sufficient older forest, or at least older canopy trees, is known to be an important habitat requirement for many threatened forest species, especially birds and mammals. Older forest or trees provide many features not found in younger forests, such as more and larger hollows for nest sites, a more open and varied forest structure, more nectar more often, and more fallen timber.

Older forest is also a particular focus because it is difficult to replace, taking many decades or even hundreds of years to develop once lost. Other habitat elements, such as understorey shrubs and trees, typically take less than 30 years to replace. Given the widespread and severe fires in recent years, identifying areas of older forest is likely to be important to ensuring the persistence of several threatened species, particularly over the next few decades while the forests burnt in the extensive fires of 1939 mature.

Previous mapping of older forest – frequently termed 'old-growth' – has focused on mapping historical disturbance, including fire, logging and grazing, and then modelling old-growth as the places with no or minimal disturbance history. Apart from the inaccuracy and imprecision of much historical mapping and the tenuous applicability of disturbance such as grazing to old forest elements, this approach takes no account of the different effects of fire in different vegetation types. Crucially, mountain ash and alpine ash trees are much more likely to be killed in high intensity fires than other 'mixed species' eucalypts (e.g. messmate). The latter may lose all their foliage in such fires but often survive and resprout the foliage from epicormic buds along the trunk and branches so that after a few years the key old tree characteristics have more or less returned. The ash forests must regenerate from seed and it will be very many decades before the old tree characteristics return, other than those provided by the dead trees (which reduce over time due to loss of dead trees). Some trees (e.g. snow gum) regenerate from lignotubers at the base of the tree. Although the tree remains alive, from an 'older forest' perspective the result is more similar to regeneration from seed – with fewer hollows, a more uniform forest structure and so on – than it is to forests dominated by trees that have resprouted from epicormic buds.

In summary, the same fire can therefore have very different effects on the age of trees, depending on their species. Old-growth modelling usually resets forest age for all areas burnt by wildfires. Tree-age modelling uses many of the same disturbance history datasets but temporally interleaves these data with forest type data defined by the dominant canopy species. Essentially this separates those dominant forest species that largely respond to a bushfire event via seed or resprouting from lignotuber from dominant forest species that have the capacity to regenerate from epicormic buds.

#### Rationale

Developing a spatially explicit model of tree age is a worthwhile exercise given that the occurrence of old trees is an important and difficult to replace ecological value in its own right. However, it is particularly useful when incorporated into other analyses such as that of forest-dependent threatened species because it improves the habitat distribution model for those species requiring old tree characteristics, and brings a temporal component to the assessment by identifying those areas that will be most important for those species in the coming decades.

### Inputs

- Fire history
- Logging history
- Ecological Vegetation Classes
- Statewide Forest Resource Inventory relative age mapping
- LandSat time series imagery
- Modelled old-growth
- Modelling of fire sensitive eucalypt species.

### Analysis

Interleaving of temporally informed disturbance mapping with forest type mapping. Disturbance mapping based on a set of geoprocessing rules, e.g.:

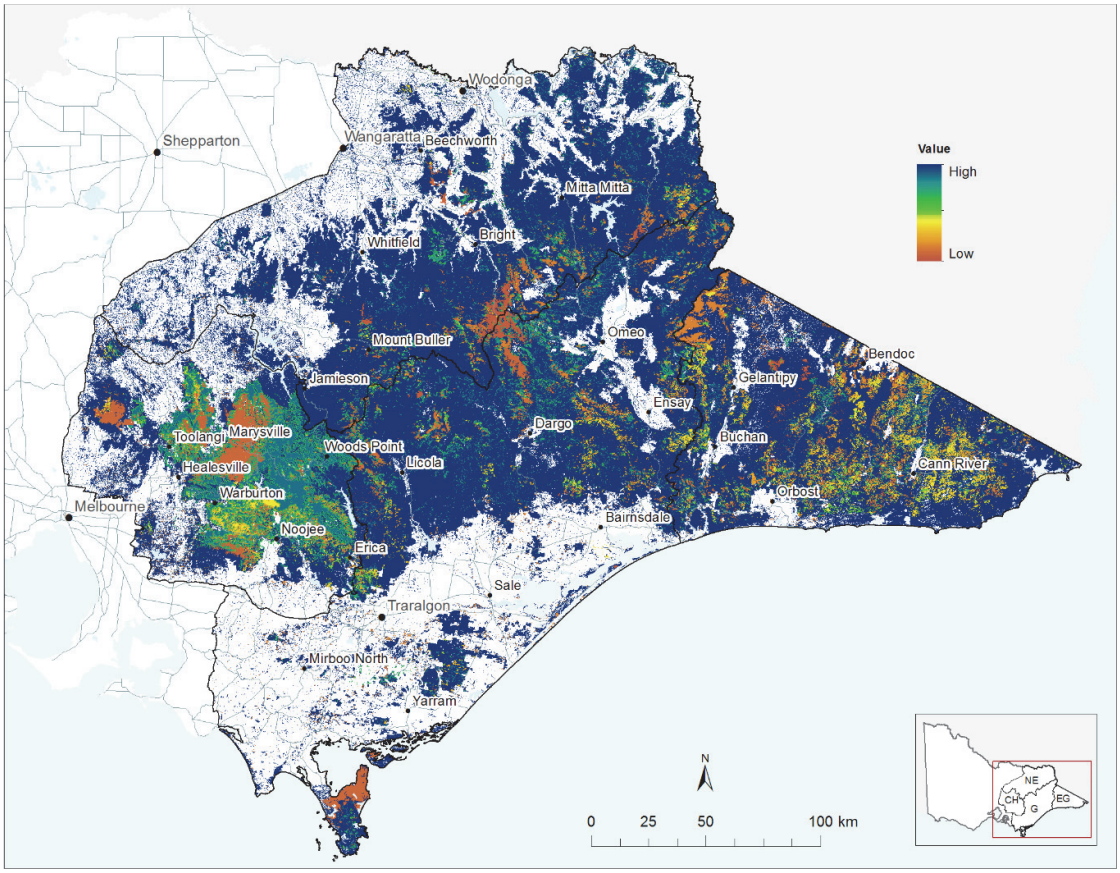
- if vegetation mapped as rainforest (in the 1980s) within the 1939 mapped fire boundary, designate as not burnt in 1939
- if bushfire mapped in 2008, do not reset age to zero for alpine ash (probably not killed due to low intensity of fire).

### Interpreting the results

- Maximum tree age was set at 120 years – estimates beyond that are unreliable, may distort the analysis of younger tree ages and are not particularly enlightening because the abundance of key old tree characteristics increases slowly in forests at this stage of maturity.
- Tree ages are absolute, not relative to forest type – and therefore comparable across the maps.

### 2.3.2 Modelled tree age – all land

Figure 2.7 Results for modelled tree age – all land

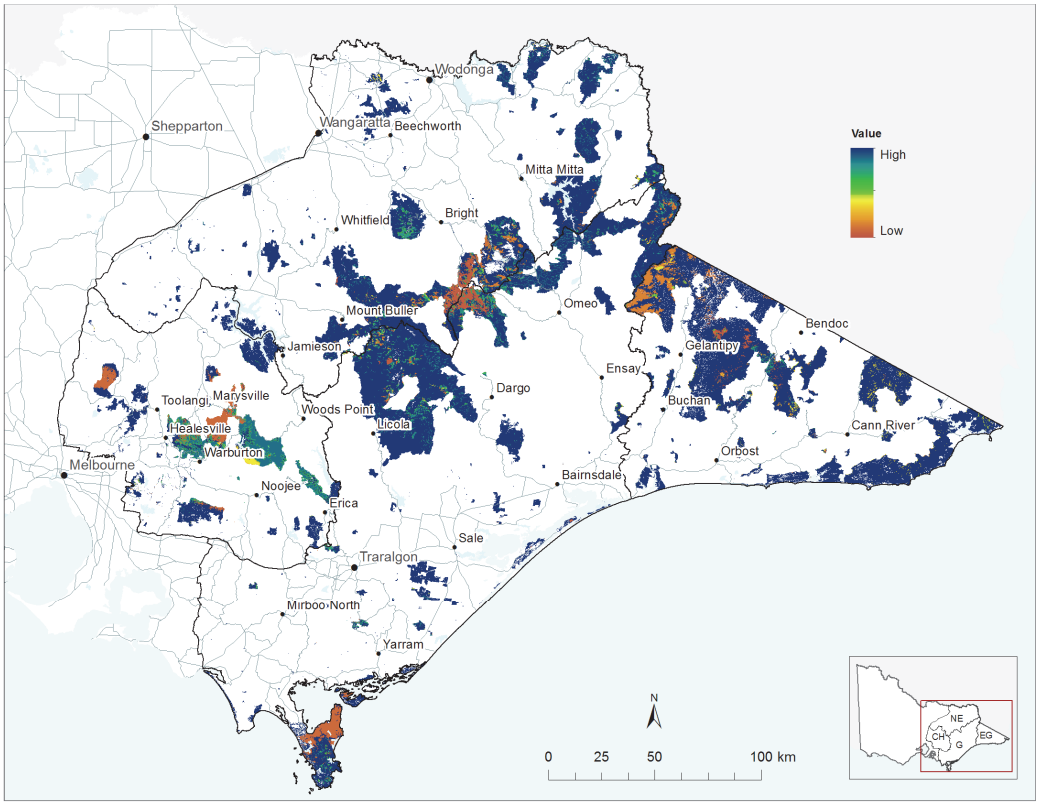



## Key points

- Ash forests killed by intense bushfires in 2009 are apparent as large orange patches around Mount Disappointment (50 kilometres north-northeast of Melbourne), northeast of Toolangi, Healesville and Marysville, and northeast of Bunyip State Park. Patches of older trees in areas burnt by those fires are generally other forest types in which more trees survive the fire and subsequently re-sprout.
- Large orange patches between Bright and Dargo, and around 50 km east of Omeo largely represent snow gums and alpine ash killed in the large fires of 2007 and 2003 respectively.
- Otherwise these large fires are predominantly shown as blue and green and without clear boundaries against adjoining unburnt forests as many trees in these burnt areas survived the fires and are of similar age to those in the adjoining areas not burnt in those fires.
- Well-known older fires are also apparent in the Central Highlands with the extensive 1939 fires still apparent as aqua shading and smaller 1983 fires between Warburton and Noojee showing as yellow.
- Away from these large fires, stippled patterns of small patches of a variety of colours closely enmeshed – e.g. between Orbost and the New South Wales border east of Cann River, and between Warburton and Erica – generally represent the timber harvesting mosaic and sometimes smaller, patchier and or variable intensity fires.
- The effect of timber harvesting in some of these stippled areas is apparent adjoining Croajingolong, Coopracambra and Errinundra national parks and Bunyip State Park (in blue), with the contrast against the younger adjoining state forest (generally in green or orange) being due largely to the absence of recent timber harvesting in the parks.

### 2.3.3 Modelled tree age – protected areas

Figure 2.8 Results for modelled tree age – protected areas




## Key points

- In general, there are relatively few clear differences in modelled tree age between protected areas (figure 2.8) and state forest (figure 2.9 and figure 2.10). This result is not surprising given that fire – the major determinant of tree age – rarely stops at land use boundaries.
- The clearest variation from this result is in East Gippsland, where the stippled pattern of the logging mosaic has not been overridden by recent large intense fires – leaving the unlogged and therefore generally older forests of the Alpine, Snowy River, Errinundra, Coopracambra and Croajingolong national parks apparent as more uniform patches of dark blue.
- There is also relatively little 'medium-aged' forest (yellowish patches) in protected areas in the Central Highlands – mostly because of the absence of timber harvesting but also because the 1983 bushfires burnt small areas (visible as a yellow patch east of Warburton and north-northwest of Noojee) of what is now the Yarra Ranges National Park.

