Victoria's Regional Forest Agreements

Assessment of matters pertaining to the modernisation of Victoria's Regional Forest Agreements

2019

Australian Government

VICTORIA State Government

Context

All data used in this document was collected prior to the 2019-20 bushfires in Victoria. Further assessments will be undertaken following the fires to understand the impacts and identify any remedial action required.

Acknowledgement

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.

Disclaimer

This report has been jointly prepared by the State of Victoria and Commonwealth of Australia to inform the modernisation of Victoria's Regional Forest Agreements (RFAs).

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ISBN 978-1-76105-032-9 (pdf/online/MS word)

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Acronyms and abbreviations

AA	Alpine Ash
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
AHC Act	*Australian Heritage Commission Act 1975* (Cth)
ANZECC	Australian and New Zealand Environment and Conservation Council
AO	Allocation Order
ARI	Arthur Rylah Institute
ASOFR	Australian State of the Forests Report
AUSLIG	Australian Surveying and Land Information Group
BRRAT	Bushfire Rapid Risk Assessment Team
CAM	Common Assessment Method
CAM MOU	Intergovernmental Memorandum of Understanding: Agreement on a Common Assessment Method for Listing of Threatened Species and Threatened Ecological Communities
CAPAD	Collaborative Australian Protected Area Database
CAR	comprehensive, adequate and representative (reserve system)
CFA	Country Fire Authority
CH	Central Highlands
CMA	Catchment Management Authority
CRA	Comprehensive Regional Assessment
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cth	Commonwealth (of Australia)
DC	Designated Catchment
DELWP	Victorian Department of Environment, Land, Water and Planning
DEPI	Victorian Department of Environment and Primary Industries (No longer active - the forestry responsibilities of DEPI moved to DEDJTR in late 2014. In 2018, these moved to DJPR.)
DEWHA	Australian Government Department of the Environment, Water, Heritage and the Arts (No longer active 2007-2010)
DJPR	Victorian Department of Jobs, Precincts and Regions

DoEE	Australian Government Department of the Environment and Energy
DSE	Victorian Department of Sustainability and Environment (No longer active 2002-2013)
DSEWPaC	Australian Government Department of Sustainability, Environment, Water, Population and Communities (No longer active 2010-2013)
DTF	Victorian Department of Treasury and Finance
EG	East Gippsland
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ERF	Emissions Reduction Fund
ESFM	ecologically sustainable forest management
ESP Act	*Endangered Species Protection Act 1992* (Cth)
EVC	ecological vegetation class
FAO	Food and Agriculture Organization of the United Nations
FAP	Forest Audit Program
FFG Act	*Flora and Fauna Guarantee Act 1988* (Vic.)
FFMVic	Forest Fire Management Victoria
FMA	Forest Management Area
FMP	forest management plan
FMZ	forest management zone
FSC	Forest Stewardship Council
FTE	full-time equivalent
G	Gippsland
GMTOAC	Gunditj Mirring Traditional Owners Aboriginal Corporation
GMZ	General Management Zone
HDM	habitat distribution model
HWP	harvested wood products
IBVM	integrated biodiversity values model
IEC	Index of Estuary Condition
ISC	Index of Stream Condition
IUCN	International Union for Conservation of Nature
IWC	Index of Wetland Condition

JANIS	Joint ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee
LGA	local government area
LiDAR	Light Detection and Ranging
LOS	Levels of Service
MA	Mountain Ash
MCFFA	Ministerial Council on Forestry, Fisheries and Aquaculture
MIS	managed investment scheme
MLE	multiple lines of evidence
MNES	matters of national environmental significance
MOG	modelled old growth
MOU	memorandum of understanding
MSP	Management Standards and Procedures
NE	North East
NFI	National Forest Inventory
NFPS	*National forest policy statement*
NPI	National Plantation Inventory
NRS	National Reserve System
NWI	National Wilderness Inventory
OCR	Office of the Conservation Regulator
R&D	research and development
RCP	Representative Concentration Pathway
RFA	Regional Forest Agreement
RFA Act	*Regional Forest Agreements Act 2002* (Cth)
RPP	Parks Victoria Research Partners Program
SAP	Special Area Plan
SFM	Sustainable Forest Management
SFRI	Statewide Forest Resource Inventory
SFT Act	*Sustainable Forests (Timber) Act 2004* (Vic.)
SIA	Social Impact Assessments
SMP	Strategic Management Prospects

SMZ	Special Management Zone
SOFR	State of the Forests Report
SPZ	Special Protection Zone
SWP	secondary wood products
SWSC	Special Water Supply Catchment
TAP	threat abatement plan
TRP	Timber Release Plan
TUP	Timber Utilisation Plan
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VAGO	Victorian Auditor General's Office
VBA	Victorian Biodiversity Atlas
VEAC	Victorian Environmental Assessment Council
VFMP	Victorian Forest Monitoring Program
VROTpop	Victorian Rare and Threatened Plant Population monitoring database
VSOFR	Victorian State of the Forests Report
W	West
WUP	Wood Utilisation Plan

Introduction

Between 1997 and 2000, the State of Victoria and the Commonwealth of Australia (i.e. 'the Parties') entered into five Regional Forest Agreements (RFAs). The Victorian RFAs are long-term bilateral agreements that strike a balance between the environmental, social and economic uses of forests. The full definition of an RFA (section 4 of the *Regional Forest Agreements Act 2002* (Cth)) is provided below:

> RFA or Regional Forest Agreement means an agreement that is in force between the Commonwealth and a State in respect of a region or regions, being an agreement that satisfies all the following conditions:
>
> (a) the agreement was entered into having regard to assessments of the following matters that are relevant to the region or regions:
>
> (i) environmental values, including old growth, wilderness, endangered species, national estate values and World Heritage values;
>
> (ii) indigenous heritage values;
>
> (iii) economic values of forested areas and forest industries;
>
> (iv) social values (including community needs);
>
> (v) principles of ecologically sustainable management;
>
> (b) the agreement provides for a comprehensive, adequate and representative reserve system;
>
> (c) the agreement provides for the ecologically sustainable management and use of forested areas in the region or regions;
>
> (d) the agreement is expressed to be for the purpose of providing long-term stability of forests and forest industries;
>
> (e) the agreement is expressed to be a Regional Forest Agreement.

The Australian and Victorian governments will extend the Victorian RFAs before they expire on 31 March 2020.

The five Victorian RFAs were among 10 that were signed between the Commonwealth and each of four states – New South Wales, Tasmania, Victoria and Western Australia – between 1997 and 2001.

The Victorian RFAs were signed following Comprehensive Regional Assessments (CRAs) of the Central Highlands, East Gippsland, Gippsland, North East and West regions, which provided an information base to evaluate the economic, social, environmental and heritage uses and values of the forests in each RFA region.

Experts contributing to the CRAs came from such fields as archaeology, botany, forest ecology, geography, geology, geomorphology, hydrology and soil science, as well as economics,

regional development and social planning. The CRAs were a result of detailed study, consultation and negotiation with a diverse range of stakeholders.

The CRAs were described in the 1996 scoping agreement for the Victorian RFAs and covered:

a. Biodiversity
b. Old growth
c. Wilderness
d. Endangered species
e. National estate values
f. World Heritage values
g. Indigenous heritage
h. Social values
i. Economic values and industry development opportunities in forested areas
j. Ecologically sustainable management

These matters were subsequently incorporated into para. (a) of the definition of 'Regional Forest Agreement' or 'RFA' in section 4 of the *Regional Forest Agreements Act 2002* (Cth) (RFA Act). The RFA Act gives effect to certain obligations of the Commonwealth under the RFAs and certain aspects of the *National forest policy statement* (NFPS).

The Parties have committed to a process that ensures that:

- the overarching purpose and objectives of the RFAs remain unchanged;
- the amended RFAs will continue to maintain their existing spatial boundaries; and
- forest management is adaptive and underpinned by a strong scientific evidence base, while also addressing community needs.

When considering changes to the RFA, the Parties will consider the outcomes of the consultation and engagement process and this further assessment of matters. The purpose of this document is to provide an updated assessment of the matters listed in para. (a) of the definition of an RFA. This will support the decision by the Parties to enter into the proposed extension of the RFAs.

This document considers the applicability of the findings of the CRAs, the current status of the values and the likely impact of the extension of the RFAs on those values.

This document provides information about relevant Victorian RFA matters, including the state of environmental, economic, social and heritage values. Australia uses the internationally agreed Montréal Process criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests as the framework for reporting on sustainability. This framework for ecologically sustainable forest management (ESFM) covers all of the matters listed in para. (a) of the definition of 'RFA' in the RFA Act, and therefore provides the performance criteria for the assessment in this report.

The assessment undertaken in this document demonstrates that the Parties have, through a comprehensive and diverse range of processes, had ongoing regard to the listed matters in para. (a) of the definition of 'RFA' in the RFA Act relevant to the Victorian RFA regions. The

recitals in each Victorian RFA (except East Gippsland) state that the agreement has regard to studies and projects carried out in relation to all of the following matters relevant to the region' (followed by a list of the matters referred to in para. (a) of the definition of 'RFA' in the RFA Act).

This report builds upon and considers the CRA assessment previously undertaken for the Victorian RFAs, along with other relevant assessments, five-yearly reviews, reports, investigations, studies and information prepared by or for Victoria and/or the Commonwealth.

It is not a replacement for other reviews that have been done relating to Victorian RFAs or which have included the Montréal Process indicators. Rather, it draws on these sources to identify the state of the matters and how they have changed over the life of the Victorian RFAs.

Background

RFAs are a means of balancing environmental, economic and social uses and values of key native forest regions across Australia. They are derived from the NFPS and are formalised in the RFA Act.

The Victorian RFAs provide stability and long-term certainty through access to a sustainable resource base for industry. At the same time, they ensure the protection of biodiversity, old growth and wilderness through a comprehensive, adequate and representative (CAR) reserve system. RFAs recognise and consider the full range of forest values when making forest resource use decisions.

The Victorian RFAs provide for efficient forest management practices within the RFA regions by exempting the areas from duplicative processes and other forms of approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and the *Export Control Act 1982* (Cth) (EC Act).

Forestry operations undertaken in accordance with a RFA do not require additional approvals under Part 3 of the EPBC Act. The inclusion of RFA provisions within the EPBC Act recognises that a CRA was undertaken to address the environmental, economic and social impacts of forestry operations; RFAs have established CAR reserve networks; and forestry operations must adhere to the principles of ESFM.

Rather than being an exemption from the EPBC Act requirements, the establishment of the RFAs constitutes a form of assessment and approval. The exceptions are forestry operations within World Heritage properties or Ramsar wetland sites, where assessment and approval is required.

The Parties entered into the Victorian RFAs as follows:

- East Gippsland on 3 February 1997
- Central Highlands on 27 March 1998
- North East on 9 August 1999
- West Victoria on 31 March 2000

- Gippsland on 31 March 2000

The Victorian RFAs established an agreed framework for ESFM and use of forests in those regions. The Parties have agreed that the objectives of the RFAs are to:

- identify areas required for the purposes of a CAR reserve system and provide for the conservation of those areas
- provide for the ecologically sustainable management and use of forested area in those regions
- provide for the long-term stability for forests and forest industries
- have regard to studies and projects carried out in relation to:
    - environmental values (including old growth, wilderness, endangered species, national estate values and World Heritage values)
    - Aboriginal heritage values
    - economic values of forested areas and forest industries
    - social values (including community needs)
    - the principles of ESFM.

In modernising the Victorian RFAs, the Parties have maintained the objectives of the agreements. The Parties also made a range of improvements to address new information and data, and views raised by public engagement and the various consultative reviews, consistent with continual improvement. These improvements include:

- reflecting contemporary legalisation, policy and institutional arrangements
- simplifying and harmonising the Victorian RFA framework
- increasing the transparency and durability of forest management
- improving engagement and communication.

The Parties have agreed that the assessment process, outcomes and data collected may be used to support other processes to help achieve objectives of ESFM. The Parties have also stated their intention to modernise and extend the existing Victorian RFAs. In order to inform this process, this document has been developed as an update on matters considered during the CRA process.

On 7 November 2019, the Victorian Government announced *Victoria's Forestry Plan*, which will transition Victoria's forest industries from native timber fully to plantation feedstock by 1 July 2030.

Victorian RFA regions

The five RFAs in Victoria are: Central Highlands, East Gippsland, Gippsland, North East and West (shown below). The total area and proportion of forest cover is outlined in Table 1.

Table 1: RFA area statement and forest cover

	Total area	Public land		Private land		per cent total forested area
RFA area	'000 ha	'000 ha	per cent forest	'000 ha	per cent forest	
Central Highlands	1,132	623	95.41	509	27.86	65.04
East Gippsland	1,213	1,052	98.18	161	48.15	91.54
Gippsland	2,655	1,484	92.04	1,171	22.28	61.27
North East	2,317	1,255	92.25	1,063	16.41	57.47
West	5,770	1,047	80.08	4,724	11.24	23.73
Non-RFA	9,635	2,411	59.66	7,225	3.65	17.66

Source: Data derived from DELWP corporate spatial layers PLM25, FMZ100 and RFA25.

Method

This document uses data and information from a range of sources, many of which report using the Montréal Process indicators. This provides consistency over time to compare the relative matters and demonstrate the accumulated changes arising since the commencement of the Victorian RFAs.

The indicators cover all of the matters listed in para. (a) of the definition of 'RFA' in the RFA Act and are the agreed framework for ESFM reporting in RFA regions. The principles of ESFM underpin the NFPS, the RFA Act and the Victorian RFAs. These principles are consistent with the criteria established in the Montréal Process, shown in Table 2.

Table 2: Comparison of Montréal Process criteria with the principles of ecologically sustainable forest management used in the Victorian RFAs

Montréal Process criteria for sustainable forest management	**Principles of ecologically sustainable forest management**
Criterion 1. Conservation of biological diversity	Principle 1: Maintain the full suite of forest values for present and future generations. Principle 3: Protect and maintain biodiversity. Principle 9: Utilise the precautionary principle for prevention of environmental degradation.
Criterion 2. Maintenance of productive capacity of forest ecosystems	Principle 1: Maintain the full suite of forest values for present and future generations. Principle 5: Maintain forest ecosystem health and vitality.
Criterion 3. Maintenance of ecosystem health and vitality	Principle 1: Maintain the full suite of forest values for present and future generations. Principle 5: Maintain forest ecosystem health and vitality.
Criterion 4. Conservation and maintenance of soil and water resources	Principle 1: Maintain the full suite of forest values for present and future generations. Principle 6: Protect soil and water resources.
Criterion 5. Maintenance of forest contribution to global carbon cycles	Principle 1: Maintain the full suite of forest values for present and future generations. Principle 7: Maintain forest contribution to global carbon cycles.

Montréal Process criteria for sustainable forest management	Principles of ecologically sustainable forest management
Criterion 6. Maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of societies	Principle 1: Maintain the full suite of forest values for present and future generations. Principle 2: Maintain and enhance long-term multiple socio-economic benefits to meet the needs of societies. Principle 8: Maintain natural and cultural heritage values.
Criterion 7. Legal, institutional and economic framework for forest conservation and sustainable management	Principle 1: Maintain the full suite of forest values for present and future generations Principle 2: Maintain and enhance long-term multiple socio-economic benefits to meet the needs of societies. Principle 3: Protect and maintain biodiversity. Principle 8: Maintain natural and cultural heritage values.

Table 3 shows the relationship between individual indicators under the Montréal Process criteria, and RFA matters for consideration in the RFA Act.

Where possible and appropriate, this document provides indicator information at discrete points over the life of the Victorian RFAs at an RFA regional level.

Some data is not available or is not meaningful at the regional level. In these cases, information may be presented on a state or national basis.

Where information has not been reported over time, or has not been reported on a consistent basis, notes to this effect are included under the individual indicators.

Table 3: Relationship between listed matters in the RFA Act and Montréal Process indicators

Montréal Process indicator	**Relevant matter in para. (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)**				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate and World Heritage values)	4(a)ii indigenous heritage values	4(a)iii economic values of forested areas and forest industries	4(a)iv social values (including community needs)	4(a)v principles of ecologically sustainable management
1.1 Ecosystem diversity					
1.1a Area of forest by forest type and tenure	■				■
1.1b Area of forest by growth stage	■				■
1.1c Area of forest in protected area categories	■				■
1.1d Fragmentation of forest cover	■				■
1.2 Species diversity					
1.2a Forest-dwelling species for which ecological information is available	■				■
1.2b The status of forest-dwelling species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment	■				■
1.2c Representative species from a range of habitats monitored at scales relevant to regional forest management	■				■
1.3 Genetic diversity					
1.3a Forest associated species at risk from isolation and the loss of genetic variation, and conservation efforts for those species	■				■
1.3b Native forest and plantations of indigenous species which have genetic resource conservation mechanisms in place	■		■		■

Montréal Process indicator	Relevant matter in para. (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate and World Heritage values)	4(a)ii indigenous heritage values	4(a)iii economic values of forested areas and forest industries	4(a)iv social values (including community needs)	4(a)v principles of ecologically sustainable management
2 Maintenance of productive capacity of forest ecosystems					
2.1a Native forest available for wood production, area harvested and growing stock of merchantable and non-merchantable tree species					
2.1b Age class and growing stock of plantations					
2.1c Annual removal of wood products compared to the volume determined to be sustainable for native forests and future yields for plantations					
2.1d Annual removal of non-wood products compared to the level determined to be sustainable					
2.1e The area of native forest harvested and the proportion of that effectively regenerated and the area of plantation clear-fell harvested and the proportion of that effectively re-established					
3 Maintenance of ecosystem health and vitality					
3.1a Scale and impact of agents and processes affecting forest health and vitality					
3.1b Area of forest burnt by planned and unplanned fire					
4 Conservation and maintenance of soil and water resources					
4.1a Area of forest land managed primarily for protective function					

Montréal Process indicator	Relevant matter in para. (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate and World Heritage values)	4(a)ii indigenous heritage values	4(a)iii economic values of forested areas and forest industries	4(a)iv social values (including community needs)	4(a)v principles of ecologically sustainable management
4.1b Management of the risks of soil erosion and the risks to soil physical properties, water quantity and water quality in forests					
5 Maintenance of forests' contribution to global carbon cycles					
5.1a Total forest ecosystem biomass and carbon pool					
6.1 Production and consumption					
6.1a Value and volume of wood and wood products					
6.1b Values, quantities and use of non-wood forest products					
6.1c Value of forest-based services					
6.1d Production and consumption and import/export of wood, wood products and non-wood products					
6.1e Degree of recycling of forest products					
6.2 Investment in the forest sector					
6.2a Investment and expenditure in forest management					
6.2b Investment in extension and use of new and improved technologies					
6.3 Recreation and tourism					
6.3a Area of forest available for general recreation/tourism					

Montréal Process indicator	Relevant matter in para. (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate and World Heritage values)	4(a)ii indigenous heritage values	4(a)iii economic values of forested areas and forest industries	4(a)iv social values (including community needs)	4(a)v principles of ecologically sustainable management
6.3b Range and use of recreational/tourism activities available					
6.4 Cultural, social and spiritual needs and values					
6.4a Area of forest to which Indigenous people have use rights that protect their special values and are recognized through formal and informal management regimes					
6.4b Registered places of non-indigenous cultural values in forests that are formally managed to protect those values					
6.4c The extent to which indigenous values are protected, maintained and enhanced through indigenous participation in forest management					
6.4d The importance of forests to people					
6.5 Employment and community needs					
6.5a Direct and indirect employment in the forest sector					
6.5b Wage rates and injury rates within the forest sector					
6.5c Resilience of forest-dependent communities to changing social and economic conditions					
6.5d Resilience of forest-dependent indigenous communities to changing social and economic conditions					
7 Legal, institutional and economic framework for forest conservation and sustainable management					

Montréal Process indicator	**Relevant matter in para. (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)**				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate and World Heritage values)	4(a)ii indigenous heritage values	4(a)iii economic values of forested areas and forest industries	4(a)iv social values (including community needs)	4(a)v principles of ecologically sustainable management
7.1a Extent to which the legal and policy framework supports the conservation and sustainable management of forests					
7.1b Extent to which the institutional framework supports the conservation and sustainable management of forests					
7.1c Extent to which the economic framework supports the conservation and sustainable management of forests					
7.1d Capacity to measure and monitor changes in the conservation and sustainable management of forests					
7.1e Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services					

Environmental values

This section reports on the environmental values that are specifically listed in para. (a)(i) of the definition of 'RFA' in the RFA Act: old growth, wilderness, endangered species, national estate values and World Heritage values. Biodiversity values and wetland values have also been included under the 'environmental values' heading.

This section includes the following Australian Montréal Process indicators:

- Indicator 1.1a – Area of forest by forest type and tenure
- Indicator 1.1b – Area of forest by growth stage
- Indicator 1.1c – Area of forest in protected area categories
- Indicator 1.1d – Fragmentation of forest cover
- Indicator 1.2a – Forest-dwelling species for which ecological information is available
- Indicator 1.2b – The status of forest-dwelling species at risk of not maintaining viable breeding population, as determined by legislation or scientific assessment
- Indicator 1.2c – Representative species from a range of habitats monitored at scales relevant to regional forest management
- Indicator 1.3a – Forest associated species at risk from isolation and the loss of genetic variation, and conservation efforts for those species
- Indicator 1.3b – Native forest and plantations of indigenous timber species which have genetic resource conservation mechanisms in place
- Indicator 4.1a – Area of forest land managed primarily for protective functions
- Indicator 4.1b – Management of the risk of soil erosion in forests
- Indicator 4.1c – Management of the risks to soil physical properties in forests
- Indicator 4.1d – Management of the risks to water quantity from forests
- Indicator 4.1e –- Management of the risks to water quality in forests
- Indicator 6.4b – Registered places of non-Indigenous cultural value in forests that are formally managed to protect those values

Information is drawn from the original documentation produced as part of the CRA process and subsequent reports. These include the Australian State of the Forests Report (ASOFR) and the Victorian State of the Forests Report (VSOFR), State of the Environment reports, statutory independent five-yearly reviews of Victorian RFAs required under the RFAs, and other relevant data.

Old-growth values

Old-growth forests are prized for their ecological, spiritual and aesthetic significance and relative rarity across the globe. Many countries protect old-growth forests through legislative instruments. Similarly, forest certification schemes such as the Forest Stewardship Council (FSC) require old-growth forests be recognised as of high conservation value and protected accordingly. Despite the broad recognition of the value of old-growth forests, finding a commonly agreed definition for these forests is challenging. The 98-item list of different formal definitions of old-growth forest from around the world, prepared by the Food and Agriculture Organization of the United Nations (FAO), illustrates this well (FAO 2002).

Victorian work led by Peter Woodgate in the 1990s significantly contributed to the development of the national old growth definition (the 'JANIS' definition): 'Old-growth forest is ecologically mature forest where the effects of disturbance are now negligible' (Joint ANZECC/MCFFA NFPS Implementation Sub-committee [JANIS] 1997).

Woodgate's work enabled Victoria to define old-growth forest in a regionally specific manner, and this definition and associated mapping endures in Victorian forest management to this day. The definition is as follows:

> *Old-growth forest is forest which contains significant amounts of its oldest growth stage in the upper stratum – usually senescing trees – and has been subjected to any disturbance, the effect of which is now negligible.*
>
> (Woodgate et al 1994, p. v)

VicForests relies on the definitions and datasets generated under the Woodgate system and managed by the Department of Environment, Land, Water and Planning (DELWP) to define old growth so it can adequately protect areas of high conservation value. In this way it applies a single definition for its mapping process. The definition is defined in the Management Standards and Procedures for timber harvesting operations in Victoria's State forests 2014 (an incorporated document to the Code of Practice for Timber Production 2014), as follows:

> Forest *which contains significant amounts of its oldest growth stage - usually senescent trees - in the upper stratum and has been subject to any disturbance, the effect of which is now negligible. For a stand to qualify as old-growth, the regrowth growth stage, if present, must be sparse (less than* per cent *of the total crown cover of the stand). Negligibly disturbed forest is that in which disturbance is known to have occurred, but the disturbance is unlikely to have altered the structure (growth stage and crown cover) or the usual species composition which characterises a given vegetation class; or, if the alteration did occur in the past, it is no longer measurable.* (Management Standards and Procedures for timber harvesting operations in Victoria's State forests 2014, p.15)

Indicator 1.1b: Area of forest type by growth stage

This indicator measures the change in area of forest by growth stage to reflect how ecological processes and species associated with those processes change as forests grow. The age and size of trees is important in maintaining forest biodiversity.

The term 'old growth' is commonly used as a growth-stage description, similar to the term 'senescent', which is used in the official growth-stage datasets. However, where old-growth forests are classified based on their disturbance history, senescent forests are not. In this way the datasets are maintained separately.

Growth-stage information was generated as part of the Statewide Forest Resource Inventory (SFRI) which was initiated in 1993 and completed in 2004 (Table 4); however, there have been no official updates to this data since then. Furthermore, Victoria has experienced a number of severe fires since 2007, which have had significant impact on many or most of the area figures presented in Table 4. The SFRI dataset informs the derivation of many other datasets and still plays a valuable role in the state's forest policy and planning processes.

Table 4: Growth-stage information from SFRI 2007

RFA	Growth stage	Area ha
CENTRAL HIGHLANDS	Early Mature	28,000
	Late Mature	18,000
	Mature	167,000
	Non-regrowth < 22 m	4,000
	Non-regrowth < 28 m	24,000
	Regenerating	34,000
	Regrowth	66,000
	Senescent	5,000
	Undefined	16,000
	Uneven aged	52,000
EAST GIPPSLAND	Early Mature	6,000
	Late Mature	72,000
	Mature	282,000
	Regenerating	49,000
	Regrowth	48,000
	Senescent	8,000
	Undefined	20,000
	Uneven aged	167,000
GIPPSLAND	Early Mature	9,000
	Late Mature	232,000
	Mature	709,000
	Non-regrowth < 28 m	1,000
	Regenerating	56,000
	Regrowth	37,000
	Senescent	28,000
	Undefined	60,000
	Uneven aged	216,000

RFA	Growth stage	Area ha
NORTH EAST	Early Mature	16,000
	Late Mature	126,000
	Mature	873,000
	Non-regrowth < 28 m	5,000
	Regenerating	48,000
	Regrowth	27,000
	Senescent	17,000
	Undefined	80,000
	Uneven aged	139,000
WEST	Late Mature	13,000
	Mature	76,000
	Regenerating	2,000
	Regrowth	5,000
	Senescent	2,000
	Undefined	13,000
	Uneven aged	19,000

Source: DELWP SFRI dataset 2007

Old-growth assessment

The CRA, undertaken between 1996 and 1999, involved detailed assessments of old-growth forests across the RFA regions, using growth stage, disturbance and species as the primary assessment metrics (Woodgate et al. 1994). Along with other environmental values, old-growth forests were one of the criteria for designing the CAR reserve system under the Victorian RFAs.

At the commencement of the RFAs, an old-growth spatial data layer (OG100) was created according to the Woodgate et al. (1994) definition. This dataset was created between 1999 and 2003 as part of the SFRI process and mapped for all forested public land in Victoria.

More recently, modelled old growth (MOG) was produced in 2018 using ecological vegetation class (EVC) and disturbance history (harvesting and fire). This dataset is not reliable at scales less than 1:100,000 and limited field verification has been undertaken. Moreover, the modelling process used to create MOG is a subtractive process only and does not inform recruitment of new old-growth areas.

The major bushfires in 2003, 2007, 2009 and 2018 caused a significant reduction in the extent of old-growth forest in Victoria. When the MOG layer was produced for 2009, the overall old-growth extent had almost halved. By comparison, harvesting accounts for less than 1 per cent of the removal of old-growth forest since 2003.

The most recent update to the MOG was produced for this report and represents a baseline year of 2018. The MOG[1] spatial layer is based on the MOG2009, with reduced extent based on disturbances from fire and timber harvesting up to July 2018. The trajectory of change between these datasets is illustrated in Figure 1.

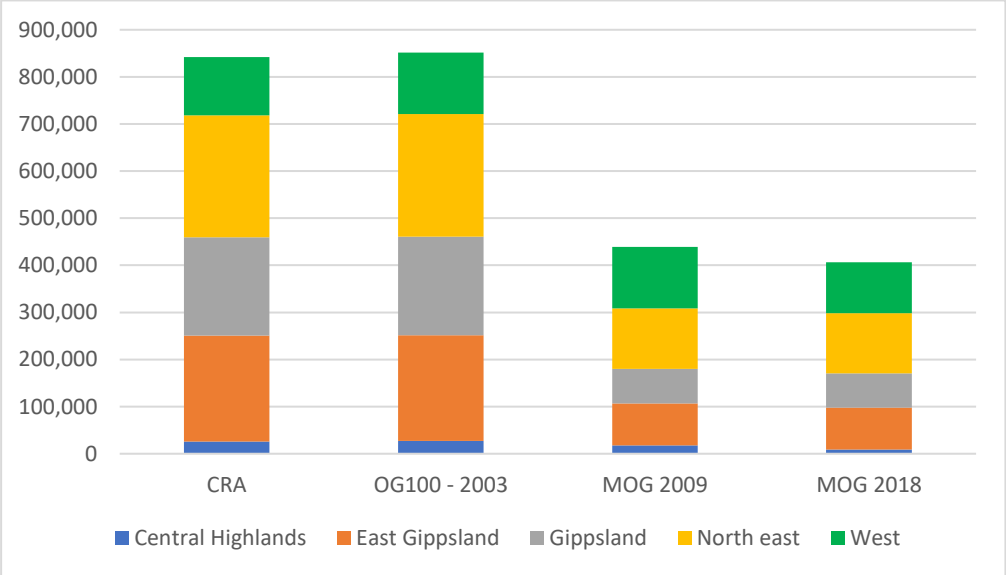

Figure 1: Old-growth areas per RFA across time

Area change in old-growth assessment

Of the 840,000 hectares of old-growth forest identified as part of the CRA process in the Victorian RFA regions, a total of 401,000 hectares (35 per cent) was protected under formal reservation, and 143,000 hectares (17 per cent) in the informal reserve.

After the five RFAs came into effect, an additional 10,000 hectares of old growth was identified through the 2003 mapping, with 48 per cent protected in formal reserves and 27 per cent protected informally (Special Protection Zone (SPZ) and code exclusions). In 2018, 49 per cent of old-growth forest was protected in formal reserves and 26 per cent is protected informally, based on the 2018 modelled extent of old growth (see Table 5).

[1] MOG is the acronym for Modelled Old Growth. The Modelled Old Growth spatial layer in the corporate data library is also named MOG.

Table 5: Area and protected status of old growth, 2003–2018

RFA region	Not protected (ha)	Informal (ha)	Formal (ha)	Total old growth (ha)	Total protected (ha)	per cent protected
2018						
Central Highlands	1,806	3,664	3,762	9,232	7,426	80%
East Gippsland	20,072	15,822	52,550	88,444	68,372	77%
Gippsland	19,492	24,723	28,932	73,146	53,655	73%
North East	44,081	34,915	48,790	127,786	83,705	66%
West	14,033	27,734	65,523	107,290	93,257	87%
Total 2018	**99,485**	**106,857**	**199,557**	**405,899**	**306,414**	**75%**
2008						
Central Highlands	4,250	4,613	8,031	16,894	12,643	75%
East Gippsland	26,984	19,762	42,005	88,751	61,766	70%
Gippsland	19,194	25,086	29,353	73,632	54,438	74%
North East	41,943	34,629	51,360	127,931	85,988	67%
West	13,515	39,441	77,813	130,769	117,254	90%
Total 2008	**105,886**	**123,530**	**208,562**	**437,977**	**332,091**	**76%**
2003						
Central Highlands	2,956	8,376	15,763	27,094	24,138	89%
East Gippsland	64,199	37,458	122,768	224,424	160,226	71%
Gippsland	51,505	68,542	89,017	209,064	157,559	75%
North East	84,808	77,101	98,218	260,128	175,320	67%
West	16,428	35,092	78,971	130,492	114,064	87%
Total 2003	**219,896**	**226,569**	**404,737**	**851,202**	**631,307**	**74%**
CRA Assessment[a]						
Central Highlands	4,105	7,769	14,077	25,951	21,846	84%
East Gippsland	209,475	3,375	122,150	225,000	125,525	56%
Gippsland	69,248	50,248	88,765	208,261	139,013	67%
North East	111,934	48,454	99,077	259,465	147,531	57%
West	12,846	33,398	76,998	123,242	110,396	90%
Total CRA	**407,608**	**143,244**	**291,067**	**841,919**	**544,311**	**65%**

a Data taken from CRA documents.

Source: DELWP Old-growth layer derived from OG100 and updated based on knowledge of EVC and disturbance history. CAR layers represent a union between FMZ100 and PLM25 for each year presented. Old-growth data for 2003 derived from OG100. 2009 derived from MOG2009, and 2018 represents MOG2018 against the CAR 2018

An update to old growth in the West RFA was modelled in 2019 to a 2018 baseline year extent, which is the reason for the significant changes between 2009 and 2018. It should be noted that old growth in many of the West RFA EVCs do not hold the same characteristics as tall, wet forests of the east, except for the tall forests of the Otways. Victoria's western EVCs often do not conform to the 'Jacobsian' forest types: the forest types that reflect the growth stages described by Jacobs (1955). Most importantly, field verification is required to confidently determine that the disturbance thresholds that were applied to the modelling to remove old growth did indeed remove the structural attributes of those areas causing a disturbance impact that was no longer 'negligible'. Similarly, sprouter forest[2] in Gippsland may recover to its old-growth status following fire more readily than obligate seeder forest in the ash-dominated forests of the Central Highlands.

Table 6 describes the quantum of change in the modelled old-growth extent on account of disturbance, of which the vast majority is aligned with forest fires. The impact of harvesting is comparatively minor.

In 2019, DELWP initiated the development of an old-growth ground validation methodology. It is intended that the method will increase confidence when applied to current and future old-growth mapping products. In addition, VicForests will verify mapped old growth through field surveys and, when observed in the field, they will exclude and protect old growth, as well as other high conservation values from timber production (VicForests 2019). In effect, this provides for informal protection of all old growth in State forest.

2 Eucalypts can broadly be categorised into 'Sprouter Forests' and ''Obligate Seeders'. The former responds to fire by sprouting epicormic shoots, are associated with mixed species forest, and are generally more tolerant of fire.

Table 6: The impacted area of modelled old-growth forest by harvesting and fire

Year	Harvesting (ha)	Fire (ha)	Total (ha)
2006	0	1,257	1,257
2007	20	217,847	217,867
2008	6	12,935	12,941
2009	0	17,567	17,567
2010	0	0	0
2011	215*	0	215
2012	0	0	140
2013	1	108,724	109,015
2014	4	27,197	27,302
2015	2	4,623	4,903
Total	**7**	**390,150**	**395,815**

Source: Data from DELWP's corporate library - FIREHISTORY and LASTLOG100 layers

*While the table suggests 215 hectares of area classified as 'old growth' was thinned, this has not been verified on the ground and may be an artefact of the data modelling.

Old-growth area by ecological vegetation class and protected area class

The JANIS criteria recognise that old growth is part of an ecological succession. It is not static and therefore cannot be maintained indefinitely through the reservation of existing examples of that age class. However, where old growth is depleted, the criteria recognise its value to the extent that examples of rare or threatened old-growth EVCs are protected, albeit in a flexible manner. Indeed, the criteria states that old growth should be reserved based on an appropriate mosaic of age-classes that encourage the regeneration of emergent old growth for the future.

For the application of JANIS, therefore, an understanding of old-growth EVC and protected area status is required. This information is documented in the Appendices under 1.

Wilderness values

The NFPS/JANIS criteria defines wilderness as:

> Land that, together with its plant and animal communities, is in a state that has not been substantially modified by, and is remote from, the influences of European settlement …[3]

Delineated wilderness was determined for the CRA by a desktop analysis of datasets relating to landscape factors (remoteness, naturalness, size, etc.) that relate to the NFPS/JANIS wilderness definition. Delineated wilderness was the layer used to determine the JANIS reservation targets (90 per cent, or more if practicable) for wilderness in the development of the five Victorian RFAs.

National Parks Act 1975

The *National Parks Act 1975* (Vic) provides for the establishment, amendment and protection of wilderness areas within Victoria. It does this through creating wilderness parks or wilderness zones within national parks and subsequently adding to or reducing the extent of these areas. Wilderness parks are large areas with landforms and native plant and animal communities relatively unaltered or unaffected by the influence of the European settlement of Australia. The Act excludes development, commercial activity, use of motorised transport and hunting from wilderness parks and wilderness zones. It ensures that they are managed in a way that enhances their status as wilderness.

Once an area is determined as a wilderness park, or where new areas are added to an existing wilderness park, a management plan must be developed which is consistent with the management provisions in the Act. Parks Victoria manages wilderness parks for conservation and self-reliant recreation. There are three wilderness parks in Victoria established by this Act: Avon Wilderness Park and Wabba Wilderness Park, which are forested and located within the Victorian RFA regions, and Big Desert Wilderness Park, which contains some areas of Mallee woodland forest but is not in an RFA region.

In the 2013 amendment, the Act listed 19 wilderness zones in Victoria. There are 12 wilderness zones located within the Victorian RFA regions.

Wilderness extent and protection in Victorian RFA regions

An assessment of wilderness values was undertaken in 1996 as part of the CRA process in the regional context of the forests of eastern Victoria. This included Central Highlands, East Gippsland, Gippsland and North East RFA regions. In the eastern Victorian forests region, 95

3 The full NFPS definition is:
land that, together with its plant and animal communities, is in a state that has not been substantially modified by, and is remote from, the influences of European settlement or is capable of being restored to such a state; is of sufficient size to make its maintenance in such a state feasible; and is capable of providing opportunities for solitude and self-reliant recreation.
(Commonwealth of Australia 1995, p. v *[*Glossary*]*)

per cent of the total area delineated in 1996 as significant for high wilderness quality was protected in the reserve system. There were 18 wilderness areas identified in the forests of eastern Victoria as a result of this assessment (see Table 7).

The resulting report, *Comprehensive regional assessment: wilderness of the eastern Victorian forests* (Commonwealth & Victorian Regional Forest Agreement Steering Committee 1996), analysed wilderness quality across the four CRA regions using data from the National Wilderness Inventory (NWI) (Lesslie & Maslen 1995) and other sources. The NWI methodology measured the variation in wilderness quality across the landscape, producing a database of 'wilderness quality'. This was achieved by using indicators that represented the two essential attributes of wilderness: remoteness and naturalness. The indicators were:

- **Remoteness from Settlement** – remoteness from places of permanent occupation
- **Remoteness from Access** – remoteness from established access routes
- **Apparent Naturalness** – the degree to which the landscape is free from the presence of permanent structures associated with modern technological society
- **Biophysical Naturalness** – the degree to which the natural environment is free from biophysical disturbance caused by the influence of modern technological society.

Wilderness areas are most commonly defined as being areas of high wilderness quality (12 and above) occupying at least 8,000 hectares. Boundaries were delineated around areas that satisfied these criteria. Wherever possible, the boundaries which were adopted followed catchment divides or other topographic features. Where such features did not prove suitable, boundaries were drawn that reflected the influence of nearby features affecting wilderness quality, such as roads.

The distance-related indicators (settlement, access and apparent naturalness) were Australian Surveying and Land Information Group (AUSLIG) digital mapping data updates with additional information in the detailed study areas (Gippsland CRA Report 1999). The disturbance information that provides the base data for the biophysical naturalness indicator was of variable quality and lineage across the RFAs.

Table 8 compares the high-value wilderness areas defined by the CRA, with the current tenure and status.

Table 7: Summary of protection of areas of high wilderness quality within the eastern Victorian forests (1996 – 1999 CRA)

RFA	Area	Size (Ha)	Reserved (Ha)	Proportion reserved
East Gippsland	Buchan	12,580	12,580	100 per cent
	Cape Howe	7,120	7,120	100 per cent
	Coopracambra	28,050	25,460	91 per cent
	Petrel	10,960	10,960	100 per cent
	Sand Patch	28,540	17,150	60 per cent
	Snowy	54,560	54,560	100 per cent
	Tamboon	5,000	5,000	100 per cent
	Tingaringy	25,250	25,060	99 per cent
	Upper-Brodribb	5,310	4,850	91 per cent
Total East Gippsland		*177,370*	*162,740*	*92 per cent*
Gippsland	Avon	39,650	39,650	100 per cent
	Indi Addition to Pilot and Davies Plain	24,300	24,300	100 per cent
	Mt Darling/Snowy Bluff	40,400	40,400	100 per cent
	Wilsons Promontory	33,228	33,228	100 per cent
Total Gippsland		*137,578*	*137,578*	*100 per cent*
Gippsland/North East	Macalister	33,300	33,300	100 per cent
	Razor/Viking	15,700	15,700	100 per cent
Total Gippsland/North East		*49,000*	*49,000*	*100 per cent*
North East	Dartmouth	26,950	20,370	76 per cent
	Wabba	19,700	19,700	100 per cent
	Yarrarabulla Creek	13,000	13,000	100 per cent
Total North East		*59,650*	*53,070*	*89 per cent*
Total all RFA regions		**423,598**	**402,388**	**95 per cent**

Source: Data derived from the CRAs accessed via the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) website (VicRFASC (1996))

Table 8: Comparison of protection of areas of high wilderness quality within the eastern Victorian forests (1996 – 1999 CRA) with wilderness zones and parks

RFA	CRA area	Current status[a]
East Gippsland	Buchan	Buchan Headwaters WZ
	Cape Howe	Cape Howe WZ
	Coopracambra	Genoa WZ, Coopracambra NP
	Petrel	Croajingolong NP
	Sand Patch	Part protected Sand Patch WZ, Croajingolong NP
	Snowy	Snowy River WZ and Bowen WZ
	Tamboon	Croajingolong NP
	Tingaringy	Tingaringy WZ, Alpine NP
	Upper-Brodribb	Errinundra NP
Gippsland	Avon	Avon WP
	Indi Addition to Pilot and Davies Plain	Indi WZ, Alpine NP
	Mt Darling/Snowy Bluff	Mt Darling/Snowy Bluff WZ, Alpine NP
	Wilsons Promontory	Wilsons Promontory WZ, Wilsons Promontory NP
Gippsland/North East	Macalister	Alpine NP
	Razor/Viking	Razor Viking WZ
North East	Dartmouth	Partly protected by Alpine NP
	Wabba	Wabba WP
	Yarrarabulla Creek	Protected as PRK Forest Management Zone in State forest

a NP: national park; WZ: wilderness zone; PRK: park

Source: Data derived from the CRAs accessed via the ABARES website (VicRFASC (1996)) and PLM25 (DELWP)

Table 9 summarises the area of wilderness in the Victorian RFA regions over five-year intervals. Note that there have been no significant changes in area over the period of the RFAs, with minor area changes attributable to accuracy of spatial data, rather than additions or excisions from the wilderness itself. There is a difference between protected areas of high wilderness quality, as detailed in Table 7, and area of wilderness, as in Table 8, as Table 8 shows only the wilderness zones and parks established by the *National Parks Act 1975* (Vic). One hundred per cent of wilderness zones and parks are reserved. Figure 2 shows the location of the wilderness areas, as established by the Act, in the Victorian RFA regions.

Table 9: Wilderness zones and parks in Victorian RFA regions

RFA region	Area (hectares)				
	Total area of RFA region	At 30 June 2001	At 30 June 2006	At 30 June 2011	At 30 June 2016
Central Highlands	1,132,000	0	0	0	0
East Gippsland	1,213,000	130,264	130,264	130,264	130,264
Gippsland	2,655,000	121,563	121,563	121,563	121,563
North East	2,317,000	35,026	35,026	35,026	35,026
West	5,770,000	0	0	0	0
All RFA regions	**13,087,000**	**286,853**	**286,853**	**286,853**	**286,853**

Source: DELWP corporate data library WILDERNESS100 layer.

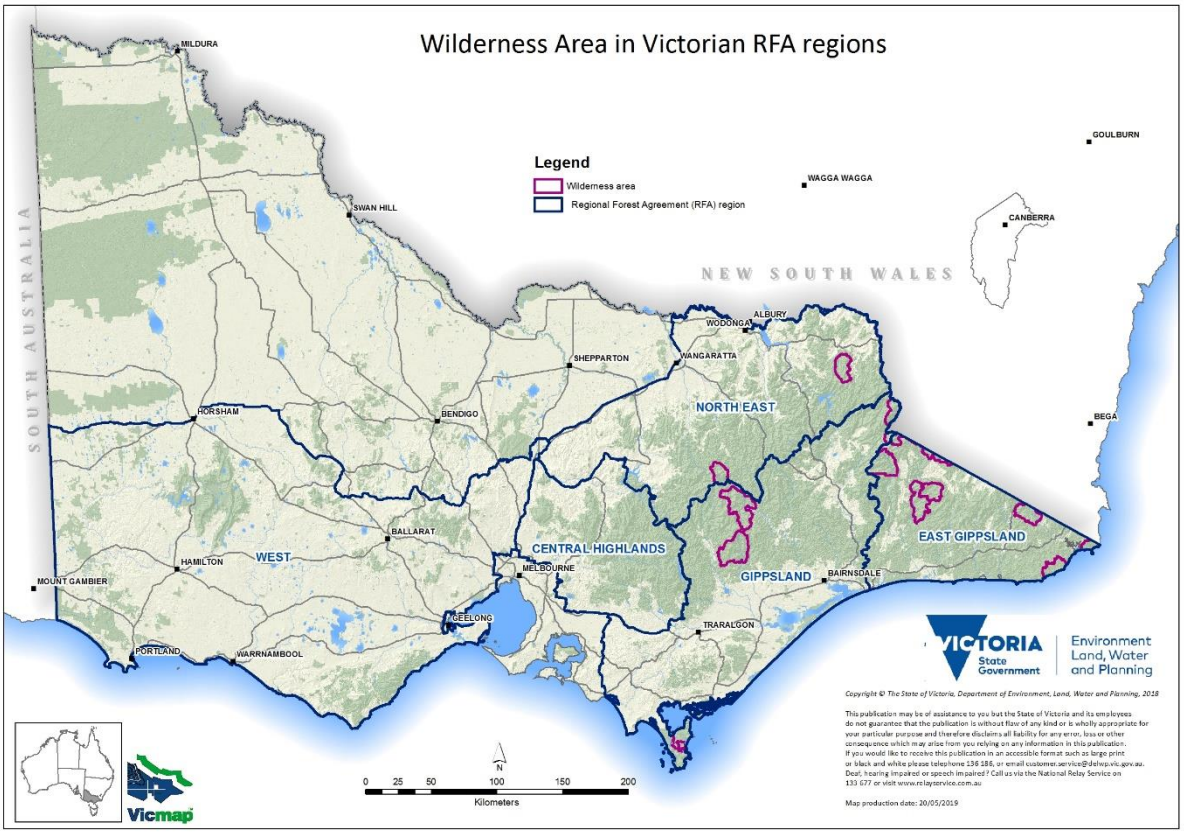

Figure 2: Wilderness areas in Victorian RFA regions

Other wilderness definitions

The extent of formally reserved delineated wilderness, formally reserved identified wilderness, and the International Union for Conservation of Nature (IUCN) protected areas wilderness category are each determined through mechanisms using differing definitions of wilderness. The IUCN Wilderness Area is derived from the Collaborative Australian Protected Area Database (CAPAD)[4] of the Australian Government Department of the Environment and Energy (DoEE), so may include wilderness outside formal reserves but otherwise protected through mechanisms recorded in CAPAD, such as informal reserves. Declared wilderness is a subset of identified wilderness.

International Union for Conservation of Nature wilderness

The IUCN defines wilderness as:

> Protected areas [that] are usually large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.
>
> (IUCN 2019a)

4 https://www.environment.gov.au/land/nrs/science/capad

The IUCN protected areas category '1b Wilderness Area' is reported through CAPAD. There are two IUCN Wilderness Areas within the Victorian RFA regions: Avon Wilderness Park and Wabba Wilderness Park.

Endangered species values

According to the *National forest policy statement*, endangered species are:

> species in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included are species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that the species are deemed to be in danger of extinction. Also included are species that are possibly already extinct but have definitely been seen in the wild in the past fifty years and have not been subject to recent thorough searching.
>
> (Commonwealth of Australia 1995, p. i [Glossary])

The states and the Commonwealth have a number of strategies and key pieces of environmental legislation to protect environmental values including threatened species and communities. These extend to species that are endangered and processes that are a threat to their viability. It is proposed that the modernised Victorian RFAs will have new terminology: 'Listed Species and Communities'. This is defined as a species or community listed under Part 13 of the EPBC Act or Part 3 of the *Flora and Fauna Guarantee Act 1988* (Vic.) (FFG Act) and that is, or has the potential to be, impacted upon by forestry operations. Listed Species and Communities in this assessment encompasses 'endangered species', which are specifically referred to as part of 'environmental values' in para. (a)(j) of the definition of 'RFA' in the RFA Act. However, the concept of 'listed species' is broader than the meaning of endangered species as defined in the *National forest policy statement* as it includes extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent categories. Listed threatened species and ecological communities are matters of national environmental significance (MNES) under the EPBC Act.

The EPBC Act is the Australian Government's central piece of environmental legislation. The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, Ramsar wetlands and World and National Heritage places – defined in the EPBC Act as MNES.

At July 2019, there were 196 threatened species and 32 non-threatened migratory birds listed under the EPBC Act that are known or likely to occur within the Victorian RFA regions (Appendix A.2). Almost all listed species (98.5 per cent) have a conservation advice and/or recovery plan to assist recovery. There are also 14 listed threatened ecological communities in the Victorian RFA regions listed under the EPBC Act (Appendix 3). All have conservation advices, recovery plans or both in place to assist in management and recovery.

There are 14 listed threatening processes affecting threatened species in the Victorian RFA regions. National threat abatement plans have been prepared for most of the key threatening processes registered under the EPBC Act where a threat abatement plan was considered a feasible, effective or efficient way to abate the processes.

At the commencement of EPBC Act the list of threatened species, ecological communities and threatening processes consisted only of those previously listed under the *Endangered Species Protection Act 1992* (Cth) (ESP Act). Since the commencement of the EPBC Act, 52 additional

species known or likely to occur in the Victorian RFA regions have been listed as threatened under national legislation.

National legislation protecting Listed Species and Communities

After the Victorian RFAs were signed (1997–2000), new Commonwealth environmental legislation came into force that changed the definition and assessment of threatened species at the national level. The EPBC Act protects Australia's native species and ecological communities by providing for the:

- identification and listing of threatened species and ecological communities
- development of conservation advice and, where appropriate, recovery plans for listed species and ecological communities
- development of a register of critical habitat identification
- recognition of key threatening processes
- development of threat abatement plans where appropriate
- implementation of environmental impact assessment processes for proposed actions with significant impacts to listed threatened species and ecological communities.

Listing and protection processes

The listing of species or ecological communities recognises their long-term survival is under threat. The national listing of species and ecological communities follows a rigorous scientific assessment process and involves consultation with stakeholders including scientific experts and the public. Advice on the eligibility of a species or ecological community for listing is provided to the responsible Australian Government minister by the independent Threatened Species Scientific Committee.

Once listed, a threatened species or ecological community is recognised as an MNES and must be considered through assessment and approval provisions of the EPBC Act.

Conservation advice and recovery plans

Since 2007, a conservation advice is required at the time of listing a threatened species or ecological community. Conservation advices outline the eligibility for listing, and immediate priorities for conservation, research and recovery (DoEE, n.d.-a).

For some species and ecological communities, a more comprehensive recovery plan may also be developed to guide recovery action. Recovery plans set out the research and management actions that are necessary to stop the decline of, and support the recovery of, listed threatened species and ecological communities (DoEE, n.d.-c). The aim of a recovery plan is to assist the long-term survival of the species or ecological community in its natural environment.

Key threatening processes and threat abatement plans

The way that key threatening processes are listed is similar to the listing of species and ecological communities. Once a key threatening process is listed under the EPBC Act, a threat abatement plan is developed if it is shown to be a 'feasible, effective and efficient way' to abate the threatening process. Threat abatement plans provide for the research, management, and

any other actions necessary to reduce the impact of a listed key threatening process on native species and ecological communities.

As with recovery plans, a threat abatement plan can be made by the minister alone or jointly with relevant states and territories, or the Australian Government minister can adopt a state or territory plan. Before a plan is made or adopted, there must be public consultation and advice from the Threatened Species Scientific Committee about the plan.

Interaction between the RFAs and the EPBC Act

Consistent with the objectives of the EPBC Act, the RFAs provide for protection of the environment, promote ecologically sustainable development, promote the conservation of biodiversity and provide for the protection of conservation of heritage.

Section 38 of the EPBC Act streamlines forest planning processes by exempting forest operations in RFA areas from assessment and approval processes under the Act. The rationale for this approach is that the EPBC Act recognises 'that in each RFA region a comprehensive assessment … has been, undertaken to address the environmental, economic and social impacts of forestry operations' (Explanatory Memorandum, Environment Protection and Biodiversity Conservation Bill 1999 (Cth), para. 113). This means forestry operations that are undertaken in accordance with an RFA do not require approval for the purposes of any provision in Part 3 of the EPBC Act (Explanatory Memorandum, Environment Protection and Biodiversity Conservation Bill 1999 (Cth), para. 112). The exceptions are forestry operations within World Heritage properties or Ramsar wetland sites, where assessment and approval is required.

Victorian legislation protecting listed species and communities

The FFG Act is the key piece of Victorian legislation for the conservation of biodiversity, including threatened species and communities. The FFG Act operates across all land tenures, including private land, although the application of some provisions on private land is limited. The FFG Act aims to conserve all of Victoria's native plants and animals, to ensure that any use of them by humans is sustainable, and to ensure that the genetic diversity of plants and animals is maintained. It establishes legal and administrative structures to enable and promote the conservation of Victoria's native flora and fauna and provides for the management of potentially threatening processes. The FFG Act establishes a range of mechanisms to achieve this objective, including:

- developing an overarching strategy for Victoria's biodiversity
- maintaining lists of:
    - threatened species and communities
    - potentially threatening processes
- preparing action statements for listed items
- declaring critical habitat
- making interim conservation orders to protect critical habitat
- placing a duty on public authorities to have regard to objectives of the Act in their operations

- requiring authorisation for activities that involve the handling of protected flora and threatened fish.

Protecting Victoria's environment – biodiversity 2037 was published in 2017 as the new Flora and Fauna Guarantee Strategy for the purposes of section 17 of the FFG Act. More detail is provided in the following section.

At June 2019, the Threatened List and Processes List include 647 threatened species, 41 threatened communities and 43 potentially threatening processes. The listing process is driven by public nominations and overseen by the Victorian independent Scientific Advisory Committee, which makes recommendations to the relevant ministers as to the validity and eligibility of items nominated for listing (or delisting).

Under the FFG Act (s. 19), it is a statutory requirement to prepare action statements for all listed species, communities and potentially threatening processes. The Secretary must prepare an action statement as soon as possible after an item has been listed. Action statements must set out what has been done to conserve and manage the item and what is intended to be done. They may include information on what needs to be done. In preparing or amending an action statement, the Secretary must consider any management advice given by the Scientific Advisory Committee and the Victorian Catchment Management Council and must consider any other relevant nature conservation, social and economic matters.

Action statements have been prepared for 276 listed species, although there are many species with advanced drafts. Action statements do not formally expire; however, many of the current action statements are more than 10 years old. Action statements for forest-dependent threatened species typically contain intended management actions that require the establishment of timber harvesting exclusion zones or modified harvesting procedures.

Actions contained within individual action statements, such as prescriptions requiring the establishment of Special Protection Zones where a Leadbeater's Possum colony is detected, may become a mandatory prescription through incorporation into the *Code of Practice for Timber Production 2014* (the Code). All prescriptions outlined in the Code are required to be complied with during timber harvesting operations in Victoria.

Other relevant Victorian legislation protecting Listed Species and Communities includes:

- The *National Parks Act 1975*, which establishes the statutory basis for the protection, use and management of a system of more than 100 national and other parks in Victoria covering over 3 million hectares (comprising both forests and non-forest vegetation). National parks generally include areas of national significance, outstanding natural values and diverse land types. Together with state and wilderness parks (and nature conservation reserves established under the *Crown Land (Reserves) Act 1978*), national parks contribute significantly to the representativeness of EVCs and biodiversity across the state and make significant contributions to Victoria's CAR reserve system.

- The *Wildlife Act 1975* regulates the taking, trading and keeping of wildlife. Under this Act, it is an offence to hunt, take or destroy wildlife – including threatened species – without authorisation.

The *Overview of Victoria's Forest Management System (DELWP,* 2020) details how Victoria provides for the protection of threatened species and communities.

Common Assessment Method

The Common Assessment Method (CAM) is a consistent approach to the assessment and listing of nationally threatened species across Australian jurisdictions. It is based on the best-practice standard developed by the IUCN, as used to create the Red List of Threatened Species and the Red List of Ecosystems, with some amendments to suit the Australian context.

The Victorian Government signed a memorandum of understanding (MOU) in April 2018 with the Australian Government and other states and territories to implement the CAM for species (known as the 'CAM MOU') (Australian Government, Australian Capital Territory Government, Tasmanian Government, Northern Territory Government, New South Wales Government, Queensland Government, Victorian Government, 2018). It has not, as yet, adopted the CAM for ecological communities.

The CAM MOU enables national assessments undertaken by one jurisdiction to be considered and accepted by another, under their legislation, ensuring that species are listed in the same national threat category across all Australian jurisdictions.

Under the CAM MOU, the Commonwealth is predominantly responsible for assessing species that occur in more than one state or territory. States and territories will generally lead on assessments for species and communities endemic to their jurisdiction.

As noted above, the CAM has not yet been given effect in Victorian law. The CAM will have a legislative basis as of 1 June 2020 when Flora and Fauna Guarantee Amendment Bill 2019 legislation comes into effect. At this time the Single Operational List of threatened species will become the Threatened List for the purposes of the FFG Act. Prior to June 2020, the department will continue to develop the Single Operational List of threatened species and their status in accordance with the CAM.

Broader biodiversity and threatened species initiatives

The management of biodiversity outcomes in State forests is also addressed through Victoria's statewide biodiversity plan, *Protecting Victoria's environment – biodiversity 2037* (*Biodiversity 2037*). The plan was developed to ensure that Victoria has a modern and effective approach to protecting and managing Victoria's biodiversity (DELWP 2017c). It was published in 2017 as the new Flora and Fauna Guarantee Strategy for the purposes of section 17 of the FFG Act. *Biodiversity 2037* notes that 70 per cent of Victoria's highest-value terrestrial biodiversity areas exist on the 40 per cent of land that is publicly owned; these areas include national, state and wilderness parks and other conservation reserves, and land used for a broader range of purposes – including State forests and smaller public land parcels.

The relevant targets in *Biodiversity 2037* are:

A net improvement in the outlook across all species by 2037, as measured by Change in Suitable Habitat,[5] with the expected outcomes being:

- That no vulnerable or near-threatened species will have become endangered.
- That all critically endangered and endangered species will have at least one option available for being conserved *ex situ* or re-established in the wild (where feasible under climate change) should they need it.
- A net gain of the overall extent and condition of habitats across terrestrial, waterway and marine environments.

(DELWP 2017c, p. 20)

In this context, the management of biodiversity outcomes from State forests is incorporated within a broader program of biodiversity initiatives across public land. These initiatives include:

- comprehensively engaging with Traditional Owners and Aboriginal Victorians to include Aboriginal values and traditional ecological knowledge in biodiversity planning and management.
- working with government agencies, private organisations and community groups to identify prospective projects across all land tenures. Biodiversity Response Planning is a new area-based planning approach to biodiversity conservation in Victoria. It is designed to strengthen alignment, collaboration and participation between government agencies, Traditional Owners, non-government agencies and the community.
- substantial, multi-year investment in the highest-priority projects arising from the Biodiversity Response Planning process. In 2018, 85 new projects for on-ground biodiversity action (worth $33.67 million) and four new projects for Marine Environment Targeted Action (worth $1.1 million) were announced. Funded projects will be delivered over three years, commencing in 2018–19 and continuing to 2020–21. Further information on projects and funding is available on the DELWP website.[6]
- developing and delivering decision-support tools which focus on the most cost-effective options for action to benefit the largest number of native species under climate change scenarios
- expanding and improving the collection of data, including consistent reporting on management activity, monitoring of asset condition where appropriate, and investigating the effectiveness of management to inform future decision-making.

In addition to the initiatives listed above, the Weeds and Pests on Public Land Program funds landscape-scale pest management projects including Southern Ark, Glenelg Ark, Grampians

5 'Change in suitable habitat' (CSH) is a measure for estimating the benefit to a species or suite of species present at a location from a specific management action or in-action. It is a composite measure, which reflects how the quality as well as the extent of habitat will improve over a 50-year timeframe. It is a key metric used within the Victorian Government's Strategic Management Prospects (SMP) tool - a decision-support tool that uses spatial models on species distributions, information on key biodiversity threats, cost information for key management actions which address those threats and expert elicited response models for thousands of species to different management actions.

6 https://www.environment.vic.gov.au/biodiversity/biodiversity-response-planning

Ark, Central Highlands Ark, Barry Mountains fox control program and Mallee Bounceback (DELWP 2019c). Weed management projects ('Edens') are being implemented in the Central Highlands, Otway Ranges and Glenelg regions. The program invests $3.1 million each year across approximately 10 per cent of the state throughout Victoria's highest biodiversity assets on public land. A further $1 million is contributed each year by delivery partner Parks Victoria. These initiatives are cross tenure and have been delivered for 15 years.

Indicator 1.2b: The status of forest-dwelling species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment

This indicator measures the conservation status of nationally listed threatened forest-dwelling species. Documentation of this information over time allows analysis of changes to species conservation status indicating the extent to which forest species biodiversity is being maintained. Forest-dwelling species are species that occur in forest vegetation types, although they may also occur outside forests. Forest-dependent species are species that require a forest habitat for at least part of their life cycle. EPBC Act listed species reported here have not been limited to those that are exclusively forest dependent.

As part of the CRA process undertaken for Victorian RFAs (1997–2000), an assessment was made of threatened flora and fauna listed under the legislation at the time, the FFG Act (Vic.) and the ESP Act (Cth). A number of non-threatened indicator species were also chosen to provide a broader assessment of fauna in the region. These included species representative of taxa at risk from various management activities. Assessments of these species included:

- vulnerability assessments to identify rare or threatened species that are at greatest risk of further significant decline and extinction as a result of activities, ongoing threatening processes and catastrophic events in the region
- species reservation analysis assessments to assess the extent to which species of conservation significance in each RFA region were protected in the reserve system at that time
- disturbances (threatening processes) assessments to describe potentially threatening processes relevant to each RFA region and the management arrangements currently in place to address these.

The Flora Information System of Victoria and the Atlas of Victorian Wildlife, comprising both formal survey and incidental observations, were used to conduct the CRA flora and fauna assessment. An assessment of the proportions of species records in reserves, non-reserve areas and partially reserved areas was also undertaken for threatened terrestrial vertebrate species.

The current assessment of threatened species for this indicator is based on species, community and threat information stored in the Commonwealth Environmental Resources Information Network Species Profile and Threats Database. Species identified here are known or likely to occur within Victoria's RFA regions as at July 2019.

Habitat distribution models (HDMs) for high-priority forest-dependent threatened species have been used to conduct a species reservation analysis for a subset of forest-dependent

threatened species. HDMs are based on species observation records stored in the Victorian Biodiversity Atlas (VBA). This analysis and further information on this process and other information systems used to inform the consideration of threatened species in forest management planning in Victoria is outlined under Indicators 1.2a and 1.2c.

As of July 2019, there are 196 EPBC Act listed threatened fauna and flora species known or likely to occur within the Victorian RFA regions (Table 10). EPBC Act listed species reported here have not been limited to those that are exclusively forest dependent. Appendix 2 details all EPBC Act listed species which are known or likely to occur within the Victorian RFA regions as well as the status of national conservation advices and recovery plans.

Table 10: Number of EPBC Act listed species known or likely to occur by RFA region

RFA region	Critically endangered	Endangered	Vulnerable	Total
Central Highlands	10	15	24	49
East Gippsland	3	11	38	52
Gippsland	11	23	46	80
North East	8	18	30	56
West	16	40	59	115
Total across all RFA regions[a]	**25**	**64**	**111**	**196**

a Totals are less than the sum of the number for each listed category because many species occur in more than one RFA region. Threatened marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.

Source: Environmental Resources Information Network Species Profile and Threats Database. Accessed 31 July 2019.

Victorian FFG Act listed species and Victorian Advisory List species

There are 647 fauna and flora species and 41 ecological communities listed as threatened in Victoria under the FFG Act. Of these, 207 species are forest dependent and located within Victorian RFA regions (Table 11).

Table 11: FFG Act listed forest-dependent species by RFA region

Species	Central Highlands	East Gippsland	Gippsland	North East	West	Total
Amphibian	3	4	4	3	1	15
Bat	3	3	3	3	2	14
Bird	6	7	7	7	5	32
Crustacean	3	3	5	1	0	12
Fish	4	0	1	4	1	10
Mammal	9	8	11	7	10	45
Plant	9	24	16	12	8	69
Reptile	2	4	2	1	1	10
Total	**39**	**53**	**49**	**38**	**28**	**207**

Source: Data sourced from verified forest-dependent species observation records in the VBA 1980–2019, accessed July 2019

Central Highlands

The Central Highlands CRA assessed more than 67 plants of conservation significance,[7] including factors that may predispose them to decline or extinction, potential threats and management actions in place to mitigate those threats. The CRA also provided information about 33 species of mammals, reptiles, birds and frogs and 15 flora species that are listed under Commonwealth or state legislation as being threatened. Six FFG Act listed native freshwater fish species were recorded at this time in the Central Highlands and two of these were also listed under the Commonwealth ESP Act when it was in force.

The Central Highlands area contains populations of Leadbeater's Possum, an endangered species with complex habitat requirements. The Baw Baw Frog is also confined to the Central Highlands, where it occupies a restricted range at higher elevations. The region also provides important habitat for a number of large forest owls. The initial discovery of the Baw Baw Frog in State forest areas on the south-western and north-eastern escarpments of the Baw Baw Plateau in 1996 led to the establishment of interim management guidelines to manage forestry activities in State forest in the species' habitat. This was followed by the establishment of an SPZ over the area to protect the species and its habitat from the impacts of logging (Hollis 2011).

In July 2019, there were 49 EPBC Act listed fauna and flora species known or likely to occur within the Central Highlands RFA region (Table 12). Since the commencement of the EPBC Act,

7 Refers to flora species listed as rare or threatened under FFG Act, *Endangered Species Protection Act 1992 (Cth)*, Victorian Rare or Threatened Species list for plants (VROTs), and Victorian Rare or Threatened Australian Plants (ROTAP).

17 additional species known or likely to occur in the Central Highlands RFA region have been listed as threatened under this legislation.

Table 12: Number of EPBC Act listed species known or likely to occur in the Central Highlands RFA region as of July 2019

Type	Critically endangered	Endangered	Vulnerable	Total
Bird	4	1	1	6
Crustacean	0	0	0	0
Flora	2	8	13	23
Freshwater fish	1	2	3	6
Frog	1	1	2	4
Insect	1	1	0	2
Mammal	1	2	3	6
Reptile	0	0	1	1
Other	0	0	1	1
Total	**10**	**15**	**24**	**49**

Note: Marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.

Source: Environmental Resources Information Network Species Profile and Threats Database. Accessed 31 July 2019.

East Gippsland

The East Gippsland CRA assessed 369 flora species of conservation significance, including factors that may predispose them to decline or extinction, potential threats and management actions in place to mitigate those threats. The CRA also provided information about 38 species of mammals, reptiles, birds and frogs. Of the 29 native freshwater fish species recorded from East Gippsland in the CRA, four were listed under the FFG Act, and three were listed under the ESP Act.

Species assessed in the CRA include the Long-footed Potoroo, Smoky Mouse, Broad-toothed Rat, Powerful Owl and Sooty Owl.

As of July 2019, there were 52 EPBC Act listed fauna and flora species known or likely to occur within the East Gippsland RFA region (Table 13). Since the commencement of the EPBC Act, 13 additional species known or likely to occur in the East Gippsland RFA region have been listed as threatened under this legislation.

Table 13: Number of EPBC Act listed species known or likely to occur in the East Gippsland RFA region as of July 2019

Type	Critically endangered	Endangered	Vulnerable	Total
Bird	2	3	4	9
Crustacean	0	0	0	0
Flora	1	4	22	27
Freshwater fish	0	0	1	1
Frog	0	0	6	6
Insect	0	0	0	0
Mammal	0	4	5	9
Reptile	0	0	0	0
Other	0	0	0	0
Total	**3**	**11**	**38**	**52**

Note: Marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.

Source: Environmental Resources Information Network Species Profile and Threats Database. Accessed 31 July 2019.

Gippsland

The Gippsland CRA assessed more than 73 plants of conservation significance (nine listed under the ESP Act), including factors that may predispose them to decline or extinction, potential threats and management actions in place to mitigate those threats. The CRA also provided information about 39 species of mammals, reptiles, birds and frogs species (five of these were listed under the ESP Act). High-priority threatened species as well as indicator species were assessed. Of the 21 native freshwater fish species recorded from Gippsland in the CRA, five were listed under the FFG Act, and one was listed under the ESP Act.

Four of the 39 species assessed in the CRA were considered vulnerable to stochastic events, such as wildfire, due to the combination of small geographic range size, low abundance and narrow habitat specificity; these were the Long-footed Potoroo, New Holland Mouse, Southern Horseshoe Bat and Swamp Skink. The CRA recommended that these species be given particular consideration in developing priorities for management action. The EPBC Act listed Long-footed Potoroo and New Holland Mouse have both (subsequent to the RFA) had conservation advice and/or recovery plans developed.

As of July 2019, there were 80 EPBC Act listed fauna and flora species known or likely to occur within the Gippsland RFA region (Table 14). Since the commencement of the EPBC Act, 28 additional species known or likely to occur in the Gippsland RFA region have been listed as threatened under this legislation.

Table 14: Number of EPBC Act listed species known or likely to occur in the Gippsland RFA region as of July 2019

Type	Critically endangered	Endangered	Vulnerable	Total
Bird	6	4	4	14
Crustacean	0	0	0	0
Flora	2	9	28	39
Freshwater fish	1	1	2	4
Frog	1	1	4	6
Insect	0	1	0	1
Mammal	1	5	7	13
Reptile	0	2	0	2
Other	0	0	1	1
Total	**11**	**23**	**46**	**80**

Note: Marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.

Source: Environmental Resources Information Network Species Profile and Threats Database. Accessed 31 July 2019.

North East

The North East CRA assessed more than 29 plants of conservation significance (14 listed under the ESP Act), including factors that may predispose them to decline or extinction, potential threats and management actions in place to mitigate those threats. The CRA also provided information about 49 species of mammals, reptiles, birds and frogs (six of these were listed under the ESP Act). At the time of the CRA, of the 14 native freshwater fish species recorded from the North East, eight are listed as threatened fauna in Victoria, including four which are listed under the FFG Act, and two of these four, which are also listed under the ESP Act.

The Long-footed Potoroo and Spotted Tree Frog were two priority species (listed nationally at that time under the ESP Act and currently listed under the EPBC Act) occurring in this RFA region and assessed as part of the CRA. Under the RFA, protections for these species included protections within the CAR reserve system and prescriptions.

Since the signing of the North East RFA, an action statement under the FFG Act and a National Recovery Plan and Conservation Advice under the EPBC Act have been developed for the Spotted Tree Frog. These guide actions to conserve this species.

As of July 2019, there were 56 EPBC Act listed fauna and flora species known or likely to occur within the North East RFA region (Table 15Table 14). Since the commencement of the EPBC

Act, 22 additional species known or likely to occur in the North East RFA region have been listed as threatened under this legislation.

Table 15: Number of EPBC Act listed species known or likely to occur in the North East RFA region as of July 2019

Type	Critically endangered	Endangered	Vulnerable	Total
Bird	3	1	2	6
Crustacean	0	0	0	0
Flora	2	4	20	26
Freshwater fish	2	3	1	6
Frog	0	3	2	5
Insect	1	1	0	2
Mammal	0	4	3	7
Reptile	0	2	2	4
Other	0	0	0	0
Total	**8**	**18**	**30**	**56**

Note: Marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.

Source: Environmental Resources Information Network Species Profile and Threats Database. Accessed 31 July 2019.

West

The West CRA assessed more than 101 plants of conservation significance (28 listed under the ESP Act), including factors that may predispose them to decline or extinction, potential threats and management actions in place to mitigate those threats. The CRA also provided information about 42 species of mammals, reptiles, birds and frogs species (five of these were listed under the ESP). Of the 21 native freshwater fish species recorded from the West RFA region in the CRA, six were listed under the FFG Act, and four of these were also listed under the ESP Act.

Species assessed in the CRA include the Hairy-pod Wattle, Brush-tailed Phascogale, Bush-stone Curlew and Spot-tailed Quoll.

As of July 2019, there were 115 EPBC Act listed fauna and flora species known or likely to occur within the West RFA region (Table 16). Since the commencement of the EPBC Act, 36 additional species known or likely to occur in the West RFA region have been listed as threatened under this legislation.

Table 16: Number of EPBC Act listed species known or likely to occur in the West RFA region as of July 2019

Type	Critically endangered	Endangered	Vulnerable	Total
Bird	7	5	6	18
Crustacean	0	1	0	1
Flora	5	26	40	70
Freshwater fish	1	1	5	7
Frog	0	0	1	1
Insect	1	0	0	1
Mammal	1	5	5	11
Reptile	0	2	2	4
Other	1	0	0	1
Total	**16**	**40**	**59**	**115**

Note: Marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.

Source: Environmental Resources Information Network Species Profile and Threats Database. Accessed 31 July 2019.

Status of listed species recovery plans and conservation advice

Almost all EPBC Act listed species known or likely to occur within Victorian RFA regions have a conservation advice and/or recovery plan to assist recovery. The 32 non-threatened EPBC Act listed migratory birds do not require a conservation advice or recovery plan.

Victorian action statements are preferentially prepared for species listed as critically endangered. There are action statements prepared for 276 FFG Act listed species. The Australian and Victorian governments continue to work collaboratively in prioritising the development of new recovery plans.

Case studies on the management of three nationally listed species, the Blue-tongued Orchid, Long-footed Potoroo and Leadbeater's Possum are outlined in the 'Overview of Victoria's forest management system 2020'.

Threatened ecological communities

As of July 2019, there were 14 ecological communities listed as threatened under the EPBC Act that were known or likely to occur in Victorian RFA region (Table 17). One ecological community, Silurian Limestone Pomaderris Shrubland of the South East Corner and Australian Alps bioregions, was listed under the predecessor to the EPBC Act, the ESP Act. The other 13 ecological communities were listed between 2006 and 2018, after all five Victorian RFAs were

signed. A list of ecological communities occurring in the Victorian RFA regions is provided at Appendix 3.

Table 17: Number of listed ecological communities under the EPBC Act known or likely to occur in the Victorian RFA regions

RFA region	Critically endangered	Endangered	Vulnerable	Total
Central Highlands	3	1	0	4
East Gippsland	3	1	1	5
Gippsland	5	3	1	9
North East	2	2	0	4
West	6	2	1	9
Total all RFA regions	**9**	**4**	**1**	**14**

Source: Environmental Resources Information Network Species Profile and Threats Database. Accessed 31 July 2019

Status of listed communities recovery plans and conservation advice

Of the 14 EPBC Act listed threatened ecological communities within Victorian RFA regions, all have either a conservation advice, recovery plan or both in place to guide their recovery. A case study on the management of the EPBC Act listed community 'Alpine Bogs and associated Fens' is outlined in the *Overview of Victoria's Forest Management System 2020*.

Key threatening processes

There are 14 threatening processes listed under the EPBC Act potentially affecting threatened species in Victorian RFA regions (see Table 18). The Australian Government has developed threat abatement plans for most of the key threatening processes registered under the EPBC Act where a threat abatement plan was considered a feasible, effective or efficient way to abate the process.

Table 18: EPBC Act listed key threatening processes potentially affecting threatened species in Victorian RFA regions

EPBC Act listed key threatening process	Effective listing date	Threat abatement plan date of approval
Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*)	9 May 2014	Not applicable – threat abatement plan not considered a feasible, effective or efficient way to abate the process.
Competition and land degradation by rabbits	16 July 2000	2016
Competition and land degradation by unmanaged goats	16 July 2000	2008
Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*)	16 July 2000	2014
Infection of amphibians with chytrid fungus resulting in chytridiomycosis	23 July 2002	2016
Land clearance (excluding timber harvesting/utilisation)	4 April 2001	Not applicable – threat abatement plan not considered a feasible, effective or efficient way to abate the process.
Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases	4 April 2001	Not applicable – threat abatement plan not considered a feasible, effective or efficient way to abate the process.
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	8 January 2010	Not applicable – threat abatement plan not considered a feasible, effective or efficient way to abate the process.
Novel biota and their impact on biodiversity	23 February 2013	Not applicable – threat abatement plan not considered a feasible, effective or efficient way to abate the process.
Predation by European Red Fox	16 July 2000	2008
Predation by feral cats	16 July 2000	2015
Predation, habitat degradation, competition and disease transmission by Feral Pigs	6 August 2001	2017
Psittacine Circoviral (beak and feather) disease affecting endangered psittacine species	4 April 2001	2005; ceased on 1 October 2015, however, a non-statutory threat abatement advice is in place.
The reduction in the biodiversity of Australian native fauna and flora due to the red imported fire ant, *Solenopsis invicta*	2 April 2003	2006; ceased on 1 October 2016, however, a non-statutory threat abatement advice is in preparation.

Source: Environmental Resources Information Network Species Profile and Threats Database. Accessed 31 July 2019

Case study: predation by European Red Fox – the Southern Ark (East Gippsland) Weeds and Pests on Public Land Program

Predation by the European Red Fox (*Vulpes vulpes*) is listed as a key threatening process under the EPBC Act. Under the Act, the Australian Government, in consultation with the states and territories, developed the *Threat abatement plan for predation by the European red fox*.

The threat abatement plan (TAP) identifies that fox populations need to be reduced over large areas because rapid population recovery, particularly by reinvasion, is a major problem (Australian Government Department of the Environment, Water, Heritage and the Arts [DEWHA] 2008b). The Southern Ark project in Victoria is identified as a successful example of a regional control program designed to protect at-risk species and substantially expand available habitat (DEWHA 2008a).

Far East Gippsland is a stronghold for native terrestrial mammals, birds and reptiles, several of which are rare or locally extinct in other parts of Victoria. In 1995 an analysis by regional biodiversity staff of the threats operating on vertebrates in East Gippsland identified predation by foxes as a process that affected multiple species, but was feasible to address. This led to the implementation of Project Deliverance (1998–2003) (Dexter & Murray 2009), a research project in which landscape-scale fox-baiting protocols were tested, refined, and applied operationally across several large areas of public forest (i.e. areas greater than 10,000 hectares) in the region.

Populations of several species of native mammals known to be preyed upon by foxes were monitored; these demonstrated a significant increase following fox control. These species included the threatened Long-nosed Potoroo and Southern Brown Bandicoot, as well as the more abundant Common Brush-tailed Possum. The results of Project Deliverance formed the basis for the Southern Ark project, which began in 2004.

Southern Ark operates across the entire eastern 'wedge' of Victoria, from the Snowy River valley to Cape Howe. It assists the recovery of multiple species across nearly one million hectares of State forest, national parks and private land. The recovery of both rare and more common species due to the reduction in the predation pressure from foxes has also led to the reinvigoration of the multiple ecosystem processes that these species are involved in, including soil aeration, the dispersal of critically important symbiotic hypogeal (underground) fungi, the breakdown in leaf litter and nutrient recycling, the reduction in fine fuels on the forest floor, and pollination and seed dispersal.

The Southern Ark project is funded by the Victorian Government through the Weeds and Pests on Public Land Program. This project is helping to ensure that Victoria's biodiversity is healthy, valued and actively cared for and is aligned with the implementation of *Biodiversity 2037*.

Key achievements from this project include:

- Around 30,000 baits have been laid over 15 years.
- Long-footed Potoroos have been detected at over 200 new locations during the first round of camera-trap monitoring.
- It features one of the largest camera-trapping programs in Australia, with over 720 sites monitored for over five weeks each.

- Potoroos, bandicoots and possums all responded positively to fox control.
- Brush-tailed Rock-wallabies are recovering due to active management and fox control.
- Community groups, school students and university students have all been involved in its delivery.

The project[8] is delivered by DELWP in partnership with Parks Victoria, a wide range of local private landholders and Moogji Aboriginal Council.

National estate values

National estate values in the RFA Act refer to the aesthetic, historic, scientific, social significance or other values [9]of places that form part of the natural or cultural environment of Australia that make those places of significance or special value to current and future generations. National estate values are protected and managed through implementation of the CAR reserve system and the application of the Victorian forest management system.

The term 'national estate' refers to places defined in s. 4 of the repealed *Australian Heritage Commission Act 1975* (Cth) (AHC Act). After the signing of the five Victorian RFAs, the *AHC Act* was repealed and the Register of the National Estate was phased out. As a consequence, the RFAs do not reflect the current system of heritage protection under the EPBC Act through the National and Commonwealth Heritage Lists and the *Australian Heritage Council Act 2003* (Cth).