### 2.3.4 Modelled tree age – state forests

Figure 2.9 Results for modelled tree age – state forest SPZs

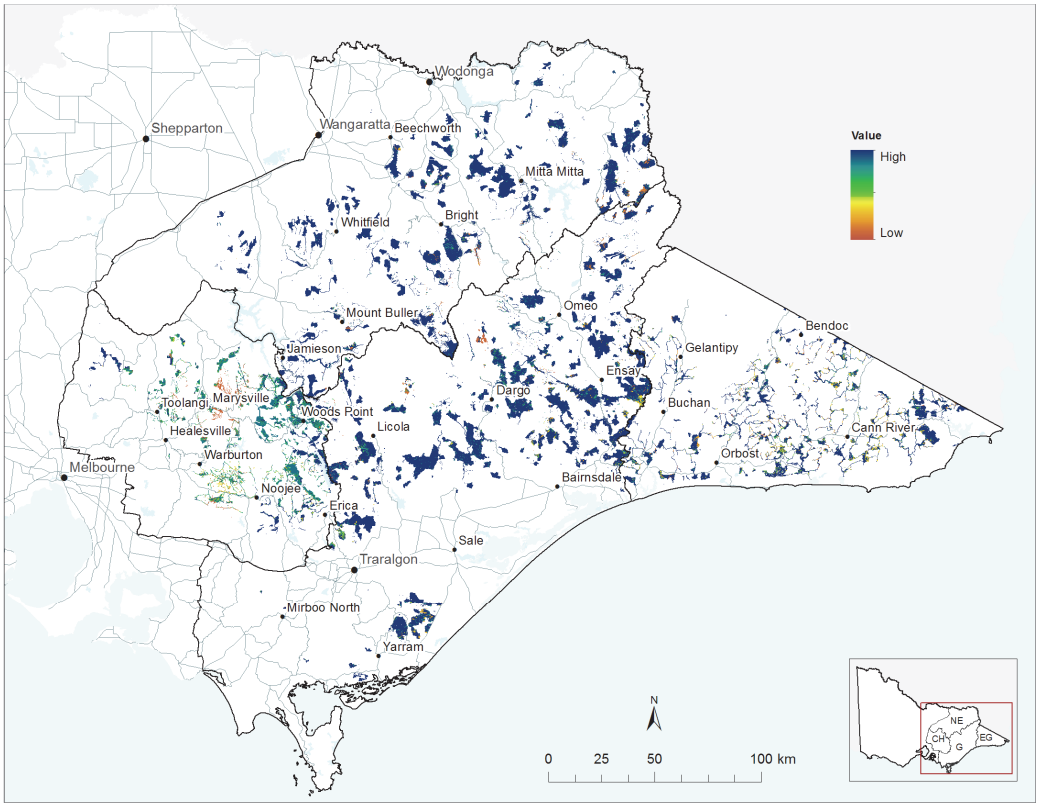
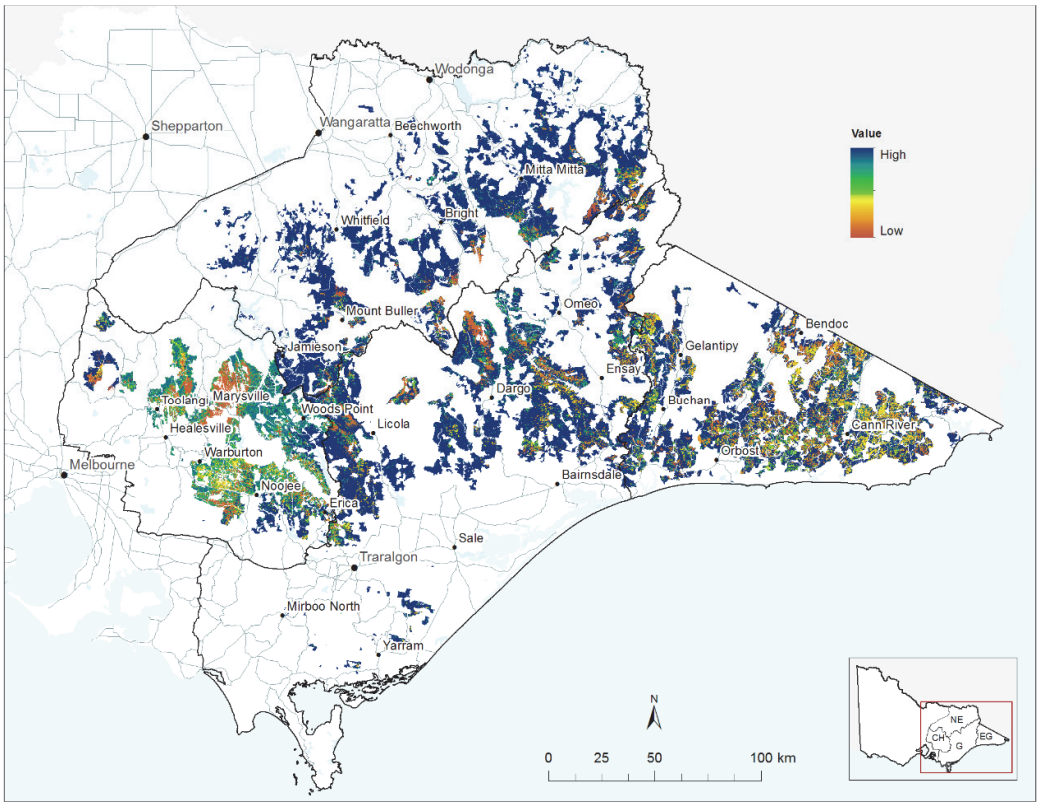



Figure 2.10 Results for modelled tree age – state forest SMZs and GMZs



### Key points

- The modelled tree age across state forest generally appears as a subset of the overall modelled tree age in any given area, but shows a distinctly more stippled pattern in the Central Highlands and East Gippsland – historically the areas most intensively harvested for timber.
- Compared to protected areas, the state forest maps show a limited extent of the youngest trees (orange patches) particularly between Bright and Omeo and in the area about 50 kilometres east of Omeo. This result may be attributable to the more widespread occurrence of snow gums killed by fire in the protected areas in these areas.
- One of the key potential benefits of this new modelled tree age mapping is in identifying potential ash forests that have avoided the impacts of recent fires. It is difficult to discern any such areas at this scale but more detailed analysis, including overlaying on forest type, would be a relatively straightforward step going forward. This line of reasoning also plays out through individual species for which such places comprise important habitat and is incorporated in the following section.

## 2.4 Focused forest-dependent species analysis

### 2.4.1 Approach

#### Background

The results of broad analysis of section 2.2 is blurred by several factors:

- many of the 79 threatened species used in that analysis are of a lower order of forest dependency than the others being, for example, predominantly drier forest species mostly found to the northwest of the assessment area or not clearly known to be impacted by timber harvesting
- the absence of a temporal component to the HDMs and the incorporation of the considerable importance of tree age
- the effect of considerable areas of high natural values distorting the ranking of areas in state forest.

This analysis focuses on state forest, and only on those forest-dependent threatened species determined by an expert panel to be negatively impacted by native forest timber harvesting. It also incorporates tree age modelling.

#### Rationale

This analysis provides a more robust, comprehensive and targeted ranking of values in state forest than that in the broad analysis of section 2.2.

#### Inputs

- The primary inputs to this multi-species zonation analysis are individual zonation solutions for each of the 35 forest-dependent species considered to be negatively impacted by timber harvesting amongst other threats (see appendix 2). Each of these species-specific analyses was created from the relevant HDM and species-specific advice from an expert panel of biologists convened by DELWP. Information sought included but was not restricted to:
  - the importance of known distinct and/or disjunct populations
  - home range size

  - important/critical habitat features not specified or distinguished in the HDMs, such as separate breeding and feeding habitats
  - preferred forest age
  - response to disturbances including fire and logging.
- This advice was used to specify the zonation analysis set-up for each species' solution and specify additional bespoke spatial inputs.

### Modelled tree age

This analysis uses some pre-existing work from which Gippsland south of the Princes Highway was excluded, and so is excluded from this analysis.

### Analysis

Core age zonation preordained to exhaust, in order: private and other public land, protected areas and code of forest practice exclusions, and state forest.

### Interpreting the results

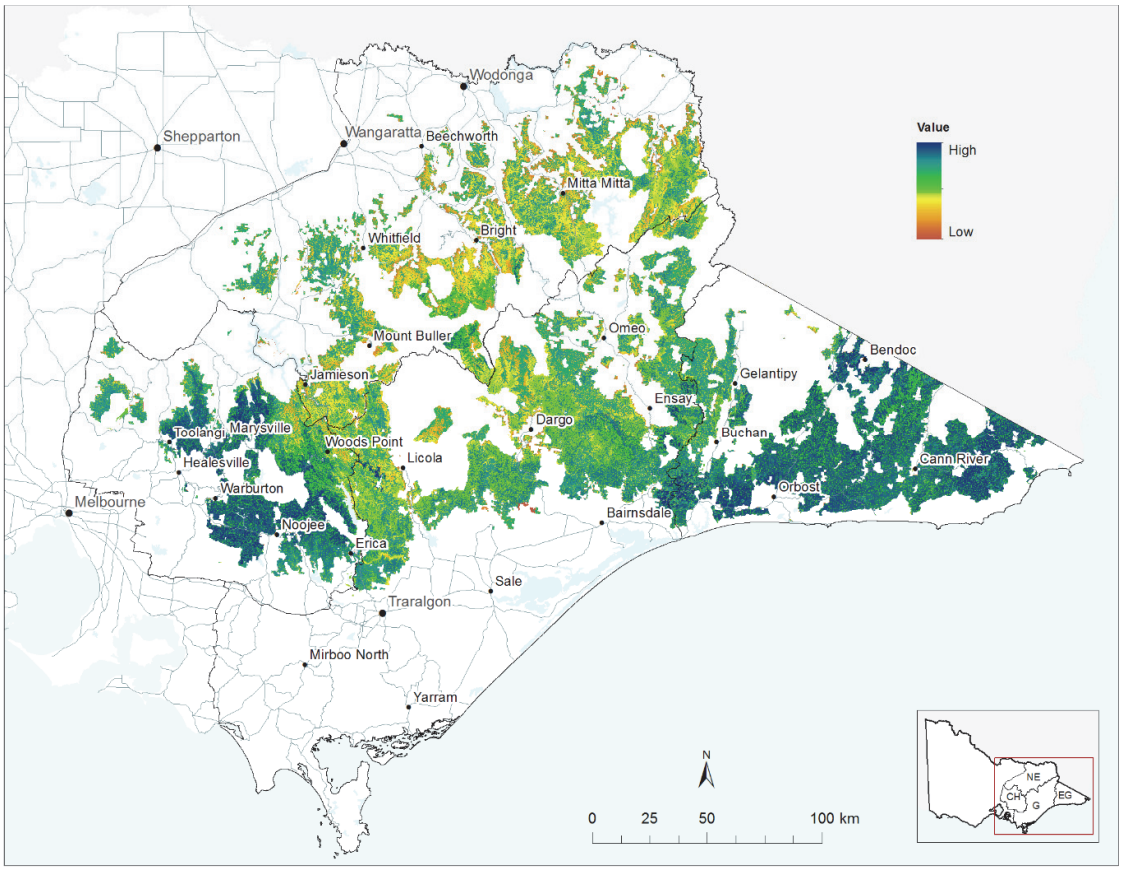
Bringing tree age into the analysis is effectively bringing a temporal perspective, helping to identify areas that are additionally important because they have older trees now which will assist in the conservation of threatened species in the next few decades. However, particularly given the potential for increased frequency of large intensive wildfires, even recently burnt areas are likely to be required for their contribution in 50 or more years.

Because of the preordained zonation sequencing to exhaust land in other categories before state forest, it would be misleading to show the mapped results for other areas (including protected areas) and this has not been done.

Because South Gippsland was not included in this analysis, it is necessary to refer to the broad forest species analysis in section 2.2 for perspective on the contribution of state forests in this area to biodiversity conservation.

### 2.4.2 Focused forest-dependent species analysis – state forest

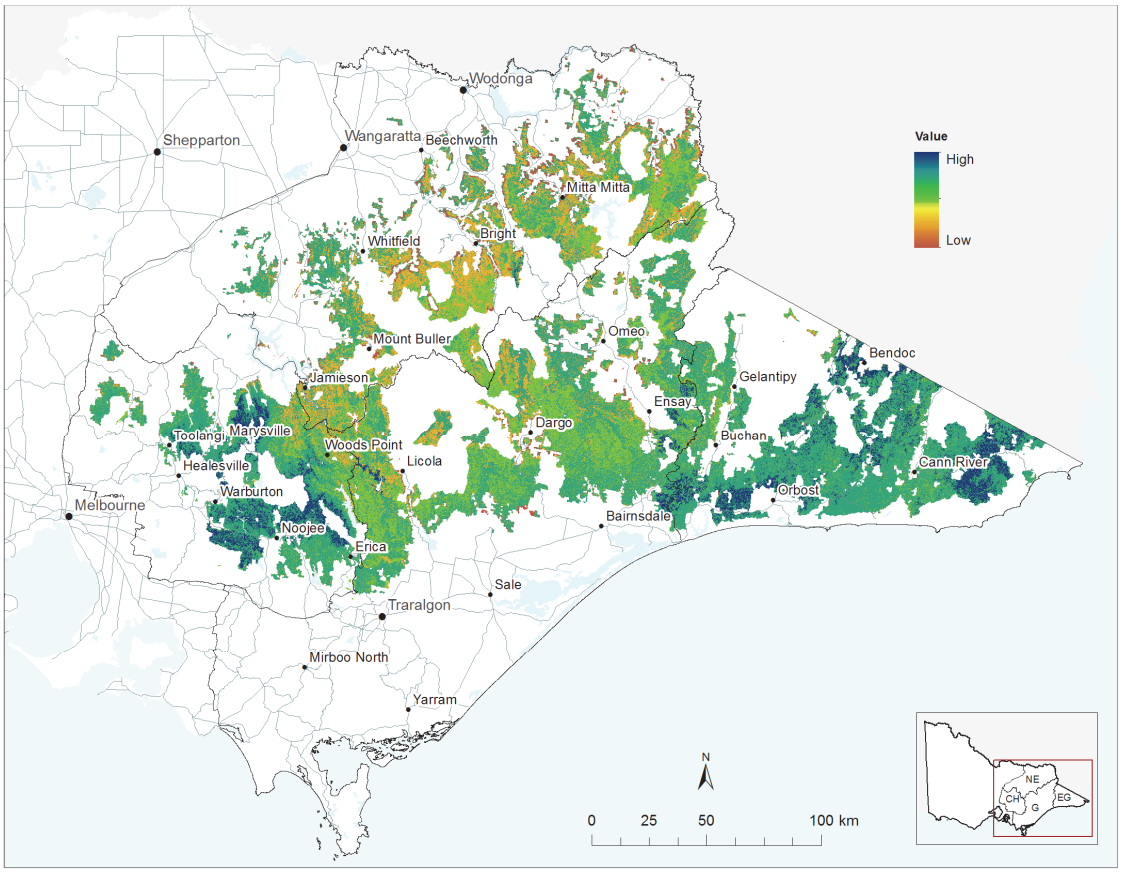
Figure 2.11 Results for focused forest species analysis – state forest




## Key points

- Figure 2.11 and figure 2.12 show the same data with slightly different colour schemes. As a result, the areas of state forest making the very highest contribution to forest biodiversity conservation are more apparent in figure 2.12. Less similar colour schemes would generate more apparent differences between the maps.
- Interpreting these maps at this broad scale, the effect of factoring in tree age to the broad forest-dependent species analysis is apparent in the very few patches in the highest contribution areas (blue and dark green) anywhere in the North East and Gippsland RFA areas. In these areas the combination of extensive fires in 2003 and 2007 over areas of generally lower contribution, has heightened the difference between these RFA areas and the Central Highlands and East Gippsland RFA areas.
- In the Central Highlands, the mapping identifies high contribution patches east from Toolangi to north of Marysville, between Warburton and Erica and around the Baw Baw National Park northwest of Erica.