The National Heritage List is a list of places with outstanding natural, Indigenous or historic heritage value to the nation. The Commonwealth Heritage List is a list of Indigenous, historic and natural heritage places owned or controlled by the Australian Government. There are 13 places on the National Heritage List and 17 places on the Commonwealth Heritage List within the Victorian RFA regions[10] (Table 19 and Table 20).

For the past 20 years, the forest management system has provided for the protection of national heritage values of National Heritage places in accordance with National Heritage management principles.[11]

Changes to national legislation

Closure of the Register of the National Estate

After the Victorian RFAs were signed between 1997 and 2000, a new system of national heritage protection was introduced. The Register of the National Estate was a national list of places of natural, historic and Indigenous significance. Each site was identified under the

[8] More information on this project or the Weeds and Pests on Public Land Program is available at www.environment.vic.gov.au/weeds-and-pests.
[9] See the criteria evaluated for listing on the National Estate https://www.environment.gov.au/system/files/resources/8b50f335-42e8-4599-b5e0-ac643f75475f/files/nhl-guidelines.pdf
[10] More information on these listing can be found at http://www.environment.gov.au/heritage/heritage-places.
11 See https://www.environment.gov.au/heritage/about/national/managing-national-heritage-places

repealed AHC Act and the EPBC Act. The register was maintained by the Australian Heritage Commission and later the Australian Government between 1975 and 2007.

In 1997, the Council of Australian Governments agreed that it was more appropriate for heritage listing and protection to be the responsibility of the government agencies that were best placed to deliver agreed outcomes. As a result, the AHC Act was repealed and the Register of the National Estate was phased out as a statutory list.

The register was frozen in 2007 and ceased to be a recognised statutory list in February 2012. The Register of the National Estate is maintained on a non-statutory basis as a publicly available archive of information on more than 13,000 places throughout Australia. This list can be publicly accessed on the Australian Heritage Database.[12]

A new national heritage system

The expiration and repeal of parts of the EPBC Act and the AHC relating to the Register of National Estate did not diminish protection of Commonwealth heritage places. These parts were superseded by stronger ongoing heritage protection provisions under national environment law.

National estate values are now managed through a combination of the National and Commonwealth Heritage Lists, the Victorian Heritage Register and the Heritage Codes of local planning schemes. The National Heritage List includes places of outstanding heritage value to the nation, and the Commonwealth Heritage List includes heritage places owned or controlled by the Commonwealth.

Commonwealth and National Heritage List assessment

Anyone can nominate a place with significant or outstanding heritage values for the Commonwealth or National Heritage List. The Australian Heritage Council assesses the values of nominated places against set criteria and makes recommendations to the Minister for the Environment about listing. There are two key tools used to assess Commonwealth and National Heritage List nominations: criteria and thresholds. To reach the threshold for the National Heritage List, a place must have 'outstanding' heritage value to the nation. This means that it must be important to the Australian community as a whole. The threshold for inclusion on the Commonwealth Heritage List is local heritage significance.

Victorian legislation to protect national estate values

Heritage Act 2017

The *Heritage Act 2017* is administered by Heritage Victoria and is Victoria's main cultural heritage legislation. The Act identifies and protects heritage places and objects that are of state-level cultural heritage significance to Victoria, including:

- archaeological sites and artefacts
- historic buildings, structures and precincts

12 See https://www.environment.gov.au/heritage/publications/australian-heritage-database

- gardens, trees and cemeteries
- cultural landscapes
- shipwrecks and artefacts
- significant objects.

The Act establishes the Victorian Heritage Register, the Heritage Inventory and the Heritage Council of Victoria. It also establishes a legislative framework for heritage protection in Victoria, replacing the *Heritage Act 1995*, *Historic Buildings Act 1981*, *Historic Shipwrecks Act 1981* and part of the *Archaeological and Aboriginal Relics Preservation Act 1971*.

The Victorian Heritage Register is a database of places and objects that are of particular importance to the people of Victoria and that may be valued by particular social groups. The Heritage Council of Victoria is responsible for determining which places and objects are added to the database.

Aboriginal Heritage Act 2006

The *Aboriginal Heritage Act 2006* (AHA) recognises Aboriginal people as the primary guardians, keepers and knowledge holders of Aboriginal cultural heritage, and links the protection of Aboriginal cultural heritage in Victoria with planning and land development processes. The AHA replaced Part IIA of the Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* and the Victorian *Archaeological and Aboriginal Relics Preservation Act 1972*.

The AHA also provides the mechanism through which Registered Aboriginal Parties (RAPs) are appointed. RAPs are organisations that represent Traditional Owners of the area for which the RAP has been appointed and hold decision-making responsibilities under the AHA for the protection, management and preservation of Aboriginal cultural heritage in these areas.

Section 148 of the AHA outlines the functions of a RAP:

(a) to act as a primary source of advice and knowledge for the Minister, Secretary and Council on matters relating to Aboriginal places located in or Aboriginal objects originating from the area for which the party is registered;

(b) to advise the Minister regarding, and to negotiate, the repatriation of Aboriginal cultural heritage that relates to the area for which the party is registered;

(c) to consider and advise on applications for cultural heritage permits;

(d) to evaluate and approve or refuse to approve cultural heritage management plans that relate to the area for which the party is registered;

(e) to enter into cultural heritage agreements;

(f) to apply for interim and ongoing protection declarations;

(g) to carry out any other functions conferred on registered Aboriginal parties by or under this Act.

The *Aboriginal Heritage Regulations 2018* give effect to the Act, outlining the standards, procedures and fees for proposing an activity or development in an area of cultural heritage sensitivity.

Indicator 6.4b: Registered places of non-Indigenous cultural value in forests that are formally managed to protect those values

This indicator measures and monitors management regimes for non-Indigenous cultural values, such as historical, research, education, aesthetic and social heritage values. Indigenous cultural heritage values are considered under indicators 6.4a, 6.4c and 6.4d, elsewhere in this document.

Within the Victorian RFA regions there are 13 places registered on the National Heritage List and 17 places on the Commonwealth Heritage List. Figure 3 shows the locations of the listed National and Commonwealth Heritage places in the Victorian RFA regions.

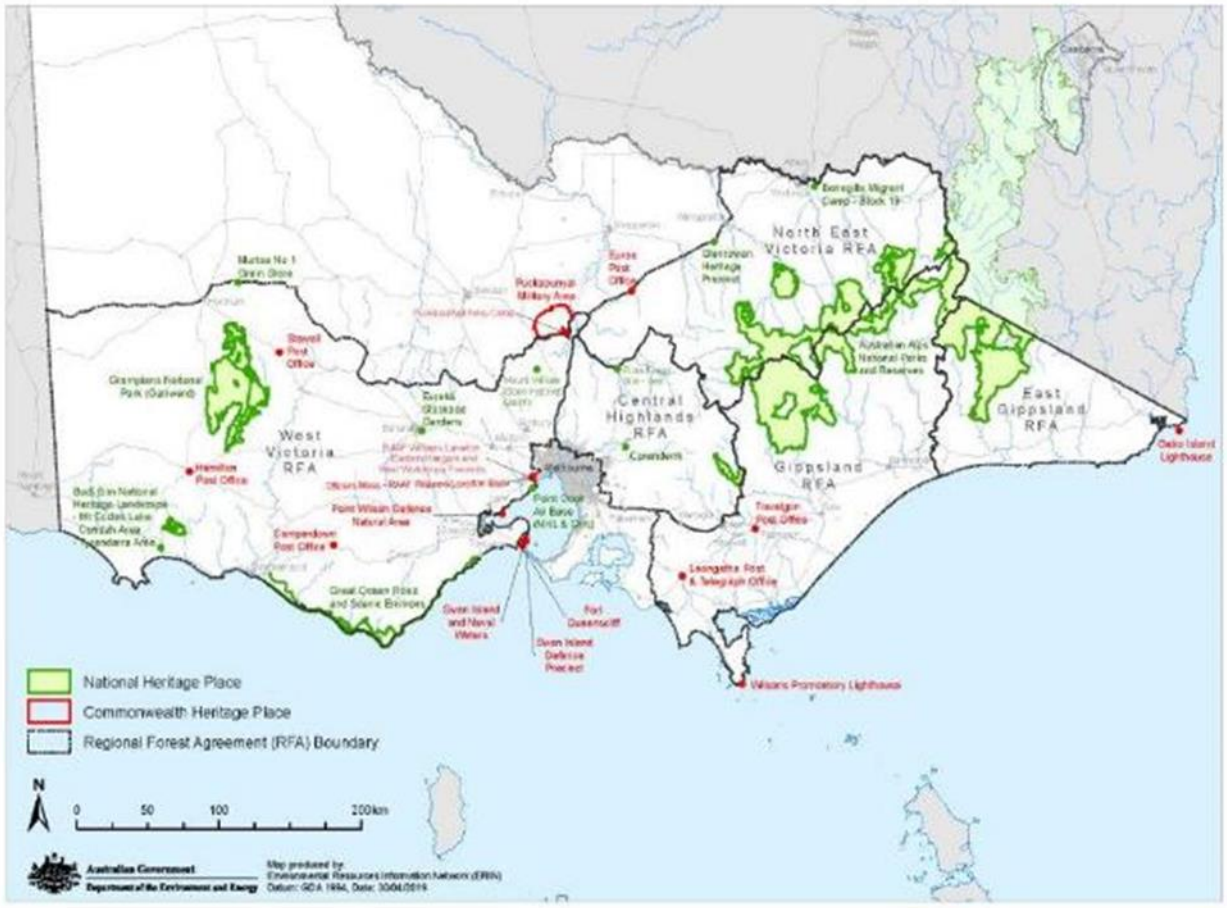

Figure 3: Locations of National Heritage and Commonwealth Heritage listed places within Victorian RFA regions, 2019

Source: DoEE 2019a

Across the Victorian RFA regions, approximately 1 million hectares of forested land is on sites classified as non-Indigenous Heritage Sites of Victoria. These are largely in the Alpine National Park and Grampians National Park. The cultural values of these sites are protected through

state and Commonwealth legislation. Many of the National Heritage places (Figure 3) include forested areas and are managed to protect cultural and natural values by being in national parks, reserves and protected areas. Table 19 provides a list of locations added to the register since 2004.

Table 19: Victorian National Heritage List places

Name	Type	RFA region[a]	Listing date
Australian Alps National Parks and Reserves	Natural	CH, EG, G, NE	07/11/2008
Bonegilla Migrant Camp – Block 19	Historic	NE	07/12/2007
Budj Bim National Heritage Landscape – Mt Eccles Lake Condah Area	Indigenous	W	20/07/2004
Budj Bim National Heritage Landscape – Tyrendarra Area	Indigenous	W	20/07/2004
Coranderrk	Indigenous	CH	07/06/2011
Eureka Stockade Gardens	Historic	W	08/12/2004
Flora Fossil Site – Yea	Natural	CH, NE	11/01/2007
Glenrowan Heritage Precinct	Historic	NE	05/07/2005
Grampians National Park (Gariwerd)	Natural	W	15/12/2006
Great Ocean Road and Scenic Environs	Historic	W	07/04/2011
Mount William Stone Hatchet Quarry	Indigenous	W	25/02/2008
Murtoa No 1 Grain Store	Historic	W	01/10/2014
Point Cook Air Base	Historic	W	31/10/2007

a RFA regions: CH – Central Highlands, EG – East Gippsland, G – Gippsland, NE – North East, W – West.

Table 20: Victorian Commonwealth Heritage List places

Name	Type	RFA region[a]	Listing date
Camperdown Post Office	Historic	W	08/11/2011
Euroa Post Office	Historic	NE	22/08/2012
Fort Queenscliff	Historic	W	22/06/2004
Gabo Island Lighthouse	Historic	EG	22/06/2004
Hamilton Post Office	Historic	W	08/11/2011
Leongatha Post & Telegraph Office	Historic	G	22/06/2004
Officers Mess – RAAF Williams Laverton Base	Historic	W	22/06/2004
Point Cook Air Base	Historic	W	26/06/2004
Point Wilson Defence Natural Area	Natural	W	22/06/2004
Puckapunyal Army Camp	Historic	W	22/06/2004
Puckapunyal Military Area	Natural	W	22/06/2004
RAAF Williams Laverton – Eastern Hangers and West Workshops Precincts	Historic	W	14/09/2009
Stawell Post Office	Historic	W	22/06/2004
Swan Island and Naval Waters	Natural	W	22/06/2004
Swan Island Defence Precinct	Historic	W	22/06/2004
Traralgon Post Office	Historic	G	08/11/2011
Wilsons Promontory Lighthouse	Historic	G	22/06/2004

a RFA Regions: CH – Central Highlands, EG – East Gippsland, G – Gippsland, NE – North East, W – West.

Victoria's (non-Indigenous) heritage assets are listed in the Victorian Heritage Register[13] and Heritage Inventory database. Those assets occurring in RFA regions are listed in Table 21.

13 See https://heritagecouncil.vic.gov.au/heritage-protection/levels-of-protection/

Table 21: Number of Historic places, according to type across RFA regions

Historic place type	No. of historic places	RFA region
Air Transport	1	Gippsland
	3	Central Highlands
	1	North East
	3	West
Cemeteries and Burial Sites	21	East Gippsland
	34	Gippsland
	24	Central Highlands
	9	North East
	111	West
Community Facilities	2	East Gippsland
	1	Gippsland
	4	Central Highlands
	92	West
Education	3	East Gippsland
	16	Gippsland
	16	Central Highlands
	3	North East
	118	West
Exploration Survey Events	39	East Gippsland
	5	Gippsland
	2	Central Highlands
	3	North East
	14	West
Farming and Grazing	21	East Gippsland
	92	Gippsland
	45	Central Highlands
	87	North East
	44	West

Historic place type	No. of historic places	RFA region
Finance	1	West
Forestry and Timber	39	East Gippsland
	125	Gippsland
	1,006	Central Highlands
	88	North East
	323	West
Government and Administration	2	East Gippsland
	1	North East
	16	West
Health Services	13	West
Hotels and Motor Inns	2	East Gippsland
	24	Gippsland
	27	Central Highlands
	12	North East
	5	West
Indigenous	5	West
Landscape	3	Central Highlands
	16	West
Law and Enforcement	3	Gippsland
	6	Central Highlands
	11	North East
	51	West
Manufacturing and Processing	2	East Gippsland
	1	Gippsland
	2	Central Highlands
	1	North East
	4	West
Maritime Industry	1	East Gippsland
	5	Gippsland

Historic place type	No. of historic places	RFA region
	25	West
Military	8	East Gippsland
	5	Gippsland
	3	Central Highlands
	2	West
Mining and Mineral Processing	56	East Gippsland
	514	Gippsland
	524	Central Highlands
	439	North East
	588	West
Monuments and Memorials	1	East Gippsland
	7	Gippsland
	10	Central Highlands
	4	North East
	153	West
Parks, Gardens and Trees	4	East Gippsland
	7	Gippsland
	10	Central Highlands
	5	North East
	23	West
Postal and Telecommunication	1	East Gippsland
	2	Gippsland
	1	Central Highlands
	1	West
Public Utilities	4	East Gippsland
	3	Gippsland
	35	Central Highlands
	15	North East
	13	West

Historic place type	No. of historic places	RFA region
Rail Transport	18	East Gippsland
	3	Gippsland
	26	Central Highlands
	25	North East
	77	West
Recreation and Entertainment	2	East Gippsland
	35	Gippsland
	9	Central Highlands
	44	North East
	99	West
Religious	3	Central Highlands
	6	West
Residential	4	East Gippsland
	132	Gippsland
	120	Central Highlands
	32	North East
	38	West
Retail and Wholesale	2	Gippsland
	11	Central Highlands
	3	North East
	21	West
Road Transport	16	East Gippsland
	13	Gippsland
	14	Central Highlands
	7	North East
	84	West
Scientific Facilities	1	East Gippsland
	2	Central Highlands
	3	West

Historic place type	No. of historic places	RFA region
Shipwrecks	16	East Gippsland
	5	Gippsland
	14	West
Unspecified	1	Gippsland
	1	Central Highlands
	3	North East
	49	West
Water Transport	6	East Gippsland
	7	Gippsland
	1	Central Highlands
	73	West

Source: Victorian Heritage Register and Heritage Inventory database (accessed May 2019).

Case study: a vision for the future at Lake Condah

Budj Bim is one of the large-scale restoration projects in Victoria made possible through the Victorian Government's $222 million investment into waterway and catchment health. The Budj Bim National Heritage Landscape was created by volcanic lava flow and is sacred to the Gunditjmara people. It extends from Budj Bim (formerly Mt Eccles) to the ocean and encompasses a series of waterways including Lake Condah and the Fitzroy River.

Lake Condah, or Tae Rak, as it is traditionally known, is part of the Budj Bim National Heritage Landscape listed in 2004. The Gunditjmara people likened the seasonal rising and falling of water in Tae Rak to the beating heart of the Budj Bim landscape. The stone eel-trap systems used by the Gunditjmara for thousands of years are the oldest example of freshwater aquaculture in the world. This had allowed the landscape to be recognised as an internationally significant site.

The construction of a rural drainage scheme in 1954 damaged this culturally important place. After many attempts to restore this landscape, spanning 40 years, a weir constructed in 2010 rehabilitated the lake. This helped to bring healing to the Gunditjmara cultural values of the Budj Bim landscape. A key part of the weir construction was the promotion of Aboriginal employment. The Australian Government provided resources to support the employment of local Gunditjmara and other Aboriginal and Torres Strait Islander people on the construction team. Training was also provided to local Budj Bim rangers to manage the land around the lake. Reactivation of the eel-trap systems now provides commercial opportunities along the Budj Bim landscape and at Lake Condah through cultural tourism. The Traditional Owners have expressed plans to build an eel-processing facility for a dual economic and educational purpose.

The Gunditj Mirring Traditional Owners Aboriginal Corporation has succeeded in getting the Budj Bim Cultural Landscape, of which Lake Condah is a part, recognised by UNESCO's World Heritage Register. Budj Bim Cultural Landscape, located in the West Victoria RFA region, was inscribed on the World Heritage List on 6 July 2019; this is the first time an Australian site has been recognised exclusively for its Aboriginal cultural values.

World Heritage values

There is one World Heritage property located within the Victorian RFA regions: Budj Bim Cultural Landscape, located in the West Victoria RFA region. Budj Bim will be discussed in more detail later in this section. The only other World Heritage property located in Victoria, the Royal Exhibition Building and Carlton Gardens, is not located within any of the Victorian RFA regions.

The Victorian and Australian governments cooperatively manage World Heritage properties in accordance with EPBC Act regulations and in line with the Australian World Heritage Intergovernmental Agreement. They have statements of Outstanding Universal Value that describe the listed World Heritage values of each property. They also have comprehensive management/strategic plans that provide broad management principles for the area and establish the framework for the integrated management, protection, interpretation and monitoring of the properties.

World Heritage properties are managed separately from processes put in place by the Victorian RFAs and are protected by Part 3 of the EPBC Act. The Australian and Victorian governments will continue to participate in the assessment and protection of any future World Heritage places consistent with the Australian World Heritage Intergovernmental Agreement.

Natural and cultural heritage, which contribute to the concept of World Heritage values, are protected and managed through the implementation of the CAR reserve system and application of the Victorian forest management system.

Legislative protection of World Heritage values

The Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention) (1972) establishes a list of places that have natural and/or cultural values of outstanding global significance. As a signatory to the convention, Australia has an obligation to identify, protect and conserve places on the World Heritage List (DoEE 2018).

Under the EPBC Act, World Heritage properties are MNES. The EPBC Act therefore provides protection for World Heritage properties by ensuring that an assessment process is undertaken for proposed actions (including forestry operations) that will, or are likely to, have a significant impact on the World Heritage values of a declared World Heritage property. This process allows the Commonwealth Minister for the Environment to grant or refuse approval to take an action, and to impose conditions on the taking of an action, within a World Heritage property. The EPBC Act also provides for the preparation of management plans which set out the significant heritage aspects of the place and detail how the values of the site will be managed.

The exemption of forestry operations in RFAs from Commonwealth assessment and approval requirements under section 38 of the EPBC Act does not apply to operations within World Heritage properties or Ramsar wetland sites[14].

14 See section 42 of the EPBC Act.

World Heritage listing

To be inscribed on the World Heritage List, properties must demonstrate outstanding universal value and meet at least one of the 10 selection criteria. These criteria are based on cultural heritage and natural heritage as defined in the World Heritage Convention.

Only the Australian Government can nominate Australian places for inclusion on the World Heritage List. The World Heritage Committee assesses nominated places against the set criteria and makes the final decision as to the places that are included on the World Heritage List.

Budj Bim Cultural Landscape

The Budj Bim Cultural Landscape is located in the traditional Country of the Gunditjmara Aboriginal people in south-eastern Australia (Figure 4). It was inscribed on the World Heritage List on 6 July 2019. The Budj Bim Cultural Landscape incorporates intact and outstanding examples of the largest Gunditjmara aquaculture complexes and a representative selection of the most significant and best-preserved smaller structures. These include complexes at Tae Rak (Lake Condah), Tyrendarra and Kurtonitj. Each complex includes all the physical elements of the system (that is, channels, weirs, dams and ponds) that demonstrate the operation of Gunditjmara aquaculture. The property also includes Budj Bim, a Gunditjmara Ancestral Being and volcano that is the source of the lava flow on which the aquaculture system is constructed.

All of the Budj Bim Cultural Landscape is Aboriginal-owned and/or managed and is administered to respect the customary and legal rights and obligations of the Gunditjmara Traditional Owners.

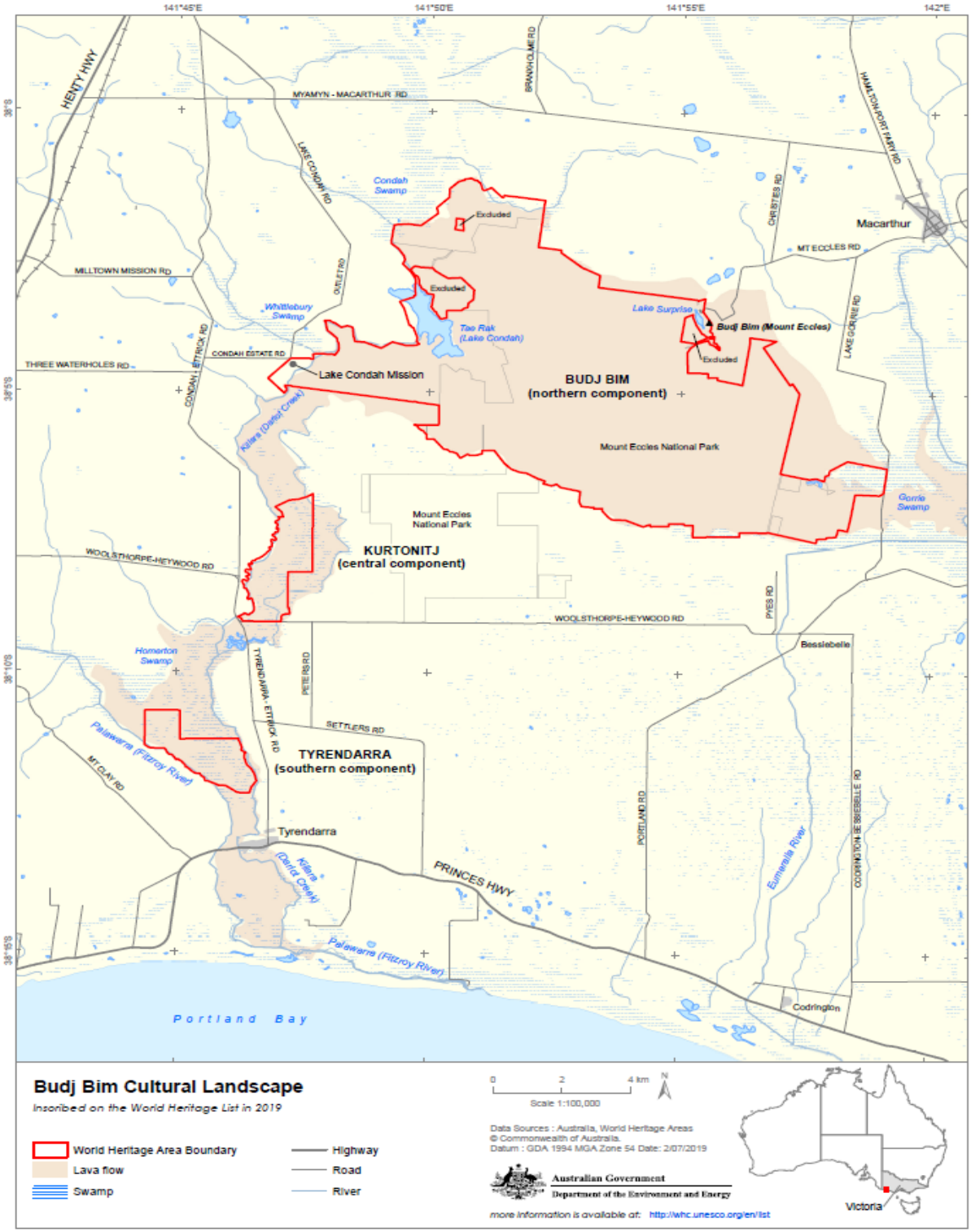

Figure 4: Budj Bim Cultural Landscape

Source: DoEE 2019

Biodiversity values

Biodiversity is the name given to the variety of living things: the different flora, fauna and organisms; the genetic information they contain; and the ecosystems they form. Biodiversity values were fundamental in establishing a CAR reserve system under Victorian RFAs and were a focus of the related CRAs.

The National Reserve System (NRS) is Australia's network of public, Indigenous and private protected areas over land and inland freshwater. Its focus is to secure long-term protection for samples of Australia's diverse ecosystems and the plants and animals they support. The NRS includes the protected areas and reserves established and effectively managed through the collective efforts of the Australian Government, states, territories, local government, Indigenous and private landholders, and non-government organisations.

Indicators of biodiversity value can include the number and diversity of flora and fauna species, ecological communities and forest types. These indicators consider the range of flora and fauna species and communities, and the reserves established to protect biodiversity.

Indicator 1.1a: Area of forest by forest type and tenure

Forest type assessment in the Comprehensive Regional Assessment

Forest type information provided in the CRA documents was described under the Forest Ecosystem Assessment sections of the respective reports and used the EVCs as the basic mapping units. However, no dedicated forest cover (by forest type) was presented. Comparisons of forest type information between the CRA process and the current data are therefore limited to changes in EVC area, and forest productive areas, as presented in Indicator 2.1a.

Area of forest, by forest type

Differences in mapping approaches

The information presented here is drawn from different processes that each contribute to inform the narrative around current forest extent by RFA region. However, the different processes present varying estimates of total forest cover in Victoria. This is important to note, as it explains the inherent uncertainty in landscape-scale landcover analysis. In Table 22, forest type statistics derived from the National Forest Inventory (NFI) are presented for the Victorian RFA regions. Table 23 presents time-series data produced by DELWP and disaggregated based on public and private tenure; however, it does not have forest type information.

The total forest cover estimates differ between these processes. In the Victorian context, differences in mapping methodology are likely to be most pronounced in the Mallee, or in similarly naturally fragmented forest types. This is due to complexities in classifying remotely sensed imagery in non-uniform land covers. It is also important to note that the NFI dataset represents forest cover as at 2016, while the Victorian data represents forest cover as at 2013.

Australia's National Forest Inventory

The definition of forest' used in this report is derived from Australia's NFI. It can be summarised as an area of single-stemmed woody vegetation with a dominant vegetation with height of greater than 2 metres and canopy cover greater than 20 per cent. While Victoria calculates its own forest type and area estimates through the Victorian Forest Monitoring Program (VFMP), the aggregation of the plot network does not currently allow the data to be disaggregated by RFA region. In consequence, the forest type statistics presented here are derived from the NFI area values as outlined in the ASOFR.[15]

The ASOFR is a comprehensive synthesis report of national, state and territory data and information on the multiple environmental, economic and social values, benefits and services of Australia's forests. The fifth report in the ASOFR series, *Australia's state of the forests report 2018*, brings together and reports on data and information current to June 2016 (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018).

15 See agriculture.gov.au/abares/forestsaustralia/sofr

Assembled for ASOFR 2018, the *Forests of Australia (2018)*[16] spatial dataset reports the extent and type of Australia's forests. Forest extent is calculated using a multiple lines of evidence (MLE) approach[17] that analyses multiple forest cover datasets from national and state sources to delineate forest extent with improved accuracy. This methodology was first used for calculating forest extent for ASOFR 2013 and was again used for ASOFR 2018. Forest typing was determined using a combination of national and state and territory vegetation information datasets. Further information on the data sources used for the MLE and forest typing can be found in Indicator 1.1a of ASOFR 2018 (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018, pp. 45–74).

Forests in the NFI and the *Forests of Australia (2018)* dataset are classed under three broad forest categories of Native forest, Commercial plantation and Other forest. Within the Native forest category there are eight forest types that describe the dominant genera and structure types. These include Acacia, Callitris, Casuarina, Eucalypt, Mangrove, Melaleuca and Rainforest. The eighth type – Other native forest – includes a range of less frequently occurring forest genera and native forests of unknown type. The Eucalypt forest type is further classified into 11 forest subtypes based on the form of dominant trees, mature tree height and crown cover. Further information on forest form, height and crown cover can be found in ASOFR 2018 Indicator 1.1a (ibid.).

The Commercial plantation category includes three types: Softwood plantation (mostly pines), Hardwood plantation (mostly eucalypts), and mixed or unknown plantations. The Other forest category includes non-commercial plantations and planted forests.

ASOFR 2018 reported 8.2 million hectares of forest occurs in Victoria, including 7.6 million hectares of Native forest, 0.41 million hectares of Commercial plantation, and 0.16 million hectares of Other forest. Of the total forest area in Victoria, 6.2 million hectares of forest occurs in the five Victoria RFA regions, with 5.6 million hectares of Native forest, 0.41 million hectares of Commercial plantation and 0.13 million hectares of Other forest. By RFA region, 1.6 million hectares of forest is in the Gippsland RFA region, 1.4 million hectares in each of the North East and West Victoria regions, 1.1 million hectares is in the East Gippsland region and 0.72 million hectares is in the Central Highlands region.

The most common forest type in the Victorian RFA regions is the Eucalypt forest type with 5.4 million hectares, followed by 0.17 million hectares of the Other native forest type. By Eucalypt forest subtypes there are 2.8 million hectares of Eucalypt medium open forest and 1.3 million hectares of the Eucalypt tall open forest subtype (Table 22).

16 See agriculture.gov.au/abares/forestsaustralia/Pages/forest-cover.aspx

17 See https://apo.org.au/sites/default/files/resource-files/2013/01/apo-nid155511-1212976.pdf

Table 22: NFI forest area in Victoria RFA regions, as at 2016

NFI forest type Forest category	Area ('000 ha) Forest, by RFA region[a] Central Highlands	East Gippsland	Gippsland	North East	West Victoria	Total in RFA regions	Total not in RFA regions	Total in Victoria
Native forest								
Acacia	0	8	24	2	2	36	1	37
Callitris	0	0	0	0	23	23	0	23
Casuarina	0	0	0	0	1	1	47	48
Eucalypt	688	1,031	1,416	1,270	973	5,378	1,797	7,175
Eucalypt mallee open	0	0	0	0	0	0	11	11
Eucalypt mallee woodland	0	0	0	0	52	53	1,227	1,280
Eucalypt low closed	1	2	2	4	4	14	0	14
Eucalypt low open	4	7	11	30	14	66	3	69
Eucalypt low woodland	1	4	3	3	6	16	4	20
Eucalypt medium closed	17	15	20	19	25	96	0	97
Eucalypt medium open	349	457	798	745	414	2,762	331	3,092
Eucalypt medium woodland	36	110	221	91	377	835	202	1,036
Eucalypt tall closed	31	18	26	28	13	116	0	117
Eucalypt tall open	239	398	317	335	58	1,348	19	1,367
Eucalypt tall woodland	9	20	17	16	10	72	1	73
Mangrove	0	0	0	0	0	0	0	0
Melaleuca	0	0	7	0	8	15	4	19
Rainforest	5	10	3	0	2	20	0	20
Other native forest	9	55	33	5	65	167	155	322
Total native forest	**703**	**1,104**	**1,483**	**1,277**	**1,073**	**5,640**	**2,004**	**7,644**
Commercial plantation								
Hardwood plantation	3	3	29	3	158	197	1	198
Softwood plantation	9	2	59	53	92	215	1	215
Unknown or mixed species	0	0	1	0	0	1	0	1
Total commercial plantation	**12**	**6**	**89**	**56**	**250**	**412**	**2**	**414**
Other forest								
Total other forest	**8**	**2**	**26**	**18**	**80**	**134**	**28**	**162**
Total all forest types	**723**	**1,113**	**1,598**	**1,350**	**1,403**	**6,187**	**2,034**	**8,220**

a RFA region boundary data supplied by Victoria DELWP.

Notes: Totals may not tally due to rounding.
Area derived by ABARES from Forests of Australia (2018) dataset.

Forest cover change

Forest cover change estimates were made as part of the VSOFR process over two time periods, 2009 and 2013. These figures were published in the 2013 and 2018 VSOFRs respectively.

Positive gains were shown in all RFA regions except the North East. Gains in other areas were attributed to regrowth from successive mega-fires in the decade to 2010. It is important to note that these forest area change figures are not related to the forest area described above and in Table 22 and vary on account of the different processes and methodologies used to create the analysis.

Area of forest, by tenure

According to the Victorian forest cover assessment, forest on public land accounts for nearly 6.5 million hectares, with about 1.2 million hectares of forest on private land. Of public land forest, almost half (47 per cent per cent) is in State forests and almost half (47 per cent per cent) is in land tenures focused on conservation. Approximately 77 per cent of forests are located within the RFA regions.

The proportion of land in each RFA region that is forested varies. The West RFA region is the largest (over 5.7 million hectares total area) and is 22 per cent forested, whereas the East Gippsland RFA region is the second smallest (1.1 million hectares total area) and is 90 per cent forested.

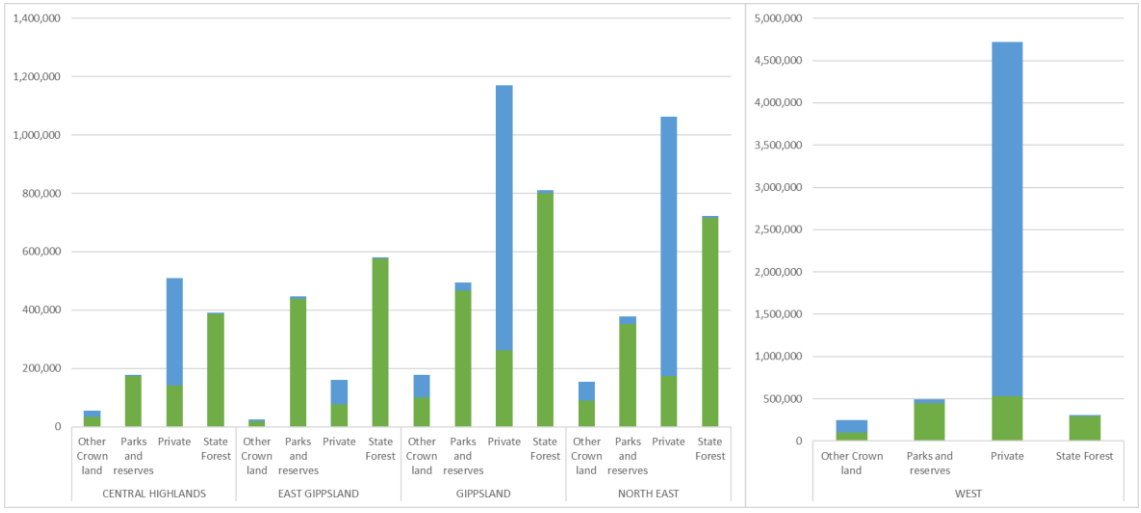

Figure 5: Forest cover and non-forest from Victoria's forest cover estimates, 2013

Note: Forest cover is shown in green and non-forest is shown in blue.

The mix of forest on public and private land also varies between RFA regions. The West RFA region has the highest proportion of forest on private land (36 per cent of total forest in the region), which partly reflects the significant plantation industry in the west of the state. In the Central Highlands RFA region, 17 per cent of forest is on private land, while in other RFA regions the proportion is less than 15 per cent.

Table 23: Forest cover change by RFA and tenure, 2009–13

	2009					2013				
		Forest		Non-forest			Forest		Non-forest	
	All Land area	Area	per cent	Area	per cent	All Land	Area	per cent	Area	per cent
Central Highlands										
Parks and reserves	174	170	14.9	4	0.3	197	175	15.40	22	0.3
State forest	402	395	34.9	7	0.5	145	142	12.53	3	32.4
Other Crown land	50	31	2.7	19	1.6	403	35	3.01	368	1.9
Private land	509	145	12.8	364	32.2	391	386	34.10	5	0.4
Total Central Highlands	**1,132**	**740**	**65.3**	**393**	**34.7**	**1,132**	**737**	**65.04**	**396**	**35.0**
East Gippsland										
Parks and reserves	448	436	35.9	12	1.0	447	440	36.21	7	0.6
State forest	583	576	47.4	7	0.5	86	78	6.39	8	6.9
Other Crown land	27	19	1.5	8	0.6	102	18	1.45	84	0.6
Private land	160	75	6.1	85	7.0	582	576	47.49	6	0.4
Total East Gippsland	**1,213**	**1,104**	**90.9**	**111**	**9.1**	**1,213**	**1,111**	**91.54**	**103**	**8.5**
Gippsland										
Parks and reserves	491	446	16.8	45	1.7	545	466	17.55	79	1.1
State forest	864	846	31.8	18	0.7	290	261	9.83	29	34.3
Other Crown land	136	59	2.2	77	2.9	1,01	100	3.76	910	3.0
Private land	1,170	246	9.2	924	34.8	812	800	30.13	12	0.4
Total Gippsland	**2,655**	**1,595**	**60.0**	**1,062**	**40.0**	**2,655**	**1,627**	**61.27**	**1,029**	**38.7**

	2009					2013				
		Forest		Non-forest			Forest		Non-forest	
	All Land area	Area	per cent	Area	per cent	All Land	Area	per cent	Area	per cent
North East										
Parks and reserves	368	332	14.3	36	1.5	418	353	15.23	65	1.1
State forest	783	763	32.9	20	0.9	201	175	7.52	26	38.3
Other Crown land	110	56	2.4	54	2.3	979	90	3.84	889	2.8
Private land	1,060	185	8.0	875	37.7	724	716	30.88	8	0.3
Total North East	**2,317**	**1,335**	**57.6**	**984**	**42.4**	**2,317**	**1,332**	**57.47**	**986**	**42.5**
West										
Parks and reserves	517	473	8.2	44	0.7	604	449	7.77	155	0.7
State forest	303	282	4.9	21	0.4	575	532	9.20	43	72.7
Other Crown land	231	80	1.4	151	2.6	4,291	98	1.68	4,193	2.7
Private land	4,725	501	8.7	4,224	73.2	305	293	5.07	12	0.2
Total West	**5,770**	**1,334**	**23.1**	**4,439**	**76.9**	**5,770**	**1,369**	**23.73**	**4,401**	**76.3**
Non-RFA										
Parks and reserves	1,665	1,111	11.5	554	5.7	1,359	1,120	11.62	239	5.9
State forest	393	231	2.4	162	1.7	832	264	2.74	568	72.2
Other Crown land	376	118	1.2	258	2.7	7,053	92	0.95	6,961	2.5
Private land	7,204	247	2.6	6,957	72.2	394	228	2.36	166	1.7
Total non-RFA	**9,635**	**1,706**	**17.7**	**7,929**	**82.3**	**9,635**	**1,702**	**17.66**	**7,933**	**82.3**
Grand total	**22,725**	**7,810**	**34.4**	**14,915**	**65.6**	**22,722**	**7,8760**	**34.66**	**14,846**	**65.3**

Note: Numbers may not add up due to rounding. Source: DELWP – forest cover change maps were produced from Landsat data and processed using the Random Forest Model. The forest masks are derived from 2009 and 2013 imagery to represent the 2013 and 2018 publication years.

Indicator 1.1c: Area of forest in protected area categories

In the context of the RFAs, the management of forests in Australia is guided by the NFPS: a set of broad goals agreed to by Commonwealth, state and territory governments. The goal of the NFPS is to implement the concept of sustainable forest management, aiming for Australia's native forests to conserve biological diversity, heritage and cultural values, while at the same time developing an internationally competitive forest products industry based on native forests that are managed sustainably.

Major elements of the NFPS include a commitment to the development of a CAR reserve system, and implementation of strategies to protect old-growth forests and wilderness as part of the reserve system. The CAR reserve system is based on three principles:

- including the full range of vegetation communities (comprehensive)
- ensuring the level of reservation is large enough to maintain species diversity (adequate)
- conserving the diversity within each vegetation community, including genetic diversity (representative).

The system identifies the forested areas based on JANIS criteria to protect nature conservation reserves. It contains four categories: formal reserves, informal reserves, areas managed by prescription and areas managed for protection on private land, defined as follows:

- Dedicated (Formal) Reserve – including Crown land formally reserved for environmental protection and where timber harvesting is prohibited (such as national parks, state parks, forest parks, nature conservation reserve and other conservation reserves)
- Informal Reserve – including public land protected to achieve conservation values while excluding timber harvesting, or protected under an approved management plan; this is mostly defined by areas of SPZ within State forest
- Values Protected by Prescription – in Victoria, those prescriptions defined under the *Code of practice for timber production 2014*, related to areas of steep slopes, or very rare values, values with fragmented distributions, or values naturally occurring in linear form such as riparian vegetation
- Private Land – defined by a registered on-title security agreement for third party offset sites as either:
  a Trust for Nature offset covenant under the *Conservation Trust Act 1972* (Vic.)
  a section 69 agreement under the *Conservation, Forests and Lands Act 1970* (Vic.)
  alternatively, as a Land Management Co-operative Agreement (DELWP).

Extent of protected areas in RFA regions

The area and proportion of forest ecosystems reserved through formal and informal processes, and the changes to that area over time, reflect policy interventions that drive strategies to conserve biodiversity.

Additions to the CAR reserve system arise from two main processes: the first being the transfer of State forest to the reserve system (most significantly the Otway National Park in 2004), which forms part of the formal reserve. The second process comes from prescriptions from the Code of Practice, which have seen significant increases in the Central Highlands, which are aligned with efforts to preserve habitat of the critically endangered Leadbeater's Possum.

The CRA process reported a total of 5.3 million hectares of public land area within the boundaries of the five RFA regions. This included 2.96 million hectares in State forest and 1.93 million hectares in parks and

reserves. A further 2.9 million hectares was private land, and 47 per cent of the area within the RFA areas was forested (Table 24). The total CAR reserve system defined when the RFAs were signed totalled 2.63 million hectares.

By 2018, dedicated reserves and SPZs had increased to over 3.3 million hectares. This accounts for the application of an additional 330 thousand hectares of exclusions under the Code, and an increased area with SPZs. This constitutes an overall increase of 730 thousand hectares added to CAR reserves during the period 1999–2018 (Figure 6).

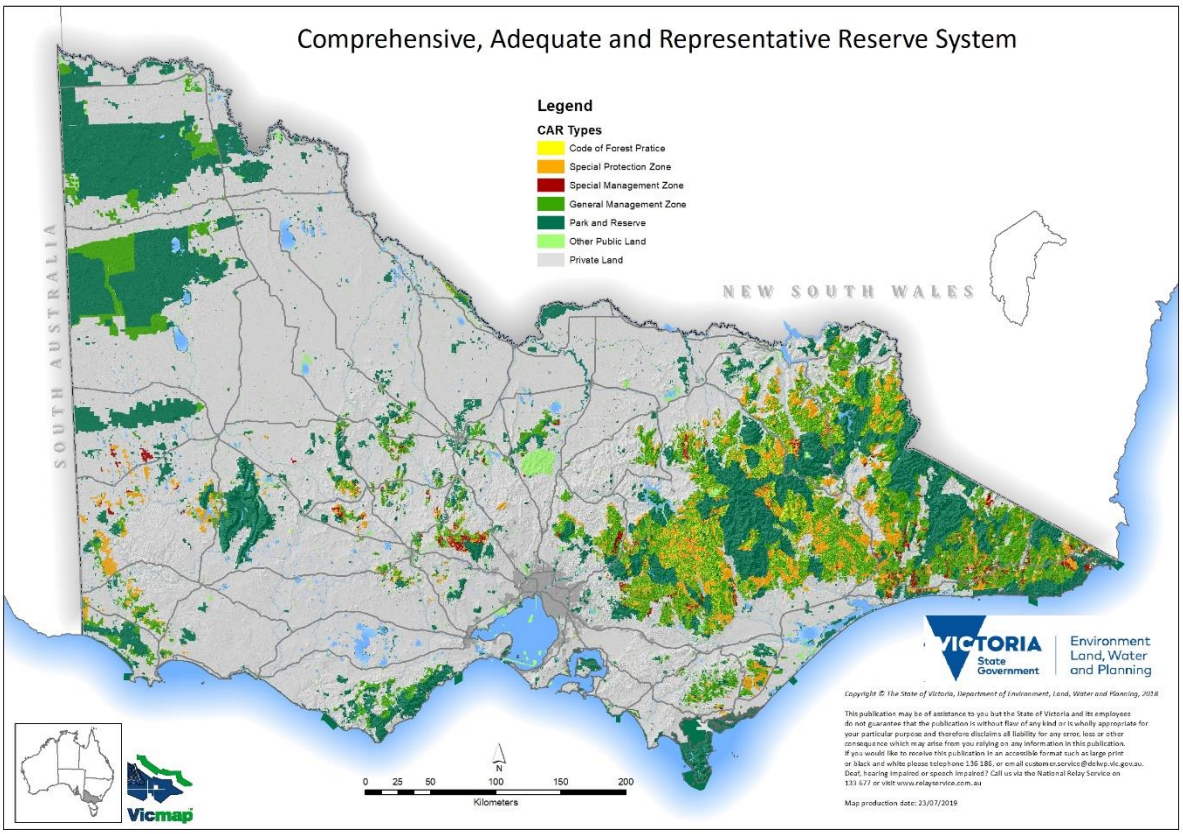

Figure 6: CAR reserves in Victorian RFA areas

Table 24: Tenure and protected area categories as represented in the CRA documents (1996 – 1999)

Original RFAs	Central Highlands (ha)	East Gippsland (ha)	Gippsland (ha)	North East (ha)	West (ha)	Total (ha)
Size of RFA region (ha)	1,132,000	1,213,000	2,655,000	2,317,000	5,770,000	13,087,000
Private land (ha)	502,800	156,000	1,200,000	1,057,300	4,800,000	7,716,000
Public land (ha)	600,000	1,044,000	1,400,000	1,260,700	1,000,000	5,305,000
State forest (ha)	389,800	637,000	806,000	718,700	411,000	2,962,000
Forest cover (ha)	740,000	1,120,000	1,630,000	1,340,000	1,370,000	6,180,000
Conservation reserves (NP and flora & fauna reserves) (ha) *(a)*	179,700	409,500	514,700	392,000	437,000	1,933,000
SPZ *(b)*	109,200	164,300	248,000	7,590*	176,000	705,000
Total area of forest protected *(a+ b)*	**288,900**	**573,800**	**762,000**	**399,000**	**613,000**	**2,630,000**

a Formal protected area
b Informal protected area
* Taken from 2003 assessment as value not found in the CRA documents.

Source: CRAs from original RFA assessment. Numbers may not add up due to rounding.

Table 25: Tenure and protected area categories, 2018

Area/Tenure	Protected	Central Highlands (ha)	East Gippsland (ha)	Gippsland (ha)	North East (ha)	West (ha)	Total (ha)
Size of RFA		1,132,000	1,213,000	2,655,000	2,317,000	5,770,000	13,087,000
Dedicated Reserves (a)	YES	183,556	465,746	549,743	434,099	542,109	2,175,252
Informal reserves (b)	YES	94,727	109,785	252,276	172,566	130,134	759,487
Prescription-ModEx/CFP/RF (c)	YES	84,319	87,833	211,080	233,890	6,514	623,637
Private Land Covenants (d)	YES	330	33	28,933	294	6,380	35,971
Unprotected – GMZ/SMZ	NO	179,709	318,217	325,882	238,395	159,809	1,222,013
Unprotected – Other Public Land/Private	NO	558,976	173,920	1,278,592	1,197,092	4,915,032	8,123,611
Total		**2,233,617**	**2,368,534**	**5,301,506**	**4,593,336**	**11,529,978**	26,026,971
Total Protected (a+b+c+d)		362,932	663,397	1,042,032	840,849	685,137	**3,**594,347

Source: Data derived from DELWP corporate spatial layers PLM25, FMZ100 and RFA25.

International Union for Conservation of Nature protected areas

The IUCN is the global authority on the status of the natural world. IUCN defines a protected area as 'a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values' (IUCN 2019b).

All Victorian formal reserves are assigned an IUCN protected area category based on protection status and primary land management (Figure 7). Informal reserves are not assigned an IUCN protected area category. These categories cover areas of forest and non-forest. IUCN categories are assigned in Victoria by DELWP and submitted to CAPAD. The CAPAD documents for IUCN extend from 1997 to 2016.

In the context of the RFA process, the Dedicated Reserve component of the CAR reserve system should be equivalent to Categories I, II, III or IV as defined by the IUCN Commission for National Parks and Protected Areas in 1994 (IUCN 2019a). Definitions of the category system are provided below:

- Ia Strict Nature Reserve: Category Ia are strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphic features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values.
- Ib Wilderness Area: Category Ib protected areas are usually large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.
- II National Park: Category II protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational and visitor opportunities.
- III Natural Monument or Feature: Category III protected areas are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.
- IV Habitat/Species Management Area: Category IV protected areas aim to protect particular species or habitats and management reflects this priority. Many Category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.
- V Protected Landscape/Seascape: A protected area where the interaction of people and nature over time has produced an area of distinct character with significant, ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.
- VI Protected area with sustainable use of natural resources: Category VI protected areas conserve ecosystems and habitats together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.

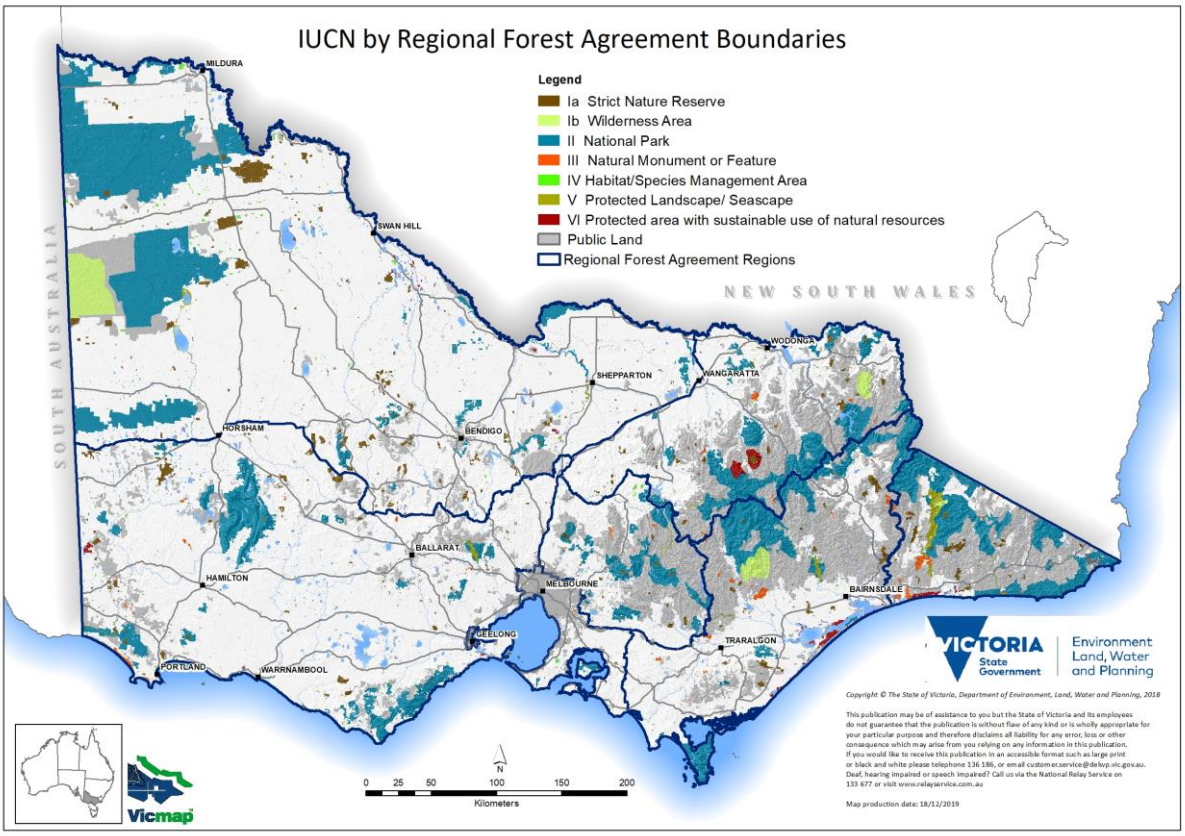

Figure 7: IUCN protected areas in Victoria as at 2016

Source: CAPAD 2016

Table 26: IUCN area categories per RFA 2014–16 (forest and non-forest)

IUCN category	RFA	2014 (ha)	2016 (ha)
IA	Central Highlands	12,339	12,339
	East Gippsland	28,924	28,924
	Gippsland	36,562	36,565
	Non-RFA	234,514	234,442
	North East	37,126	37,126
	West	69,414	69,366
IB	Central Highlands	0	0
	East Gippsland	61,193	61,193
	Gippsland	107,634	107,634
	Non-RFA	536,126	536,125
	North East	34,938	34,939
	West	0	0
II	Central Highlands	159,042	158,970
	East Gippsland	316,163	316,161
	Gippsland	309,211	309,156
	Non-RFA	843,379	842,876
	North East	306,444	306,436
	West	386,019	385,996
III	Central Highlands	2,369	2,366
	East Gippsland	17,534	17,514
	Gippsland	16,655	16,655
	Non-RFA	10,355	10,356
	North East	8,839	8,839
	West	18,589	18,587
IV	Central Highlands	3,371	3,371
	East Gippsland	314	314
	Gippsland	1,404	1,404
	Non-RFA	30,305	30,295
	North East	3,015	3,016
	West	9,082	9,061

IUCN category	RFA	2014 (ha)	2016 (ha)
V	Central Highlands	5,693	5,693
	East Gippsland	34,428	34,428
	Gippsland	16,517	16,517
	Non-RFA	65,374	65,374
	North East	3,384.9	3,384.9
	West	9,699.03	9,699.03
VI	Central Highlands	0	0
	East Gippsland	8,772.39	8,772.39
	Gippsland	45,928.08	45,884.79
	Non-RFA	45,221.58	43,269.84
	North East	24,010.11	24,010.11

Source: CAPAD dataset

Extent of RFA forest and non-forest ecosystems in protected areas

Assessment of forest ecosystems is important to determine whether representative examples of these ecosystems and the natural ecological processes that support them are maintained throughout their natural range.

Ecological vegetation classes are the basic mapping units used for biodiversity planning and conservation assessment at landscape, regional and broader scales in Victoria. They are derived from large-scale forest type[18] and vegetation community mapping and are based on the following types of information:

- species composition;
- forest structure;
- dominant species;
- ecological information relevant to the species that comprise the communities (including life history and response to disturbance and reproductive strategies); and
- physical environmental attributes such as aspect, elevation, geology and soils, landform, rainfall, salinity and climatic zones.

Each EVC represents one or more plant communities that occur in similar types of environments. The communities in each EVC tend to show similar ecological responses to environmental factors such as disturbance (e.g. bushfire). As well as representing plant communities, the EVCs can be used as a guide to the distribution of individual species and groups of species, including animals, and lower plants such as mosses and liverworts.

[18] Forest structure and dominant species

For the purposes of RFAs, EVCs are equivalent to forest ecosystems, as defined in the *Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia* (Commonwealth of Australia 1997) (JANIS criteria).

Current EVC maps for Victoria are publicly accessible on NatureKit[19] and the Spatial Datamart

Comprehensive Regional Assessment

The extent of forest ecosystems in the Victorian RFA regions were assessed through the CRA process between 1996 and 1999.[20]

Under the CRA process, an assessment of the existing reserve system was undertaken to establish the reservation levels at that time for each EVC as a proportion of its pre-1750 extent.

At the time of assessment, a total of 103 extant EVCs were identified as occurring in the Gippsland RFA region. Fourteen EVCs occur predominantly on private land, with the remaining 89 occurring mainly on public land. Fifty-nine were classified as endangered, vulnerable or rare within the Gippsland RFA region.

In the North East RFA region, a total of 58 EVCs were identified. Thirty-one occur predominantly on private land, with the remaining 27 occurring mainly on public land. A total of 46 EVCs were classified as endangered, vulnerable or rare.

In the West RFA region, a total of 96 EVCs were identified as currently occurring. Twenty of the EVCs occur predominantly on private land, with the remaining 76 occurring mainly on public land. A total of 74 EVCs were classified as endangered, vulnerable or rare.

In the East Gippsland RFA region, a total of 49 EVCs were identified. More than 15 per cent of the pre-1750 extent of all but one EVC (Limestone Grassy Woodland) is protected in the conservation reserve system, while for most EVCs in the region, 60 per cent or greater is protected in the conservation reserve system. A total of 20 EVCs were classified as rare. Tables referring to endangered or vulnerable EVCs are missing from the East Gippsland CRA.

In the Central Highlands, a total of 43 EVCs were identified. A total of 27 EVCs were classified as endangered, vulnerable or rare.

The conservation status of EVCs in all RFA regions was assessed in the CRAs using the Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia (Table 27; JANIS 1997).

Table 27: Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia (JANIS 1997)

Status of EVC	Criteria
Rare	R1. Total range generally less than 10,000 ha. R2. Total area generally less than 1,000 ha. R3. Patch sizes generally less than 100 ha.

19 See http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit

20 Further information on the CRA forest ecosystems classification and mapping projects for the Victorian RFA regions can be found at .

Vulnerable	V1. Approaching greater than 70 per cent lost (depletion) and remains subject to threatening processes. V2. Includes EVCs where threatening processes have caused: • significant changes in species composition, • loss or significant decline in species that play a major role within the ecosystem, or • significant alteration to ecosystem processes. V3. Not depleted but subject to continuing threatening processes which may reduce its extent.
Endangered	E1. Distribution has contracted to less than 10 per cent of original range. E2. Less than 10 per cent of original area remaining. E3. 90 per cent of area is in small patches subject to threatening processes and unlikely to persist.

Conservation Status Reassessment

The conservation status of EVCs in Victoria's five RFA regions has been reassessed in line with the national reserve criteria (Table 27; JANIS 1997), presented in Appendix 5 and summarised below.

The conservation status reassessment of EVCs was conducted using the best available information and considered the impact of past and potential future threatening processes relevant to EVCs within each RFA region.

Threatening processes considered in this assessment included land clearing, altered fire regimes, weed invasion, timber harvesting, sea level rise, climate change, overabundant or introduced grazers and browsers, livestock grazing, cropping and the cumulative effect of these threats.

In line with JANIS (1997) conservation statuses were assigned using both area-based criteria and consideration of the impact of past and likely future threats. This included the extent to which threatening processes had caused significant changes in species composition, loss or significant decline in species that play a major role within the ecosystem, a significant alteration to ecosystem processes and/or where significant threatening processes may reduce the extent of an EVC. The impact of future threatening processes was assessed through to 2069 (50-year horizon) using a mix of predictive modelling, spatial analysis and relevant academic literature.

As at 1 December 2019, a total of 375 EVC RFA combinations (excluding mosaics, complexes, aggregates and other mapping units) were mapped across the five Victorian RFA regions: 50 in Central Highlands, 50 in East Gippsland, 93 in Gippsland, 55 in North East and 127 in West. The conservation status of EVCs in each region is summarised in Table 28.

Table 28.Conservation status (JANIS 1997) of EVCs within each RFA region as at 2019

EVC Conservation Status	Central Highlands	East Gippsland	Gippsland	North East	West
No Status	2	6	10	4	8
Vulnerable	35	29	58	34	69
Rare	7	9	14	7	37

EVC Conservation Status	Central Highlands	East Gippsland	Gippsland	North East	West
Endangered	6	6	11	10	13
Total	50	50	93	55	127

In comparison to the CRA process 20 years ago, substantially more EVCs have been assigned a conservation status in 2019 using the JANIS (1997) criteria. For many Vulnerable EVCs, the combined impacts of climate change, altered fire regimes, impacts of deer browsing, and for some forest EVCs – ongoing timber-harvesting – means that criterion V3 ("Not depleted but subject to continuing threatening processes which may reduce its extent") has been triggered even if these EVCs are relatively common and not currently depleted.

Over the life of the current RFAs, many threatening processes have continued or accelerated. The Gippsland Biodiversity Assessment report for the CRA (Commonwealth of Australia, 1999) noted at the time that several relatively widespread EVCs are subject to a variety of threatening processes but were not judged at that time to be impacted to a sufficiently significant degree (i.e. in extent and/or severity) to be considered endangered, vulnerable or rare in accordance with the JANIS criteria. For example, EVCs with heathy understoreys (Heathy Dry Forest, Heathy Woodland, Granitic Hills Woodland) are particularly sensitive to altered fire regimes and the resultant reduced diversity is commonly identified across the region. The understorey composition of mountain forest EVCs (Damp Forest, Wet Forest, Montane Wet Forest, Shrubby Damp Forest, Shrubby Wet Forest), particularly old individuals of some prominent understorey species (e.g. tree ferns), is significantly impacted by mechanical disturbance associated with timber harvesting. Open fertile EVCs (Montane Grassy Woodland, Sub-alpine Grassland) are favoured for grazing and are relatively more prone to weed invasion. The conservation status of these EVCs at that time was analogous to the "near threatened" category that is applied to some species.

Following the reassessment conducted in 2019, a number of these EVCs are now judged as Vulnerable.

Stabilising the status of these EVCs relies on a range of management strategies aimed at minimising long-term impacts and is achieved through the CAR Reserve System and complementary active management strategies. Management mechanisms currently available to address the threatening processes listed above includes (but is not limited to): Victorian Government on-ground programs for biodiversity (e.g. weed control), private land conservation mechanisms, regulatory mechanisms (e.g. Code of Practice for Timber Production, Code of Practice for Bushfire Management on Public Land and native vegetation removal regulations).

Analysis of forest and non-forest ecosystems by land tenure, including reservation and depletion analysis

A reserve system that is comprehensive, adequate and representative in its regional coverage of forest ecosystems is an important component of RFAs. The extent of representation of EVCs in conservation reserves has been used as the basis for evaluating the current reservation status of forest ecosystems in the region and subsequent analysis against the JANIS criteria as required under the RFAs.

As a general criterion, 15 per cent of the pre-1750 extent of each forest ecosystem should be protected in the CAR reserve system with flexibility considerations applied according to regional circumstances, and recognising that as far as possible and practicable, the proportion of Dedicated Reserves should be maximised.

The conservation status assessment is relevant to JANIS (1997) Criteria 2 and 3 which specify reservation objectives for EVCs classified as endangered, vulnerable or rare which include: all remaining occurrences of rare and endangered EVCs should be reserved or protected by other means as far as is practicable, and at least 60 per cent of the remaining extent of vulnerable EVCs should be reserved.

JANIS (1997) contains regional flexibility provisions in consideration of differing regional circumstances to ensure that the CAR reserve system delivers optimal nature conservation outcomes as well as acceptable social and economic outcomes. Therefore, the criteria are to be considered guidelines rather than mandatory targets.

Table 29 below summarises the area of terrestrial ecosystems in the Victorian RFA regions and the proportion that is protected as at 2019. Appendix 5 shows the area of all terrestrial ecosystems in each individual RFA region, by individual forest and non-forest ecosystems as at 2019.

The EVC map used at the time of the CRAs has since been updated, including updates to the native vegetation extent and progressive improvements in the modelling of EVCs based on new information. The EVC map used in this report is an updated 2019 layer which uses a 2015 native vegetation extent and includes an updated rainforest map and minor typology changes.

The EVC data 2019 summarised in **Table 29** is not directly comparable to the data used in the CRA process (1998-2000) given these updates. Differences between the two data sets include: changes to the method used to generate the pre-1750 EVC model, changes to the method DELWP uses to creates a view of EVC extent (using a new native vegetation extent model and the pre 1750 dataset), applying nomenclature standards to EVCs which may have resulted in the discontinuation of certain EVC names, the splitting of EVCs, reconciliation of mapping units (such as mosaics and complexes), the delineation of new EVC types and spatial adjustments.

Of the 7.5 million hectares of terrestrial ecosystems identified in the five RFA regions (current extent), a total of 3.6 million hectares (47 per cent) is protected as at 2019 within the CAR reserve system (formal reserve, informal reserve, prescription and private land covenants). As at 2019, across all RFA regions, forest ecosystems have been depleted on average by 40 per cent and non-forest ecosystems have been depleted by 65 per cent since European settlement.

Victoria is the most intensively settled and cleared state in Australia. Large areas of Victoria were cleared for agriculture and although the rate of land clearing has slowed since the introduction of Victoria's native vegetation regulations in 1989, the quality and extent of native vegetation continues to decline by about 4,000 habitat hectares each year[21]. This trajectory is largely driven by activities inconsistent with (or in breach of) the regulatory framework (resulting in loss of extent of native vegetation), together with insufficient management of threats (resulting in loss of quality).

In response, DELWP has developed a statewide Biodiversity Plan: *Protecting Victoria's Environment – Biodiversity 2037* (DELWP 2017c). This document sets out a strategic vision to protect biodiversity and reverse the trajectory of native vegetation decline. In addition, the Office of the Conservation Regulator (OCR) was established early in 2019. The function of the OCR is to provide a central point of coordination and oversight for DELWP's regulatory functions including the natural environment, timber harvesting,

[21] 'Habitat hectares' is a method for assessing native vegetation, in terms of both quality and extent. Quality is assessed by scoring habitat attributes at a site in comparison to a reference point (benchmark) for the relevant vegetation type - this provides a 'habitat score'. The number of habitat hectares of a stand of native vegetation is determined by multiplying the score by the area of vegetation. For example, 10 hectares with a habitat score of 100 per cent is counted as 10 'habitat hectares', whereas 10 hectares of vegetation with a score' of 50 per cent would be scored as five 'habitat hectares'

public land use, fire prevention, wildlife and biodiversity. More detail about the OCR is provided on page 304 of this report and in the *Overview of Victoria's Forest Management System 2020*.

Table 29: Summary of forest and non-forest ecosystems by RFA

	Forest ecosystem	Pre-1750 extent (ha)	Current extent as at June 2019 (ha)	per cent depletion since 1750	per Cent of pre-1750 extent protected as at Dec 2019 (CAR Reserve System)	per cent of remaining ecosystem protected as at Dec 2019 (CAR Reserve System)	Area of terrestrial ecosystems not in protected areas as at June 2019 (ha)
Central Highlands	Total	1,131,782	830,927	27 per cent	32 per cent	44 per cent	439,188
	Forest	1,064,891	806,250	24 per cent	33 per cent	44 per cent	421,739
	Non-Forest	66,891	24,678	63 per cent	11 per cent	29 per cent	17,449
East Gippsland	Total	1,238,561	1,155,338	7 per cent	53 per cent	57 per cent	430,356
	Forest	1,177,480	1,116,689	5 per cent	54 per cent	57 per cent	420,641
	Non-Forest	61,080	38,649	37 per cent	47 per cent	74 per cent	9,715
Gippsland	Total	2,654,114	1,795,356	32 per cent	39 per cent	58 per cent	747,652
	Forest	2,306,168	1,594,181	31 per cent	40 per cent	58 per cent	656,637
	Non-Forest	347,945	201,175	42 per cent	32 per cent	55 per cent	91,015
North East	Total	2,317,697	1,588,679	31 per cent	36 per cent	53 per cent	707,159
	Forest	2,288,529	1,563,287	32 per cent	36 per cent	53 per cent	699,816
	Non-Forest	29,168	25,392	13 per cent	62 per cent	71 per cent	7,344
West	Total	5,770,882	2,151,266	63 per cent	12 per cent	32 per cent	1,464,842
	Forest	4,438,363	1,736,813	61 per cent	13 per cent	32 per cent	1,172,961
	Non-Forest	1,332,519	414,452	69 per cent	9 per cent	30 per cent	291,881
Total all RFAS		13,113,035	7,521,565	43 per cent	27 per cent	47.56 per cent	3,789,198

Notes:
The figures shown in this table are based on modelled information mapped at a scale of 1:100,000 derived during the pre-1750 analysis of vegetation types in the Central Highlands and are therefore only approximate. EVC mapping used in 1998 has been revised to ensure the state-wide EVC data set is based on the best available information and integrates new methods of mapping and modelling vegetation across Victoria. As a result, information relating to EVC extent or reservation levels between 1998 and 2019 is not directly comparable and may differ due to the different modelling and mapping approaches.

Protected areas for the purpose of this report include dedicated reserves, SPZs, covenants on private land and mapped Code of Forest Practice exclusions. This dataset is identified in the aggregation of the PLM25 dataset and the Forest Management Zone dataset (FMZ100). In this report, areas protected by prescription are estimated using the spatial layer 'ModEx'.

Source: Data derived from DELWP corporate spatial layers PLM25, FMZ100 and 2019 interim RFA EVC mapping (unpublished).

Indicator 1.1d: Fragmentation of forest cover

The VSOFR 2018 described forest fragmentation in the following way:

> Forest fragmentation is a metric to describe forest quality. It assumes that the highest quality forests are at the centre, and that the larger the area, the more resilient the forest is to disturbances. Forest loss and the deterioration of forest health via increasing fragmentation, pose significant threats to biodiversity, and endanger the sustainability of ecological goods and services from forested land.
>
> (Commissioner for Environmental Sustainability Victoria 2019, p. 64)

Change in forest cover and the spatial configuration of gain and loss show the level of fragmentation in Victoria's forests (Figure 8) and have implications for forest-dependent species.

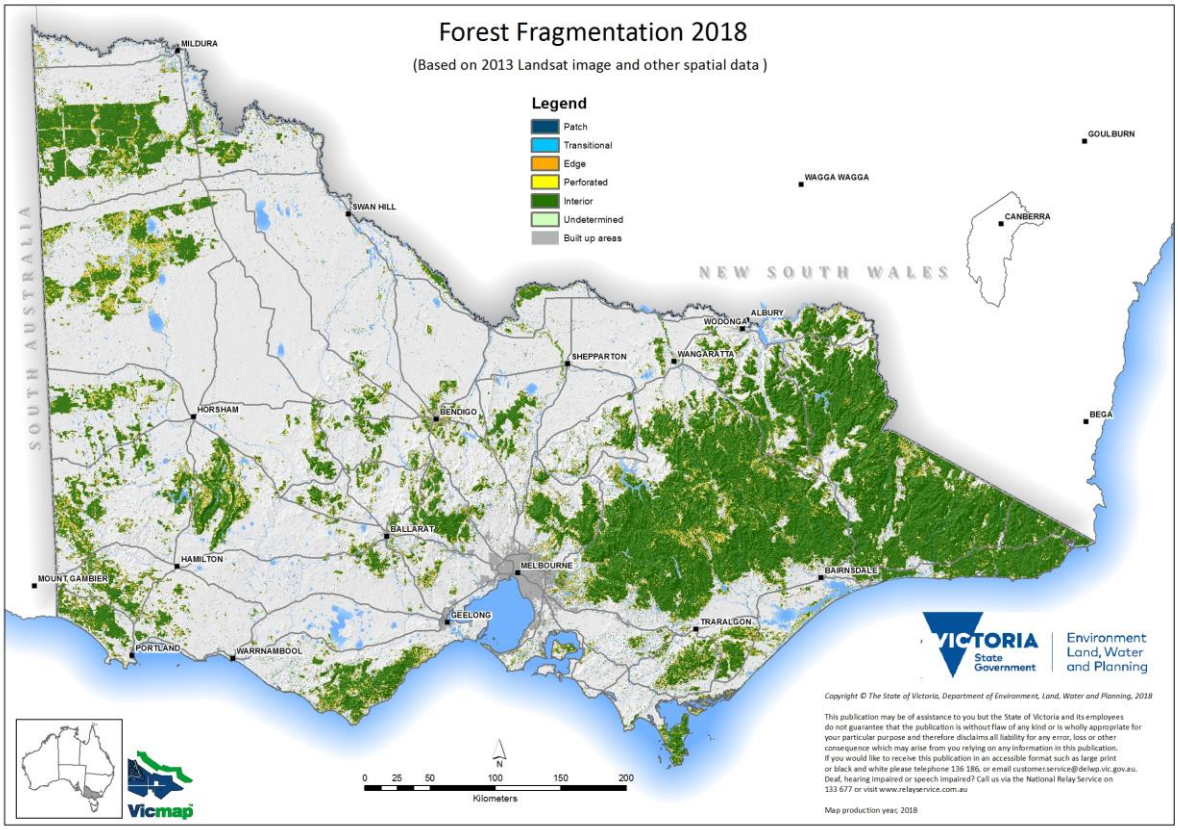

Figure 8: Forest fragmentation in Victoria (published 2018 reprinting 2013 baseline year)

The fragmentation analysis provided here is derived from two forest/non-forest datasets which represent baseline years of 2009 and 2013 and published in 2013 and 2018 respectively. This analysis uses five fragmentation categories. Increasing area of interior forest reflects an improvement, while increases in Patch, Edge and Perforated categories reflect an increasing level of fragmentation (Figure 9).

Increases of interior forest across all RFAs largely reflect the significant regeneration from major bushfires that occurred in the decade to 2010, as quantified through this remote-sensing approach. The overall trend for forest fragmentation across the RFA regions between

2009 and 2013 is good, as reflected in the Interior gains; however, site-scale analysis in some areas may provide different results than landscape-level analysis.

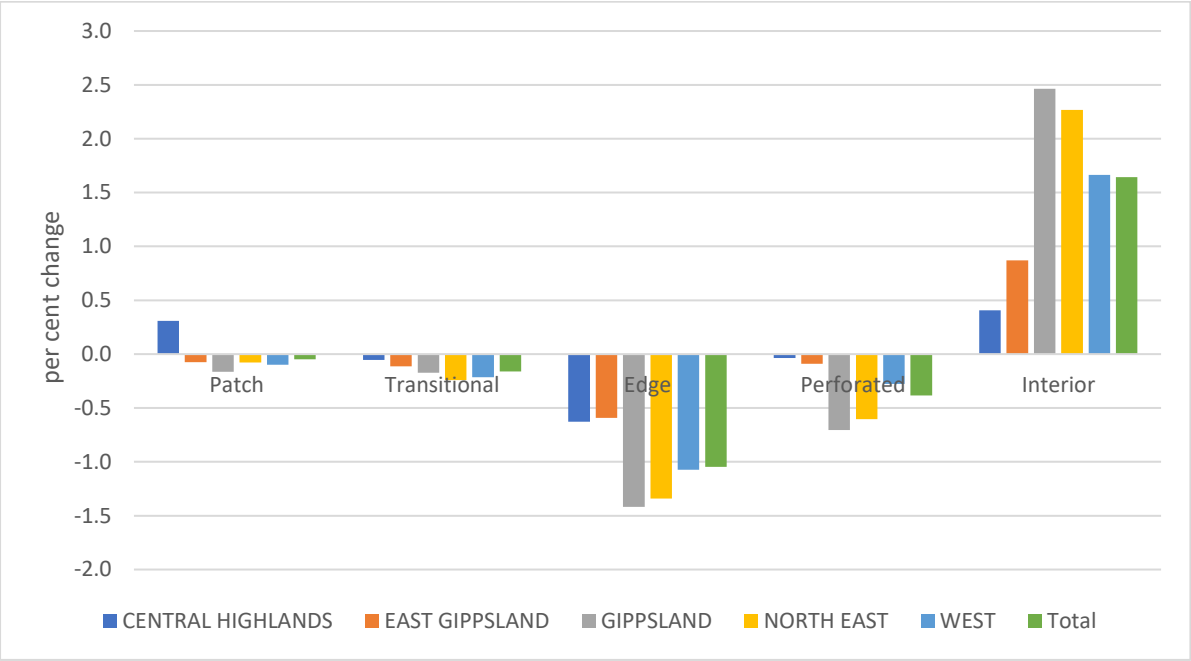

Figure 9: Change in fragmentation status between baseline years of 2009 and 2013

Table 30: Forest fragmentation 2009

RFA region	Forest fragmentation 2009				
	Patch (ha)	Transitional (ha)	Edge (ha)	Perforated (ha)	Interior (ha)
Central Highlands	15,600	22,600	81,900	29,400	590,200
East Gippsland	5,300	9,900	56,400	28,400	1,003,500
Gippsland	33,100	39,800	165,700	82,200	1,273,300
North East	25,500	35,500	141,800	62,900	1,068,800
West	62,100	75,300	267,400	100,300	828,000
Non-RFA	141,600	183,100	713,200	303,200	4,763,800

Source: DELWP Corporate data (unpublished)

Table 31: Forest fragmentation 2013

RFA region	Forest fragmentation 2013				
	Patch (ha)	Transitional (ha)	Edge (ha)	Perforated (ha)	Interior (ha)
Central Highlands	17,800	22,100	76,900	29,000	590,400
East Gippsland	4,500	8,700	50,200	27,600	1,019,700
Gippsland	31,100	37,800	146,000	72,400	1,339,400
North East	24,400	32,200	123,600	54,700	1,096,500
West	62,400	74,400	259,900	99,200	873,000
Non-RFA	140,200	175,200	656,600	282,900	4,919,000

Source: DELWP Corporate data (unpublished)

Indicator 1.2a Forest-dwelling species for which ecological information is available

This indicator reports the level of information available to manage forest-dwelling species and tracks changes in this knowledge over time. The amount of habitat, disturbance and life history information available to make management decisions indicates the capacity to assess risk to species and implement conservation strategies. The following section outlines the key information sources in Victoria and summarises information where available.

Victorian Biodiversity Atlas

The VBA species observations is a foundation dataset that feeds into some of the many biodiversity tools used in DELWP's everyday decision-making, showing where wildlife is now and how this has changed over time. This makes it a core input to the majority of the government processes and programs that impact native species. It is used in conservation status assessments, HDMs that feed into the Strategic Management Prospects and Native Vegetation Removal Regulations and into our public land management, research activities and State of the Environment reporting.

The VBA dataset is collated from a wide range of contributors including DELWP biodiversity staff, government agencies and partner organisations, non-government organisations such as BirdLife Australia, ecological consultancies, university students and the many and varied community wildlife survey groups and individuals.

The majority of the data is from project-based work where structured surveys were undertaken to assess presence or abundance of targeted species. It also includes all the records from previous department-managed datasets such as the Victorian Rare and Threatened Plant Population monitoring database (VROTpop).

As part of the RFA modernisation program, landscape scale surveys are being conducted to collect new field data on high-priority forest-dependent threatened species (both presence and true absence data), which will be stored in the VBA and inform forest management. This process is described in the case study below on page 102.

In addition, as part of the Forest Protection Survey Program, surveys are being undertaken in planned timber harvesting areas in State forests in eastern Victoria. These surveys collect data on plants; arboreal and terrestrial mammals; some bird species, frogs, fish and crayfish; and vegetation communities prior to the commencement of harvesting operations. A target of 80% coupes are planned to be surveyed prior to harvesting. The VicForests' Rolling Operations Plan provides the basic information about what is planned to be harvested and where. This information, along with a wide range of other information such as HDMs and species lists, is used to help prioritise what species will be surveyed where and when. The proposed harvest date is used by DELWP to prioritise the timing and location of surveys. Observations from this survey program will be stored in the VBA.

Habitat distribution models

Information that aids in understanding the distribution of the habitat for plant and animal species in Victoria is essential for conservation management. This information becomes critical for rare or threatened taxa.

Fauna and flora species have different habitat requirements. They need a place to live and reproduce. They also need to tolerate changes in the weather, and flood and fire disturbances. As a result of these different needs, species are found in different locations across the landscape. Some species have highly specific habitat requirements (such as the Mountain Pygmy-possum), while others can thrive in a number of different habitat types (such as the Australian Magpie).

Habitat distribution models collect and compare information on where a species has been recorded. They relate that data to environmental variables, such as soil, prevailing climate and topography. Sophisticated statistical and mathematical processes are then used to estimate the distribution of a species' habitat. The HDMs do not predict whether or not a species currently occupies the habitat at a particular location. Many factors can influence whether a species is present in the habitat at any given time, including: biogeography, size of the habitat patch and distance from other suitable habitat, natural disturbance cycles, historic catastrophes, the impact of predators or disease and seasonal factors (DELWP 2017a).

Since the first RFA was signed in 1997, HDMs have been developed for all rare or threatened Victorian species where sufficient data is available. This information has been used to inform biodiversity decision-making, native vegetation clearing regulations and guide cost-effective investment decisions (see NaturePrint and Strategic Management Prospects).