Figure 2.12 Results for focused forest species analysis – state forest




## Key points

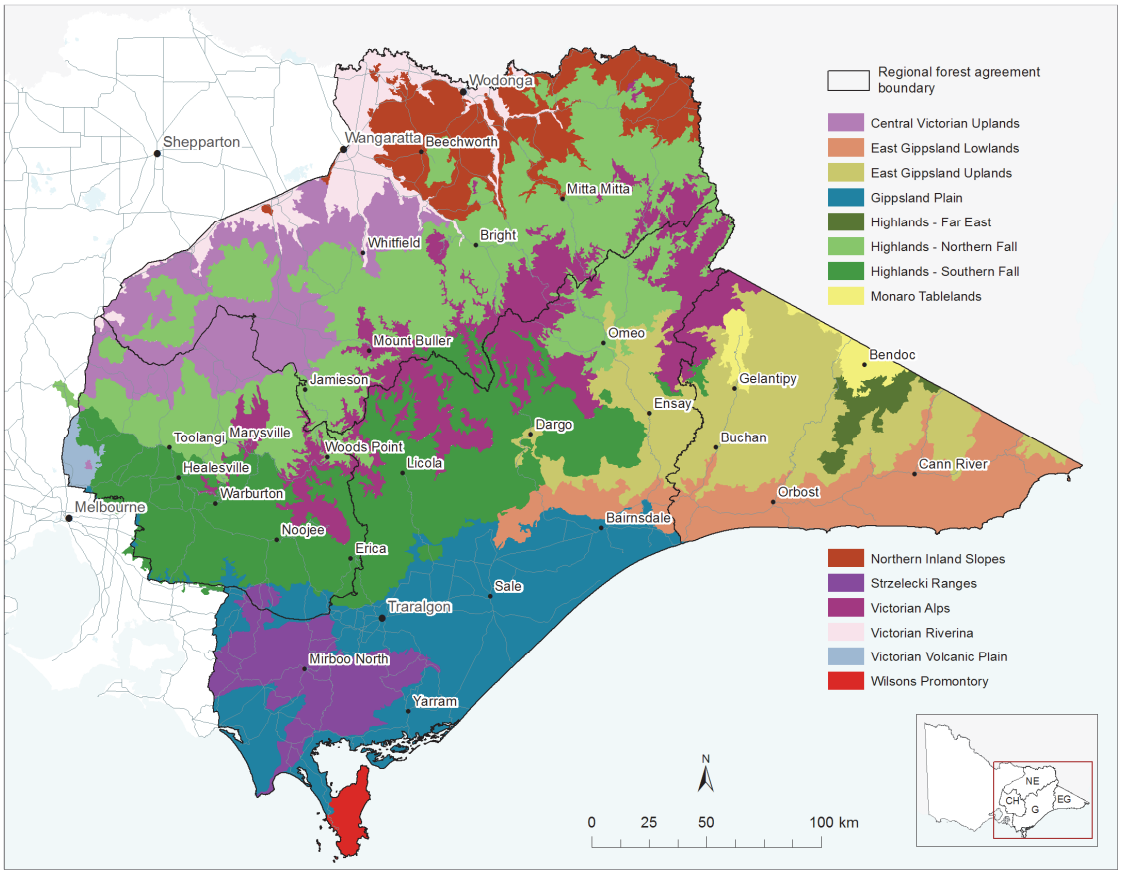
- Large areas of East Gippsland are in the highest categories in terms of contribution to forest biodiversity conservation with particularly high contribution patches between Bairnsdale and Orbost, around Bendoc, and east of Cann River.
- The dark blue areas in figure 2.12 represent around 3 to 4 per cent of the total state forest area and overlap with some of the most productive forests for timber. Some analyses of the extent of areas required to maintain viable populations of some threatened species – analogous to setting a target of the area of habitat needed to be maintained to support the species – produce estimates that are at least an order of magnitude larger than this arbitrary 3 to 4 percent threshold.

## 2.5 Ecosystem distribution

Ecosystems are a distinct and important level of biodiversity and have been a major element of spatial conservation planning and public land use planning for several decades. Ecosystem diversity is the variety of habitats, ecological communities and ecological processes. In Victoria, 'bioregional EVCs' have been developed as the unit to represent ecosystems for conservation planning at the landscape, regional and broader scales in Victoria. EVC stands for Ecological Vegetation Class which is the standard unit for classifying native vegetation in Victoria. An EVC is differentiated by a combination of floristics (occurrences of plant species), lifeforms, position the landscape, and an inferred preference for or fidelity to particular environments.

Bioregions are landscape-scale units classified based on features such as climate, geology, landform, native vegetation and species information (see figure 2.13). An EVC may occur in several bioregions i.e. an EVC may have several bioregional EVCs, each of which is treated as a separate unit in conservation planning.

Figure 2.13 Victorian bioregions in the assessment area




In analysing the distribution of EVCs in the assessment area, maps of bioregions, the original extent of EVCs, the current extent of EVCs and public land were digitally overlaid. The public land map was divided into protected areas, state forest and other public land, all other land in the assessment area being private land.

## Key points

The resulting area statement indicates the area of the 670 bioregional EVCs in each land category in the assessment area. Table 2.1 shows that information for the 40 most widespread of the 212 EVCs in the assessment area (current extent). Table 2.2 shows the four most widespread mixed species and ash EVCs in the assessment area by bioregion.

The two tables show that state forest supports large areas of these widespread EVCs at least, usually at least as much as and often much more than is found in protected areas. However, for many of the more depleted drier EVCs such as Grassy Woodland – which are more likely to occur extensively in other parts of Victoria outside the assessment area – a large majority of their occurrence is in protected areas.

## Table 2.1 40 EVCs with the largest current extent in the assessment area

Forest type: MS = mixed species forest; Ash = ash forest; Blank = other (generally drier) forest types.
Unless denoted otherwise, numbers are spatial extents in hectares

| Forest type | EVC name | Current extent | % of original extent | Protected areas | State forest | Other public land | Private land |
|---|---|---|---|---|---|---|---|
| | Shrubby Dry Forest | 769,999 | 96 | 248,404 | 447,353 | 38,172 | 36,070 |
| | Herb-rich Foothill Forest | 694,562 | 81 | 160,311 | 355,687 | 49,746 | 128,818 |
| Ash | Damp Forest | 562,779 | 78 | 133,387 | 352,703 | 22,479 | 54,210 |
| MS | Lowland Forest | 399,333 | 72 | 79,418 | 211,681 | 28,976 | 79,257 |
| | Montane Dry Woodland | 329,126 | 94 | 141,646 | 154,394 | 15,695 | 17,391 |
| | Grassy Dry Forest | 311,870 | 72 | 49,036 | 89,717 | 23,223 | 149,894 |
| Ash | Wet Forest | 292,089 | 79 | 78,898 | 146,955 | 34,049 | 32,188 |
| | Heathy Dry Forest | 189,777 | 93 | 74,879 | 85,902 | 7,904 | 21,092 |
| Ash | Montane Damp Forest | 176,385 | 98 | 66,754 | 104,038 | 4,610 | 983 |
| MS | Valley Grassy Forest | 128,103 | 37 | 8,095 | 10,114 | 14,433 | 95,461 |
| | Sub-alpine Woodland | 113,025 | 99 | 84,749 | 17,404 | 9,722 | 1,150 |
| | Grassy Woodland | 97,903 | 50 | 28,277 | 1,922 | 7,354 | 60,350 |
| | Riparian Forest | 78,866 | 80 | 17,661 | 36,420 | 11,025 | 13,761 |
| Ash | Montane Wet Forest | 74,501 | 99 | 31,014 | 42,304 | 971 | 212 |
| MS | Shrubby Foothill Forest | 69,375 | 71 | 12,196 | 40,721 | 4,127 | 12,332 |
| MS | Shrubby Damp Forest | 67,746 | 98 | 10,560 | 54,959 | 1,225 | 1,002 |
| | Plains Grassy Woodland | 59,305 | 18 | 858 | 21 | 11,993 | 46,434 |
| | Montane Grassy Woodland | 48,171 | 64 | 6,708 | 22,618 | 2,338 | 16,507 |
| | Banksia Woodland | 38,064 | 93 | 22,352 | 12,128 | 1,637 | 1,947 |
| | Heathy Woodland | 33,164 | 70 | 13,164 | 7,017 | 5,087 | 7,897 |
| | Plains Grassy Forest | 32,840 | 37 | 1,616 | 13,800 | 2,967 | 14,457 |
| | Floodplain Riparian Woodland | 30,581 | 39 | 597 | 59 | 9,396 | 20,529 |
| | Granitic Hills Woodland | 27,239 | 75 | 14,978 | 146 | 2,237 | 9,878 |
| MS | Lowland Herb-rich Forest | 24,356 | 68 | 920 | 10,826 | 2,092 | 10,519 |
| MS | Montane Herb-rich Woodland | 24,079 | 97 | 8,573 | 13,364 | 505 | 1,637 |
| | Swamp Scrub | 23,841 | 28 | 1,429 | 112 | 7,863 | 14,436 |
| | Riparian Scrub/Swampy Riparian Woodland Complex | 23,710 | 75 | 6,299 | 9,048 | 1,888 | 6,475 |
| MS | Dry Valley Forest | 21,197 | 85 | 2,742 | 12,918 | 2,595 | 2,942 |
| MS | Damp Sands Herb-rich Woodland | 17,789 | 40 | 5,571 | 16 | 2,683 | 9,519 |
| | Cool Temperate Rainforest | 17,331 | 98 | 7,013 | 8,621 | 1,383 | 314 |
| Ash | Tableland Damp Forest | 16,009 | 99 | 2,968 | 12,641 | 333 | 67 |
| | Box Ironbark Forest | 15,840 | 52 | 4,100 | 41 | 2,291 | 9,409 |
| | Swampy Riparian Complex | 13,343 | 29 | 326 | 14 | 1,488 | 11,515 |
| | Blackthorn Scrub | 12,897 | 99 | 4,274 | 7,780 | 539 | 304 |
| | Rocky Outcrop Shrubland/ Rocky Outcrop Herbland Mosaic | 12,342 | 97 | 8,920 | 2,634 | 481 | 307 |
| | Wet Heathland | 11,090 | 45 | 5,366 | 4,342 | 305 | 1,076 |
| | Plains Woodland | 10,967 | 18 | 123 | 0 | 2,555 | 8,289 |
| | Riverine Escarpment Scrub | 9,951 | 85 | 2,500 | 5,640 | 772 | 1,038 |
| | Warm Temperate Rainforest | 9,737 | 74 | 3,017 | 4,811 | 609 | 1,300 |
| | Swampy Riparian Woodland | 9,285 | 39 | 1,180 | 1,181 | 2,790 | 4,133 |

Table 2.2 Four mixed species and ash EVCs with the largest current extent (hectares) in the assessment area, by bioregion.

**Breg = bioregions abbreviated:**
CVU = Central Victorian Uplands
EGL = East Gippsland Lowlands
EGU = East Gippsland Uplands
GP = Gippsland Plain
HFE = Highlands - Far East
HNF = Highlands - Northern Fall
HSF = Highlands - Southern Fall
MT = Monaro Tablelands
NIS = Northern Inland Slopes
SR = Strzelecki Ranges
VA = Victorian Alps

**BCS = bioregional conservation status:**
E = endangered, V = vulnerable,
LC = least concern

| EVC name | Breg | BCS | Current extent | Protected areas | State forest | Other public land | Private land |
|---|---|---|---|---|---|---|---|
| Damp Forest | EGU | LC | 195,247 | 70,706 | 116,820 | 3,347 | 4,374 |
| Damp Forest | HSF | LC | 182,520 | 31,868 | 122,181 | 7,076 | 21,394 |
| Damp Forest | HNF | LC | 96,451 | 17,831 | 70,321 | 4,232 | 4,067 |
| Damp Forest | EGL | LC | 36,219 | 8,517 | 25,789 | 736 | 1,177 |
| Damp Forest | SR | E | 27,762 | 425 | 422 | 6,279 | 20,636 |
| Damp Forest | HFE | LC | 10,197 | 926 | 9,179 | 89 | 2 |
| Damp Forest | VA | LC | 7,847 | 1,976 | 5,586 | 280 | 4 |
| Damp Forest | MT | LC | 3,230 | 635 | 1,693 | 87 | 816 |
| Damp Forest | GP | E | 2,514 | 391 | 335 | 340 | 1,447 |
| Damp Forest | CVU | LC | 789 | 110 | 373 | 13 | 293 |
| Lowland Forest | EGL | LC | 254,642 | 54,221 | 156,320 | 14,727 | 29,374 |
| Lowland Forest | HSF | LC | 75,388 | 10,202 | 27,113 | 7,555 | 30,518 |
| Lowland Forest | GP | V | 31,750 | 5,053 | 8,235 | 3,849 | 14,613 |
| Lowland Forest | EGU | LC | 29,842 | 9,207 | 18,420 | 1,096 | 1,119 |
| Lowland Forest | SR | V | 6,379 | 164 | 1,087 | 1,687 | 3,442 |
| Lowland Forest | HNF | LC | 1,179 | 475 | 458 | 63 | 182 |
| Lowland Forest | HFE | LC | 150 | 97 | 44 | 0 | 8 |
| Wet Forest | HSF | LC | 107,766 | 32,665 | 66,625 | 2,447 | 6,028 |
| Wet Forest | SR | D | 58,199 | 2,949 | 1,122 | 29,276 | 24,851 |
| Wet Forest | HFE | LC | 51,448 | 20,057 | 30,503 | 772 | 117 |
| Wet Forest | HNF | LC | 31,192 | 4,814 | 24,300 | 1,194 | 884 |
| Wet Forest | EGU | LC | 30,937 | 16,140 | 14,474 | 173 | 150 |
| Wet Forest | VA | LC | 8,874 | 1,791 | 6,887 | 152 | 45 |
| Wet Forest | MT | LC | 3,393 | 468 | 2,861 | 19 | 45 |
| Wet Forest | EGL | LC | 181 | 13 | 166 | 2 | 0 |
| Wet Forest | GP | D | 81 | 0 | 0 | 14 | 68 |
| Wet Forest | NIS | LC | 12 | 0 | 12 | 0 | 0 |
| Montane Damp Forest | VA | LC | 159,989 | 62,288 | 92,938 | 4,250 | 512 |
| Montane Damp Forest | HNF | LC | 10,256 | 2,210 | 7,406 | 227 | 413 |
| Montane Damp Forest | HSF | LC | 2,999 | 1,064 | 1,865 | 50 | 21 |
| Montane Damp Forest | MT | LC | 2,089 | 753 | 1,273 | 59 | 4 |
| Montane Damp Forest | EGU | LC | 868 | 332 | 480 | 23 | 34 |
| Montane Damp Forest | HFE | LC | 129 | 108 | 20 | 1 | 0 |
| Montane Damp Forest | NIS | LC | 52 | 0 | 52 | 0 | 0 |

# 3. Threats to biodiversity values

The terms of reference for this assessment specify that VEAC is to report on the current and likely future threats to the biodiversity and ecological values in the assessment area.