Examples of HDMs for the Greater Glider (*Petauroides volans*), Sooty Owl (*Tyto tenebricosa tenebricosa*) and Tall Astelia (*Astelia australiana*), including the VBA survey points used to generate the model, are shown below (Figure 10). The models used to develop the maps in Figure 10 to Figure 12 have a colour gradient applied in the legend to represent the range of habitat values for each species from high (80 and above, represented as one colour) to low (30 and below, represented as one colour) to aid the reader in discerning areas of high and low habitat values.

Habitat distribution models can also be used to inform conservation strategies and levels of protection by assessing the area of a species' modelled suitable habitat that is within the CAR reserve system – an analysis of the HDMs for priority EPBC Act listed species is at Appendix 4.

As part of the RFA modernisation program, HDMs for High-priority species are being updated with new field data and approaches to modelling. This process is described in the case study below on page 102. Currently published HDMs are publicly available on NatureKit.[22]

22 See http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit

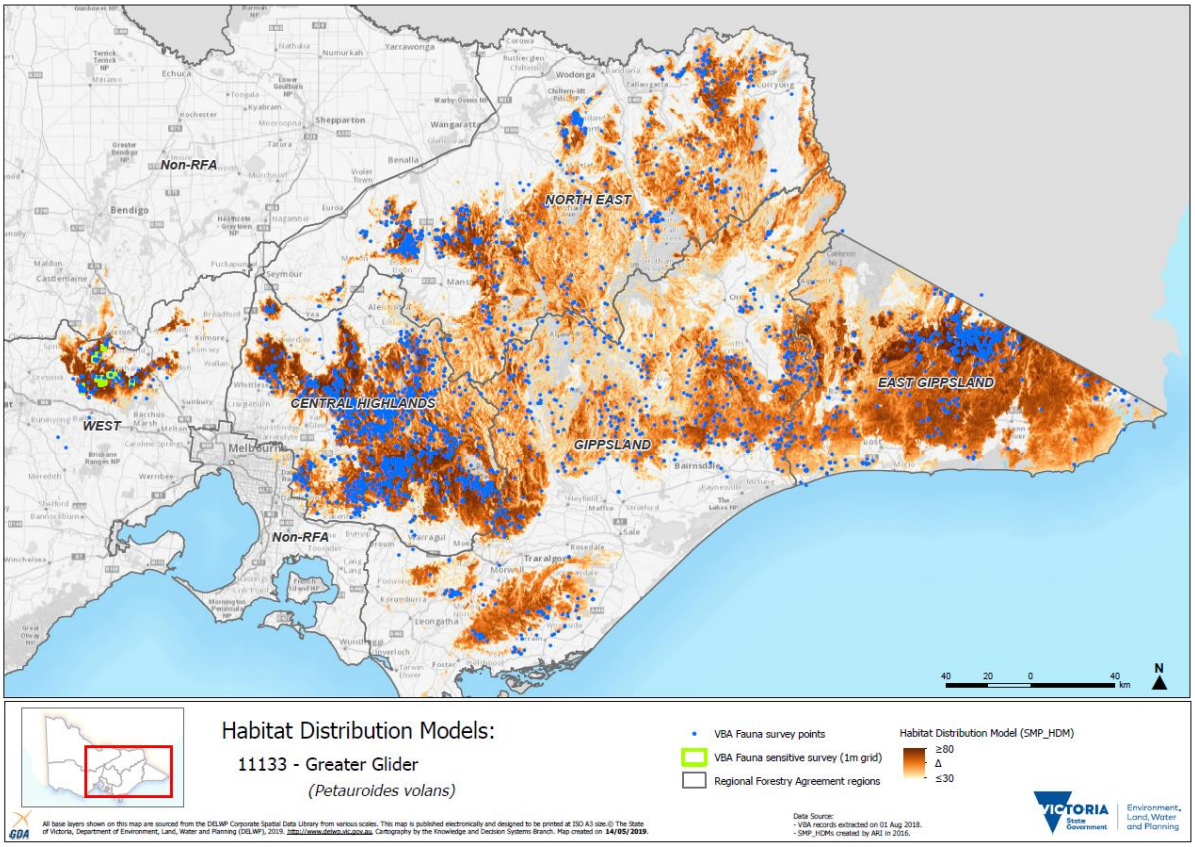

Figure 10: Habitat Distribution Model for the Greater Glider (*Petauroides volans*)

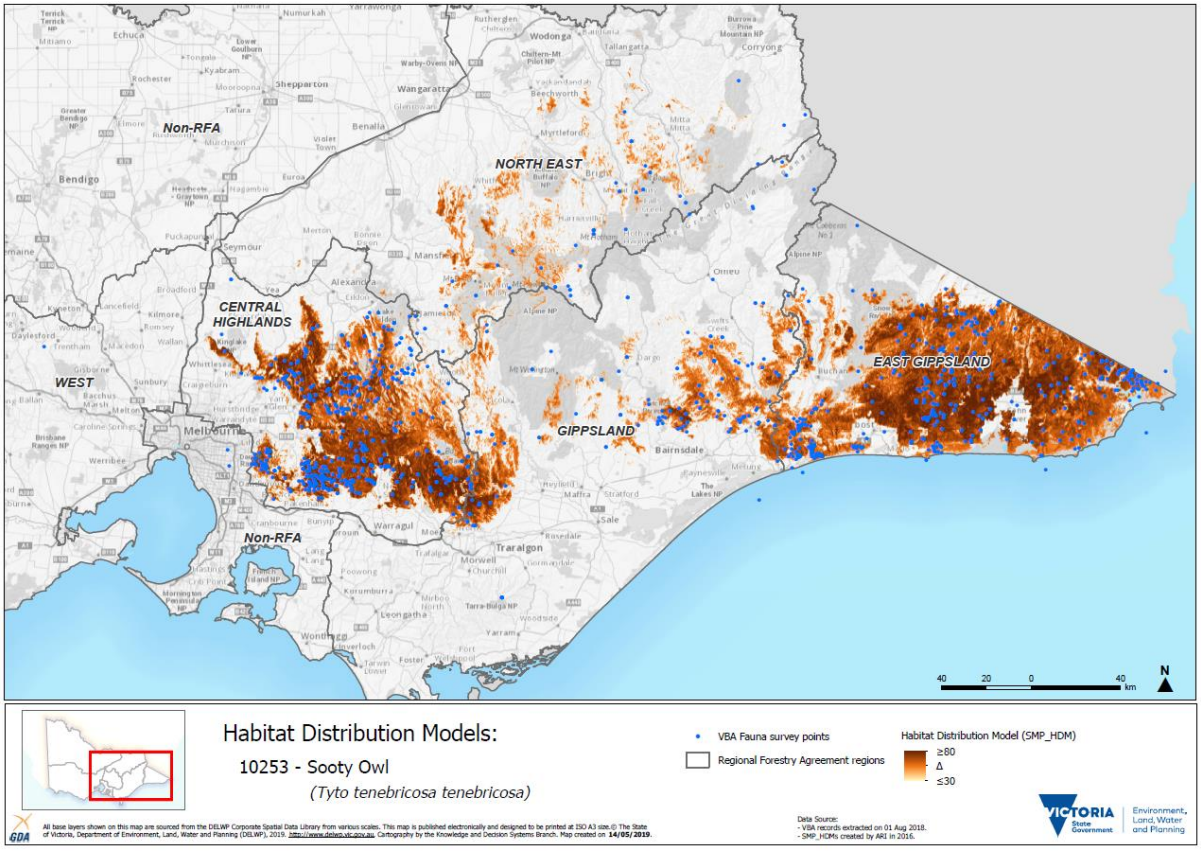

Figure 11: Habitat Distribution Model for the Sooty Owl (*Tyto tenebricosa tenebricosa*)

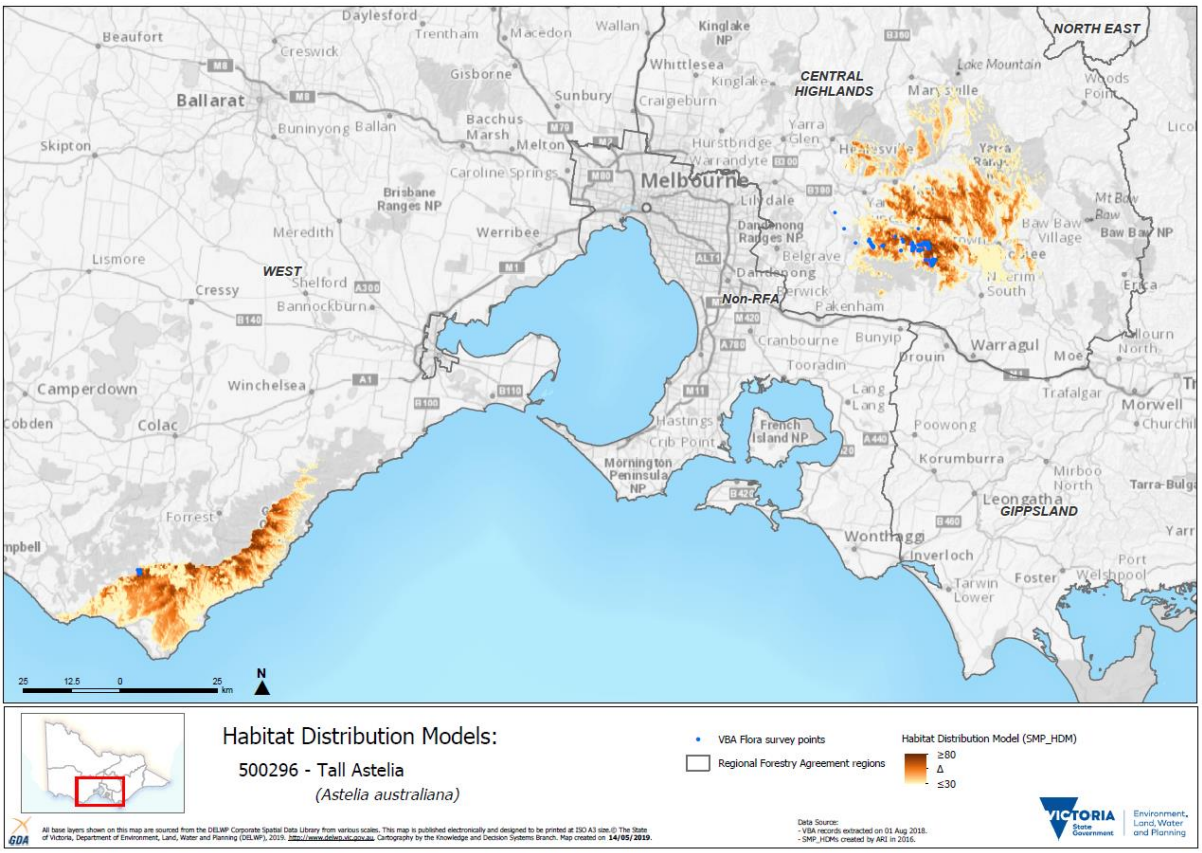

Figure 12: Habitat Distribution Model for the Tall Astelia (*Astelia australiana*)

NaturePrint and Strategic Management Prospects

Evidence-based decision-making is critical to improving outcomes for biodiversity. Strategic Management Prospects (SMP) is a decision-support tool that helps biodiversity managers identify and prioritise management options in a transparent, objective and repeatable way. SMP uses a new spatially explicit, landscape-scale approach to identify the most effective and efficient management actions to benefit biodiversity across Victoria (DELWP 2019a).

The aim of *Biodiversity 2037* is to 'see an overall improvement, where the majority of habitats and threatened species will be improved, and habitat gains will outweigh losses' (DELWP 2017c, p. 14).

To have the best chance to achieve the greatest outcomes for biodiversity in Victoria we need to compare information about thousands of biodiversity values. There are a range of best-practice methods now available for use.

SMP integrates and simultaneously compares information on biodiversity values, threats, effectiveness of management actions and indicative costs of management actions for biodiversity across Victoria (Table 32). Example output is at Figure 13.

Habitat distribution models for over 4,000 species are used in the first version of SMP analysis. HDMs have been created for most of Victoria's vertebrate fauna, threatened vascular flora and some rare or threatened invertebrates. The majority of terrestrial forest-dwelling species are considered in SMP. SMP can be used to make management decisions about forest-dependent species, assess risks to species and implement conservation strategies.

When undertaking management actions, it is important to know how those actions benefit different plants and animals in different places. Information on where actions have the greatest benefit, or the greatest prospects for change for particular species, is essential to guide investment or management planning.

Benefits can vary in spatial magnitude and temporal scale. Some actions (e.g. caging orchids to protect from herbivores) are only appropriate in unique situations, while other actions (e.g. fox baiting) can provide benefits for a number of species in many places. A common measure of benefit is required to enable comparisons across a wide range of species, threats and actions (DELWP 2017b).

Biodiversity 2037 identifies a new measure – Change in Suitable Habitat – that will standardise the measurement of benefit and be used to assess overall progress towards the plan's targets.

In 2018, SMP was used to guide decision-making and investment for 85 new projects for on-ground biodiversity action worth $33.67 million through Biodiversity Response Planning. Funded projects will be delivered over three years, commencing in 2018–19 through to 2020-2021.[23]

23 See https://www.environment.vic.gov.au/biodiversity/biodiversity-response-planning

Table 32: Strategic Management Prospects inputs (DELWP 2017b)

Inputs to SMP	Relationships modelled
Habitat distribution models	Known observations of species and characteristics of the environment (e.g. terrain, climate).
Threat models	Known occurrences of threats (e.g. deer or rabbits) and characteristics of the environment (e.g. terrain, climate).
Benefit of action models	Expert opinion of site-specific and situation-specific settings assessed by multiple experts with a standardised method called expert elicitation. These opinions were extrapolated from sites to landscape.
Costs of actions	Costs of on-ground operations calculated as dollars per hectare, informed by considering temporal (time-related), spatial (place-related), and cost components (site costs, opportunity costs to private landholders, transaction costs and travel costs).

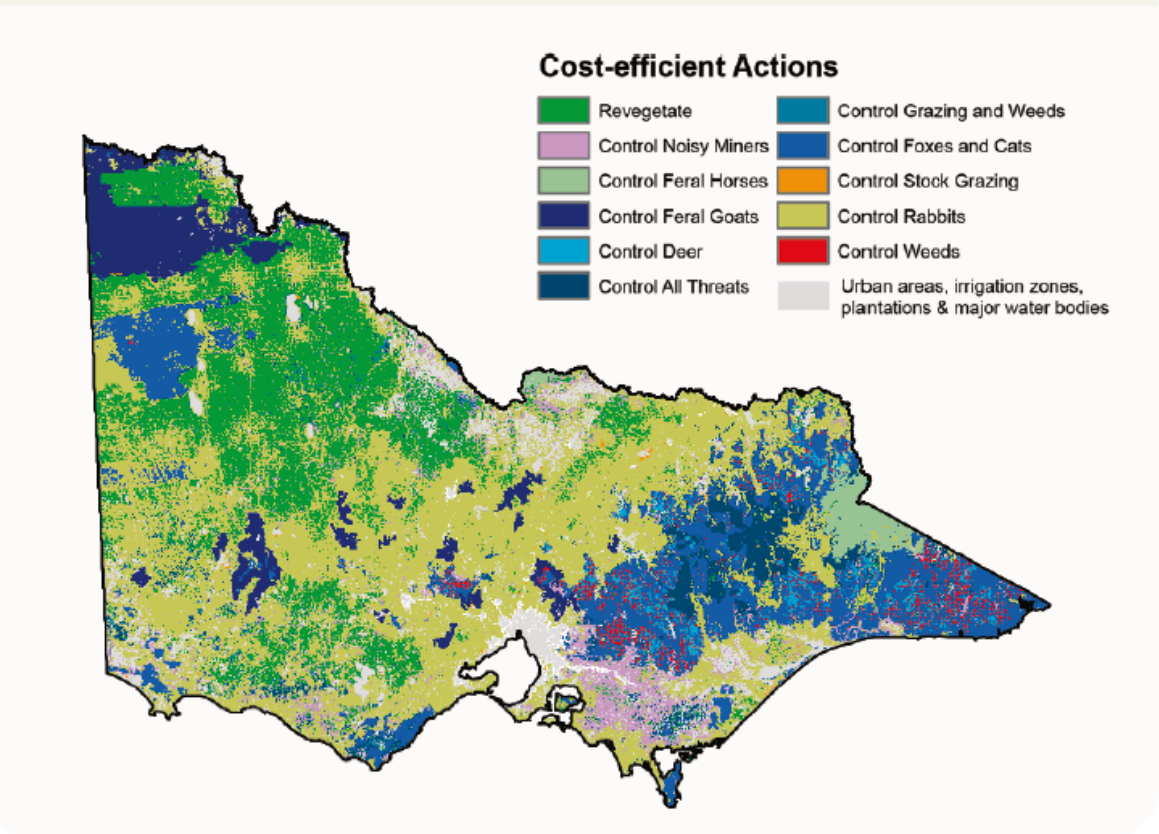

Figure 13: Strategic Management Prospects cost-effective actions (modelled output)

Indicator 1.2c: Representative species from a range of habitats monitored at scales relevant to regional forest management

As outlined above, the VBA is a repository for information on flora and fauna sightings across Victoria. The VBA database includes observations from dedicated monitoring programs implemented by government and non-government entities, as well as sightings from 'citizen scientists' (non-professionals who volunteer time and effort for scientific research). The VBA database helps managers understand where wildlife is now, and importantly, where it is not – in the form of absence data. It is a key tool for the government's processes and programs that manage native species. Specifically, it is used in conservation status assessments, and for the development of HDMs that inform strategic decision-making processes, including Native Vegetation Removal Regulations (Commissioner for Environmental Sustainability Victoria 2019, p. 75).

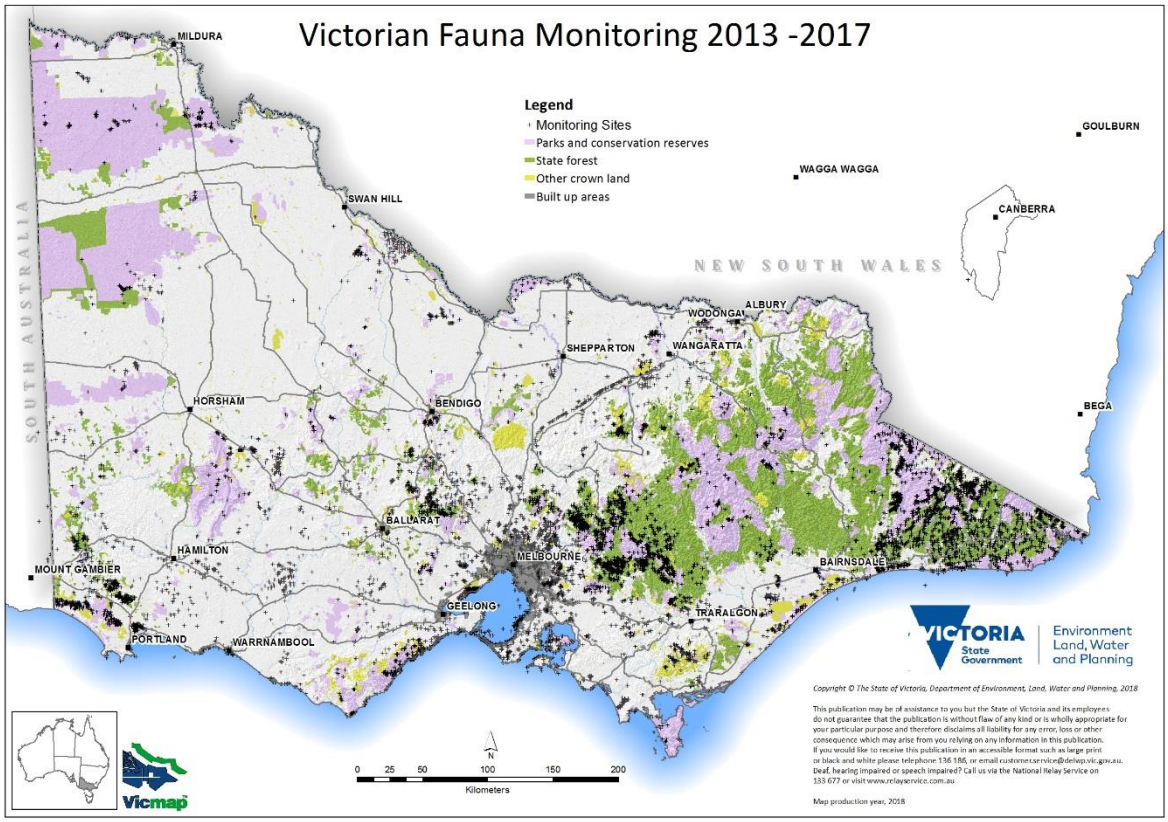

Figure 14: Monitoring sites across Victoria as recorded in the VBA as at 2018

Table 33: Number of species monitored, by taxonomy types, 2013–17

Taxon group	Central Highlands	East Gippsland	Gippsland	North East	West
Amphibians	14	8	11	4	20
Aquatic invertebrates	1	1	0	0	1
Fish	7	13	13	7	7
Invertebrates	6	2	4	1	5
Mammals	42	17	26	12	67
Marine birds	1	0	0	0	1
Mussels, decapod crustacea	8	13	10	3	8
Non-passerine birds	36	12	18	9	42
Passerine birds	29	9	15	11	28
Reptiles	21	10	10	5	25
Waders	3	0	2	1	4
Total	**168**	**85**	**109**	**53**	**208**

Source: VBA 2018

Table 34: Number of monitoring projects by year

Year	Central Highlands	East Gippsland	Gippsland	North East	West
2013	29	13	15	11	38
2014	27	12	18	6	42
2015	24	15	16	7	44
2016	22	14	13	6	37
2017	12	11	12	5	25

Note: 'Total' column not included, as many monitoring projects last more than a year, meaning a duplication in counts each year.

Data source: VBA 2018

Case study: biodiversity values assessment as part of the Victorian forest modernisation program

As part of the RFA modernisation program and Victoria's broader forest management system reform, DELWP has commissioned a number of projects to improve the current information base and knowledge of threatened forest-dependent species and their habitat. These projects include:

Landscape scale survey

The Arthur Rylah Institute (ARI) is collecting new field data on high-priority forest-dependent threatened species from late 2018 to mid-2020. This new on-ground data will be used to improve DELWP's understanding of where the species are likely to be found across forests in Victoria. It will also help to fine-tune current HDMs, which are based on records of species distribution and abundance stored in the VBA. Researchers will target 10 terrestrial fauna species for surveys in eastern Victoria, including Leadbeater's Possum, Long-footed Potoroo, gliders and owls, Glossy Black-cockatoo, Large Brown Tree Frog and Giant Burrowing Frog. In addition, surveys will target up to 15 threatened aquatic species (galaxias and crayfish) and 27 threatened plants to improve our understanding of their distribution and enhance their protection. ARI is using a range of methods including motion-sensor cameras, spotlighting and call playback to survey for species.

Survey locations have been chosen to give the greatest information gain for the HDMs. Survey sites will be located across public and private land as well as on the edge of species range to test understanding of where species do not occur and improve model outputs. This is known as confirming true absence data. Surveys are only occurring in eastern Victoria (east of the Hume Highway). All species that are found through this survey work will be recorded in the VBA, helping to improve the understanding of all species, possibly including other threatened species that are not the targets of specific surveys.

Updated habitat distribution models for key forest-dependent species

Through the RFA modernisation process, ARI is developing a revised set of HDMs for selected forest-dependent threatened species. This project proposes to develop a series of HDMs that better reflects the current distribution of the selected forest-dependent taxa, particularly with respect to an increasing interest in 'landscape scale' threatened species management.

Population viability analysis

Researchers from the University of Melbourne, with input from DELWP, are undertaking a program to develop spatially explicit population viability models for seven key/focus forest-dependent fauna taxa (Greater Glider, Leadbeater's Possum, Long-footed Potoroo, Powerful Owl, Sooty Owl, Baw Baw Frog, Broad-toothed Rat), as well as series of metapopulation analyses for up to 77 other priority forest species.

Climate change vulnerability analysis of forest ecosystems

Over the next 50 years and beyond, climate change will continue to significantly impact our forests and the ecosystems and species they comprise. While it is known that increasing temperatures, reduced rainfall and increased frequency and severity of bushfires and other extreme weather events will impact forests, the potential changes are not clearly understood.

Forest changes due to climate change are a complex web of interacting factors. Climate change impacts in Victoria's forests are currently difficult to predict due to limited field-based forest experimentation. In addition, many climate change and ecological modelling approaches are still in the early stages of development, particularly regarding their application to Australia's forests.

DELWP has commissioned a project to identify key EVCs and key forest-dependent species impacted by timber harvesting that are most vulnerable to climate change. This information will be brought together to help inform decisions and assist the government in considering measures to better manage and protect those communities and species most vulnerable to the impacts of climate change as part of the RFA modernisation process.

A longer-term piece of work is required to determine how Victoria's forests can be better protected from the impacts of climate change. This includes consideration of the optimal scale and design of a 'climate smart' CAR reserve system.

There are a number of discrete and complementary analyses that will provide information to help identify and inform the current state of ecological vegetation communities. They can also provide information on those communities and forest-dependent species most vulnerable to climate change over a 50-year outlook, given various climate scenarios. Useful information to be collected is as follows:

- current EVC status for recent fire history and tolerable fire interval
- ecological niche analysis of key forest-based EVCs and key forest-dependent species under climate scenarios Representative Concentration Pathway (RCP) 2.6, 4.5, 6.0 and 8.5
- expert elicitation of climate change vulnerability for key forest-dependent species under climate scenarios RCP 2.6 and 8.5.

Results from the various analyses will provide a current status of the tolerable fire interval of forest-based EVCs, which can be used as a surrogate for ecosystem resilience and potential current vulnerability of these communities. In addition, for key forest-based EVCs a climate niche analysis under a range of RCP climate change scenarios will provide a comparison of the modelled distribution of the ecological niche of EVCs under current climate with future modelled distributions (overlap analysis). This will determine the distribution of current areas that remain suitable under future climate scenarios.

Results for key forest-dependent species include a climate niche analysis as for the EVCs for those species able to be modelled under two climate scenarios, combined with expert elicitation. The models and information are considered, if experts choose to, among a range of other information and judgements by experts involved in the elicitation process, to judge key forest-dependent species vulnerability to climate change. The formal elicitation will identify the following across all five RFA regions:

- the perceived level of vulnerability to climate change over a 50-year time frame, considering climate scenarios RCP 2.6 and RCP 8.5
- the perceived causes of decline
- candidate protection measures or other conservation actions that may mitigate risks that could be considered in the short term under the RFA modernisation process and forest management planning process to adequately manage and protect those species and communities most vulnerable to climate change.

Integrated biodiversity values model

The purpose of the integrated biodiversity values model (IBVM) is to provide indicative spatial representations of relevant biodiversity 'value' which can support structured decision-making relating to forest and fire management planning. This product is a prototype grid-based spatial dataset incorporating attributes of specific biodiversity values (habitat for forest-dependent threatened species, forest ecosystems and old-growth forest – where available) across multiple layers. The IBVM will assist in decision-making around what areas of the forest estate should be prioritised for conservation, given (1) the distribution of biodiversity values, and (2) the predicted future state of biodiversity under scenarios of disturbance. Zonation algorithms are used to consider each grid cell's relative contribution to net habitat (extent and quality).

Indicator 1.3a: Forest associated species at risk from isolation and the loss of genetic variation, and conservation efforts for those species

Risk of isolation and loss of genetic variation

This indicator assesses the risks to loss of forest genetic variation and describes the formal measures designed to mitigate this risk. A loss of genetic diversity in species can result in a decreased ability to adapt to future environmental change, and thus a higher risk of extinction.

Information on the number of forest-dependent species at risk from isolation is relatively limited and difficult to consolidate on a statewide scale; however, there are a number of studies that detail some species that are at particular risk, and also discuss some techniques to alleviate that risk. A selection of these studies is outlined in Table 35.

Isolated populations of a species are in greater danger of extinction due to genetic drift. Genetic drift is the loss of genetic variation in a small isolated population, which decreases a population's ability to cope with changes in environment, and increases the effect and prevalence of genetic disease, due to inbreeding within the small population.

Amos et al. (2014) showed that a suite of woodland-occupying birds in central Victoria were at risk of genetic decline, largely due to habitat fragmentation. They found that these effects would be greater where habitat fragmentation was greatest and would affect the least dispersive species over more dispersive ones.

Genetic rescue – the addition of genes from an external population of the same taxa, but from a different, broader population – has been shown to alleviate some of the consequences of genetic drift and inbreeding, allowing a fitter overall population. In the case of the Mt Buller Mountain Pygmy-possum population, individuals from a larger, more diverse population were introduced to the site, along with more traditional management strategies, such as habitat restoration and construction of corridors linking suitable habitat, greatly increasing the chances of survival of this population.

Where a closely related taxon exists and is known to have interbred with the threatened taxon previously (e.g. breeding Helmeted Honeyeater (*Lichenostomus melanops cassidix*) with another subspecies of the Yellow-tufted Honeyeater (*L. m. gippslandicus*)), interbreeding may be successful in reducing loss of genetic variety; however, overuse of this technique will result in the threatened population's genetics being 'diluted' by the larger population's. It is suggested that only four new individuals per generation be introduced to the gene pool to allow for this dilution (Harrison et al. 2016).

Weeks, Stoklosa and Hoffman (2016) discuss various management programs for threatened mammals across Australia and demonstrate that managing small populations as separate genetic populations to the remainder of the species may contribute to the decline of these species as a whole.

Conversely, Hansen and Taylor (2008) show that an isolated population of Leadbeater's Possum (*Gymnobelideus leadbeateri*) may not benefit from genetic rescue, as the population has evolved separately to occupy a markedly different habitat (lowland swamp forests,

Eucalyptus camphora, *Leptospermum* spp. and *Melaleuca* spp.) to that of the main population (montane wet forests, *E. regnans*, *E. delegatensis*, *Acacia* spp.)

Van der Ree et al. (2010) and Soanes et al. (2018) have conducted a long running investigation into the effects of fragmentation, due to a large highway, on the Squirrel Glider (*Petaurus norfolcensis*). They have shown that large highways can impede isolated populations of the species from interbreeding, but a simple expedient of a rope bridge across the roadway enables individual gliders to cross and therefore allows genetic dispersal.

While these studies show that there are forest-dependent species in Victoria at risk from loss of genetic diversity, there are programs in place to reduce or remove some of these problems, both through interbreeding with other populations, and enabling isolated populations to connect with the broader population. More study is required to gain a broader idea of the extent of loss of genetics due to fragmentation, over the forest estate of Victoria.

Table 35: Recent studies examining risk from isolation and the loss of genetic variation

Species	Common name	Reference
	Various woodland birds	Amos, JN et al. 2014, 'Species- and sex-specific connectivity effects of habitat fragmentation in a suite of woodland birds', *Ecology*, vol. 95, no. 6, pp. 1556–68.
Gymnobelideus leadbeateri	Leadbeater's Possum (Yellingbo population)	Hansen, BD & Taylor, AC 2008, 'Isolated remnant or recent introduction? Estimating the provenance of Yellingbo Leadbeater's possums by genetic analysis and bottleneck simulation', *Molecular Ecology*, vol. 17, pp. 4039–52.
Lichenostomus melanops cassidix	Helmeted Honeyeater	Harrisson, KA et al. 2016, 'Scope for genetic rescue of an endangered subspecies though re-establishing natural gene flow with another subspecies', *Molecular Ecology*, vol. 25, no. 6, 1242–58.
Petaurus norfolcensis	Squirrel Glider	Van der Ree, R, Cesarini, S, Sunnucks, P, Moore, JL & Taylor, A 2010, 'Large gaps in canopy reduce road crossing by a gliding mammal', *Ecology and Society*, vol. 15, no. 4: 35. Soanes, K, Taylor, AC, Sunnucks, P, Vesk, PA, Cesarini, S, van der Ree, R 2018, 'Evaluating the success of wildlife crossing structures using genetic approaches and an experimental design: lessons from a gliding mammal', *J Appl Ecol.*, vol. 55, no. 1, pp. 129–38.
Burramys parvus	Mountain Pygmy-possum	Weeks, AR et al. 2017, 'Genetic rescue increases fitness and aids rapid recovery of an endangered marsupial population', *Nature Communications*, vol. 8: 1071.
	Endangered endemic mammals	Weeks, AR, Stoklosa, J & Hoffmann, AA 2016, 'Conservation of genetic uniqueness of populations may increase extinction likelihood of endangered species: the case of Australian mammals', *Frontiers in Zoology*, vol. 13:31.

Conservation efforts supporting vulnerable species

DELWP undertakes numerous management actions to promote the conservation of species. Table 36 shows the level of management activity for each forest-dependent threatened species for eight action categories, as provided by DELWP's regional implementation teams. The categories are:

- community engagement;
- policy and planning;
- survey and monitoring;
- habitat protection and restoration;
- pest and weed control;
- population manipulation;
- captive management; and
- research.

All efforts were made to populate this table as comprehensively as possible; however, it should be viewed as a non-exhaustive list. Indeed, the categories of 'survey and monitoring' and 'research' may be underrepresented as initiatives from other research institutions or land management agencies implement may not have been captured.

Table 36: Management activity for each forest-dependent threatened species, 2013–17

Common name	Community engagement	Policy and planning	Survey and monitoring	Habitat protection and restoration	Pest and weed control	Population manipulation	Captive management	Research
Mammals								
Broad-toothed rat								
Brush-tailed phascogale								
Brush-tailed rock-wallaby								
Eastern horseshoe bat								
Greater glider								
Grey-headed flying-fox								
Leadbeater's possum								
Long-footed potoroo								
Long-nosed potoroo								
Smoky mouse								
Spot-tailed quoll								
Squirrel glider								
Swamp antechinus								

Common name	Community engagement	Policy and planning	Survey and monitoring	Habitat protection and restoration	Pest and weed control	Population manipulation	Captive management	Research
White-footed dunnart								
Yellow-bellied glider								
Yellow-bellied sheathtail bat								
Birds								
Barking owl								
Brown treecreeper								
Chestnut-rumped heathwren								
Glossy black-cockatoo								
Grey goshawk								
Helmeted honeyeater								
Hooded robin								
Masked owl								
Powerful owl								
Regent honeyeater								
Sooty owl								
Speckled warbler								
Spotted quail-thrush								
Square-tailed kite								
Swift parrot								
Turquoise parrot								
White-bellied sea-eagle								
Reptiles								
Alpine bog skink								
Eastern she-oak skink								
Lace monitor								
Rosenberg's goanna								
Swamp skink								
Amphibians								
Baw Baw frog								
Booroolong tree frog								

Common name	Community engagement	Policy and planning	Survey and monitoring	Habitat protection and restoration	Pest and weed control	Population manipulation	Captive management	Research
Brown toadlet								
Giant burrowing frog								
Green and golden bell frog								
Large brown tree frog								
Martin's toadlet								
Southern toadlet								
Spotted tree frog								
Fish								
Australian grayling								
Barred galaxias								
Cox's gudgeon								
Dwarf galaxias								
Empire gudgeon								
Flat-headed galaxias								
Macquarie perch								
Murray cod								
Trout cod								
Invertebrates								
Orbost spiny cray								
Plants								
Baw Baw berry								
Blackfellow's hemp								
Brown guinea-flower								
Colquhoun grevillea								
Eastern pomaderris								
Elegant daisy								
Forest geebung								
Forest phebalium								
Forest sedge								
Gippsland stringybark								

Common name	Community engagement	Policy and planning	Survey and monitoring	Habitat protection and restoration	Pest and weed control	Population manipulation	Captive management	Research
Gully grevillea								
Leafless pink-bells								
Outcrop guinea-flower								
Oval fork-fern								
Oval-leaf grevillea								
Sandfly zieria								
Serpent heath								
Slender fork-fern								
Small fork-fern								
Smooth geebung								
Tall astelia								
Tasmanian wax-flower								
Toothed leionema								
Tree geebung								
Upright pomaderris								
Veined pomaderris								
Velvety geebung								

Note: Yellow cells denote minor activity – routine or ad hoc. Green cells denote substantial activity – targeted or sustained. Blank cells denote no activity.

Indicator 1.3b: Native forest and plantations of indigenous timber species which have genetic resource conservation mechanisms in place

Mountain Ash (*Eucalyptus regnans*) and Alpine Ash (*E. delegatensis*) forests are at risk of regeneration failure and forest type conversion following bushfires. Forests most at risk are those younger than seed-bearing age (20 years) because they lack their own seed and cannot self-regenerate. This is an increasing class of forest in Victoria due to frequent bushfires in the past 15 years.

This risk was acknowledged in June 2018 by the Victorian Auditor-General's Office (VAGO). In their published follow-up of selected 2012–13 and 2013–14 performance audits, they noted, for the audit titled *Managing Victoria's native forest timber resources*, that DELWP 'still has more to do' including 'ensuring there is adequate seed supply for forest regeneration' (VAGO 2018, p. 27). VAGO went on to note that DELWP has 'increased its stores of ash seed to close to four tonnes but estimates that it needs 12 tonnes to assist in future fire recovery works' (ibid., p. 35).

In response, DELWP has committed to improve its management of seed policy and seed stores and has established a Statewide Seed Coordination Group under the Forest Fire Operations Division. The aim of this group is to drive improvement in strategic seed management through coordinated liaison with relevant stakeholders and agencies such as VicForests and Parks Victoria.

The *Management Standards and Procedures for timber harvesting operations in Victorian State forests 2014* defines the protocol for seed collection to support regeneration following timber harvesting. A number of provisions relate to the maintenance of genetic resources. These include (but are not limited to) the following:

> 9.1.3.1 Prioritise seed collection from within areas available for timber harvesting operations.
>
> 9.1.3.2 Ensure large hollow-bearing trees and habitat trees retained during previous timber harvesting operations are not felled for seed collection.
>
> 9.1.3.3 Collect seed from stands that show no evidence of hybridisation and have experienced a widespread and preferably heavy flowering in which trees with good crops are close together.
>
> 9.1.3.4 Collect seed only from stands of natural origin or artificially regenerated stands of satisfactory genetic status in which the full, original gene pool of the population is represented. Stands regenerated from seed trees are regarded as of natural origin for seed collection purposes.
>
> 9.1.3.5 Prioritise using seed collected from the coupe; i.e., regenerate with seed fall from retained trees and/or logging slash, or sow the coupe with seed collected from that coupe. Otherwise, prioritise using seed that meets the following criteria:
>
> (a) the collection site is within 25 km of the coupe to be sown;
>
> (b) the mid-elevation of the collection site is within 350 m above to 150 m below the mid-elevation of the coupe to be sown;

(c) for slopes >10 ° the collection and sowing sites have similar aspect (separate between 'drier' aspects (W, NW, N, NE) and 'moister' aspects (SW, S, SE, E); and

(d) the collection and sowing sites are of similar soil type and parent material.

9.1.3.6 Where seed quantities within areas available for timber harvesting operations are inadequate to meet regeneration requirements, application may be made to the Minister or delegate to collect seed from standing trees within areas excluded from timber harvesting operations in accordance with section 1.4 and clauses 9.1.3.7 to 9.1.3.10.

(Victorian Department of Environment and Primary Industries [DEPI] 2014b, pp. 64–5)

Seed harvests (Table 37) fluctuate depending on environmental factors associated with seed availability. Seed usage remains fairly constant, but collection peaks in times of better seed availability. When there are good crops available it is possible to collect enough to compensate for times of poorer availability. Eucalypts tend to only flower heavily about once every five years or so, with much lighter flowering and consequently poorer seed crops in between.

Table 37: Seed harvest

Year	Seed harvest (kg)
2010–11	6,174
2011–12	4,457
2012–13	1,526
2013–14	1,192
2014–15	1,380
2015–16	4,317
2016–17	1,378

Data from VicForests.

The following table details the location of DELWP's seed holdings for eastern regions as at end of September 2018. A summary of quantity and numbers of stored seed-lots are given, including specific reference to Alpine Ash (AA) and Mountain Ash (MA).

Table 38: DELWP's seed holdings, eastern regions, September 2018

Storage Location	Seed Owner By Region (% of kg)	Sub-total (kg)	No. of seed-lots	Ash species			
				Alpine Ash	Mountain Ash	No. of seed-lots	Total Ash
Laverton North	Gippsland (84%) Port Phillip (16%)	3,414	275	1,479	1,345	207	2,824
Alexandra	Hume (100%)	1,018	50	389	451	30	840
Mansfield	Hume (100%)	1,918	142	1	321	15	322
TOTAL	DELWP	6,350	467	1,869	2,117	252	3,986

- DELWP's current Ash seed holdings are 2.1 tonnes MA and 1.9 tonnes AA = 4.0 tonnes total.
- DELWP's proposed Ash seed storage target of 14 tonnes = Milestone 2 + 2 additional tonnes.
- Stocks of Messmate, Shining Gum and Cut-tail are required, and current stocks are insufficient.
- Seed is stored at three locations. Laverton and Mansfield are the high-quality storage facilities.
- VicForests' current Ash seed holdings are 2.1 tonnes MA and 4.5 tonnes AA = 6.6 tonnes total.
- Total Victorian Ash current seed stocks = 4.0 + 6.6 = 10.6 tonnes, approaching Milestone 2.

For non-Ash species, it is recommended DELWP maintains a store of 500 kilograms Messmate, and 200 kilograms each of Shining Gum, Errinundra Shining Gum and Cut-tail.

Wetland values

Criterion 4 of the Montréal Process is concerned with soil and water resources. Specifically, this criterion is listed as 'Conservation and maintenance of soil and water resources'.

Wetlands are 'still-water' environments, usually occurring where water collects in depressions in the landscape from either surface water or groundwater. Wetlands can include swamps, lakes, peatlands, mangroves, saltmarshes, bogs, billabongs and mudflats. Some wetlands are dependent on groundwater for their existence; others depend on surface water run-off or large floods from adjacent rivers. The 2013 inventory of Victoria's wetlands[24] recorded 23,739 natural wetlands covering 604,322 hectares and 11,060 artificial wetlands covering 170,613 hectares. Some wetlands naturally have water in them all the time, while others naturally dry out for short or long periods of time. Within Victoria's RFA regions, wetland covers 1,774,707 hectares (Table 39).

Table 39: Area of wetland in Victoria's RFA regions

RFA	Wetland area (ha)
Central Highlands	3,332
East Gippsland	87,701
Gippsland	1,578,375
North East	31,565
West	73,732
Total	**1,774,707**

Source: WETLANDDIR spatial layer

The Ramsar Convention

The Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention) is an international intergovernmental treaty which was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975. Australia was one of the first countries to become a Contracting Party to the Ramsar Convention and designated the world's first Wetland of International Importance, Cobourg Peninsula Aboriginal Land and Wildlife Sanctuary, in 1974. As a Contracting Party to the Ramsar Convention, Australia has a commitment to protect designated areas according to the convention (Department of Sustainability, Environment, Water, Population and Communities [DSEWPaC] 2012).

The Ramsar Convention is embarking on its Fourth Strategic Plan 2016–2024. The strategic plan focuses on three strategic goals and one operational goal which supports them (Table 40). Each goal has associated targets, tools/actions/resources, key actors, indicators and baselines (Ramsar 2016).

[24] Data accessible via data.vic.gov.au: https://discover.data.vic.gov.au/dataset/victorian-wetland-inventory-current

Table 40: Strategic and operational goals for Ramsar's Fourth Strategic Plan 2016–2024

Strategic goals	Operational goal
Goal 1: Addressing the Drivers of Wetland Loss and Degradation	Goal 4: Enhancing Implementation
Goal 2: Effectively Conserving and Managing the Ramsar Site Network	
Goal 3: Wisely Using All Wetlands	

There are five Ramsar-declared wetlands within the Victorian RFA regions (Figure 15, 41). These are:

- Corner Inlet
- The Gippsland Lakes
- The Glenelg Estuary and Discovery Bay
- Port Phillip (Western Shoreline) and Bellarine Peninsula
- Western District Lakes.

The Gippsland Lakes has the largest area and extends across East Gippsland and Gippsland RFAs, while Corner Inlet in Gippsland RFA has the second-largest area and is also a shorebird site (Figure 15; Table 44).

The characteristics of Victoria's Ramsar wetlands, within RFA regions and the respective management authority, are outlined in Table 41. While the original RFAs did not include clauses specifically on wetland values, they include commitments from the Victorian Government to address water and catchments, outlining the associated legislative and policy framework, involving the adoption of an integrated catchment management approach to water resource management (DELWP 2016).

Non-Ramsar wetland areas in RFA regions and the extent in terrestrial ecosystems and in the CAR reserve system

A full summary of the extent of wetlands in each RFA region, by land type, including terrestrial ecosystems and the extent in the CAR reserve system, is presented in Appendix 6.

Figure 15: Ramsar wetland distribution across RFA regions

Source: VSDL RAMSAR25 spatial layer.

Table 41 Ramsar wetlands in the Victorian RFA regions

Name	Listing date	Location	RFA region	Area (ha)	Description	Reserved/owned	Managed by
Corner Inlet	1982	The Corner Inlet is the most southerly marine embayment and tidal mudflat system of mainland Australia and is located 260 kilometres south-east of Melbourne near Yarram.	Gippsland	67,235	Corner Inlet: • has shallow intertidal mudflats which support the world's most southerly population of white mangroves (*Avicennia marina*), as well as extensive areas of saltmarsh and seagrass • is an important feeding and nesting area for many waterbirds and one of the most important areas in Victoria for migratory shorebirds • supports a range of native fish species.	Reserved in the Corner Inlet Marine and Coastal Park and Nooramunga Marine and Coastal Park	Parks Victoria
The Gippsland Lakes	1982	The Gippsland Lakes are located 300 kilometres from Melbourne, south of the Eastern Highlands and to the east of the La Trobe valley. Ninety Mile Beach lies to the south.	East Gippsland, Gippsland	119,393	The Gippsland Lakes consists of a series of lakes and fringing wetlands. It is the largest estuarine lagoon system in Australia. The lakes are important for waterbirds, including migratory shorebirds, fish such as Black Bream (*Acanthopagrus butcheri*) and threatened species such as the nationally vulnerable Growling Grass Frog (*Litoria raniformis*).	Reserved in Gippsland Lakes National Park and public reserves	Parks Victoria
The Glenelg Estuary and Discovery Bay	2018	The Glenelg Estuary and Discovery Bay is situated approximately 340 kilometres west of Melbourne on the border with South Australia.	West	22,289	Glenelg Estuary and Discovery Bay: • has diverse aquatic habitats, including intertidal sandy beaches, estuarine habitat, freshwater swamps and permanent lakes • supports nationally threatened coastal saltmarsh, and eight nationally or	Reserved in Lower Glenelg National Park, Discovery Bay Coastal Park and the Nelson Streamside Reserve	DELWP, Glenelg Hopkins Catchment Management Authority and Ramsar

Name	Listing date	Location	RFA region	Area (ha)	Description	Reserved/owned	Managed by
					internationally listed species of conservation significance, such as the critically endangered Eastern Curlew and the endangered Australasian Bittern • provides feeding, spawning and nursery habitat for 28 fish species • supports 24 bird species that migrate annually from the northern hemisphere • has rare geological and geomorphic features.		Coordinating Committee
Port Phillip (Western Shoreline) and Bellarine Peninsula	1982	The site is made up of a number of wetlands stretching from Point Cook in Melbourne's south-western suburbs to the north shore of Corio Bay north of Geelong and extending to the Bellarine Peninsula and Mud Islands. There are six sections of the site, as follows: Point Cook–Cheetham, Werribee–Avalon, Point Wilson – Limeburner's Bay, Lake Connewarre, Swan Bay and Mud Islands.	West	22,645	The site supports: • international migratory shorebirds, flying from as far away as Russia and Alaska • very large numbers of waterbirds, on both its natural and artificial wetlands, with annual numbers likely to be in excess of 300,000 • 12 threatened fauna species and one threatened vegetation community • breeding colonies of several species including Royal Spoonbills (*Platalea regia*), Pied Cormorant (*Phalacrocorax varius*) and White-faced storm Petrels (*Pelagodroma marina*) • important habitat for over 50 fish species. The site also provides: • winter feeding habitat for the nationally listed critically endangered	Multi-tenure	DELWP, Parks Victoria and Melbourne Water

Name	Listing date	Location	RFA region	Area (ha)	Description	Reserved/owned	Managed by
					Orange-bellied Parrot (*Neophema chrysogaster*) • an important drought refuge through its wetlands for waterbirds when inland lakes and wetlands dry out. Notable vegetation includes saltmarsh, seagrass and mangroves.		
Western District Lakes	1982	Western District Lakes consists of nine lakes on the Victorian Volcanic Plain between Winchelsea and Camperdown approximately 150 kilometres southwest of Melbourne. Lake Corangamite, one of the nine lakes, is the largest permanent saline lake in Australia but also supports localised groundwater-fed freshwater habitat.	West	32,675	The site supports large numbers of waterbirds, including migratory shorebirds and a breeding colony of the Australian Pelican (*Pelecanus conspicillatus*) at Lake Corangamite when conditions are favourable. Lake Beeac is very significant for Banded Stilt (*Cladorhynchus leucocephalus*) and Red-necked Avocet (*Recurvirostra novaehollandiae*). Threatened species at the site include Salt Tussock Grass (*Poa sallacustris*) and Spiny Pepper-cress (*Lepidium aschersonii*) which are both listed as nationally vulnerable.	Consists of conservation reserves	Parks Victoria The Corangamite Catchment Management Authority

Source: DELWP (2019b)

Wetland area in Victoria was examined using the CAR reserve extent for 2018 (Table 42). The West RFA region contains the largest area of wetland of all the regions, estimated at 102,739 hectares in 2018. The North East and Central Highlands RFAs only contain nationally important wetlands, while in East Gippsland, Gippsland and the West, 2.8 per cent, per cent, 79 per cent and 70 per cent of the wetland area respectively is contained within a Ramsar site.

Table 42: Extent of wetlands in CAR reserves, 2018

Land Type	Ramsar Wetlands (ha)	Nationally Important Wetlands (ha)	Sum of Area (ha)
CENTRAL HIGHLANDS		3,332	3,332
Dedicated Reserve		242	242
Informal		1,715	1,715
Prescription		7	7
Prescription - MOG		0	0
Private land		720	720
Unprotected Public Land		648	648
EAST GIPPSLAND	2,054	71,500	73,554
Dedicated Reserve	594	58,163	58,757
Immediate Protection Areas		292	292
Informal		6,063	6,063
Prescription		71	71
Prescription - MOG		11	11
Private land	17	2,671	2,688
Private Land Covenants		16	16
Unprotected Public Land	1,443	4,212	5,655
GIPPSLAND	71,772	19,031	90,803
Dedicated Reserve	35,842	9,363	45,205
Informal		101	101
Prescription		145	145
Prescription - MOG		10	10
Private land	1,531	5,779	7,311
Private Land Covenants	33		33
Unprotected Public Land	34,366	3,632	37,998
Non-RFA	69,502	164,801	234,303
Dedicated Reserve	46,570	68,458	115,029
Informal	876	22	899
Private land	602	47,630	48,232
Private Land Covenants	0	324	324
Unprotected Public Land	21,453	48,366	69,819
NORTH EAST		21,161	21,161

Dedicated Reserve		2,694	2,694
Informal		815	815
Prescription		15	15
Private land		463	463
Unprotected Public Land		17,174	17,174
WEST	71,785	30,953	102,738
Dedicated Reserve	29,632	12,818	42,451
Informal		1,249	1,249
Prescription		213	213
Prescription - MOG		14	14
Private land	5,792	10,180	15,972
Private Land Covenants		139	139
Unprotected Public Land	36,361	6,340	42,701
Grand Total	215,114	310,777	525,891

Source: Ramsar data is from the RAMSAR25 spatial layer, while the nationally important wetland data is from WETLANDDIR in the VSDL/CSDL. The CAR data is unpublished Statewide_CAR_update_20191223

Nationally important wetlands

Nationally important wetlands are wetlands that are a good example in a particular area, an important habitat for native species, or that have outstanding heritage or cultural significance. Nationally important wetlands are listed in the *Directory of important wetlands in Australia*.[25] The criteria for determining nationally important wetlands in Australia, and hence their eligibility for inclusion in the Directory, are those agreed to by the Australian and New Zealand Environment and Conservation Council (ANZECC) Wetlands Network in 1994.

A wetland may be considered nationally important if it meets at least one of the following criteria:

1. It is a good example of a wetland type occurring within a biogeographic region in Australia.
2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex.
3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles or provides a refuge when adverse conditions such as drought prevail.
4. The wetland supports 1 per cent or more of the national populations of any native plant or animal taxa.
5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
6. The wetland is of outstanding historical or cultural significance.

25 *Directory of important wetlands in Australia* was accessed in 2019. However, the directory has not been updated since 2005. See https://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands.

There are 159 wetlands in Victoria listed in the Directory. The nationally important wetlands are listed according to RFA region in Table 43. Of the nationally important wetlands, there are:

- 3 in Central Highlands RFA
- 8 in North East RFA
- 24 in Gippsland RFA
- 18 in the East Gippsland RFA
- 38 in West RFA.

Table 43: Nationally important wetlands in Victoria by RFA

East Gippsland	Gippsland	Central Highlands	North East	West
Thurra River	Corner Inlet	Central Highlands Peatlands	Lake Hume	Dergholm (Youpayang) Wetlands
Bemm, Goolengook, Arte and Errinundra Rivers	Lake Dartmouth	Yarra River	Mt Buffalo Peatlands	Lake Connewarre State Wildlife Reserve
Tamboon Inlet Wetlands	Davies Plain	Big River	Lake Dartmouth	Mundi-Selkirk Wetlands
Genoa River	Raymond Island Marsh 2		Wongungarra River	Woorndoo-Hopkins Wetlands
Snowy River	Nuniong Plateau Peatlands		Wonnangatta River	Long Swamp
Sydenham Inlet Wetlands	Mitta Mitta River		Howqua River	Lower Lough Calvert & Lake Thurrumbong
Suggan Buggan and Berrima Rivers	Raymond Island Marsh		Ryan’s Lagoon	Lake Connewarre State Wildlife Reserve
Mallacoota Inlet Wetlands	Russells Swamp		Black Swamp	Kooraweera Lakes
Lower Snowy River Wetlands System	Billabong Flora and Fauna Reserve			Yambuk Wetlands
Rooty Break Swamp	Anderson Inlet			Mount William Swamp
Benedore River	Wongungarra River			Glenelg Estuary
Nuniong Plateau Peatlands	Macleod Morass			Lake Muirhead
Ewing's Marsh (Morass)	Jack Smith Lake State Game Reserve			Widderin Swamps
Tea Tree Swamp (Delegate River)	Wonnangatta River			Werribee–Avalon Area

East Gippsland	Gippsland	Central Highlands	North East	West
Lake Bunga	Shallow Inlet Marine & Coastal Park			Stonyford-Bungador Wetlands
Lake King Wetlands	Deep Water Morass			Lake Corangamite
Upper Buchan River	Tambo River (Lower Reaches) East Swamps			Lake Buninjon
Lake Tyers	Lake Wellington Wetlands			Princetown Wetlands
	Bald Hills State Wildlife Reserve			Cundare Pool/Lake Martin
	Lake Victoria Wetlands			Lower Aire River Wetlands
	Caledonia Fen			Lake Wendouree
	Lake King Wetlands			Tower Hill
	Lindenow Wildlife Sanctuary			Hately's Lake Swamp
	Bosses/Nebbor Swamp			Lake Condah
				Point Cook & Laverton Saltworks
				Lake Linlithgow Wetlands
				Banongill Network
				Swan Bay & Swan Island
				Cobden-Terang Volcanic Craters
				Nerrin Nerrin Wetlands
				Lindsay-Werrikoo Wetlands
				Saint Marys Lake

East Gippsland	Gippsland	Central Highlands	North East	West
				Lake Gnarpurt
				Boiler Swamp System
				Red Rock Lakes & The Basins
				Glenelg River
				Lerderderg River
				Lower Merri River Wetlands

Source: WETLANDDIR spatial layer in the VSDL/CSDL

Victorian Waterway Management Strategy

The Victorian Waterway Management Strategy (DELWP 2019) provides the framework for government, in partnership with the community, to maintain or improve the condition of rivers, estuaries and wetlands so that they can continue to provide environmental, social, cultural and economic values for all Victorians. The framework is based on regional planning processes and decision-making, within the broader system of integrated catchment management in Victoria.

In Victoria, there are 10 catchment management regions (see Figure 16) and each has a Catchment Management Authority (CMA) to coordinate integrated management of land, water and biodiversity.

Figure 16: The 10 catchment management regions in Victoria

Waterway condition indices

The condition of waterways in Victoria is periodically assessed by DELWP using the Index of Stream Condition (ISC), Index of Wetland Condition (IWC) and the pilot Index of Estuary Condition (IEC). The IWC was initially developed in 2005 to assess the condition of naturally occurring wetlands in Victoria. In the period 2009–11, the IWC was used to benchmark the condition of almost 600 high-value wetlands and 240 additional wetlands selected to represent a range of different wetland types. The assessment found that 24 per cent of high-value wetlands were in excellent condition, 32 per cent in good condition, 30 per cent in moderate condition, 13 per cent in poor condition and 1 per cent in very poor condition.

Overall, a higher proportion (65 per cent) of wetlands on public land were in good or excellent condition than those on private land (39 per cent).

This was the first time a systematic, statewide assessment of wetland condition had been undertaken in Victoria. The IWC measures six parameters to assess wetland condition (Victorian Department of Sustainability and Environment [DSE] 2012b):

1. Hydrology (river-flow characteristics);
2. Biota (life forms, weeds, altered process, vegetations structure and health);
3. Physical form (extent, changes in bathymetry);
4. Soils (disturbance);
5. Water properties (nutrients, salinity; and
6. Wetland catchment (land-use intensity, buffer width, buffer continuity).).

Statewide resource condition assessment will occur through the Indices of Condition programs (ISC, IWC and IEC) every eight years, subject to available funding. The Waterway Condition Indices will be used to:

- provide statewide information on the condition of Victoria's rivers, estuaries and wetlands;
- provide high-quality baseline information on environmental values and threats to values to inform regional planning and priority setting; and
- help assess the overall, long-term effectiveness of the Victorian Waterway Management Program.

The *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act aims to protect and manage MNES (i.e. nationally and internationally important flora, fauna, ecological communities and heritage places). The MNES of relevance to wetlands are:

- declared Ramsar wetlands of international importance;
- listed threatened species;
- threatened ecological communities; and
- migratory species.

The EPBC Act establishes a process for identifying Ramsar wetlands and encourages best-practice management through nationally consistent management principles. It provides automatic protection for Ramsar wetlands by ensuring an assessment process is undertaken for proposed actions (including forestry operations) that will, or are likely to, have a significant impact on the ecological character of a declared Ramsar wetland. This process allows the Commonwealth Minister for the Environment to grant or refuse approval to take an action, or to impose conditions on the taking of an action.

The exemption from Commonwealth assessment and approval requirements under section 38 of the EPBC Act for forestry operations in RFA areas does not apply to forestry operations within Ramsar wetland sites.

Migratory shorebirds

Migratory shorebirds visit Victoria each summer to feed on invertebrates on the mudflats in coastal and inland wetlands. Each year they travel from their breeding areas in the tundra regions of the northern hemisphere and back again along particular routes known as flyways. Along the way they stop at suitable wetlands to feed and build reserves of fat for the next stage of their journey.

The conservation of wetlands which provide suitable habitat for breeding along the migratory route and at their non-breeding summer destinations in Victoria and elsewhere is critical to migratory shorebirds' survival and requires international cooperation. A number of international agreements are in place to protect migratory shorebirds and other migratory waterbird species.

Shallow Inlet, Corner Inlet, Western Port, the Western Shoreline of Port Phillip Bay and the Bellarine Peninsula and Discovery Bay (Table 44) have been recognised for their importance to migratory shorebirds through listing as shorebird sites on the East Asian – Australasian Flyway (Figure 17) Site Network (Figure 18).

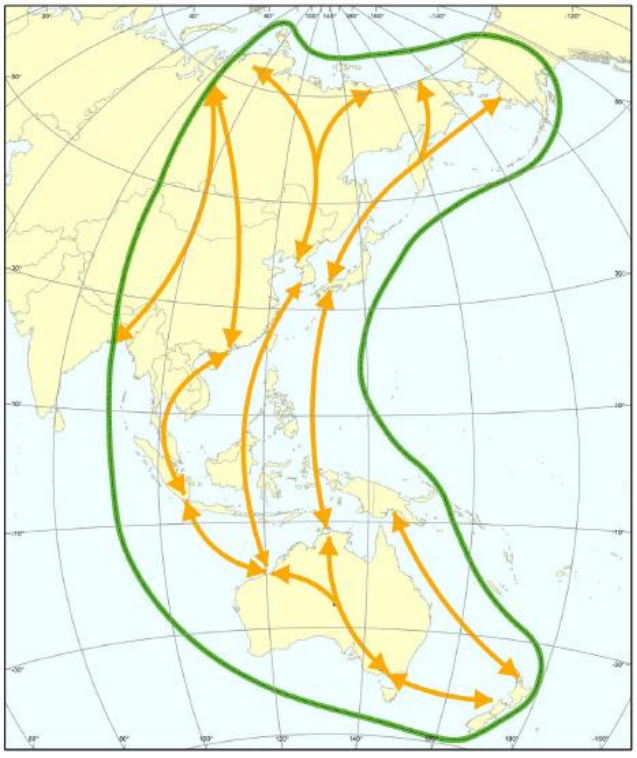

Figure 17: The East Asian – Australasian Flyway

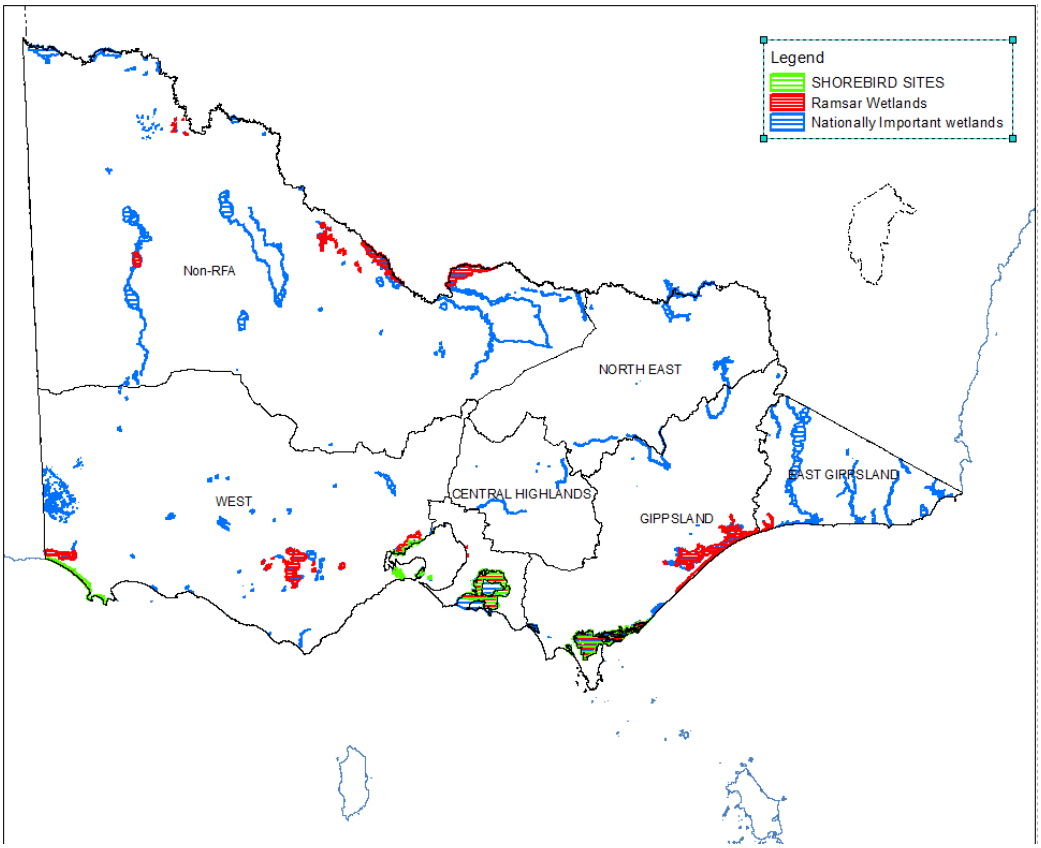

Figure 18: Victorian Flyway shorebird sites, wetlands and Ramsar network across RFAs

Source: Analysis derived from spatial layers: SHOREBIRD, RAMSAR25 and WETLANDDIR, all available within data.vic.gov.au.

Table 44: Shorebird network across wetlands and RFAs

RFA	Shorebird site	Wetland name
Gippsland	Corner Inlet	Corner Inlet
	Shallow Inlet	Shallow Inlet Marine and Coastal Park
West	Port Phillip (Western Shoreline) and Bellarine Peninsula	Point Cook and Laverton Saltworks
		Werribee–Avalon Area
		Lake Connewarre State Wildlife Reserve
		Swan Bay and Swan Island
	Discovery Bay	Glenelg Estuary
		Long Swamp

Source: Shorebird spatial layer from Victorian Spatial Data Library.

Indicator 4.1a: Area of forest land managed primarily for protective functions

There are 134 declared special water supply catchment areas (formerly known as proclaimed water supply catchments) within Victoria (Department of Jobs, Precincts and Regions [DJPR] 2019). The relationship of water quality and quantity with different levels of catchment planning is the basis for catchment planning and management under the provisions of the *Catchment and Land Protection Act 1994* (Vic.) (formerly the *Soil Conservation and Land Utilization Act 1958*). Under this Act, special water supply catchment areas are declared 'special areas' and are officially recognised as designated catchments for water supply purposes. This process highlights to the community, land managers and planners the importance of the catchment for water supply purposes.

An underlying principle of catchment planning is the recognition of water production as a valid land-use activity. Water in streams, drainage lines and storages is extremely vulnerable to deterioration and therefore requires a high level of protection. Many water quality problems can be minimised if land use is consistent with the capability of the land – that is, the ability of the land to sustain a proposed use.

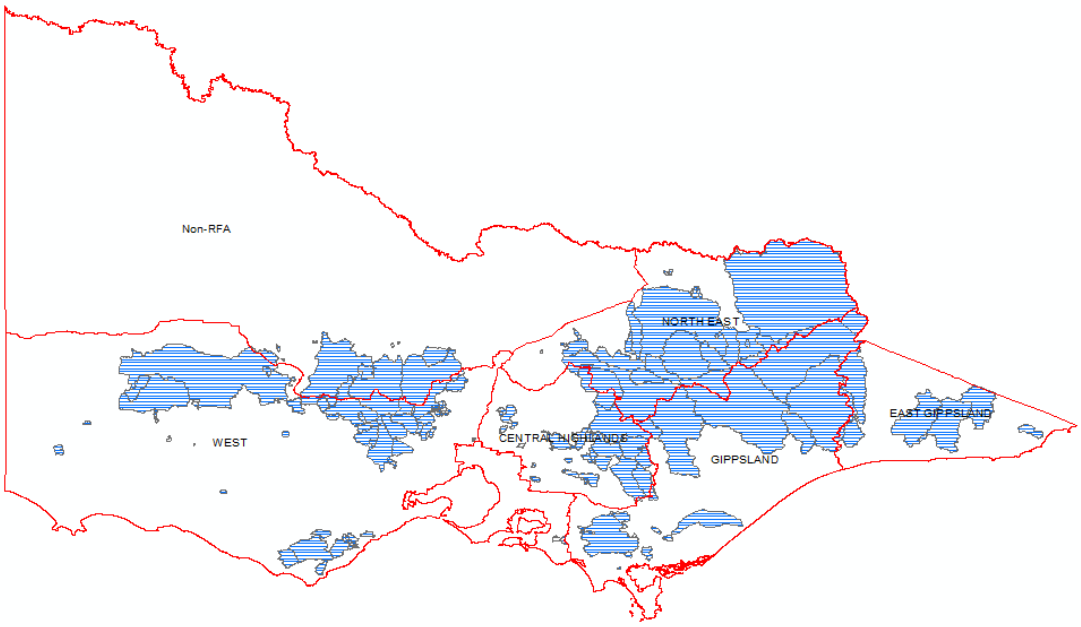

Figure 19: Proclaimed water supply catchments in Victoria across the RFAs

Data source: Information derived from the PWSC100 spatial layer.

The CRA for the Gippsland, North East and West RFA regions captured information regarding rivers and catchment basins, their area as a percentage of the RFA, and the corresponding forest cover as a percentage of land tenure (Table 45). This information was presented in the Water and Catchments chapter of each CRA. It revealed a significantly greater percentage forest cover on public land than freehold, with the West RFA region demonstrating lower forest coverage on public land than the Gippsland and North East regions.

Table 45: Basins and rivers across RFA regions (CRA)

RFA	AWRC[a] Basin	Major rivers in RFA region	per cent in RFA region	Land tenure	Total area (ha)	per cent forest cover
East Gippsland		Betka, Cann, Brodribb, Rocky, Buchan, Bemm, Tambo, Boggy Creek		NOT REPORTED		
Gippsland	Up per Murray River	Mitta Mitta, Cobungra, Bundarra	30	Public land	75 per cent	98
				Freehold	25 per cent	27
				Total	302,300	80
	Goulburn River	Goulburn, Black	1	Public land	100 per cent	100
				Freehold		0
				Total	18,400	100
	Snowy River		<1	Public land	100 per cent	98
				Freehold		0
				Total	1,820	98
	Tambo River	Tambo, Timbarra, Nicholson	81	Public land	71 per cent	99
				Freehold	29 per cent	27
				Total	340,190	78
	Mitchell River	Mitchell, Wonnangatta, Dargo	90	Public land	74 per cent	98
				Freehold	26 per cent	21
				Total	470,950	78
	Thomson River	Thomson, Macalister, Avon	91	Public land	67 per cent	97
				Freehold	33 per cent	19
				Total	544,900	71
	Latrobe River	Latrobe, Morwell,	65	Public land	19 per cent	66
				Freehold	81 per cent	30
				Total	331,420	37
	South Gippsland	Tarwin, Tarra, Albert	89	Public land	23 per cent	80
				Freehold	77 per cent	19
				Total	555,000	33
	Bunyip River	Lang Lang	12	Public land	2 per cent	11
				Freehold		2
				Total		3
Central Highlands	Goulburn	Acheron, Big, Goulburn		NOT REPORTED		
	Thomson	Thomson				
	Latrobe	La Trobe				

RFA	AWRC[a] Basin	Major rivers in RFA region	per cent in RFA region	Land tenure	Total area (ha)	per cent forest cover
	Yarra	Blue Jacket Creek, Yarra River				
	Bunyip	Bunyip				
North East	Upper Murray River	Mitta Mitta	71	Public land	69 per cent	93
				Freehold	31 per cent	23
				Total	709,294	72
	Kiewa River	Kiewa	100	Public land	52 per cent	87
				Freehold	48 per cent	16
				Total	196,051	53
	Ovens River	Ovens, King, Buffalo	92	Public land	53 per cent	96
				Freehold	47 per cent	16
				Total	719,860	58
	Broken River	Broken	24	Public land	37 per cent	96
				Freehold	63 per cent	14
				Total	181,870	45
	Goulburn River	Goulburn, Howqua, Jamieson, Delatite	28	Public land	36 per cent	90
				Freehold	64 per cent	15
				Total	458,826	42
	Mitchell River	Wongungarra, Wonnangatta	9	Public land	100 per cent	100
				Freehold	0 per cent	0
				Total	51,109	100
	Thomson River	Barkly	<1	Public land	100 per cent	100
				Freehold	0 per cent	0
				Total	224	100
West	Goulburn River	Goulburn River	6.4	Public land	2 717	45.8
				Freehold	105,409	13.6
				Total	108,125	14.4
	Campaspe River	Campaspe River Coliban River	13.1	Public land	7,930	85.6
				Freehold	46,954	21.3
				Total	54,884	30.6
	Loddon River	Loddon River	8.1	Public land	21,464	86.6
				Freehold	101,253	16.2
				Total	122,717	28.5
	Avoca River	Avoca River	2.9	Public land	10,081	95.7
				Freehold	25,186	17.4
				Total	35,267	39.8
	Wimmera – Avon River	Wimmera, Avon	31.1	Public land	151,692	80.6
				Freehold	599,461	8.5
				Total	751,152	23.1
	Yarra River		5.2	Public land	2,256	6.2
				Freehold	19,094	2.5
				Total	21,350	2.9
	Maribyrnong River	Maribyrnong River	89.6	Public land	9,312	79.7
				Freehold	119,205	15.1

RFA	AWRC[a] Basin	Major rivers in RFA region	per cent in RFA region	Land tenure	Total area (ha)	per cent forest cover
				Total	128,517	19.8
	Werribee River	Werribee River, Lerderderg River	93.9	Public land	53,051	83.4
				Freehold	133,976	9.7
				Total	187,027	30.6
	Moorabool River	Moorabool River, Little River	98.6	Public land	36,142	51.6
				Freehold	184,098	10.1
				Total	220,240	16.9
	Barwon River	Barwon River, Leigh River	98.9	Public land	46,442	70.4
				Freehold	335,521	7.8
				Total	381,963	15.4
	Lake Corangamite	Woady Yaloak River	100	Public land	59,028	21.5
				Freehold	359,060	5.6
				Total	418,088	7.8
	Otway Coast	Gellibrand River, Curdies River, Aire River	100	Public land	141,991	90.9
				Freehold	238,572	24.6
				Total	380,563	49.3
	Hopkins River	Hopkins River, Merri River	100	Public land	43,380	43.7
				Freehold	951,806	2.7
				Total	995,186	4.5
	Portland Coast	Moyne River, Eumeralla River, Fitzroy River	100	Public land	64,234	83.5
				Freehold	332,588	7.4
				Total	396,822	19.8
	Glenelg River	Glenelg River, Wannon River	100	Public land	308,636	86.3
				Freehold	942,419	13.6
				Total	1,251,055	31.5
	Millicent Coast	(no permanent surface water supplies)	34.6	Public land	46,303	80
				Freehold	271,887	11.4
				Total	318,191	21.4

a Australian Water Resource Council

Source: Data derived from the CRAs accessed via the ABARES website

Indicator 4.1b: Management of the risk of soil erosion in forests

This indicator aims to evaluate soil properties, compliance with soil disturbance standards, and current disturbances, to assess whether levels are acceptable for sustainable forest management. Soil quality is critical to regulation processes in forest ecosystems, including plant production and ecological and hydrological functions.

A regulatory framework has been established in Victoria to support river health and soil conservation in public forests (Table 46). The framework includes legally binding instruments, recognised and enforceable by law. As outlined in the VSOFR, categories 1 to 4 in Table 46 demonstrate how each instrument assists with soil conservation and river health.

Considerable changes have been made to elements of the regulatory framework, including:

- review and update of the *Code of Practice for Timber Production 2007* to the *Code of Practice for Timber Production 2014* – this included streamlining the environmental regulatory framework for harvesting managers, harvesting entities and operators conducting and planning timber harvesting operations (DEPI 2014a)
- revocation of Sustainable Forests (Timber Harvesting) Regulations 2006 in 2014 (no longer in operation)
- replacement of *Management procedures for timber harvesting, roading and regeneration in Victoria's State forests 2009* with *Management Standards and Procedures for timber harvesting operations in Victoria's State forests 2014* (DEPI 2014b); this document was supplemented by '*Planning Standards for timber* harvesting operations *in Victoria's State forests 2014*' (DEPI 2014c).

In terms of assessment of risk to soil attributes timber production and bushfire management are the only forest activities with legally binding and systematic requirements. The relationship between these two activities and soil conservation and river health is well-documented (Weston and Attiwill 1990).

Table 46: Instruments that address forest-related soil attributes in Victoria

Instrument	Legally binding	Public land tenure	Forest activity	Category[a]
Catchment and Land Protection Act 1994	Yes	All	All	3
Heritage Rivers Act 1992	Yes	All	Timber production, mining, grazing, roading, clearing, water regulation	2, 3
Land Conservation (Vehicle Control) Act 1972	Yes	All	Vehicle use, general recreation	2
Water Act 1989	Yes	All		3
Environment Protection Act 1970	Yes	All	All	3
Forests (Recreation) Regulations 2010	Yes	State forest	General recreation	2
National Parks (Park) Regulations 2003	Yes	National and state parks	General recreation	2
Code of practice for timber production 2014	Yes	All	Timber production	1
Code of practice for bushfire management on public land 2012	Partially	All	Bushfire management	1
Forest management plans	Partially	State forest	All	4
Management Standards and Procedures for timber harvesting operations in Victoria's State forests 2014	Partially	State forest	Timber production and roading	1
Planning Standards for timber harvesting operations in Victoria's State forests 2014	Partially	State forest	Timber production and roading	1
Native forest silviculture guidelines	No	State forest	Timber production	4
Mining and exploration guidelines	No	All	Mining	4

Data source: DELWP (2018).

a Description of categories:
Category 1 specifies requirements to assess risk to soil attributes, and standards and procedures for forest activities to control risks to soil attributes
Category 2 specifies controls over the type and location of forest activities for soil conservation or river-health purposes, e.g. the prohibited use of vehicles in declared erosion hazard areas
Category 3 provides for the administration of soil conservation or river health, e.g. the *Catchment and Land Protection Act 1994* provides for the establishment of special areas (including special water supply catchment areas) and establishes management responsibilities
Category 4 provides guidance on soil conservation methods.

Timber production

The *Code of Practice for Timber Production 2014* (the Code) (DEPI 2014a), lists mandatory actions for timber harvesting activities in native forests and plantations in Victoria. The *Management Standards and Procedures for timber harvesting operations in Victoria's State forests 2014* (the MSP) (DEPI 2014b) are designed to help interpret the Code for timber harvesting and related activities in State forests. They are a secondary source of mandatory prescriptions for forest management.

The Code outlines the mandatory actions relating to water quality, river health and soil protection (Table 47). Specific thresholds relating to these actions with respect to slope, buffer width and filter strips can be found in the MSP.

These prescriptions have been modelled across the state and are reflected in the FMZ spatial layer. In this way, VicForests operationally excludes areas as defined under the Code, such as slopes greater than 30 degrees, or buffers and filter strips around water bodies to the dimensions specified. These areas are listed as 'Code Exclusions' in reference to the CAR reserve and can complement the informal protected area in relation to the JANIS criteria.

Table 47: Mandatory actions relating to water quality, river health and soil protection, as outlined by the *Code of practice for timber production 2014*

Code	Mandatory actions
2.2.1.1	Planning and management of timber harvesting operations must comply with relevant water quality, river health and soil protection measures specified within the MSP.
2.2.1.2	Management actions to protect waterways, river health and soil must be appropriate to the waterway class, soil category, and potential water quality risk posed by timber harvesting operations at each site.
2.2.1.3	Additional measures to protect water quality and aquatic habitat (including widening buffers or filter strips) must be adopted within coupes where there is a high local risk due to: • Local topography; • The intensity and magnitude of the timber harvesting operation; • Events such as wildfire that reduce the effectiveness of protection measures; or • The location of the timber harvesting operation in a declared Special Water Supply Catchment or any other water supply protection area.
Protecting waterways and aquatic and riparian habitat	
2.2.1.4	Use buffers and filters of effective width in forest adjacent to aquatic and riparian habitats to protect them from microclimate changes, sedimentation and disturbance.
2.2.1.5	Where practical exclude roads and snig tracks from aquatic and riparian habitats.
2.2.1.6	Where crossings are required, minimise the extent of habitat damage, constriction to stream flow and barriers to fish and other aquatic fauna.
2.2.1.7	Remove temporary crossings immediately after harvesting or any subsequent regeneration work is complete using a technique that minimises soil and habitat disturbance.

Minimising water pollution	
2.2.1.8	Use drainage, artificial structures, buffers and filters of effective width to slow and disperse surface flows and deposit sediment before reaching waterways.
2.2.1.9	Locate coupe infrastructure, roads and other activities that generate sediment or other potential pollutants in places where risk of entry into waterways is lowest unless otherwise sanctioned.
2.2.1.10	Minimise the extent and duration of soil disturbance adjacent to or within waterways.
2.2.1.11	Use management practices such as modified harvesting techniques, scheduling, wet weather suspensions or progressive rehabilitation to minimise the potential for sediments and other pollutants to move into streams.
2.2.1.12	Design, construct and maintain roads, crossings, coupe infrastructure and drainage structures to withstand foreseeable rainfall events and traffic conditions, and protect water quality.
2.2.1.13	Ensure chemical use is appropriate to the circumstances and takes into account the maintenance of water quality.
Maintaining soil productive capacity	
2.2.1.14	Minimise potential for soil erosion or mass movement by planning and using operational methods and restrictions appropriate to the assessed soil erosion risk and slope.
2.2.1.15	Locate coupe infrastructure and roads to minimise soil erosion and degradation.
2.2.1.16	Use appropriate equipment, harvesting techniques and operational management to minimise soil rutting, mixing or compaction.
2.2.1.17	Limit the area of soil affected by coupe infrastructure and roads to the minimum required to safely complete timber harvesting operations to the required standard.
2.2.1.18	Employ topsoil conservation techniques in timber harvesting areas affected by coupe infrastructure and roads.
2.2.1.19	During timber harvesting operations maintain effective drainage of coupe infrastructure and roads.
2.2.1.20	Minimise the time soil is left unvegetated, except at coupe infrastructure sites that are required in the longer term.
2.2.1.21	Ensure chemical use is appropriate to the circumstances and takes into account the maintenance of soil productive capacity.