There are many different approaches used to assess threats to biodiversity. Some involve qualitative, judgement-based assessment utilising expert opinion, while others are quantitative assessments that include modelling. There has been a significant amount of work undertaken in Victoria on threats to forest biodiversity in eastern Victoria.

## 3.1 Previous and current work

Some of the most detailed work relating to forest biodiversity in the assessment area was carried out 15 to 20 years ago in the preparation of the comprehensive regional assessments for the Regional Forest Agreements (RFAs) in the late 1990s. In addition, action statements prepared for listed species, communities and threatening processes under the *Flora and Fauna Guarantee Act 1988* specifically focus on threats and management action to address those threats. However the preparation of action statements has not kept pace with the listing of species, communities and threatening processes.

The most notable change since that time is the increased attention given to climate change and its potential effects on biodiversity. In addition, it is recognised that climate change is likely to exacerbate and alter the nature of other threats, as well as increase the frequency and severity of extreme events like fire, floods, and drought.

### 3.1.1 Comprehensive regional assessment processes

In the preparation of the comprehensive regional assessments for the RFAs the Victorian and Commonwealth governments agreed that the biodiversity assessments should be undertaken at the species and ecosystem levels and should include reviews of the main threats to such biodiversity in the regions. Each of the biodiversity assessments for the four RFAs in eastern Victoria identified threats or disturbances to forest ecosystems, terrestrial flora, terrestrial fauna and aquatic fauna.

Threatening processes identified as likely to affect forest ecosystems were summarised and discussed in the assessment reports (dated from 1997 to 1999). At a species level, the assessments generally noted that the decline of species can be largely attributed to the impacts of disturbances, both directly on the species and indirectly on essential components of their habitat. Disturbances which can have negative effects (direct or indirect) on a species were referred to as potentially threatening processes.

Table 3.1 lists the potentially threatening processes identified in the comprehensive regional assessments for the four eastern RFAs. Most were mentioned in the biodiversity assessments for all four RFAs.

Table 3.1 Potentially threatening processes identified in comprehensive regional assessments for the eastern RFAs

| Threatening process or disturbance |
|---|
| Clearing of native vegetation/fragmentation |
| Timber harvesting |
| Planned burning - fuel reduction |
| Planned burning - regeneration burning |
| Planned absence of fire |
| Unplanned fire (wildfire) |
| Grazing |
| Road construction and maintenance |
| Recreation |
| Environmental weed invasion |
| Introduced fauna species/predation/competition |
| Pest control |
| Firewood collection |
| Deliberate collection/harvesting (legal and illegal) |
| Mining/quarrying |
| Dams/impoundments/instream barriers |
| Climate change |
| Mineshaft collapse |
| Pathogens/disease/dieback |
| Loss of genetic diversity/genetic pollution |
| Drainage of wetland habitat |
| Waste disposal |

### 3.1.2 Flora and Fauna Guarantee Act listings and action statements

The *Flora and Fauna Guarantee Act 1988* provides for the listing of taxa (genera, species, subspecies, varieties) and communities of flora and fauna which are threatened, and potentially threatening processes.

More than 700 species and communities and 42 threats are listed under the Act. To date, more than 300 action statements have been developed for threatened species, communities and threatening processes listed under the Act.

Listed potentially threatening processes relevant to forest ecosystems in eastern Victoria are shown in table 3.2, ranked in two categories with the first being those with a potential relatively high significance for forest biodiversity in the assessment area and the second being those with a potential moderate significance.

## Table 3.2 Potentially threatening processes listed under the Flora and Fauna Guarantee Act relevant to the assessment area

| **Potential high significance for forest biodiversity** |
|---|
| High frequency fire resulting in disruption of life cycle processes in plants and animals and loss of vegetation structure and composition |
| Human activity which results in artificially elevated or epidemic levels of Myrtle Wilt within *Nothofagus*-dominated Cool Temperate Rainforest |
| Infection of amphibians with Chytrid Fungus, resulting in chytridiomycosis |
| Invasion of native vegetation by Blackberry *Rubus fruticosus* L. agg. |
| Invasion of native vegetation by 'environmental weeds' |
| Loss of coarse woody debris from Victorian native forests and woodlands |
| Loss of hollow-bearing trees from Victorian native forests * |
| Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases |
| Predation of native wildlife by the cat, *Felis catus* * |
| Predation of native wildlife by the introduced Red Fox *Vulpes vulpes* * |
| **Potential moderate significance for forest biodiversity** |
| Alteration to the natural flow regimes of rivers and streams * |
| Alteration to the natural temperature regimes of rivers and streams |
| Collection of native orchids |
| Degradation and loss of habitats caused by feral Horses (*Equus caballus*) * |
| Degradation of native riparian vegetation along Victorian rivers and streams * |
| Habitat fragmentation as a threatening process for fauna in Victoria |
| Inappropriate fire regimes causing disruption to sustainable ecosystem processes and resultant loss of biodiversity |
| Increase in sediment input into Victorian rivers and streams due to human activities |
| Introduction of live fish into waters outside their natural range within a Victorian river catchment after 1770 * |
| Loss of biodiversity in native ant populations and potential ecosystem integrity following invasion by Argentine Ants (*Linepithema humile*) |
| Prevention of passage of aquatic biota as a result of the presence of instream structures * |
| Reduction in biodiversity of native vegetation by Sambar (*Cervus unicolor*) |
| Reduction in biodiversity resulting from Noisy Miner (*Manorina melanocephala*) populations in Victoria |
| Reduction in biomass and biodiversity of native vegetation through grazing by the Rabbit *Oryctolagus cuniculus* |
| Soil degradation and reduction of biodiversity through browsing and competition by feral goats (*Capra hircus*) |
| Soil erosion and vegetation damage and disturbance in the alpine regions of Victoria caused by cattle grazing * |
| Spread of *Pittosporum undulatum* in areas outside its natural distribution |
| The spread of *Phytophthora cinnamomi* from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority |
| Threats to native flora and fauna arising from the use by the feral honeybee *Apis mellifera* of nesting hollows and floral resources |
| Use of *Phytophthora*-infected gravel in construction of roads, bridges and reservoirs |
| Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing |

Note: an asterisk (*) denotes potentially threatening processes for which there is an approved Action Statement

Of the 35 threatened species used in the focused forest-dependent species analysis presented in section 2.4 of this report, twelve have approved action statements under the Flora and Fauna Guarantee Act. Eleven of the twelve action statements mention timber harvesting as a threat and six mention wildfire and six mention competition from other plants/weeds/pests/predators and so on. The next two most frequently mentioned threats are roading and visitor pressures including over collection.

### 3.1.3 Climate change

Of the likely future threats to biodiversity and ecological values, climate change is the one that has received the most recent attention. Several substantial international and national reviews have recently documented the nature of the threats to biodiversity e.g. Steffan et al 2009 in Australia.[8] Climate change is recognised as a new stressor that adds to, and interacts with, a range of existing stressors that have already significantly changed and diminished Australia's biodiversity. At a national level, the most important proximate drivers of change in Australia's biodiversity that will interact with climate change are considered to include:

- loss and fragmentation of habitat associated with land clearing
- redistribution of water resources
- changes in nutrient distributions in soil and water
- changes in fire regimes, mining and salinity
- the introduction of exotic species and diseases.[9]

The recent consultation paper on the review of Victoria's Flora and Fauna Guarantee Act observes that the current objectives of the Act do not acknowledge the significant threat posed by climate change to biodiversity.[10]

## 3.2 Overall approach for this assessment

As well as the Strategic Biodiversity Values component (see section 2), DELWP's NaturePrint initiative includes a decision support tool known as Strategic Management Prospects (SMP). The primary purpose of SMP is to provide spatially explicit information on the expected biodiversity benefits and costs of different management actions to guide programs of active on-ground management.

Key threats and threat management actions for which biodiversity benefits have been modelled include a range of invasive species (and their control), and a lack of habitat and habitat connections (and revegetation to improve this). The likelihood and consequences for biodiversity of timber harvesting and 'too frequent' planned burning have also been modelled. These management regimes have their own planning processes, but the models are included in SMP so that the consequences of these regimes are also considered when analysing options for on-ground threat management (e.g. where a location is required to be in a high-intensity planned burning zone to protect infrastructure, this will be a less-preferred location for a revegetation corridor).

---

8 Steffen W, Burbidge AA, Hughes L, Kitching R, Lindenmayer D, Musgrave W, Stafford Smith M, Werner PA (2009) *Australia's biodiversity and climate change: A strategic assessment of the vulnerability of Australia's biodiversity to climate change*, Report to the Natural Resource Management Ministerial Council commissioned by the Australian Government. CSIRO Publishing

9 Hughes L, Hobbs R, Hopkins A, McDonald J, Stafford Smith M, Steffen W, Williams S, 2010: *National climate change adaptation Research plan for terrestrial biodiversity*, National Climate Change Adaptation Research Facility, Gold Coast.

10 DELWP 2017 *Flora and Fauna Guarantee Act review consultation paper*

In summary, the SMP modelling applies information about the expected benefit from the action for each species to places where that action would take effect. It then combines that information for all species to produce the overall modelled benefits for that action.

Information about the expected benefit from each action for relevant species was derived from extensive and systematic consultation with expert biologists familiar with the species and threats. Resultant information covered such things as the spatial extent and intensity under different conditions of the predicted benefits.

The results of the analyses for some invasive species and fire frequency are presented in the following two sections.

## 3.3 Threats from invasive species

### 3.3.1 Approach

#### Background

Invasive species are one of the major threats to biodiversity worldwide and many are known to adversely affect threatened species in the assessment area.

DELWP's Strategic Management Prospects tool has modelled the benefit of management actions to mitigate the threats from a range of invasive species – foxes, all deer species, all weeds, cats, rabbits, feral horses and goats, and the native – but invasive – noisy miner. In this assessment the analyses for foxes, deer and weeds have been applied to the forest-dependent threatened species as the most likely to have the most significant impact in the assessment area.

#### Rationale

Invasive species are a major threat to forest biodiversity – in its own right, as well as assisting in providing context for other threats analysed here.

#### Inputs

- Habitat distribution models for all vertebrate fauna and vascular plant species
- Response models predicting the benefit of controlling specific invasive species for each species, derived from expert input and species traits
- Habitat distribution models of the specific invasive species.

#### Analysis

The trait-based species response models were used to map the expected benefit, for each species, of controlling invasive species at each location (225 metre x 225 metre grid cell), based on local habitat type, condition (including the likelihood of other threatening processes in a location), and landscape context. The species-specific benefit is defined as the change in habitat suitability associated with controlling a given invasive species (e.g. foxes). The total benefit for a location is calculated as a weighted sum of the benefits for all species, where the weights are determined by the relative importance of each location to the overall persistence of a species (i.e. benefits to rare or restricted species are weighted above benefits to widespread and common species).

#### Interpreting the results

When interpreting these maps, it should be noted that because the maps are derived from a process fundamentally designed to quantify benefits, they include a consideration of the extent to which actions to address the threat are likely to actually do so. As a result, these maps are less similar to maps of impact than the map for fire frequency (figure 3.4). This is because, for example, the question with fire frequency would be ‘how much would this species benefit from the removal of too frequent burning in this area?’ assuming the total removal of the threat in the given area. However, total removal of the threat is unrealistic for most invasive species (e.g. ‘fox extinction’) and so the benefit would be less than the total extent of the impact.

### 3.3.2 Analysis of the threat from invasive species – all land

Figure 3.1 Results for invasive species analysis – red fox, all land

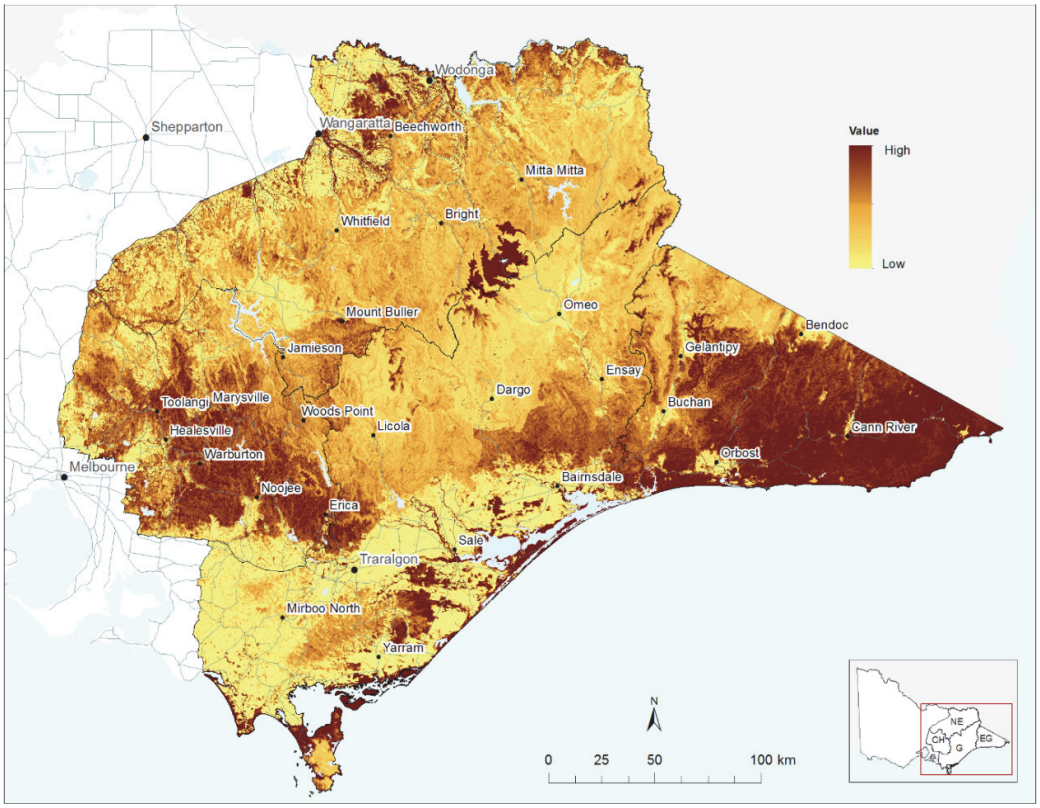



Figure 3.2 Results for invasive species analysis – all deer, all land

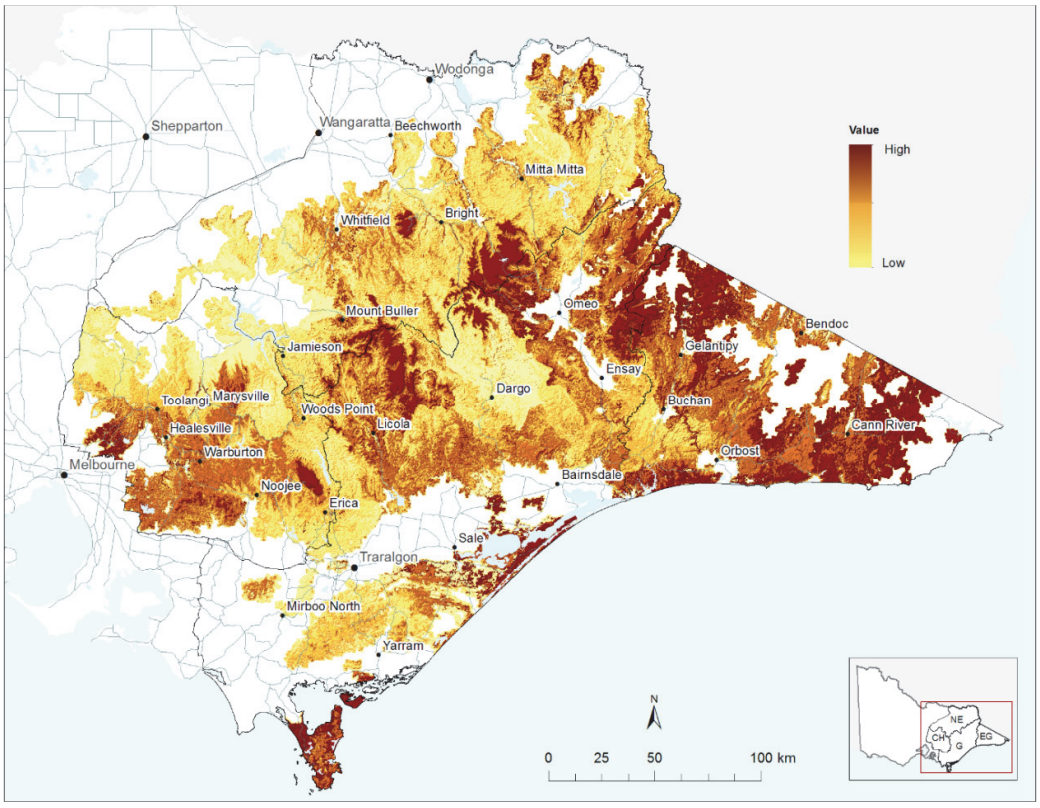
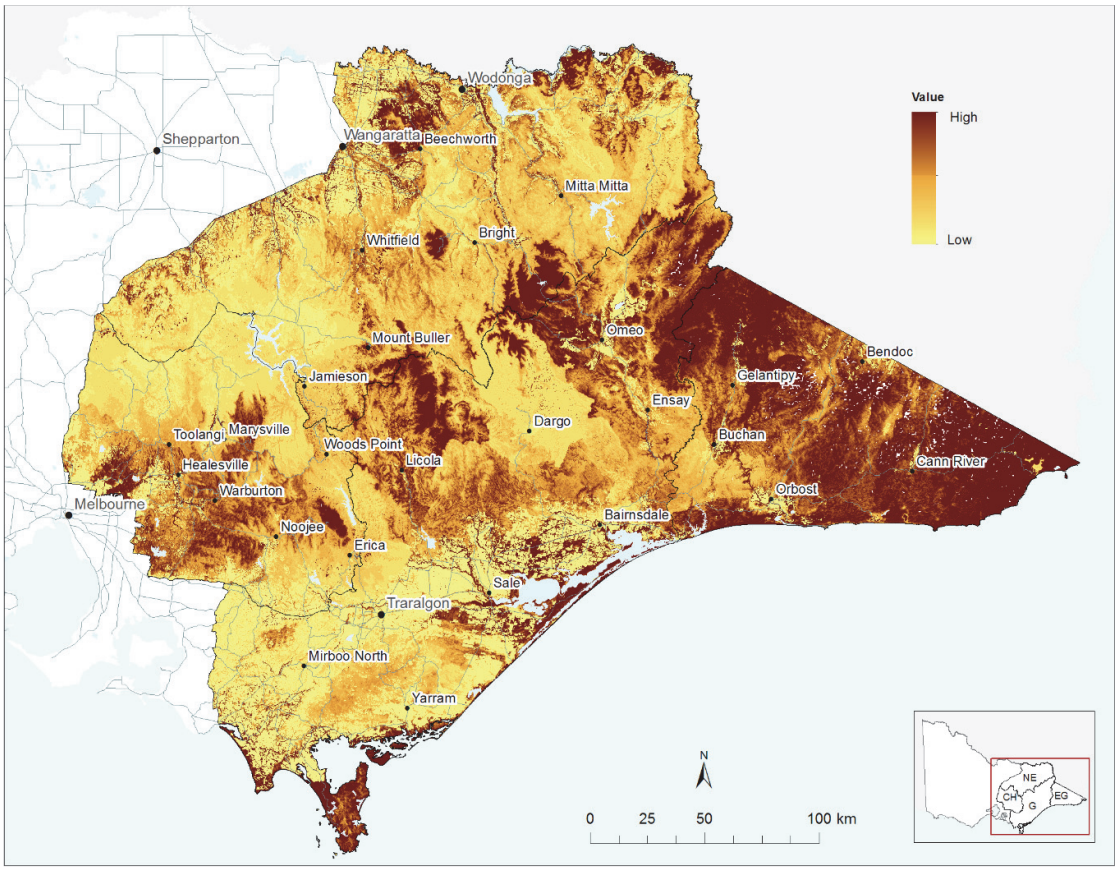


Figure 3.3 Results for invasive species analysis – all weeds, all land




## Key points

- The most obvious difference between these three maps results from the different spatial occurrence of the threats – with foxes and weeds apparent across the entire assessment area, while the distribution of deer is more patchy and largely absent from extensive cleared areas such as the La Trobe Valley and much of northeast Victoria.
- No pattern of variation is apparent between different categories of public land, pointing to the spread of the various invasive species across the landscape largely unimpeded by differences in environmental or management regimes.
- The invasive species threats are all more patchy compared to planned burning, often with high and low threat areas in close proximity. In particular there are some large patches around several higher elevation areas where the other threats are generally not high – e.g., between Mount Buller and Licola, and Bright and Omeo. In recent years the sambar population and its range in the assessment area have expanded considerably and as a result the threat is likely to be in a state of flux. The same may be true, albeit to a lesser extent, for fallow deer but probably not for hog deer, foxes and weeds generally.
- The threat from invasive species is generally high in the high biodiversity value areas of East Gippsland and the Central Highlands.

## 3.4 Consequences from frequent fire

### 3.4.1 Approach

#### Background

Planned burning for fuel reduction is a widespread management tool on public land across the assessment area, with the potential to impact on threatened species if burning is too frequent or infrequent. In reality insufficiently frequent fires rarely manifest to the point of significant impact on forest biodiversity. The threat from frequent fire is relatively amenable to analysis largely because of work done to incorporate ecological factors into the planning of fuel reduction burning, particularly in the determination of the 'tolerable fire interval' for vegetation communities across the state.

The tolerable fire interval between fires for any given vegetation community is determined by the time taken by the constituent plant species to reach maturity and set seed, and the time to extinction in the absence of fire. If fire is too frequent, species that are not able to reproduce may be lost from the community. If the interval between fires is too long, species that depend on fire for regeneration may die out. Accordingly, the tolerable fire interval provides an ecologically meaningful, spatially explicit and widely applied basis to analyse the threat from frequent fire.

Wildfires (as opposed to planned fires) are not presently included in the Strategic Management Prospects analysis because of complexities in predicting their effects and occurrence. Compared to planned burns, wildfires generally make a small contribution to fire frequency.

#### Rationale

Too frequent fire is a potentially pervasive threat to forest biodiversity that, as well as being of interest in its own right, assists in providing some context for other threats analysed here.

#### Inputs

- Habitat distribution models for all vertebrate fauna and vascular plant species
- Response models predicting the benefit of preventing burning below the tolerable fire interval for each species, derived from expert input and species traits
- Tolerable fire interval mapping
- Mapping of the likelihood of burning below the tolerable fire interval

#### Analysis

The trait-based species response models were used to map the expected change in habitat suitability (benefit), for each species, associated with increasing the interval between planned burns beyond the tolerable fire interval, in areas where more frequent burns are expected under current planning regimes. The total benefit for a location is calculated as a weighted sum of the benefits for all species, where the weights are determined by the relative importance of each location to the overall persistence of a species (i.e. benefits to rare or restricted species are weighted above benefits to widespread and common species).

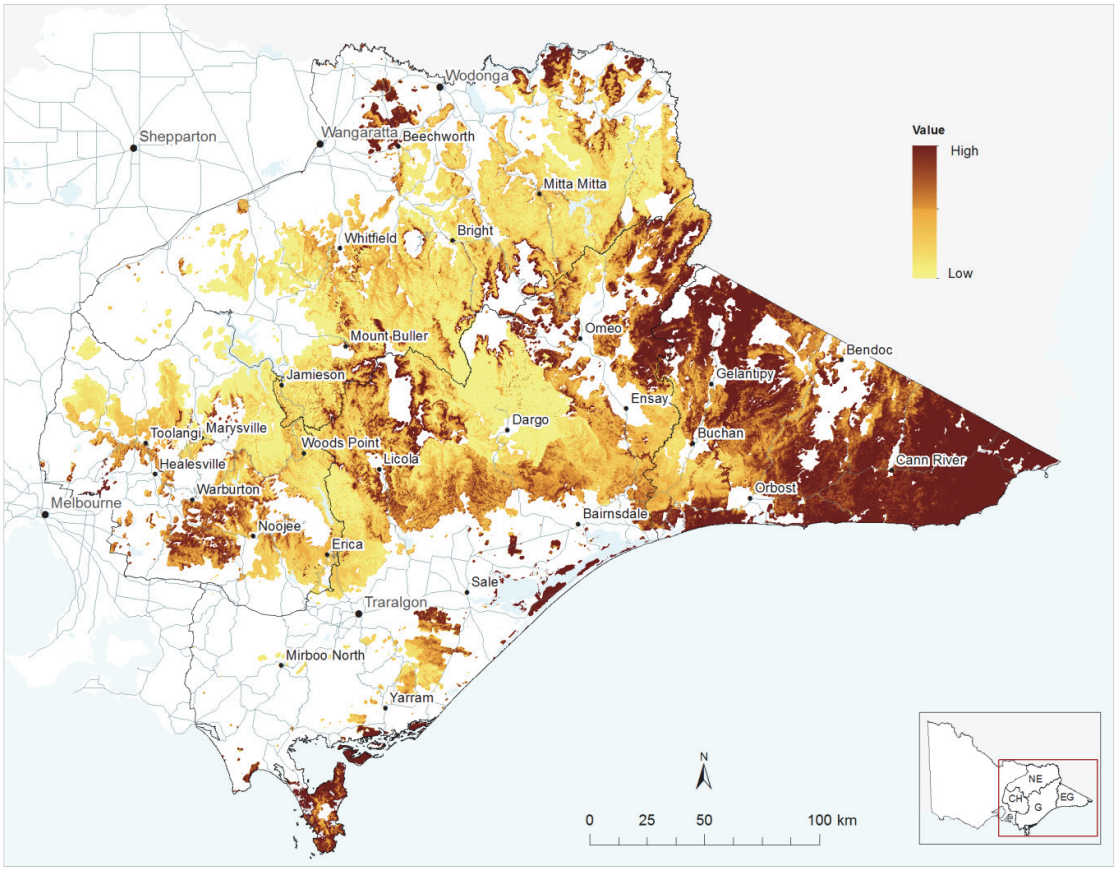
#### Interpreting the results

When interpreting this map, it should be noted that areas scoring highly in this analysis have both a relatively high number of species likely to be negatively affected by burning below the tolerable fire interval and a relatively high probability of such burning. Because planned burns are generally low intensity ground fires and rarely do significant damage to the forest canopy,

species likely to be negatively affected by burning below the tolerable fire interval will mostly live close to the ground.