The Forest Audit Program (FAP) provides an independent, objective assessment of VicForests' level of compliance with the environmental regulations for timber production in State forests. The FAP addresses mandatory compliance elements, based on the Code and the MSP. Since 2015–16, FAP audits have largely focused on Code compliance priorities relating to:

- environmental values in State forests, particularly those relating to soils, water, waterways and biodiversity (Table 48)
- design, construction, maintenance and closure of in-coupe roads.

These audits relate to compliance priorities that have a higher risk of environmental harm, and the coupes selected for audit have features (e.g., waterways) that are associated with these higher risk elements. Therefore, the audit results are not representative of all VicForests' operations and should not be extrapolated.

Table 48: Environmental compliance themes and their respective elements for the Forest Audit Program

Environmental compliance theme	Compliance elements
Protection of water flows, water quality and river health	Classifying waterways present in the coupe and applying at least the minimum width of filters and/or buffers required Applying seasonal closures to reduce the risk of sediment mobilisation during wet weather in water supply catchments Undertaking appropriate design, construction and maintenance of in-coupe roads, road drainage and waterway crossing
Protection of forest soils	Assessing and understanding soil erosion hazard within the coupe Not harvesting in excessively steep areas Applying seasonal closures to reduce the risk of sediment mobilisation during wet weather in water supply catchments Undertaking appropriate construction, maintenance, closure and/or removal of in-coupe roads, road drainage and road or snig track waterway crossings
Protection of biodiversity values	Retaining trees and other habitat within the gross coupe and/or harvested area, including old-growth elements and trees with or with potential to form hollows Not undertaking harvesting activities or roading within sensitive vegetation communities (e.g. heathlands, montane riparian thickets, rainforest stands) Identifying listed, threatened species of native flora and fauna which have been recorded within or adjacent to the coupe and applying the management measures prescribed by the MSPs and PS Not harvesting in SPZs established to protect important native fauna habitats (e.g. for Leadbeater's Possum, Long-footed Potoroos, Owls) Maintaining passage for fish or other aquatic fauna along permanent streams Managing the risk of entry or spread of weeds and soil-borne or other diseases

Independent auditors are commissioned by DELWP for the FAP and audit reports are made public, to inform the community of the standard of environmental management applied to State forests.

Prospective coupes for the audit are selected from a list of coupes included in VicForests' current Timber Release Plan. A risk-based selection process is used by the auditors to identify the target coupes, based on some of this information. Coupes are short-listed for selection where they are identified in coupe planning as having one or more of these characteristics:

- A waterway crossing was to be constructed to access the coupe.

- Modelled rainforest vegetation was identified as being present within the gross coupe area.
- At least 400 metres of in-coupe road was to be constructed to provide access to landing(s) or through the coupe.
- Soil erosion hazard in the A or B horizon was high.
- Average coupe slope was 15° or greater.

Selection is randomised but weighted towards coupes with high potential for risk to soil, water quality and/or biodiversity values. Specifically, the environmental compliance elements (Table 48) specific to each compliance theme are addressed by the FAP. For the period 2015–18 (Table 49), 90 coupes were audited across four of the five RFAs with at least six coupes required to be located within Melbourne water's water supply catchment areas. As shown in Table 49, since 2015, audits have been restricted to the Central Highlands, East Gippsland, Gippsland and North East RFAs. The West RFA was audited more frequently before 2015–16, when DELWP's predecessors still managed commercial timber harvesting, specific to this area.

Table 49: Number of coupes audited between 2015–18 across RFA regions

Year	Audit criteria relevant to protection of forest soils	Average level of compliance with criteria relevant to protection of forest soils	Audit criteria relevant to protection of water flows, water quality and river health	Average level of compliance with criteria relevant to protection of water flows, water quality and river health	RFA				
					Central Highlands	East Gippsland	Gippsland	North East	West
2015–16	Breakdown not available				28	0	0	2	0
2016–17	21	83 per cent	39	85 per cent	20	0	10	0	0
2017–18	19	87 per cent	40	90 per cent	12	10	3	5	0

Source: DELWP Forest Audits and Standards- Matthew P Zanini (2011-2018)

Bushfire management

The VSOFR has identified the Bushfire Rapid Risk Assessment Team (BRRAT) program as a source of information regarding the impact of bushfires on soil stability (Commissioner for Environmental Sustainability Victoria 2019). BRRATs carried out rapid assessment of the major risks to human life, infrastructure and property following the 2009 bushfires, as well as investigating the impact on the natural environment on public land.

The teams comprise multi-disciplinary members, deployed to level 2 or 3 incidents while the incident is still under way (scope of level 2 and 3 incidents are described by Emergency Management Victoria (EMV 2015)). The results of each deployment need to be reported within seven days. The reports focus on providing alerts to government agencies about the magnitude of potential post-emergency risks, where more detailed rehabilitation and/or recovery planning is required.

Table 50 is a summary of the erosion risks and mitigation options that were described by the BRRAT program following deployment to fires between 2013 and 2017.

> *The team includes a flooding and erosion discipline specialist who assesses risks caused by water quality, flooding and erosion post-fire. The specialist also makes recommendations for mitigation actions to ameliorate these risks. These assessments are used to assist land managers in identifying and minimising future (immediate and long-term) negative impacts.*
>
> Commissioner for Environmental Sustainability Victoria 2019, pg. 120.

These deployments also highlighted 162,000 hectares at risk of erosion and potential mitigation options in 2013; in 2014, 330,130 hectares were highlighted. Since 2015, identified areas decreased significantly.

Table 50: Summary of some of the highlighted erosion risks and mitigation options identified by BRRAT deployments, 2012–13 to 2017–18

Fire	Risk description	Risk level	Likelihood	Consequence	Suggested mitigation work	Season	Area (ha)
2017 Timbarra	Flash-flooding and debris flow impacting on Timbarra Road	Moderate	Possible	Important	Alert local government to risk and road closure during high rainfall events	2017–18	8,693
2016 Wye River – Jamieson track	Landslide Great Ocean Road	Moderate	Possible	Serious	Immediate geotechnical investigation; Otways post-fire hydrology study	2015–16	2,515
2015 Lancefield	Soil erosion leading to poor water quality affecting Pyalong water supply	High	Likely	Serious	Containment line rehabilitation; sediment retainers in gullies	2014–15	3,055
2014 Orbost complex	Soil erosion leading to poor water quality in the Brodribb River catchment	Moderate	Likely	Important	East Gippsland Water to activate its Water Quality Contingency Plan	2013–14	174,600
2014 Grampians northern complex	Land and infrastructure impacted by landslide	Medium	Likely	Important	Restricted access to high-risk areas of the park; signage and education/awareness for park users	2013–14	54,790
2014 Mallee complex	Landforms impacted by wind erosion	Moderate	Almost certain	Important	Assessment of sand dune and lunette vegetation cover; control-line rehabilitation	2013–14	100,750
2013 Baw Baw Heyfield group	Debris flows impact water quality flows to Lake Glenmaggie	High	Likely	Major	Southern Rural Water informed of risks to water quality; Southern Rural Water implement treatment options and monitoring	2012–13	87,600
2013 Grampians Victoria Valley	Land and infrastructure impacted by landslide	High	Almost certain	Important	Restricted access to high-risk areas of the park; signage and education/awareness for park users	2012–13	35,900
2013 Alpine bushfires	Landslide Great Alpine Road	Extreme	Almost certain	Major	Closure of Great Alpine Road and geotechnical assessment	2012–13	38,500

Data source: VSOFR (2019, p. 121)

Indicator 4.1c: Management of the risks to soil physical properties in forests

Activities that may affect soil health or structure include timber harvesting and regeneration, bushfire management (including burning), roading, mining and some recreation activities, (such as four-wheel driving). Repeated use of recreational vehicles on designated four-wheel-driving tracks, heavy vehicles along the same path and inappropriate use of four-wheel drives and machinery required in bushfire management and timber harvesting all have the potential to pose more serious risks if appropriate mitigation and remedial works are not put in place.

Review of compliance audits in State forests

Observations made during the 2016–17 and 2017–18 audits (across 60 coupes in all RFAs, except the West; see Table 49) suggest that the method of assessing soil erosion risk in the MSPs warrants review and possible revision. The coupes in these audits with apparently erodible soils have been assessed as having low water quality risk using the method described in the MSPs. In both cases, the soils' high permeability seems to have dominated the water quality risk classification, despite evidence that they are relatively easily eroded. DELWP responds to these matters via the Office of the Conservation Regulator with announcements made via the Forests and Reserves page of the department's website. Further work is being considered by the department in line with erosion management protocols.

Access restrictions to State forest

A number of tracks and roads across Victoria's State forests are temporarily closed during winter and spring, as part of an annual driver safety and road damage prevention program. Seasonal road closures are an important procedure that deliver a twofold environmental and safety benefit. The program helps to:

- limit the damage done to forest roads and tracks during the wet season
- ensure that dangerous and difficult-to-negotiate sections of road are closed off from motorists
- maintain water quality in rivers, creeks and reservoirs, by reducing the amount of erosion and silt washed away from roads and tracks.

DELWP consults with a range of stakeholders, including Four Wheel Drive Victoria, to identify sections of the road network that require closures. Most of the roads and tracks are reopened in time for the Melbourne Cup weekend, but the closure period can be extended if the conditions demand it. Table 51 presents the length of road or track seasonally closed within State forests across the five RFA regions for the period 2013 to 2019.

Under the *Catchment and Land Protection Act 1994*, areas within catchments warranting particular attention, such as those required for water supply, can be declared Special Areas by CMAs. These areas are for the protection of predominately town water but also water used for irrigation, stock, industrial and domestic, as well as for hydro-electric use. Furthermore, areas within these catchments are also seasonally closed to prevent erosion and run-off.

Table 51: Roads and tracks seasonally closed across RFA regions within State forests for period 2013–19

RFA	2013		2014		2015		2016		2017		2018		2019	
	No. of Roads and Tracks	Total Length (km)	No. of Roads and Tracks	Total Length (km)	No. of Roads and Tracks	Total Length (km)	No. of Roads and Tracks	Total Length (km)	No. of Roads and Tracks	Total Length (km)	No. of Roads and Tracks	Total Length (km)	No. of Roads and Tracks	Total Length (km)
East Gippsland	60	DATA NOT AVAILABLE	60	DATA NOT AVAILABLE	57	DATA NOT AVAILABLE	53	DATA NOT AVAILABLE	53	DATA NOT AVAILABLE	53	366.8	53	367.9
Gippsland	58		62		63		62		61		62	532.3	62	530.1
Central Highlands	174		166		186		163		172		174	988.7	174	998.6
North East	79		81		93		91		91		92	1,015.4	94	1,006.2
West	61		64		70		63		63		62	254.5	62	253.7

Source: DELWP Assets and Data, State Roads and Crossings

Indicator 4.1d: Management of the risks to water quantity from forests

Water yield characteristics indicate the amount of water available for forest ecosystems and human use. In Victoria, many upstream catchments are in forested areas, meaning that changes to forest conditions affect water yields.

For the harvesting of timber in Victoria, the MSP details the procedures required for the protection of water supply areas. Procedures included in the 2014 MSP are outlined below.

> *Apply the slope limits, seasonal closures, buffer and filter strip widths and other relevant management actions specified for timber harvesting operations and associated roading and regeneration in water supply protection areas.*

DEPI 2014b, pg. 30 (See the conditions listed in Table 52, in the Bunyip, Thomson and Tarago special water supply catchments and the Yarra tributaries State forests, the area harvested must not exceed the following limits measured as a rolling average:

(a) Thomson – ash forests 150 ha/year, mixed species forests 15 ha/year

(b) Tarago – ash forests 55 ha/year, mixed species forests 23 ha/year

(c) Yarra Tributaries –ash forests 52 ha/year, mixed species forests 15 ha/year

(d) Bunyip –ash forests 15 ha/year, mixed species forests 15 ha/year.

In addition to Table 52, harvesting in the Learmonth Creek special water supply catchment must not exceed 7 hectares per annum in Ash forests or 3 hectares per annum in mixed species forests, averaged over the previous 10-year period.

Table 52: Water supply protection areas

RFA	Catchment	Status	Slope limit (degrees)	Seasonal closure	Stream buffers	Filter strips	Comments
North East	**Benalla – Mansfield FMA**						
	Lake Eildon	SWSC		1 June - 31 Oct			
	Upper Goulburn (Upper Delatite)	SWSC & SAP		Refer to section 3.2 table 2 in Appendix 5 the Planning Standards for prescriptions applicable to water supply protection area SMZs.			
	Lake Nillahcootie	SWSC		Refer to section 3.2 table 2 in Appendix 5 the Planning Standards for prescriptions applicable to water supply protection area SMZs.			
	Ryans Creek	SWSC & SAP; DC		Refer to section 3.2 table 2 in Appendix 5 the Planning Standards for prescriptions applicable to water supply protection area SMZs.			
	Central FMA						
	Sunday Creek	SWSC	30		20m	10m	

RFA	Catchment	Status	Slope limit (degrees)	Seasonal closure	Stream buffers	Filter strips	Comments
Part in Central Highlands	Kilmore	SWSC & SAP	30		20m, 40m, 60m	10m	Buffers in accordance with *Notice of Determination of Land Use, Plan No. 1633.*
	Upper Goulburn	SWSC	30		20m	10m	
Part of Central Highlands	**Dandenong FMA** [a]						
	Bunyip River	SWSC & SAP	25	1 May – 30 Nov	20m	10m	60 m buffer upstream of weir.
	Britannia Creek	SWSC & SAP	30	1 July – 30 Sept	20m	10m	
	Tomahawk Creek		30	1 July – 30 Sept	20m	10m	
	McCrae's Creek	SWSC & SAP	30	1 July – 30 Sept	20m	10m	60 m buffer upstream of weir.
	Micks Creek	SWSC & SAP					Harvesting excluded.
	Healesville	SWSC & SAP					Harvesting excluded.
	Armstrong Creek East	Restricted					Harvesting excluded.
	Learmonth Creek	Restricted	25	1 May – 30 Nov	40m [b]	10m	Max 7 ha Ash and 3ha MS.
	McMahons Creek	Restricted	25	1 May – 30 Nov	40m [b]	10m	A maximum of 30 per cent of each of these catchments is to be harvested over a 10 year period. There is to be harvesting in only 1 of the 4 restricted access catchments in any 1 year.
	Starvation Creek	Restricted	25	1 May – 30 Nov	40m [b]	10m	
	Cement Creek	Restricted	25	1 May – 30 Nov	40m [b]	10m	
	Armstrong Creek West	Restricted	25	1 May – 30 Nov	40m [b]	10m	
East Gippsland	**East Gippsland FMA**						
	Orbost (Rocky River)	SWSC & SAP		Refer to section 3.2 table 2 in Appendix 5 the Planning Standards for prescriptions applicable to water supply protection area SMZs.			
	Betka River	SWSC		Refer to section 3.2 table 2 in Appendix 5 the Planning Standards for prescriptions			

RFA	Catchment	Status	Slope limit (degrees)	Seasonal closure	Stream buffers	Filter strips	Comments
				applicable to water supply protection area SMZs.			
Gippsland	**Gippsland FMA**[b]						
	Thomson River	SWSC & SAP	30	1 May – 30 Nov			
	Tyers River	SWSC & SAP	30	1 June – 31 Oct			
	Tanjil River	SWSC & SAP	30	1 June – 31 Oct			
	Tarago River	SWSC & SAP	30	1 May – 31 Oct			
	Bunyip River	SWSC & SAP	25	1 June – 30 Nov			
	Loch River	SWSC	30	1 July – 30 Sept			
	Drouin	SWSC	30	1 July – 30 Sept			
	Glenmaggie	SWSC		1 June – 31 Oct	40 m Macalister below Caledonia 40 m Wellington below Carey 40 m Barkley below Mt Skene Creek 40 m of Glenmaggie Creek below east and west branches		
	Mirboo North	SWSC & SAP			Buffer of 100 m around the off-take weir Buffer from the banks of streams, watercourses and spring areas. 40 m buffer on the Little Morwell River and 20 m for other water courses.		
	Tarra River	SWSC		1 June – 31 Oct			
North East	**North East FMA**						
	Lake Hume (Northern)	SWSC		1 July – 30 Sept			
	Mount Tabor Creek	DC		1 July – 30 Sept		40 ha maximum annual area harvested.	
	Black Dog Creek	DC		1 July – 30 Sept		30 ha maximum coupe size.	
	Bakers Gully Creek	SWSC; DC		1 July – 30 Sept		20 ha maximum coupe size.	
	West Kiewa River	DC		1 July – 30 Sept		40 ha maximum coupe size.	
	Musk Gully Creek	DC		1 July – 30 Sept		35 ha maximum coupe size.	
	Diddah Diddah Creek	SWSC; DC		1 July – 30 Sept		20 ha maximum coupe size.	
West	**Otway FMA** [c]						
	Lorne – St Georges River		25	1 May – 30 Nov	Max harvest 2.5 per cent per year and 15 per cent per		

RFA	Catchment	Status	Slope limit (degrees)	Seasonal closure	Stream buffers	Filter strips	Comments
	Barham River	SWSC	25	1 May – 30 Nov	decade of total forested area of each catchment		
	Upper Barwon	SWSC	25	1 June – 31 Oct	Max harvest 5 per cent per year and 25 per cent per decade of total forested area of each catchment.		
	Gellibrand River	SWSC	25	1 June – 31 Oct			
	Painkalac Creek	SWSC & SAP	25	1 June – 31 Oct			
	Pennyroyal Creek	SWSC	25	1 June – 31 Oct			
	Matthews Creek	SWSC	25	1 June – 31 Oct			
	Gosling Creek	SWSC	25	1 June – 31 Oct			
Gippsland	**Tambo FMA**						
	Lake Hume (Northern)	SWSC		30 June – 1 Oct	In accordance with Plan No. S-1275B		
	Mitchell River	SWSC		30 June – 1 Oct	Seasonal closure applies above 900 m.		
	Nicholson River	SWSC & SAP	30		200 m buffer around the Nicholson Reservoir and Water supply off-take on the Nicholson River. 40 m buffer around Nicholson and Barmouth Rivers. 20 m buffer from banks of permanent streams & drainage lines Maps outlining above are shown on Plan No. S-1411. Obtain instruction on implementing plan from Operations Planning before marking.		

Notes: Where cells are blank, data was either not applicable or available.

a In addition to the above prescriptions for the Gippsland FMAs and the Dandenong FMA, refer to clauses 3.5.1.5 and 3.5.1.6 of the MSP.

b Major streams only.

c Within the Otway FMA, 20 degree and 15 degree slope limits will be applied in special water supply catchments in areas of Land Degradation Hazard Class 4 and 5 respectively.

Source: DEPI (2014b)

This indicator is informed from estimations of groundwater yield change in forested catchment areas in response to timber harvesting and fire, as estimated using EnSym – Environmental Systems Modelling platform[26].

EnSym derived data in Figure 20 to Figure 24 shows the annual change in water yield in response to both timber harvesting and fire (expressed as a percentage of the theoretical maximum), for Victorian catchments containing ash forests, by RFA region. Among the

[26] More descriptions of the software can be found at https://ensym.biodiversity.vic.go.au/home/aboutensym.

catchments, Tarago River, Kilmore and Kinglake catchments were estimated to have a significant reduction (>25%). Fire is a much greater agent for disturbance than timber harvesting. The reduction of water yield from catchments across all RFAs was largely attributed to fire. However, the impact of timber harvesting on the water yield reductions was also evident in East Gippsland, Gippsland and West RFA regions.

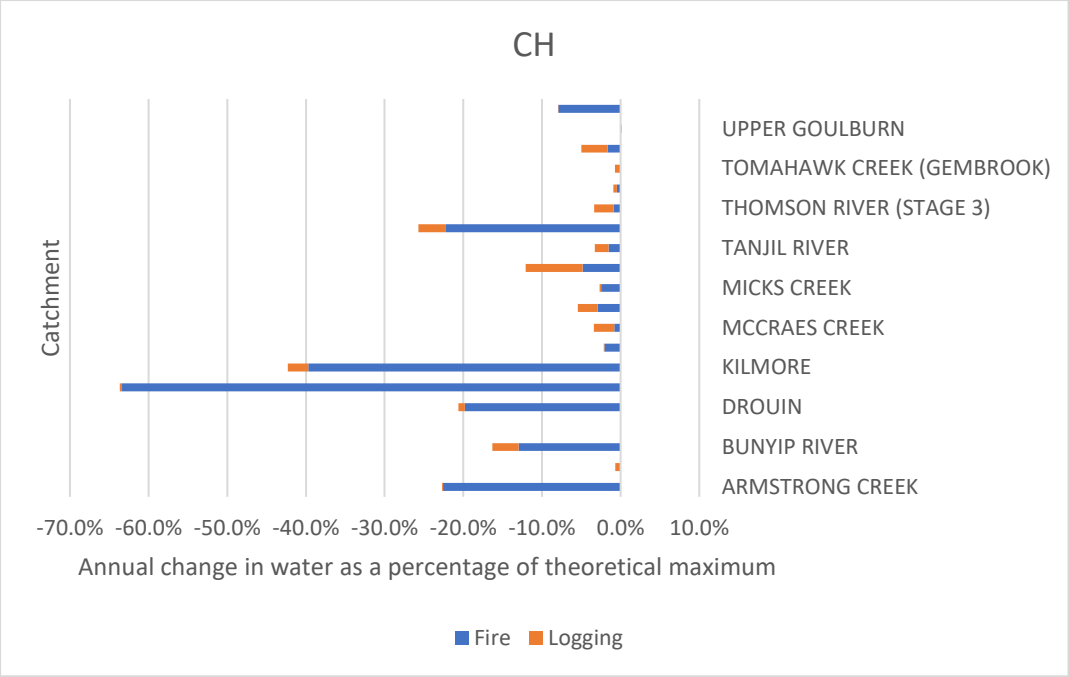

Figure 20: Annual change in water yield as a percentage of the theoretical maximum due to fire and timber harvesting in 2017 for Central Highlands RFA catchments

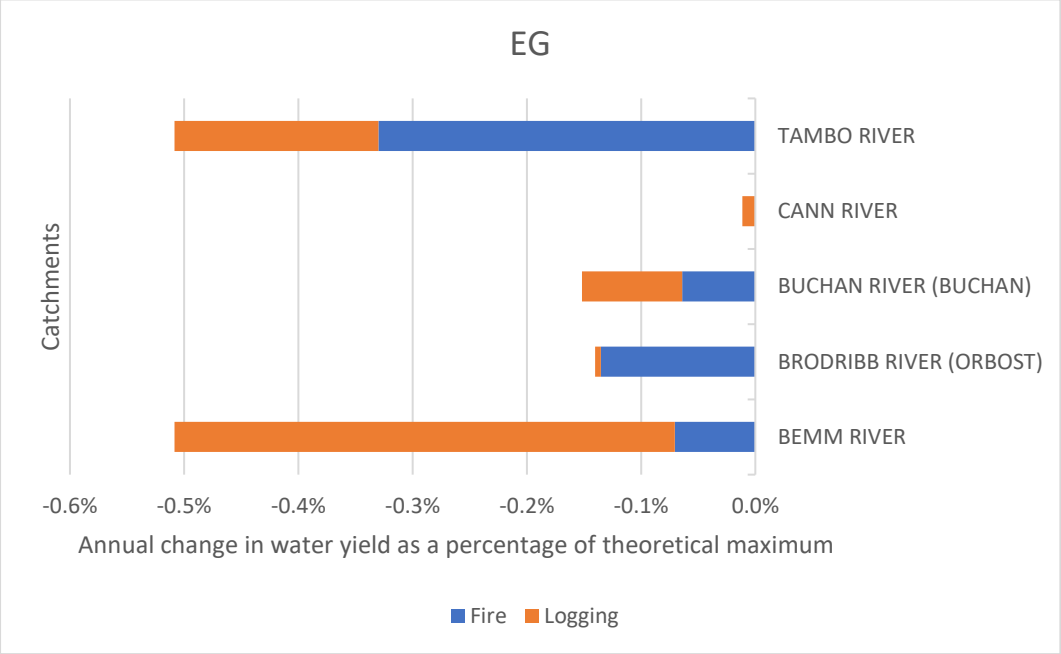

Figure 21: Annual change in water yield as a percentage of the theoretical maximum due to fire and timber harvesting in 2017 for East Gippsland RFA catchments

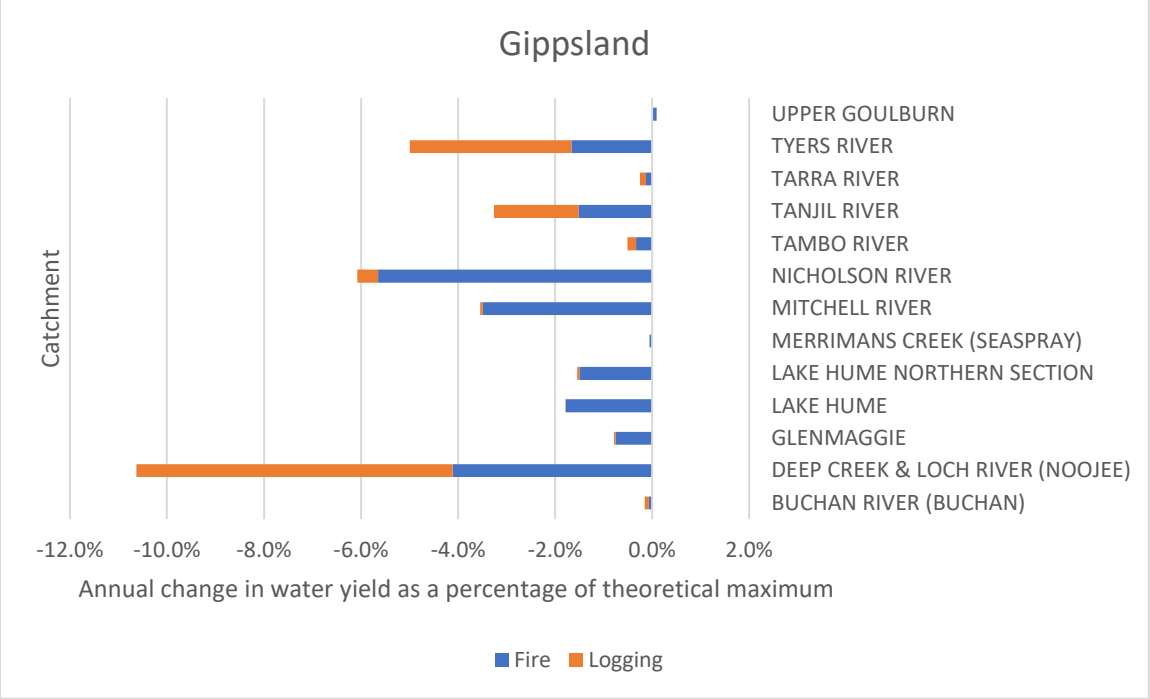

Figure 22: Annual change in water yield as a percentage of the theoretical maximum due to fire and timber harvesting in 2017 for Gippsland RFA catchments

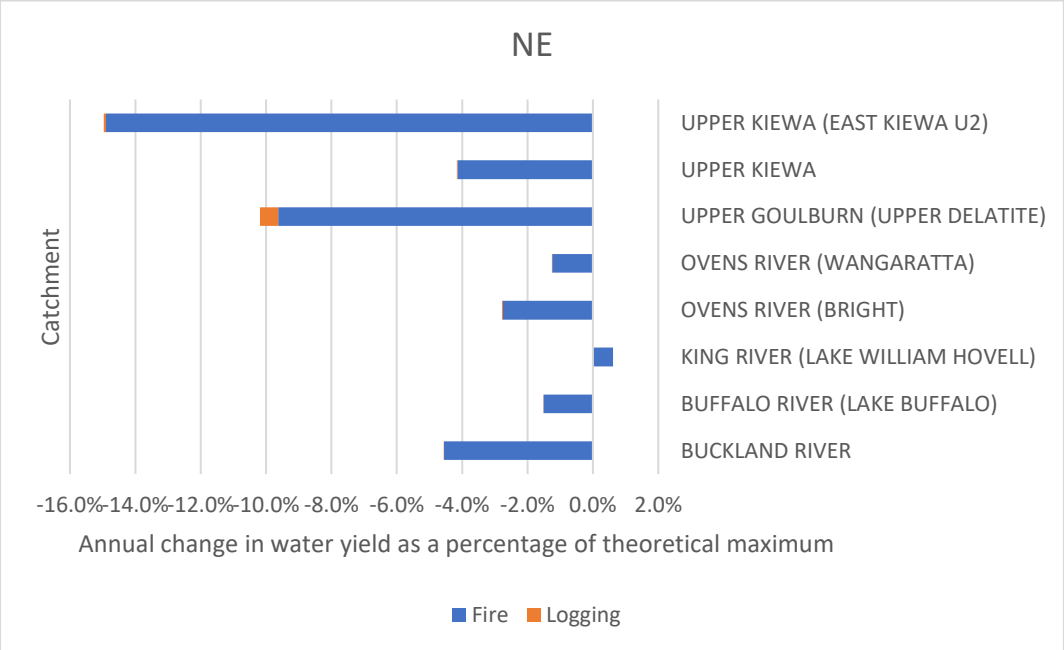

Figure 23: Annual change in water yield as a percentage of the theoretical maximum due to fire and timber harvesting in 2017 for North East catchments

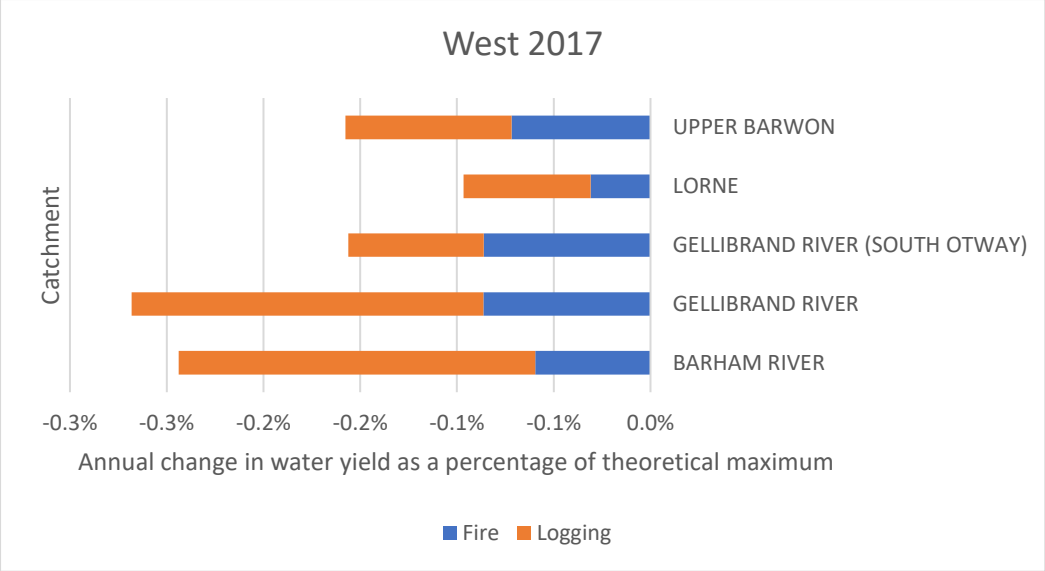

Figure 24: Annual change in water yield as a percentage of the theoretical maximum due to fire and timber harvesting in 2017 for West RFA catchments

The information provided in this indicator, as based on a statistical prediction model, demonstrates that there are several catchment areas in ash forests that are at risk of dramatic changes in water yield due to timber harvesting and wildfire. Note that this data provides a 'coarse filter', as estimated water yield could vary with topography, underlying surficial material, forest type and regional weather patterns.

Future analysis and reporting should encompass the causes of disturbances, whether natural or anthropogenic, the relative magnitude of changes in water yield from each type of disturbance, and the potential effects of climate change, in the interpretation of this indicator. For example, the potential effects of climate change on ash-type eucalypt forests include a highly likely increase in fire weather conditions, resulting in more frequent bushfires. When fires are more frequent, ash-type eucalypt forests change their composition to ash–acacia stands, which alters water yields. In particular, species-level physiological change may decrease catchment evapotranspiration and increase streamflow in ecosystems such as Mountain Ash forests (Hawthorne et al. 2018).

Indicator 4.1e: Management of the risks to water quality in forests

Many Victorian catchment areas are forested. River health is closely linked to the condition of forested catchments. The proportion of non-forest land in the catchment is also an important consideration due to the proportion of grazing land being closely linked to catchment condition.

Disturbances such as bushfire in forested catchments can damage river health. Monitoring activities help land managers develop and refine river-health programs, and thereby maintain the various benefits of river health for Victorians.

In Victoria, river health is monitored through the Index of Stream Condition (ISC). The ISC provides a snapshot of river health for 29,000 kilometres of major rivers and tributaries at six-year intervals from 1999. The ISC does not currently measure change in condition over time (that is, trend), because this requires consistency in the methodology used in assessments. To date, the emphasis has been on improving the assessment methods and increasing confidence in the results.

The ISC measures five parameters to assess river health for individual reaches:

- hydrology (river-flow characteristics;
- physical form (artificial barriers, in-stream large wood, bank;
- streamside zone (riparian or streamside vegetation condition;
- water quality (turbidity and chemical characteristics; and
- aquatic life (macroinvertebrate condition).

On the basis of their condition relating to these five parameters, individual streams are categorised as either 'excellent', 'good', 'moderate', 'poor' or 'very poor'.

The 2010 ISC benchmark assessed approximately 29,000 kilometres of rivers and streams. The results showed that 12 per cent of river length was in excellent condition, 11 per cent in good condition, 43 per cent in moderate condition, 19 per cent in poor condition and 13 per cent in very poor condition (2 per cent of stream length had insufficient data to allow its condition to be determined (DSE 2012a)).

The 2010 ISC data was examined according to RFA region. Overall condition was summarised according to RFA (Figure 25 to Figure 29). East Gippsland demonstrated the greatest number of rivers in excellent condition, while the remaining four RFA regions had the largest number of rivers demonstrating moderate condition.

The Victorian Catchment Management Council used the three ISC reports to assess changes in stream condition in 2017.

> *These were minimal over each of the three assessments. The report also indicates that Victoria's current river condition is likely to be either stable or declining. However, this assessment is also based on outdated data, leading to a difficulty in evaluating recent status and trend of stream condition. The increasing impacts of climate change and population growth will make it*

harder to maintain current river conditions. Improvements to current conditions can be achieved through counteracting activities at local and regional scales, with management interventions in restoring riparian land and enhancing flow regimes.

Victorian Catchment Management Council 2017, pg. 45

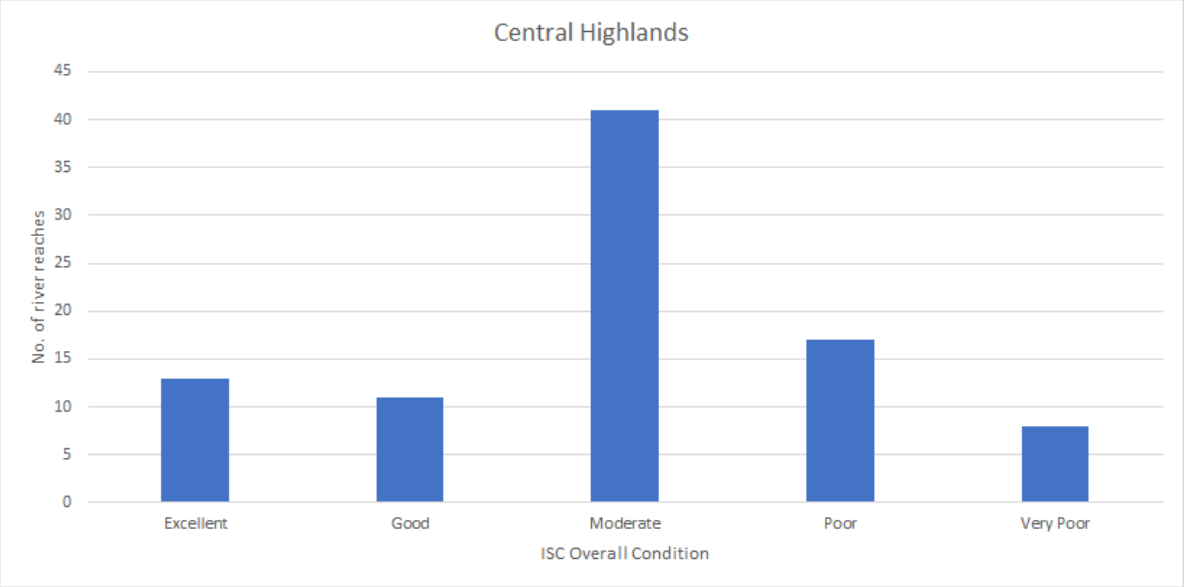

Figure 25: 2010 ISC Overall Condition scores for rivers in Central Highlands

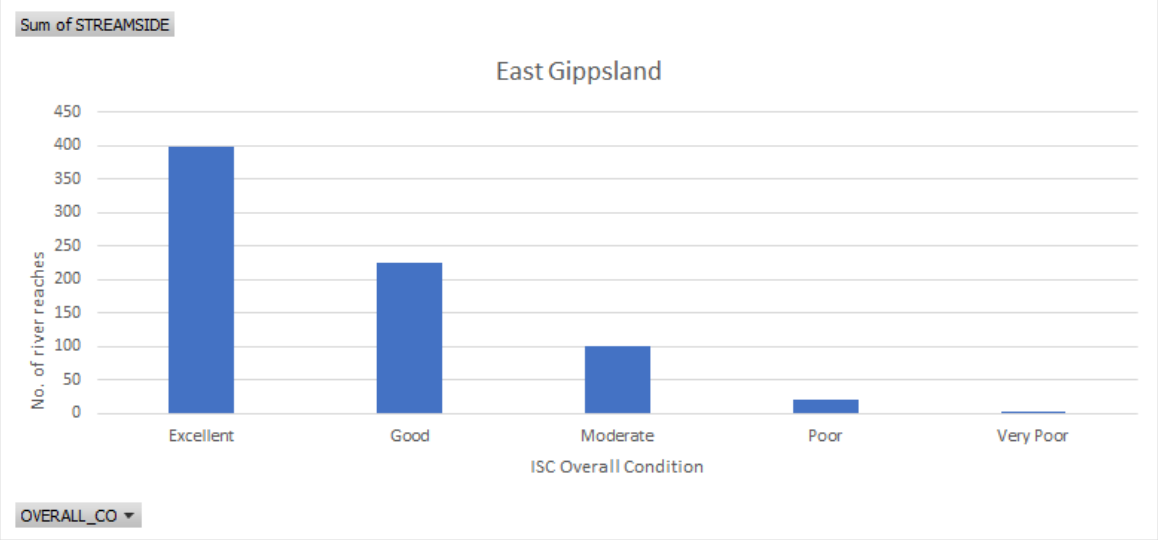

Figure 26: 2010 ISC Overall Condition scores for rivers in East Gippsland

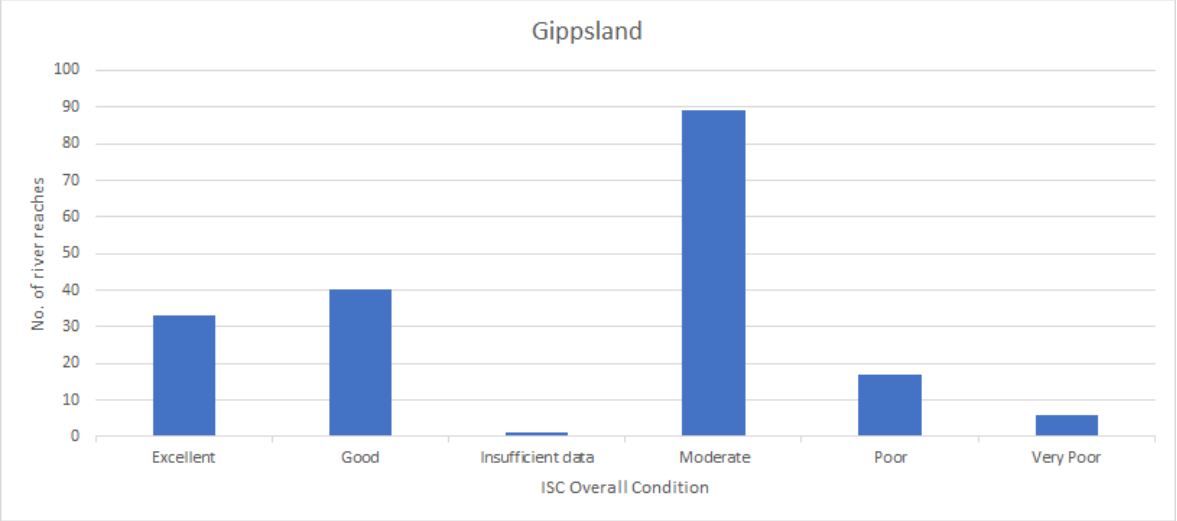

Figure 27: 2010 ISC Overall Condition scores for rivers in Gippsland

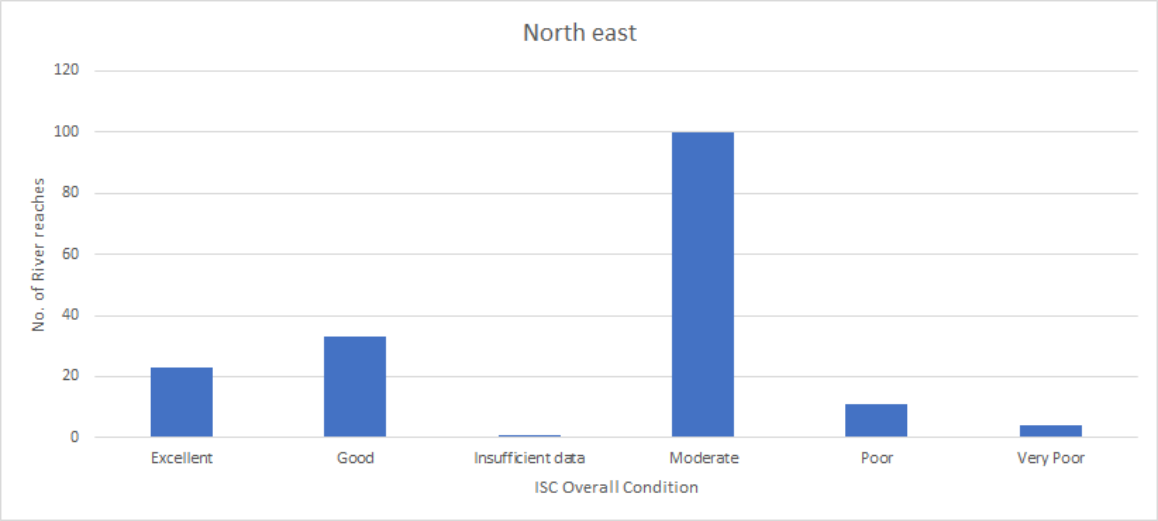

Figure 28: 2010 ISC Overall Condition scores for rivers in North East

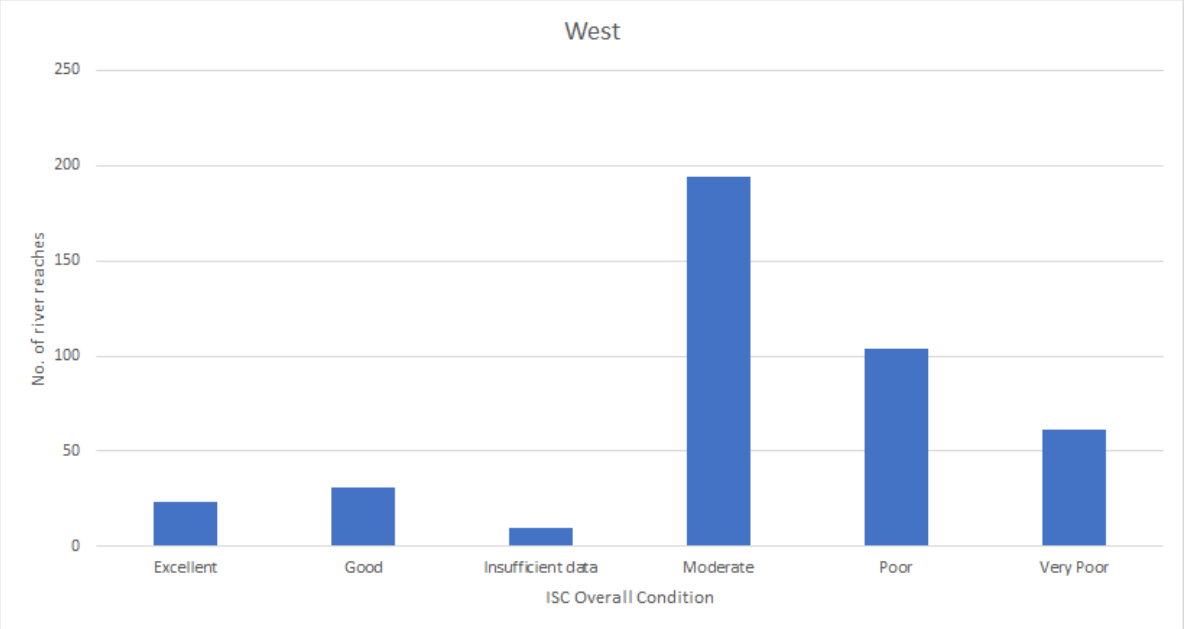

Figure 29: 2010 ISC Overall Condition scores for rivers in the West

One of the five ISC parameters used to measure river health is the Streamside Zone sub-index. Streamside Zone is measured by seven indicators (Table 53) and is represented by a score out of 10, with the higher scores indicating better condition. Figure 30 shows that the condition of the Streamside Zone is considerably better for the eastern RFAs, while the RFA in the west demonstrates large areas encompassing rivers with a low to mid-range Streamside Zone score. This may be due to higher proportion of non-forest land in western Victoria.