### 3.4.2 Analysis of the potential consequences from frequent fire – all land

Figure 3.4 Results for frequent fire consequences analysis – all land




## Key points

- The generally very low or zero potential consequences on private land reflects the focus of planned burning being on public land. As a result this issue is not as widespread as that of invasive species (figure 3.1 – figure 3.3) but it is more pervasive than the issue of timber harvesting with most public land exposed to some degree to the likelihood of frequent fire.
- There is no broad consistent pattern of variation across different categories of public land (e.g., protected areas compared to state forest), with a few exceptions that tend to be correlated with environmental attributes – such as the high elevation plateaux of Baw Baw, Howitt Plains, Buffalo and Bogong which are all in national parks.

# 4. Public land use and management

The terms of reference for this assessment specify that VEAC is to report on public land use and management. This section of the report provides information on the public land base in the assessment area, outlines the role of VEAC and its predecessors in establishing the current framework for public land management, and describes the complex legal and policy framework for managing state forest and forest biodiversity.

In addition to harvesting of timber for sawlog and pulplog, state forest also provides domestic firewood, honey, forage, road-making materials and other forest products and minerals to satisfy various community needs. State forest also has a multiplicity of other uses and values including protection of water supply catchments, conservation of plants and animals, outdoor recreation and education.

Some of these values and uses are potentially in conflict — in particular protection of biodiversity and uses that disturb the natural environment such as timber harvesting. The potential conflicts are starkly illustrated in section 2 of this report, in the maps showing some of the areas making the highest contributions to forest biodiversity conservation overlapping with some of the most productive forests for timber.

The discussion paper for VEAC's Statewide Assessment of Public Land (2016) provides a comprehensive stocktake of the values and uses of public land including biodiversity, cultural values, recreation and tourism, resource uses, and government and operational uses. The discussion paper also has a detailed description of Victoria's public land, including classification, legislation and management.

## 4.1 Public land in the assessment area

### 4.1.1 Areas of public land and state forest

For the purposes of its Statewide Assessment of Public Land, VEAC recalculated the total area of Victoria and the area of public land in Victoria.[11] The total area of terrestrial land is 22,752,350 hectares (including islands) of which public land makes up 8,397,709 hectares. The area of state forest in Victoria is 3,148,800 hectares or approximately 37 per cent of terrestrial public land. There is approximately 2,468,202 hectares of state forest in the four RFA areas east of the Hume Highway.

State forest is zoned into three management zones: the Special Protection Zone (SPZ), the Special Management Zone (SMZ) and the General Management Zone (GMZ). Areas zoned GMZ and SMZ are potentially available for timber harvesting. In the four eastern RFAs 1,842,877 hectares of state forest is zoned GMZ and SMZ. This area differs from the area cited by VicForests as available for harvesting (1,820,000 hectares) because VicForests cites the allocated area in the allocation order[12] which has a different western boundary than that of the eastern RFA areas and excludes some areas. RFAs are described in more detail in section 4.2.2, and timber allocation orders and the forest management zoning scheme in section 4.2.3.

### 4.1.2 Role of the Land Conservation Council (LCC) and successors

The LCC, established in 1971, and its successors (the ECC and VEAC) were established to carry out studies on public land throughout Victoria and make recommendations to government on the appropriate use of that land.

---

[11] VEAC 2016 *Statewide assessment of public land – Discussion paper pages* 16-17

[12] Allocation (Amendment) Order 2014 Victorian Government Gazette No S 405, 30 October 2014

The recommendations, as accepted by government, form the framework for the way in which public land is used and managed in Victoria.

Government-accepted LCC/ECC/VEAC recommendations are binding on government departments and public authorities. The recommendations govern how the public land is used and managed, regardless of the underlying legal status.

To enable the orderly investigation of public land, the LCC initially divided Victoria into 17 study areas. Since it made its first recommendations to government in 1973, the LCC and its successors have conducted 44 separate regional studies, reviews and statewide or special investigations on most public land in Victoria. The area-specific recommendations of the councils identify land use categories and, for each category, specify its purpose, nominate the suitable uses and list the inappropriate uses that are not permitted. Some of the most relevant LCC land use studies or reviews for the eastern Victoria forests are: Alpine Area Special Investigation (1983), East Gippsland Area review (1986), Melbourne Area District 2 review (1994), Wilderness Special Investigation (1991) and Rivers and Streams Special Investigation (1991).

More information on the origin and role of the LCC and that of its successors and the legal status of government-accepted land use recommendations is provided in chapter 2 of the discussion paper for VEAC's Statewide Assessment of Public Land (2016).

## 4.2 Legal and policy framework

Management of state forests in Victoria is carried out within a complex legal and policy framework.

### 4.2.1 National forest policy

Australia has endorsed the Global Statement of Principles on Forests, presented at the 1992 United Nations Conference on the Environment and Development. An outcome of this endorsement was the preparation of a strategy for the ecologically sustainable management of Australia's forests, the National Forest Policy Statement[13], which has been signed by the federal and all state and territory governments.

In 1993, Canada convened the International Seminar of Experts on the Sustainable Development of Boreal and Temperate Forests. This led to the development of the Montreal Process criteria and indicators. These criteria are designed to reflect the ecological, economic and social components of sustainable forest management. The Montreal Process criteria are:

- conservation of biological diversity
- maintenance of productive capacity of forest ecosystems
- maintenance of ecosystem health and vitality
- conservation and maintenance of soil and water resources
- maintenance of forest contribution to global carbon cycles
- maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies; and legal, institutional and economic framework for forest conservation and sustainable management.

[13] Commonwealth of Australia 1992

Regional indicators have been developed within these criteria for use in Australia. *Australia's Sustainable Forest Management Framework of Criteria and Indicators* 2008[14] forms the basis for measuring and reporting on sustainable forest management in Australia.

### 4.2.2 Regional forest agreements (RFAs)

Regional forest agreements between the federal, state and territory governments are a key outcome of the National Forest Policy Statement. Victoria has five such agreements, signed between 1997 and 2000. The Australian government coordinates a national approach to environmental and industry issues, while Victoria is responsible for managing the forests. These agreements are intended to last for 20 years.

The main objectives of the Victorian RFAs are:

- to identify a comprehensive, adequate and representative reserve system and provide for the conservation of those areas
- to provide for the ecologically sustainable management and use of forests in each RFA region, and
- to provide for the long-term stability of forests and forest industries.

The performance of all RFAs is reviewed together every five years. The first review period was from the date the RFAs were signed to 30 June 2004, and the second review period was from 1 July 2004 to 30 June 2009. These two review periods were assessed in one report, which was tabled in Parliament in 2010.[15] The joint Australian and Victorian government response to the review was tabled in Parliament in 2015.[16] No subsequent reviews have yet been completed.

The Australian and Victorian governments executed an amendment to the East Gippsland RFA on 20 January 2017, extending its expiry from 3 February 2017 to 27 March 2018.

This extension of the agreement for 13 months will line up its expiry with the Central Highlands RFA. It allows the governments to consider the outcomes from the third five-yearly review of Victoria's RFAs which is expected to be completed by September 2017. It also allows the Victorian government to consider the advice from the Forest Industry Taskforce on the future management of forests in eastern Victoria.[17]

### 4.2.3 Victoria's legislative framework

The Department of Environment, Land, Water and Planning (DELWP) manages state forests on behalf of the Victorian community. State forest is managed to balance a variety of uses. These uses include conserving flora and fauna, protecting water catchments and water supply, providing timber for sustainable forestry, protecting landscape, traditional owner, archaeological and historic values, and providing recreational and educational opportunities.

VicForests is the state-owned enterprise that is responsible for the sustainable harvest and commercial sale of timber from state forests in Victoria. The Minister for Agriculture through the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) provides guidance to VicForests on operating in a framework that is consistent with Victorian government policy and priorities. The Department of Treasury and Finance supports the Treasurer in his role as the sole shareholder of VicForests and oversees its commercial and financial performance.

---

14 Commonwealth of Australia 2008

15 Wallace, L 2010 *Independent review on progress with implementation of the Victorian Regional Forest Agreements*

16 DEPI 2014

17 http://www.agriculture.gov.au/forestry/policies/rfa/regions/vic-eastgippsland

A range of state legislation governs forest management and timber harvesting in Victoria and specifies the areas of state forests that are subject to commercial activities.

### Sustainable Forests (Timber) Act 2004

This Act provides a framework for sustainable forest management and sustainable timber harvesting in state forests. Amongst other things, it provides for the allocation of timber to VicForests through an allocation order and the development of a sustainability charter for Victoria's state forests, determines sustainability criteria and indicators and reporting requirements, and establishes the requirement to comply with codes of practice.

#### Sustainability Charter for Victoria's state forests (2006)

The Sustainability Charter sets objectives for the sustainability of public native forests and the sustainability of the timber harvesting industry on public land in Victoria. The seven objectives set out in the charter are consistent with the Montreal Process for sustainable forest management and the principles of ecologically sustainable development.

Victoria's performance on progressing these objectives is monitored through Victoria's criteria and indicators for sustainable forest management and publicly reported through the five-yearly release of Victoria's state of the forests report.

#### Criteria and indicators for sustainable forest management in Victoria (2007)

The criteria and indicators were developed by the then Department of Sustainability and Environment with the assistance of key experts, Government partners, and in consultation with the community. These criteria and indicators are consistent with the Montreal Process, and complement the *Australia's Sustainable Forest Management Framework of Criteria and Indicators* (2008). The 45 indicators will inform Victorians on progress toward the objectives set out in the sustainability charter.

#### State of the forests reporting

DELWP produces a State of the Forests Report every five years to assess progress towards sustainable forest management. The report assesses this progress using the 45 indicators for sustainable forest management in Victoria. The third and most recent report was released in 2013.

#### Timber allocation order

The Minister for Agriculture allocates timber resources in state forest to VicForests for harvesting and sale through an allocation order. The allocation order is published in the Victorian Government Gazette, and describes the location and extent of forest stands within state forest to which VicForests has access, the maximum area available for timber harvesting in any five-year period, any additional activities that VicForests is allowed to undertake, and a number of conditions VicForests must comply with in carrying out its functions under the allocation order.

VicForests may only harvest and/or sell vested timber resources in accordance with the allocation order. The most recent allocation order is dated 30 October 2014, which was an amendment of the 1 October 2013 order.

#### Timber release plans

Areas for harvesting in eastern Victoria are managed by VicForests according to timber release plans (TRP). After the allocation order to VicForests has been gazetted by the Minister, the Act requires a plan to be developed for the area to which an allocation order applies.

The TRP is a five-year rolling plan that identifies areas (coupes) that may be harvested for timber over the next three to five years. The TRP lists the coupes, their locations, the type of forest within and the method of harvesting that would be used in each one. Evaluation and feedback is provided on proposed TRPs by a number of stakeholders including DELWP, DEDJTR, Parks Victoria, Aboriginal Affairs Victoria, and the local community.

### Forests Act 1958

This Act provides for the management of state forests, including the protection of public land from fire, the development of forest management plans, licensed occupations including grazing and beekeeping, and the sale of forest produce.

#### Forest management areas

Forest management areas (FMAs) are units for planning and managing state forest, and are defined in the Forests Act. Victoria has 15 forest management areas. The Wodonga and Wangaratta FMAs are currently managed together as the North East FMA. The assessment area includes the East Gippsland, Tambo, Central Gippsland, Central, Benalla Mansfield and North East FMAs and part of the Dandenong FMA. The FMA boundaries do not align with the RFA boundaries.

#### Forest management plans

Section 22 of the Forests Act provides the Secretary of DELWP with a broad power to establish and revise a working plan 'with respect to the control, maintenance, improvement, protection from destruction or damage by fire or otherwise, and removal of forest produce in and from State forests'. For the purposes of section 22, forest management plans are a working plan.

Forest management plans outline information and minimum prescriptive management actions resulting from Victoria's RFA process. They establish strategies for integrating the use of state forest for wood production and other purposes with the conservation of natural, aesthetic and cultural values. To balance these uses, forest management plans include:

- conservation guidelines which specify minimum levels of planned protection provided for natural values in state forest, taking into account the extent of those values in formal reserves
- forest management zones which set priorities and permitted uses in different parts of state forest
- a process for adapting to change in a systematic and orderly manner.

Forest management plans are developed with experts from disciplines such as forestry, botany, wildlife biology, catchment management, water resources, cultural heritage and recreation planning, in consultation with the public. Information on the uses and values of the forest (including natural, cultural, social, resource and economic) arising from the RFA comprehensive regional assessment processes informs the planning process. There are several forest management plans covering the four RFA areas subject to this assessment (see table 4.1). Forest management plans align with the RFA areas and therefore may cover one or more FMAs, and different areas of a FMA may be subject to different management plans.

Table 4.1 Forest management plans applying to the assessment area

| Plan | Date created | Forest management areas (FMA) |
|---|---|---|
| *Forest Management Plan for the East Gippsland Forest Management Area* | 1995 | East Gippsland FMA |
| *East Gippsland Forest Management Plan Amendment: amendments subsequent to the East Gippsland RFA* | 1997 | East Gippsland FMA |
| *Forest Management Plan for the Central Highlands* | 1998 | Central FMA, western part of Central Gippsland FMA, northern part of Dandenong FMA (no forests in the southern part of this FMA) |
| *Forest Management Plan for the North East* | 2001 | Benalla–Mansfield FMA, Wangaratta FMA, majority of Wodonga FMA (Wangaratta and Wodonga FMAs are managed as North east FMA) |
| *Forest Management Plan for Gippsland* | 2004 | Entire Tambo FMA, eastern part of Central Gippsland FMA, 11 south-eastern blocks of Wodonga FMA (now North-east FMA) |

### Forest zoning

The forest management zoning scheme is the spatial representation of a working plan, or forest management plan. This detailed zoning system allows for the protection and management of a range of values and uses of state forest.

The zoning scheme includes special protection zones (SPZ), special management zones (SMZ), and general management zones (GMZ).[18]

***Special protection zones*** are managed for the conservation of natural, cultural, recreation and amenity values. Larger components of SPZs include old-growth forest, habitat for rare and threatened species, areas of rainforest, and representative examples of ecological vegetation classes. SPZs form part of the Comprehensive, Adequate Reserve (CAR) System, which is a key element of delivering on the conservation objectives set out in Regional Forest Agreements. A number of smaller areas such as historic and recreation sites are also included in SPZs. Each component of this zone is managed to minimise disturbances or processes which threaten conservation values, and timber harvesting is excluded. Timber resources in the SPZ are not included in sawlog sustainable yield forecasts. SPZs may be removed or amended, for example, if the values they are protecting no longer exist, or review processes demonstrate that alternative areas are a higher priority for protection.

Special management zones are managed to maintain specific values while catering for some timber production. This zone primarily includes areas of high landscape value, the protection of which require modification to timber harvesting or other land use practices rather than their exclusion. Management of this zone tends to be considered on a case-by-case basis within the constraints outlined in relevant forest management plans. Timber and other forest produce may be harvested from this zone. This zone forms part of the area that contributes to the sustainable yield of sawlogs, provided that modifications to normal management practices adequately address the protection of the identified values, or positively contribute to their conservation.

[18] Descriptions of zones are drawn from forest management plans, particularly the Forest Management Plan for Gippsland 2004

***General management zones*** cater for a range of uses, with timber production being a high priority. Forest in this zone will be managed for the sustainable production of sawlogs in accordance with the Code of Practice for Timber Production (see section 4.4) and more detailed local management prescriptions. Other management aims include protection of landscape and water quality, provision of recreation and educational opportunities, fire protection and conservation of natural values to complement adjacent zones.

A number of sub-zones apply within the SMZ and GMZ, as follows:

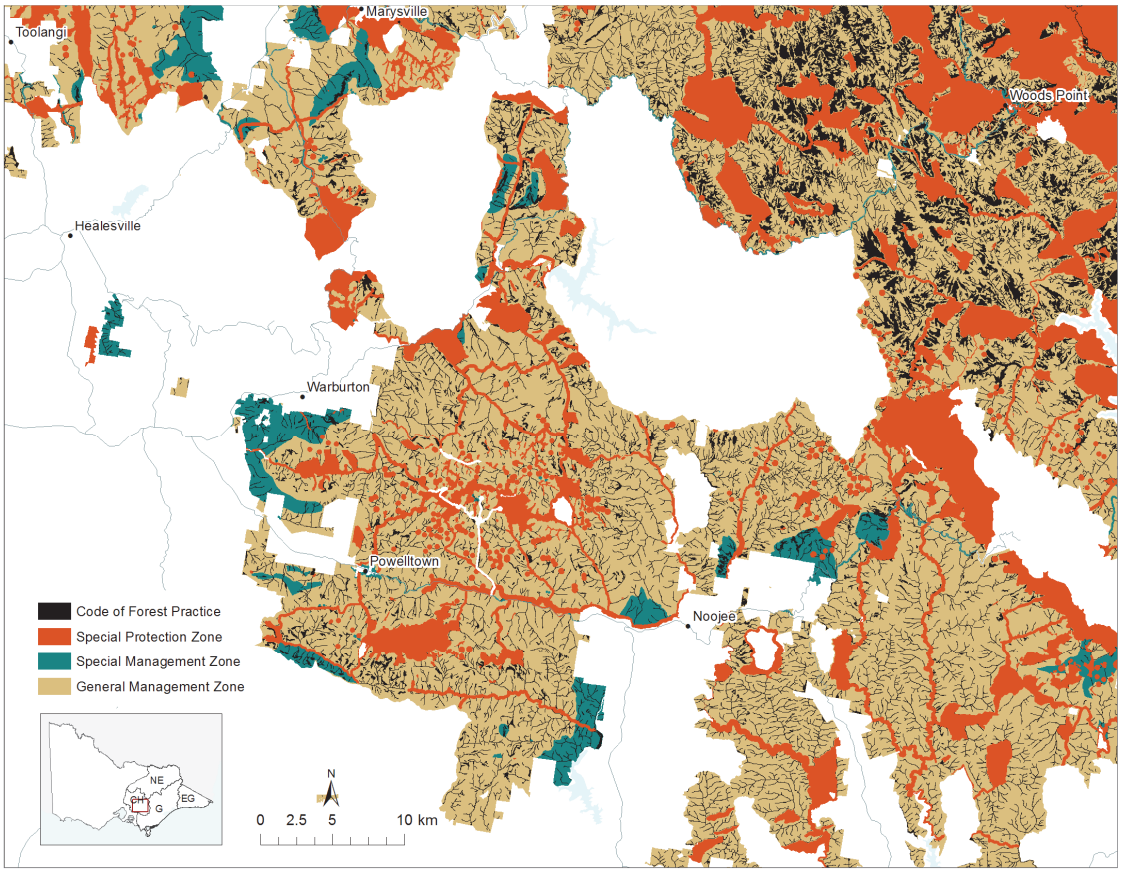
***Timber production sub-zones*** are used to produce sawlogs on a sustainable basis in accordance with the Code of Practice for Timber Production and regional prescriptions. This sub-zone corresponds to the net area in both the GMZ and the SMZ that is both available and suitable for producing sawlogs. It generally corresponds to sites where soil and rainfall conditions enable suitable tree species to grow to a height of about 28 m or greater. Harvested areas will be regenerated with local species, and the regrowth across the sub-zone will produce a mosaic of native forest of different ages.

***Other uses sub-zones*** apply to forest within the GMZ and SMZ where productivity is too low for sawlog harvesting under current arrangements. This sub-zone contributes to the conservation of drier forest types and associated fauna. While activities such as fuel-reduction burning, harvesting of other forest produce (such as firewood, poles and honey) and recreation are permitted, they will generally be localised, leaving much of the area relatively undisturbed.

***Code exclusions sub-zones*** identify areas within the GMZ and SMZ that are excluded from harvesting operations due to the requirements of the Code of Practice for Timber Production. It includes stream buffers and slopes generally greater than 30 degrees. Much of this area will remain largely undisturbed and contributes to the conservation of a number of ecological vegetation classes and related fauna.

Figure 4.1 shows the combination of forest management zones and code exclusion subzones for an example area near Warburton in the Central Highlands RFA area.

Figure 4.1 Forest management zones and code exclusion sub-zones near Warburton




The Secretary of DELWP may amend the forest management zones at any time, subject to administrative processes. Amendments must also be consistent with Regional Forest Agreements. The *Code of Practice for Timber Production 2014* (the Code) discussed below incorporates a set of planning standards that were transcribed from relevant forest management plans and action statements under the *Flora and Fauna Guarantee Act 1988*. These planning standards are the basis for decision making but are not binding on the Secretary. Where these planning standards do not reflect the latest information or are silent, other relevant information may also be taken into account. For example, Action Statements written since 2014 and the advice of biodiversity experts may be used to create an interim planning standard that forms the basis for zoning decisions until the Code can be updated. For significant updates of the forest management zones, public consultation is required.

Table 4.2 indicates the activities permitted in each zone. Soil and water conservation, maintenance of native forest cover and wildfire suppression are high priorities in all zones.

Table 4.2 Activities permitted in forest management zones

| Activity | SPZ | SMZ | GMZ |
|---|---|---|---|
| Timber production: sawlog, residual log, sleepers | No | Conditional | Yes |
| Timber production: firewood, posts, poles | No | Conditional | Yes/ Conditional[1] |
| Regrowth thinning | No | Conditional | Yes |
| Prescribed fire | Conditional | Conditional | Yes/ Conditional |
| Recreation and tourism[2] | Conditional | Yes/ Conditional | Yes |
| Apiculture | Conditional | Yes/ Conditional | Yes |
| Seed collection | Conditional | Yes/ Conditional | Yes |
| Eucalyptus oil production[3] | No | Conditional | Yes |
| Stock grazing | No/ Conditional | Conditional | Yes/ Conditional |
| Extractive activities[4] | No/ Conditional | Conditional | Yes/ Conditional |
| Mining activities | Yes | Yes | Yes |
| Road construction | Conditional | Conditional | Yes/ conditional |

Notes

1. The collection of firewood, posts, poles is only described as conditional in the East Gippsland and Midlands FMAs.
2. Recreation includes bushwalking, fishing, hunting, four wheel driving, horse riding, and camping.
3. The collection of eucalyptus oil is only described in the Bendigo FMP.
4. Extractive activities includes extraction of rock, sand, gravel, clay and soils and is regulated under the *Extractive Industries Development Act 1995* (EIDA).

   Yes: permitted under standard conditions.

   Conditional: permitted with additional conditions specified in FMP, or to the extent it does not conflict with the values identified for the respective area.

   No: not permitted.

   Yes/ conditional or No/ conditional: this activity is permitted (or not) in some FMPs and conditional in others.

### Conservation, Forests and Land Act 1987

This Act addresses requirements for the protection of land, water and wildlife prior to the commencement of harvesting or construction activities, as met through approval of the Timber Release Plan process, and enforces compliance with the Code of Practice for Timber Production.

## 4.3 Administrative arrangements

A number of state government agencies have roles and responsibilities relating to state forests and/or native timber harvesting in Victoria.

The Department of Environment, Land, Water and Planning (DELWP) has responsibility for managing public land in Victoria including the Crown land making up state forest. It also regulates compliance of VicForests' activities with the Code of Practice for Timber Production. DELWP also has broader roles in forest policy and forest management zoning, and management roles in relation to fire, biodiversity, recreation, administration of some non-commercial licences. The Department of Economic Development, Jobs, Transport and Resources (DEDJTR), VicForests and Department of Treasury and Finance (DTF) are the key

government agencies with roles and responsibilities in relation to the native timber industry in Victoria.

VicForests was established in 2003 by Order in Council under the *State Owned Enterprises Act 1992*. The Treasurer is the sole shareholder. The responsible Minister is the Minister for Agriculture. VicForests is responsible for the sustainable harvest, regrowing and commercial sale of timber from Victoria's state forests on behalf of the Victorian government. DTF undertakes functions on behalf of the Treasurer as the shareholder of VicForests. DEDJTR manages the allocation orders, has responsibility for forest industries policy, manages public safety zones for timber harvesting operations, supports the Minister for Agriculture in her duties relating to VicForests and, together with DTF, monitors VicForests' corporate governance.

## 4.4 Environmental management of Victoria's forests

In addition to the formal conservation reserve system and forest management zones, there is a comprehensive regulatory system for activities that occur in state forest that may impact biodiversity and other natural values. The primary regulatory document is the *Code of Practice for Timber Production 2014* which applies to all commercial timber production activities in public and private native forests and plantations in Victoria.

### 4.4.1 Code of practice for timber production

The purpose of the code is to provide direction and guidance to forest managers and operators to deliver sound environmental performance when growing and harvesting commercial timber in a way that:

- permits an economically viable, internationally competitive, sustainable timber industry;
- is compatible with the conservation of the wide range of environmental, social and cultural values associated with forests;
- provides for the ecologically sustainable management of native forests proposed for cyclical timber harvesting operations; and
- enhances public confidence in the management of timber production in Victoria's forests and plantations.

Timber production on all native forest and plantations in Victoria is guided by six code principles, which are developed from the internationally recognised Montreal Process criteria, and are consistent with the objectives of the sustainability charter.

The six principles are that:

- biological diversity and the ecological characteristics of native flora and fauna within forests are maintained
- the ecologically sustainable long-term timber harvesting capacity of forests managed for timber harvesting is maintained or enhanced
- forest ecosystem health and vitality is monitored and managed to reduce pest and weed impacts
- soil and water assets within forests are conserved. River health is maintained or improved
- cultural heritage values within forests are protected and respected
- planning is conducted in a way that meets all legal obligations and operational requirements.

The *Management standards and procedures for timber harvesting operations in Victoria's State forests* 2014 are derived from the Code of Practice for Timber Production, and are intended to assist managing authorities, and harvesting entities in interpreting the requirements of the

Code. These management standards include a number of planning standards. Prior to 2014, prescriptions that specified particular management actions, such as threatened species protections or stream buffers, were stated in Forest Management Plans and Action Statements. With the 2014 revision of the Code, many of these prescriptions (e.g. for Leadbeater's possum) were transcribed directly into the planning standards.

### 4.4.2 Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act) is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. It provides for the listing of threatened plant and animal species, ecological communities and potentially threatening processes. Under the Act, action statements are required to be prepared for listed species and ecological communities. Action statements outline research and actions to help threatened species or ecological communities or mitigate potentially threatening processes and are available on DELWP's website.

The Act also requires the preparation of a Flora and Fauna Guarantee Strategy. The most recent strategy was published as Victoria's Biodiversity Strategy in 1997 and a new strategy is currently in preparation under the title *Protecting Victoria's Environment – Biodiversity 2036*.

The FFG Act is currently being reviewed by the Victorian Government.[19]

### 4.4.3 Forest management and Leadbeater's possum

The Leadbeater's possum is a small marsupial, endemic to Victoria. It is Victoria's state faunal emblem. While it occurs in three habitat types, the greatest population occurs in area of approximately 5,600 square kilometres within ash forests and sub-alpine woodlands in the Central Highlands. The species is listed as threatened under the Victorian Flora and Fauna Guarantee Act, and critically endangered under the Commonwealth Environment Protection and Biodiversity Conservation Act. Habitat loss and fragmentation, through bushfires and timber harvesting, is the main threat to the persistence of the species.

#### Leadbeater's possum 'reserve'

The Central Highlands Forest Management Plan divided the known range of the Leadbeater's possum into 21 management units (LMUs), based on the extent and distribution of their preferred habitat type, ash forest. Within each LMU, the goal was to identify and protect over 600 hectares of suitable habitat so that each unit could support a viable population of the species.

The so-called Leadbeater's Possum reserve was designated in 2008. This 'reserve' contained 30,500 hectares of high-quality Leadbeater's possum habitat in 127 patches greater than 50 hectares in size and containing predominantly old-growth ash forest. Areas for inclusion in the reserve were assessed irrespective of public land use category; 58 per cent of the reserve occurred in existing parks and reserves, and 27 per cent occurred in pre-existing SPZs in state forest. Less than 2,500 hectares fell within productive forest areas available for timber harvesting, and these areas became SPZs in 2008. In the February 2009 fires, 45 per cent of the 30,000 hectares Leadbeater's Possum reserve was burnt.[20]

#### Zoning

A special zoning system exists for managing Leadbeater's possum in areas of state forest. This was first proposed in the 1995 FFG Act action statement and implemented through the Central

[19] DELWP 2017 Review of the Flora And Fauna Guarantee Act 1988 Consultation Paper

[20] DEPI 2014 Action Statement #62 Leadbeater's Possum *Gymnobelideus leadbeateri* Flora and Fauna Guarantee Act 1988

Highlands Forest Management Plan. Timber harvesting and the construction of associated roads is excluded from areas of forest meeting the criteria for Zone 1A or Zone 1B through timber harvesting prescriptions contained in the Code of Practice for Timber Production. The definition of Zone 1A habitat was modified in 2014 from greater than 12 trees to greater than 10 trees as a result of a recommendation of the Leadbeater's possum advisory group.

**Zone 1A - Special Protection Zone**

Greater than 10 living mature or senescing hollow-bearing trees (comprising Mountain Ash, Alpine Ash or Shining Gum) per 3 hectares in patches greater than 3 hectares.

**Zone 1B - General Management Zone**
**(excluded from timber harvesting while Zone 1B attributes remain)**

Greater than 12 dead mature or living senescent trees containing hollows per 3 hectares in patches greater than 10 hectares, with wattle density (basal area) of greater than $5m^2$ per hectare.

**Zone 2 - General Management Zone**

Consists of the remaining ash-eucalypt forest: regrowth ash forest of varying ages; or areas with features of Zone 1A or Zone 1B but less than 3 hectares or 10 hectares respectively.

### Leadbeater's Possum Advisory Group

To support the recovery of Leadbeater's possum while maintaining a sustainable timber industry, the then Minister for Environment and Climate Change and then Minister for Agriculture and Food Security established the Leadbeater's possum advisory group in June 2013. The group was co-convened by the CEO of Zoos Victoria and the CEO of the Victorian Association of Forest Industries, with representatives from Parks Victoria, VicForests and the Leadbeater's possum recovery team.

In January 2014, the advisory group made 13 recommendations to government. In April 2014, the Victorian government accepted all of the recommendations and committed $11 million for implementation over the following five years.

One recommendation of the advisory group was to establish timber harvest exclusion zones around all recorded locations for Leadbeater's possums. These zones have a radius of 200 metres and are centred on the detection site. The effectiveness of this recommendation in supporting the recovery of the possum will be reviewed after two years of targeted surveys, or once 200 new colonies have been located. It is currently under review by DELWP.

Exclusion zones have now been applied to all pre-existing records for Leadbeater's possums from 1999 to 2014, except for records in areas that were severely burnt in the 2009 fires. As of 30 September 2016, new exclusion zones have been applied to 270 new colonies (2,983 hectares) that have been detected in state forest since 2014.[21] The exclusion zones have been introduced into the *Planning Standards for timber harvesting operations in Victoria's State forests* 2014.

Of the 270 new colonies detected in state forest, 79 were from records submitted by the community. To assist in the timely verification of these records, DELWP released a new survey standard for Leadbeater's possum which details the acceptable methods to determine the presence or absence of the possum. This standard is being applied in targeted surveys to identify new colonies. It also specifies the evidence required from the community when reporting new possum colonies and the process for verification of these records.

[21] DELWP 2016 *Supporting the Recovery of the Leadbeater's Possum Progress Report December 2016*

# Appendix 1 Forest Industry Taskforce membership

## Independent Chair

Don Henry – University of Melbourne

## Planning Group

Jane Calvert – Construction Forestry Mining and Energy Union (CFMEU)
Tim Johnston – Victorian Association of Forest Industries
Amelia Young – The Wilderness Society

## Core Group

Planning group plus:

Jess Abrahams – Australian Conservation Foundation
Vince Hurley – Australian Sustainable Hardwoods
Julian Mathers/Peter Williams – Australian Paper
John McConachy – representing harvest and haulage contractors
Alex Millar/Travis Wacey/Anthony Pavey – CFMEU
Sarah Rees – MyEnvironment
Matt Ruchel – Victorian National Parks Association

# Appendix 2 Forest-dependent threatened species

This appendix lists the forest-dependent threatened species selected for the biodiversity analyses presented in sections 2. Species marked with a bullet point in the column headed Broad denote the 79 species used in the broad forest-dependent species analysis in section 2.2. Species marked with a bullet point in the column headed Focus denote the 35 species used in the focused forest-dependent species analysis in section 2.4.

EPBC: National conservation status under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* CE=Critically Endangered, E=Endangered, V=Vulnerable.

Vic Stat: Conservation status in Victoria CE= Critically Endangered, E=Endangered, V= Vulnerable, R=rare, DD = data deficient, P = Parent (a species with all its subspecies listed as threatened: *Grevillea miqueliana cincta* is endangered, *G. m. miqueliana* and *G. m. moroka are vulnerable*).

FFG: L= listed as a threatened taxon under the Victorian *Flora and Fauna Guarantee Act 1988*.

| English name | Scientific name | Broad | Focus | EPBC | Vic Stat | FFG |
|---|---|---|---|---|---|---|
| Spot-tailed Quoll | *Dasyurus maculatus* | • | • | E | E | L |
| Brush-tailed Phascogale | *Phascogale tapoatafa* | • | | | V | L |
| Swamp Antechinus | *Antechinus minimus* | • | | V | NT | L |
| White-footed Dunnart | *Sminthopsis leucopus* | • | | | NT | L |
| Greater Glider | *Petauroides volans* | • | • | V | V | |
| Squirrel Glider | *Petaurus norfolcensis* | • | | | E | L |
| Yellow-bellied Glider | *Petaurus australis* | | • | | | |
| Leadbeater's Possum | *Gymnobelideus leadbeateri* | • | • | CE | E | L |
| Long-nosed Potoroo | *Potorous tridactylus* | • | | V | NT | L |
| Long-footed Potoroo | *Potorous longipes* | • | • | E | V | L |
| Brush-tailed Rock Wallaby | *Petrogale penicillata* | • | | V | CE | L |
| Grey-headed Flying-fox | *Pteropus poliocephalus* | • | | V | V | L |
| Eastern Horseshoe Bat | *Rhinolopus megaphyllus* | • | | | V | L |
| Yellow-bellied Sheathtail Bat | *Saccolaimus flaviventris* | • | | | DD | L |
| Smoky Mouse | *Pseudomys fumeus* | • | | E | E | L |
| Broad-toothed Rat | *Mastacomys fuscus* | • | | V | E | L |
| Square-tailed Kite | *Lophoictinia isura* | • | | | V | L |
| White-bellied Sea-Eagle | *Haliaeetus leucogaster* | • | | | V | L |
| Grey Goshawk | *Accipiter novaehollandiae* | • | | | V | L |
| Glossy Black-Cockatoo | *Calyptorhynchus lathami* | • | • | | V | L |
| Swift Parrot | *Lathamus discolor* | • | | CE | E | L |
| Turquoise Parrot | *Neophema pulchella* | • | | | NT | L |

| English name | Scientific name | Broad | Focus | EPBC | Vic Stat | FFG |
|---|---|---|---|---|---|---|
| Powerful Owl | *Ninox strenua* | ● | ● | | V | L |
| Barking Owl | *Ninox connivens* | ● | | | E | L |
| Sooty Owl | *Tyto tenebricosa* | ● | ● | | V | L |
| Masked Owl | *Tyto novaehollandiae* | ● | ● | | E | L |
| Brown Treecreeper | *Climacteris picumnus victoriae* | ● | | | NT | |
| Chestnut-rumped Heathwren | *Calamanthus pyrrhopygius* | ● | | | V | L |
| Speckled Warbler | *Chthonicola sagittata* | ● | | | V | L |
| Regent Honeyeater | *Anthochaera phrygia* | ● | | CE | CE | L |
| Helmeted Honeyeater | *Lichenostomus melanops cassidix* | ● | | CE | CE | L |
| Hooded Robin | *Melanodryas cucullata* | ● | | | NT | L |
| Spotted Quail-thrush | *Cinclosoma punctatum* | ● | | | NT | |
| Giant Burrowing Frog | *Heleioporus australiacus* | ● | | V | V | L |
| Baw Baw Frog | *Philoria frosti* | ● | ● | E | CE | L |
| Brown Toadlet | *Pseudophryne bibronii* | ● | | | E | L |
| Southern Toadlet | *Pseudophryne semimarmorata* | ● | | | V | |
| Martin's Toadlet | *Uperoleia martini* | ● | | | E | L |
| Green and Golden Bell Frog | *Litoria aurea* | ● | | V | V | I |
| Booroolong Tree Frog | *Litoria booroolongensis* | ● | | E | CE | L |
| Large Brown Tree Frog | *Litoria littlejohni* | ● | | V | E | L |
| Spotted Tree Frog | *Litoria spenceri* | ● | | E | E | L |
| Rosenberg's Goanna | *Varanus rosenbergi* | ● | | | E | L |
| Lace Monitor | *Varanus varius* | ● | | | E | |
| Eastern She-oak Skink | *Cyclodomorphus michaeli* | ● | | | NT | L |
| Swamp Skink | *Egernia coventryi* | ● | | | E | L |
| Alpine Bog Skink | *Pseudemoia cryodroma* | ● | | | V | L |
| Flat-headed Galaxias | *Galaxias rostratus* | ● | | CE | V | I |
| Barred Galaxias | *Galaxias fuscus* | ● | | E | CE | L |
| Dwarf Galaxias | *Galaxiella pusilla* | ● | | V | E | L |
| Australian Grayling | *Prototroctes maraena* | ● | | V | V | L |
| Murray Cod | *Maccullochella peelii* | ● | | V | V | L |
| Trout Cod | *Maccullochella macquariensis* | ● | | E | CE | L |
| Macquarie Perch | *Macquaria australasica* | ● | | E | E | L |

| English name | Scientific name | Broad | Focus | EPBC | Vic Stat | FFG |
|---|---|---|---|---|---|---|
| Empire Gudgeon | *Hypseleotris compressa* | ● | | | V | L |
| Cox's Gudgeon | *Gobiomorphus coxii* | ● | | | E | L |
| Orbost Spiny Cray | *Euastacus diversus* | | ● | | E | L |
| Tall Astelia | *Astelia australiana* | ● | ● | V | V | L |
| Elegant Daisy | *Brachyscome salkiniae* | ● | ● | | R | |
| Forest Sedge | *Carex alsophila* | ● | ● | | R | |
| Blackfellow's Hemp | *Commersonia rossii* | ● | ● | | V | |
| Gippsland Stringybark | *Eucalyptus mackintii* | ● | ● | | R | |
| Gully Grevillea | *Grevillea barklyana* | ● | ● | | V | L |
| Colquhoun Grevillea | *Grevillea celata* | ● | ● | V | V | L |
| Oval-leaf Grevillea | *Grevillea miqueliana* | | ● | | P | |
| Outcrop Guinea-flower | *Hibbertia hermanniifolia* | ● | ● | | R | |
| Brown Guinea-flower | *Hibbertia rufa* | ● | ● | | R | |
| Toothed Leionema | *Leionema bilobum* | ● | ● | | R | |
| Tree Geebung | *Persoonia arborea* | ● | ● | | V | |
| Smooth Geebung | *Persoonia levis* | ● | ● | | R | |
| Forest Geebung | *Persoonia silvatica* | ● | ● | | R | |
| Velvety Geebung | *Persoonia subvelutina* | ● | ● | | R | |
| Forest Phebalium | *Phebalium squamulosum squamulosum* | ● | ● | | R | |
| Tasmanian Wax-flower | *Philotheca virgata* | ● | ● | | V | |
| Veined Pomaderris | *Pomaderris costata* | ● | ● | | R | |
| Eastern Pomaderris | *Pomaderris discolor* | ● | ● | | R | |
| Upright Pomaderris | *Pomaderris virgata* | | ● | | V | |
| Serpent Heath | *Richea victoriana* | | ● | | R | |
| Leafless Pink-bells | *Tetratheca subaphylla* | ● | ● | | R | |
| Slender Fork-fern | *Tmesipteris elongata* | ● | | | V | |
| Oval Fork-fern | *Tmesipteris ovata* | ● | | | R | |
| Small Fork-fern | *Tmesipteris parva* | ● | | | R | |
| Baw Baw Berry | *Wittsteinia vacciniacea* | ● | ● | | R | |
| Sandfly Zieria | *Zieria smithii smithii* | ● | ● | | R | |

www.veac.vic.gov.au