Table 53: Streamside Zone indicators

Streamside Zone indicators	Description
Vegetation width	Width of woody vegetation along the river
Fragmentation	A measure of the quantity of gaps where there is no woody vegetation
Vegetation overhang	Percentage of the stream bank that has overhanging vegetation
Large trees	Older mature trees that are larger than a prescribed diameter (usually 80 cm)
Tree and shrub cover	The amount of vegetative cover in the shrub layer (<5 m in height) and tree layer (>5 m in height)
Structure	The amount of woody vegetation (where cover is >20 per cent)
Weeds	The percentage cover of willows and hawthorn in the tree layer

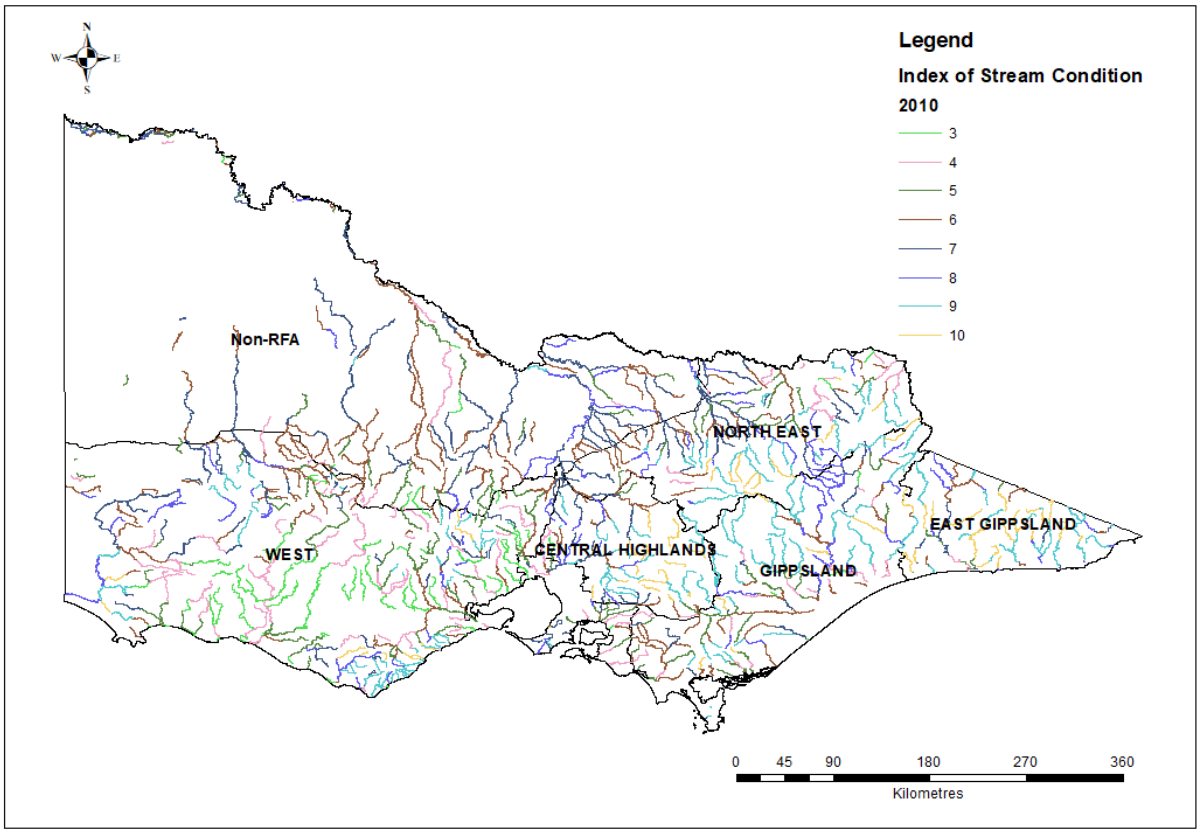

Figure 30: Streamside Index (1–10) across the five RFA regions for 2010

Summary and future management of environmental values

Old-growth values

Along with other environmental values, old-growth forests were one of the criteria for designing the CAR reserve system under the Victorian RFAs; their subsequent depletion due to bushfire has significant implications for the applications of the JANIS criteria.

It is acknowledged that old-growth forest figures given at the time of the CRAs were an estimate, and the area of old-growth forest was not subsequently monitored over time. This means that much of the data provided over the last 20 years has been modelled data only.

Modelled data suggested that the area of old growth has reduced by more than half since 2000 – from 840,000 hectares to 406,000 hectares in 2018. The largest losses of old-growth forest have been in the Gippsland and East Gippsland RFA regions. The decrease in the area of old-growth forest is predominantly due to the major bushfires in 2003, 2007, 2009 and 2013. Timber harvesting accounts for less than 1 per cent of the loss of old-growth forest since 2003. Old-growth forest in many EVCs in the West Victoria RFA region displays different characteristics from that in the eastern part of the state.

The Victorian Government has commissioned a comprehensive airborne data acquisition, using LiDAR across priority forested areas in eastern Victoria. This data will provide a valuable update to the understanding of the old-growth extent – particularly when matched with a new old-growth ground verification method which is being developed by DELWP – to inform future management of this value.

The modernised Victorian RFAs will protect all old-growth forest in Victoria in line with government policy.

Wilderness values

Assessments of wilderness were completed during the CRA process in the Central Highlands, East Gippsland, Gippsland and North East RFA regions. In these areas, 18 wilderness areas were identified and 95 per cent of the total area of significant high-quality wilderness was protected in the reserve system. There has been no wilderness identified in the Central Highlands or West Victoria RFA regions. Current protection levels for wilderness exceed the JANIS reservation targets, which were for 90 per cent or more wilderness to be protected in formal reserves. There are two IUCN Wilderness Areas within the Victorian RFA regions.

The IUCN Wilderness Area is derived from CAPAD, so may include wilderness outside formal reserves but otherwise protected through mechanisms recorded in CAPAD, such as informal reserves.

There are 286,853 hectares of wilderness in the Victorian RFA regions. There has been no significant change in the area of wilderness over the RFA period. Minor changes in area are attributed to changes in the accuracy of spatial data rather than changes to the actual area of wilderness itself.

Pest plant, animal and bushfire control occur as part of the management and conservation of wilderness values. Wherever possible, management strategies aim to minimise the effects of these activities on wilderness value.

The extension to the Victorian RFAs will provide for the continued protection of wilderness values through the ongoing maintenance of the CAR reserve system, protections as part of the Victorian forest management system, and their status as wilderness parks and wilderness zones under the *National Parks Act 1975* (Vic). Wilderness areas will continue to be protected in national parks and reserves.

Endangered species values

The Victorian RFAs provide for the protection of endangered species through the establishment of conservation reserves and the management of habitat in areas outside the reserve system, including the application of prescriptions in forest harvesting operations which may involve establishment of timber harvesting exclusion zones or modified harvesting procedures in sensitive areas such as steep slopes or riparian zones. These are given regulatory force under the *Code of Practice for Timber Production 2014*.

There are currently 196 threatened species and 32 non-threatened migratory birds listed under the EPBC Act that are known or likely to occur within the Victorian RFA regions. Almost all listed species (98.5 per cent) have a conservation advice and/or recovery plan to assist recovery. There are also 14 threatened ecological communities in the Victorian RFA regions listed under the EPBC Act. All have conservation advices, recovery plans or both in place to assist in management and recovery.

There are 14 listed threatening processes affecting threatened species in the Victorian RFA regions. National threat abatement plans have been prepared for eight listed processes. Since the commencement of the EPBC Act, 50 additional species known or likely to occur in the Victorian RFA regions have been listed as threatened under national legislation.

The national CAM provides a consistent approach to the assessment and listing of nationally threatened species, but it has not yet been given effect in Victorian law. However, the Victorian Government continues to meet the requirements of the CAM MOU, signed in 2018, by making best endeavours to establish a Single Operational List of threatened species. Additionally, the management of biodiversity outcomes in State forests is also addressed through the statewide biodiversity plan, *Biodiversity 2037*. This plan notes that 70 per cent of Victoria's highest-value terrestrial biodiversity areas exist on the 40 per cent of land that is publicly owned. *Biodiversity 2037* sets targets for the future management of values. These include a net improvement in the outlook across all species by 2037, with the following expected outcomes:

- no vulnerable or near-threatened species will have become endangered
- all critically endangered and endangered species will have at least one option available for being conserved ex situ or re-established in the wild (where feasible under climate change) should they need it
- a net gain of the overall extent and condition of habitats across terrestrial, waterway and marine environments.

Future management of endangered species values will include engaging more with Traditional Owners; working with government agencies, private organisations and community groups; developing decision-support tools; expanding and improving data collection; and multi-year investment in the highest-priority projects. These commitments are in addition to the landscape-scale cross-tenure pest management projects run as part of the Weeds and Pests on Public Land Program, which have been operating for 15 years and will continue under the extended RFAs.

National estate values

The amended Victorian RFAs will continue to provide for the protection of national estate values through a combination of the National and Commonwealth Heritage Lists, the Victorian Heritage Register and the Heritage Codes of local planning schemes. The expiration and repeal of parts of the EPBC Act and the *Australian Heritage Council Act 2003* (Cth) relating to the Register of National Estate did not diminish protection of Commonwealth heritage places. These parts were superseded by stronger ongoing heritage protection provisions under national environment law.

For the past 20 years, the Victorian forest management system has provided for the protection of national heritage values of National Heritage places in accordance with National Heritage management principles. This will continue under the modernised Victorian RFAs and will incorporate new information and adapt to changing circumstances. There are 13 places on the National Heritage List and 17 places on the Commonwealth Heritage List within the Victorian RFA regions.

The Victorian RFAs will continue to ensure that the Victorian forest management system and CAR reserve system provide for the protection of national and Commonwealth heritage values. The Victorian RFAs will be modernised to reflect current heritage concepts and definitions consistent with the EPBC Act.

World Heritage values

There is one World Heritage property located within the Victorian RFA regions: Budj Bim Cultural Landscape in the West Victoria RFA region. All of the Budj Bim Cultural Landscape is Aboriginal-owned and/or managed and is administered to respect the customary and legal rights and obligations of the Gunditjmara Traditional Owners. This listing is the first time an Australian site has been recognised solely for its Aboriginal cultural values.

World Heritage properties in Victoria are managed cooperatively by the Victorian and Australian governments in accordance with the 2009 Australian World Heritage Intergovernmental Agreement.

Under the EPBC Act, World Heritage properties are MNES. The EPBC Act therefore provides protection for World Heritage properties by ensuring that an assessment process is undertaken for proposed actions (including forestry operations) that will, or are likely to, have a significant impact on the World Heritage values of a declared World Heritage property. The exemption of forestry operations in RFAs from other Commonwealth assessment and approval

requirements under section 38 of the EPBC Act does not apply to operations within World Heritage properties. World Heritage values will continue to be managed and protected through assessment processes for proposed actions under the renewed Victorian RFAs.

Biodiversity values

Biodiversity values were fundamental in establishing a CAR reserve system under the Victorian RFAs and were a focus of the CRAs. The formal reserves in the CAR reserve system form part of the NRS, which aims to secure long-term protection for samples of Australia's diverse ecosystems and the plants and animals they support.

At the time of the CRAs, the total CAR reserve system across the RFA areas totalled 1.93 million hectares. Addition of State forest to the reserve system, and the application of prescriptions from the *Code of practice for timber production*, have resulted in increases to the CAR reserve system through the life of the RFAs. In 2018, the CAR reserve system totalled nearly 3 million hectares, an increase of over 700 thousand hectares since the RFAs came into effect.

Victoria is undertaking improved mapping as part of the RFA modernisation program, to collect new field data on high-priority forest-dependent threatened species. This will inform future forest management. This includes landscape scale surveys for high-priority forest-dependent threatened species, and collection of new on-ground data. Surveys have commenced and will be completed by March 2020. The program also includes updating HDMs, developing population viability analysis for seven key forest-dependent taxa, modelling climate change vulnerability of forest ecosystems and undertaking integrated analysis. This increased information will ensure that an extended RFA will continue to support the management of biodiversity values.

Future RFA five-yearly reviews will be focused on outcomes and the objectives of the Victorian RFAs. Monitoring and reporting arrangements will be strengthened and streamlined, and where possible will indicate the impact of forest utilisation activities and the benefit of associated management prescriptions. This demonstrates that modernising the Victorian RFAs will maintain and enhance protections for biodiversity values.

Wetland values

Wetlands in Victorian RFA regions include Ramsar-declared wetlands, nationally important wetlands, and other wetlands. Overall, there are 1,774,707 hectares of wetland in Victorian RFA regions. Each category of wetland is described below.

There are five Ramsar-declared wetlands within the Victorian RFA regions: Corner Inlet, the Gippsland Lakes, the Glenelg Estuary and Discovery Bay, Port Phillip Bay (Western Shoreline) and Bellarine Peninsula, and Western District Lakes. The Gippsland Lakes has the largest area and extends across East Gippsland and Gippsland RFAs, while Corner Inlet in Gippsland RFA has the second-largest area and is also a shorebird site. All Ramsar-listed wetlands, including those in Victorian RFA regions, are protected by Part 3 of the EPBC Act.

While the original RFAs did not include clauses specifically on wetland values, they included commitments from the Victorian Government to address water and catchments, outlining associated legislative and policy framework and involving the adoption of an integrated catchment management approach to water resource management.

Nationally important wetlands are listed in the *Directory of important wetlands in Australia* and are wetlands that provide a good example in a particular area, are an important habitat for native species or have outstanding heritage or cultural significance. There are 159 nationally important wetlands covering 145,977 hectares in the CAR reserve system in Victoria. The East Gippsland RFA region contains the largest area of nationally important wetlands (71,499 hectares) in Victoria.

Wetland values are also protected by the Victorian Waterway Management Strategy, which provides the framework to maintain and improve the condition of rivers, estuaries and wetlands. DELWP monitors the condition of wetlands in Victoria using the IWC. In 2009–11, this was used to benchmark the condition of naturally occurring wetlands in Victoria.

The proposed amendments to the five Victorian RFAs have been drafted to ensure consideration of MNES, including Ramsar sites, and continued protection of the ecological character of Ramsar-listed wetlands through Victoria's forest management system, in accordance with Australia's obligations under the Ramsar Convention. Any extended RFA will also acknowledge that the EPBC Act does not exempt forestry operations within Ramsar wetlands.

Future RFA five-yearly reviews will be focused on outcomes reporting, and specifically reporting against the objectives of the Victorian RFAs.

Indigenous heritage values

Indigenous heritage values are the values of places of significance which arise from Aboriginal practice, observances, customs, traditions, beliefs and history. The participation of Aboriginal people in forest management supports their connection with the lands, water and other natural resources (also referred to as Country) and allows for Indigenous values to be integrated into forest management practice, policy and decision-making.

For clarity, while the RFA Act and the Montréal Process criteria and indicators use the term 'Indigenous', the Victorian Government and community use the terms 'Aboriginal' and 'Traditional Owner' to describe the First Peoples of Victoria. The three terms are used throughout this report, dependent on context.

This section includes the following Montréal Process indicators:

- Indicator 6.4a – Area of forest to which Indigenous people have use and rights that protect their special values and are recognised through formal and informal management regimes
- Indicator 6.4c – The extent to which Indigenous values are protected, maintained and enhanced through Indigenous participation in forest management
- Indicator 6.5d – Resilience of forest-dependent Indigenous communities to changing social and economic conditions

Aboriginal peoples' relationships with their lands and waters and other resources can be enhanced through their having access to and being involved in managing and caring for Country. There are various legal instruments in Victoria which recognise the rights and responsibilities of Victorian Traditional Owners and provide for their involvement in decision-making and planning over matters regarding their lands and waters and other resources. These are discussed in detail below.

Comprehensive Regional Assessment

When the CRAs were, initially undertaken to guide decision-making in the negotiations of the original RFAs, Aboriginal values were not comprehensively addressed in the original CRA documents. The following extract was included for each of Victoria's five RFAs.

> The RFA process addresses indigenous issues in two distinct ways: consultation on the outcomes and process in general (as part of the wider consultation process); and cultural heritage, through the National Estate assessment. As with all communities and stakeholder groups with an interest in the RFA, Aboriginal communities in the region and appropriate representative bodies are already involved and will continue to be consulted throughout the RFA process. The *Native Title Act 1993* recognises and protects native title rights and interests. In recognition of this Act: where any Government action to implement an RFA could affect native title, the action will be taken in accordance with the Native Title Act; and an RFA is not intended to influence in any way native title claims that may arise.

Central Highlands Comprehensive Regional Assessment Report, 1997; pg. 19

Indicator 6.4a: Area of forest to which Indigenous people have use and rights that protect their special values and are recognised through formal and informal management regimes

For thousands of years, the land, water and other natural resources that make up what is now the State of Victoria were managed through traditional laws, practice and customs. Country, considered as the land, water, plants, animals, people, spirits and customs, met the material, cultural and spiritual needs of thousands of generations of Traditional Owners, who used sustainable regimes to manage it. Despite colonisation resulting in the fragmentation of the landscape into different land tenures and management regimes, many Traditional Owners remain connected to their Country today.

This indicator focuses on the degree to which Traditional Owners' formal and informal agreements protect their values in forests and how they can manage their traditional forested land. Traditional Owners' rights and responsibilities are recognised under various legal instruments, including *Native Title Act 1993* (Cth), the *Traditional Owner Settlement Act 2010* (Vic) and the *Aboriginal Heritage Act 2006* (Vic). Information for this indicator has been sourced from datasets of Victorian Crown land uses.

Area of land and forest in Victoria in the NFI Indigenous forest estate dataset, by Indigenous land ownership and management categories, and RFA region

Data and information on forest and non-forest land of which Traditional Owners have management functions or rights of use is assembled in the *Australia's Indigenous forests estate (2018)* dataset[27] and reported in ASOFR 2018. Reporting the Indigenous estate uses a method that groups Indigenous interest in land and forest into the following four categories,[28] from highest degree of Indigenous interest to least:

- **Indigenous owned and managed** – freehold lands that are both owned and managed by Indigenous peoples or communities
- **Indigenous managed** – lands that are managed but not owned by Indigenous communities, and lands that are owned but not managed by Indigenous peoples or communities
- **Indigenous co-managed** – lands that are owned and managed by other parties but have formal agreements that include input from Indigenous peoples or communities
- **Other special rights** – lands subject to native title determinations, registered Indigenous Land Use Agreements and legislated special cultural use provisions.

Further information on these categories can be found in the ASOFR 2018 Indicators 6.4a and 6.4c (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018, pp. 397–405; pp. 412–426).

27 See agriculture.gov.au/abares/forestsaustralia/forest-data-maps-and-tools/spatial-data/indigenous-forest

28 See agriculture.gov.au/abares/forestsaustralia/publications/display?url=http://143.188.17.20/anrdl/DAFFService/display.php?fid=pb_aif13d9abfs20150828_11a.xml

The ASOFR 2018 reported 8.6 million hectares of land is in the Indigenous estate in Victoria, of which 3 million hectares was forested. In the Victorian RFA regions, a total of 2.8 million hectares of land is in the Indigenous estate, of which 1.9 million hectares is forested (ABARES 2018b). This is 30 per cent of the total forest area in Victorian RFA regions. Of the 1.9 million hectares of forested land in the Indigenous estate, 4,000 hectares is in the Indigenous owned and managed category, 38,000 hectares is Indigenous managed, 104,000 hectares is Indigenous co-managed, and 1.7 million hectares is in the Other special rights category (Table 54).

By RFA region, there are 950,000 hectares of forest in the Indigenous estate in the Gippsland region, 440,000 hectares of forest in West Victoria, 170,000 hectares in the Central Highlands, 160,000 hectares in the North East, and 130,000 hectares in East Gippsland.

Table 54: Area of land and forest in Victoria in the NFI Indigenous forest estate dataset, by Indigenous land ownership and management category and RFA region

NFI Indigenous ownership and management category[b]	Land cover type	Area[a] ('000 hectares)							
		Central Highlands RFA	East Gippsland RFA	Gippsland RFA	North East RFA	West Victoria RFA	Total in RFA regions	Not in RFA regions	Total in Victoria
Indigenous owned and managed	All	0	2	0	0	8	**10**	1	10
	Forest	0	1	0	0	2	**4**	0	4
Indigenous managed	All	0	9	45	0	3	**57**	46	103
	Forest	0	9	26	0	3	**38**	44	82
Indigenous co-managed	All	0	0	0	0	118	**118**	209	327
	Forest	0	0	0	0	104	**104**	151	255
Other special rights	All	172	129	993	225	1,111	**2,629**	5,510	8,138
	Forest	167	124	928	163	329	**1,711**	936	2,647
Total	**All**	**172**	**139**	**1,038**	**225**	**1,240**	**2,814**	**5,765**	**8,579**
	Forest	**167**	**134**	**955**	**163**	**438**	**1,856**	**1,132**	**2,988**
Total forest in area		**723**	**1,113**	**1,598**	**1,350**	**1,403**	**6,187**	**2,035**	**8,222**
Proportion of total forest that is forest on the Indigenous estate		**23 per cent**	**12 per cent**	**60 per cent**	**12 per cent**	**31 per cent**	**30 per cent**	**56 per cent**	**36 per cent**

a RFA region boundary data supplied by Victoria DELWP. Area derived by ABARES from *Australia's Indigenous forest estate (2018)* dataset.

b NFI Indigenous ownership and management categories are described in *Australia's state of the forests report 2018* Indicators 6.4a and 6.4c.

Note: Totals may not tally due to rounding.

The VSOFR 2018 outlines some of the key legislation and frameworks related to Aboriginal participation in Forest Management Areas (Commissioner for Environmental Sustainability 2019, pp. 180–3). This information is summarised below.

Aboriginal Heritage Act 2006

Aboriginal cultural heritage in Victoria is protected under the *Aboriginal Heritage Act 2006* (AHA). The AHA establishes a framework of mechanisms for the management and protection of Aboriginal cultural heritage, through cultural heritage management plans, cultural heritage permits, Protection Declarations and Aboriginal cultural heritage land management agreements. Registered Aboriginal Party (RAP) is a status provided under the AHA to Traditional Owner organisations. RAPs hold decision-making powers under the AHA for the protection and management of Aboriginal cultural heritage within their appointed area. The Victorian Aboriginal Heritage Council was established under the AHA to ensure that Traditional Owners throughout Victoria play a central role in the protection and management of their heritage. There are currently 11 Registered Aboriginal Parties covering more than 60 per cent of Victoria.

Traditional Owner Settlement Act 2010

This Act provides for certain Crown land sites, in the Traditional Owner agreement area, to be granted to the Traditional Owner corporation in 'Aboriginal title', and to then be jointly managed with the state. Aboriginal title is a highly modified freehold grant to the Traditional Owners, where the right to occupy, use, control and manage the land is transferred back to the state, including the authority to issue leases and licences. Joint management recognises the ongoing connection of Traditional Owners to their land and enables the knowledge and culture of the Traditional Owner group to be incorporated in the management of that land. Traditional Owners and the state work together in partnership to manage the natural and cultural values of parks and reserves under Aboriginal title.

Managing cultural landscapes in Victoria's parks and reserves

Parks Victoria is building on its existing reporting frameworks, which largely focus on ecology and natural systems, by adding three elements pertinent to determining the health of cultural landscapes. These are:

- social, spiritual and emotional wellbeing of Traditional Owners
- extent and condition of culturally significant species
- tangible and intangible Aboriginal cultural heritage.

At the time of writing, Victoria had seven formal agreements with five Traditional Owner Groups for joint management of their traditional lands under the *Native Title Act 1993*, *Traditional Owner Settlement Act 2010* and the *Aboriginal Heritage Act 2006*. These agreements are unique, reflecting native title, self-determination and the aspirations of the Traditional Owner communities. They increase Traditional Owners' involvement and the recognition of their rights to protect and manage cultural heritage in specific areas of Crown land that primarily comprise public forest.

Traditional Owner Joint Management

At the time of writing this report, 375,166 hectares, or about 5 per cent, of public forest was covered by formal Traditional Owner agreements (Table 55). The most recent, the Taungurung Recognition and Settlement Agreement, was formally accepted by the Victorian Government in 2018, but has not yet commenced.

Table 55: Public forest area under joint management with Traditional Owners in Victoria

Agreement name	Traditional Owner Group entity	RFA region	Public forest area (ha)
Yorta Yorta Co-o perative Management Agreement (2004)	Yorta Yorta Nation Aboriginal Corporation	Non-RFA	50,000
Wotjobaluk Co-o perative Management Agreement (2005)	Barengi Gadjin Land Council Aboriginal Corporation	West	194,000
Gunditjmara Co-o perative Management Agreement (2007)	Gunditj Mirring Traditional Owner Aboriginal Corporation	West	8,375
Yorta Yorta Traditional Owner Land Management Agreement (2010)	Yorta Yorta Traditional Owner Land Management Board (Public entity)	Non-RFA	28,505
Gunaikurnai Recognition & Settlement Agreement (2010)	Gunaikurnai Traditional Owner Land Management Board	Gippsland and East Gippsland	45,463
Dja Dja Wurrung Recognition & Settlement Agreement (2012)	Dhelkunya Dja Land Management Board	West	48,823
Taungurung Recognition and Settlement Agreement (2018)	Taungurung Clans Aboriginal Corporation	Central Highlands and North East	To be determined
		Total	**375,166**

Source: Commissioner for Environmental Sustainability (2018)

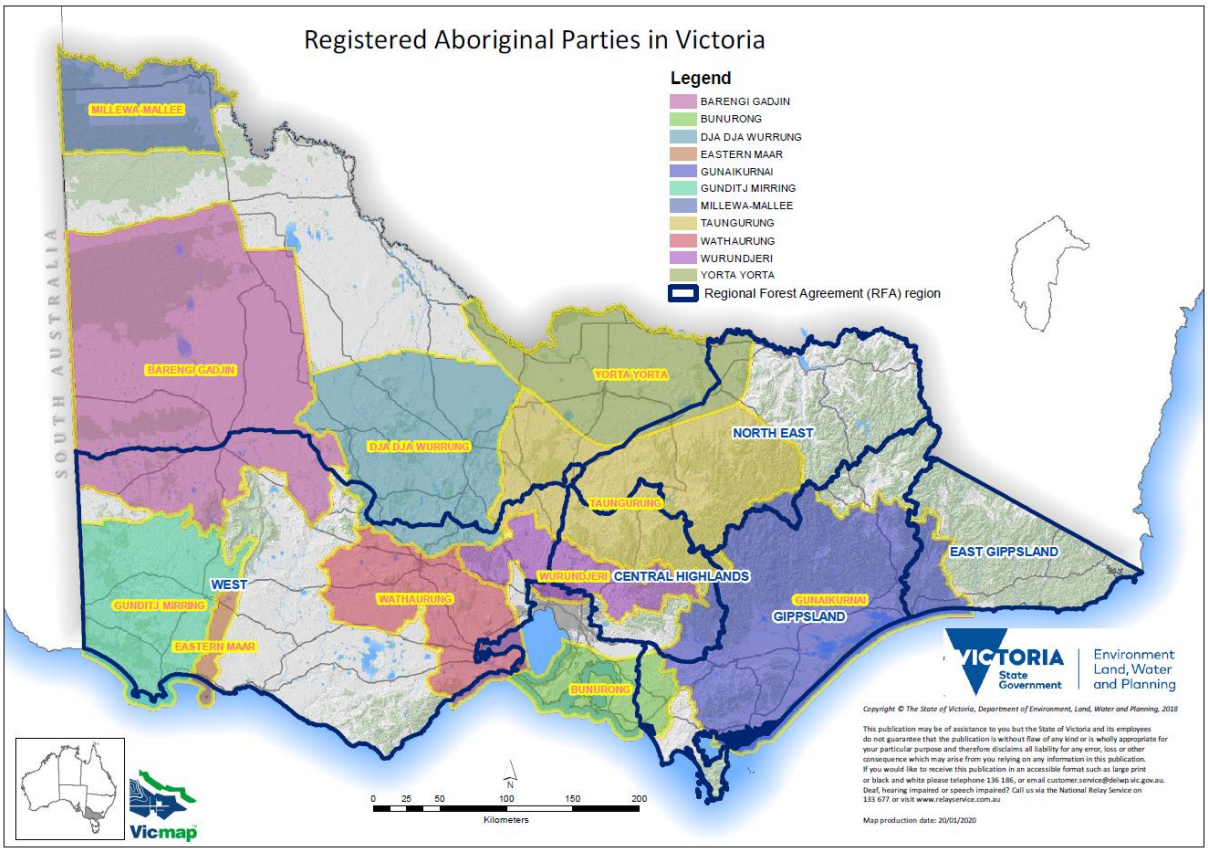

Figure 31: Registered Aboriginal Parties in Victoria

Source: DELWP Corporate Spatial Data Library

There are also informal management regimes that grant Traditional Owners access and rights that protect their cultural heritage. These operate in both public and private lands in Victoria. Leasehold forest/Aboriginal co-managed land by RAPs accounts for about 15 million hectares including both public and private forests (Table 56).

Table 56: Area of Victorian forest to which Traditional Owners' rights are recognised through formal and informal management arrangements

LandLand tenure	Name of agreement/arrangement	Area (ha)
Leasehold forest/ Aboriginal Co-managed Land through Registered Aboriginal Parties	Gunditj Mirring Traditional Owners Aboriginal Corporation Barengi Gadjin Land Council Aboriginal Corporation Taungurung Land and Waters Council Aboriginal Corporation Yorta Yorta Nation Aboriginal Corporation Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation Dja Dja Wurrung Clans Aboriginal Corporation Wathaurung Aboriginal Corporation Eastern Maar Aboriginal Corporation Gunaikurnai Land and Waters Aboriginal Corporation Bunurong Land Council Aboriginal Corporation First People of the Millewa-Mallee Aboriginal Corporation	15,892,000
Private forest	Lake Tyers Forest (1,600 hectares) Framlingham Forest (1,130 hectares) Lake Condah Indigenous Protected Area (1,700 hectares) Freehold land owned by the Gunditjmara community, declared as an Indigenous Protected Area by the Australian Government.	4,430
Other Crown land/ Indigenous co-managed	Dja Dja Wurrung Clans Have been granted title to six parks and reserves within their native title settlements area, including: Greater Bendigo National Park, Kara Kara National Park, Hepburn Regional Park, Kooyora State Park, Wehla Nature Conservation Reserve and Paddys Ranges State Park.	47,502
	Grampians National Park Includes a very small strip of Crown land that is reserved under section 4 of *the Crown Land Reserves Act 1978* (Vic).	167,219
	Gunaikurnai Joint Management Plan Partnership between the Gunaikurnai peoples and the Victorian Government to jointly manage nine parks and reserves in Gippsland; Buchan Caves Reserve, Corringle Foreshore, Lake Tyers State Park, Mitchell River National Park, New Guinea Caves, Raymond Island Gippsland Lakes Reserve, Tarra-Bulga National Park and The Knob Reserve.	47,070

Note: Data includes areas potentially outside of RFA.

Source: Commissioner for Environmental Sustainability Victoria (2018).

Small parts of private forests in Victoria, totalling 2,830 hectares, are managed by Traditional Owner groups. One significant area is the Lake Condah Indigenous Protected Area (1,700 hectares) — part of the Budj Bim National Heritage Landscape, which was listed for its outstanding cultural heritage value in 2004. Currently, this area is managed by the Gunditj Mirring Traditional Owners Aboriginal Corporation. The Deen Marr Indigenous Protected Area, the Kurtonitj Indigenous Protected Area and the Tyrendarra Indigenous Protected Area are among the other declared Indigenous Protected Areas in Victoria.

Indicator 6.4c: The extent to which Indigenous values are protected, maintained and enhanced through Indigenous participation in forest management

This indicator measures the involvement of Traditional Owners in forest management. Active participation in forest management supports their connection to Country and the integration of their values into forest management practice, policy and decision-making.

There are a variety of mechanisms through which Traditional Owners can participate in forest management, including: forest management, joint management of national parks and conservation reserves, Indigenous Land Use Agreements, native title rights and direct employment. It is difficult to measure the extent to which these mechanisms protect, maintain and enhance Indigenous values; however, there is a diverse range of activities that demonstrate Indigenous participation in forest management. A number of these are mentioned in greater detail below:

Munganin – Gadhaba: 'Achieve Together'

Munganin – Gadhaba: 'Achieve Together' is DELWP's Aboriginal Inclusion Plan. Munganin – Gadhaba identifies partnership opportunities across all of DELWP's work, from land use, water, planning and policy-making to service delivery, governance and representation on boards and committees, and work with external providers and partner agencies. Munganin – Gadhaba is one of the Forest Fire Regions Group key priorities as documented in its 2018–19 business plan (DELWP 2015).

Aboriginal involvement in the management of the national parks estate

Cooperative management is one mechanism through which Indigenous values are protected, maintained and enhanced by allowing participation in forest management. The native title settlement process of the Gunditjmara Traditional Owners resulted in the Ngootyoong Gunditj Ngootyoong Mara South West Management Plan, a multi-park management plan in the West RFA region. It was developed in 2014 using a unique partnership between Parks Victoria, Gunditjmara Traditional Owners, Budj Bim Council and DELWP, and covers several parks and reserves to integrate knowledge of the Gunditjmara Traditional Owners into park management.

The Dja Dja Wurrung Recognition and Settlement Agreement included a suite of agreements on natural resources, land use and Traditional Owner land management, and created a management board to jointly manage six parks and reserves with Aboriginal title. This agreement also involved the development of an Aboriginal ranger team within Parks Victoria. As a result of this, the Dja Dja Wurrung Clans Aboriginal Corporation is involved in natural resource management planning alongside DELWP, Parks Victoria and other key stakeholders. This participation in decision-making and planning is a key step in ensuring Indigenous values are acknowledged, protected and maintained in forest management.

Currently, forest and fire management planning in Victoria involves cooperation between DELWP and local Aboriginal groups to ensure cultural values are identified and protected where possible. DELWP Aboriginal Inclusion Coordinators and Regional Heritage Advisors have regular contact and working relationships Traditional Owner groups whose land falls within their DELWP region, who indicate areas of cultural value on a map of the area. This information

is kept by DELWP in a secure confidential location and is used for regional forest management planning and to assess developments or proposals, such as planned burns.

Cultural burning strategy

In the last five years, many new local partnerships have formed between Traditional Owners and land management authorities including Forest Fire Management Victoria (FFMVic), the Country Fire Authority (CFA), CMAs and Local Government Authorities. Through these partnerships, cultural burning in Victoria and traditional fire practice is being revitalised and rediscovered.

At the same time, many Traditional Owners have developed strategic planning documents (such as Country plans) that state their aspirations for how Country should be managed. These local initiatives show the opportunities and challenges for Traditional Owners who are navigating the fire management sector in Victoria.

To address the challenges and support an increase in cultural burning practice across Victoria, the Federation of Victorian Traditional Owner Corporations worked in partnership with Victorian Traditional Owners, FFMVic and the CFA during 2017–18 to develop a Victorian cultural burning strategy. This involved supporting a practice network of Traditional Owner fire knowledge-holders across Victoria who want to build practice knowledge and heal Country through the traditional use of fire. On-Country burns and conversations with these knowledge-holders has enabled information-sharing and peer-to-peer learning about traditional fire and cultural burning practices.

For Victorian Traditional Owners, traditional fire practice means 'right fire, right time, right way, for the right reasons'. A cultural burn is planned, led and implemented by a Traditional Owner(s) who has authority on the Country on which a burn is taking place. The reasons for the burn may include increasing or protecting totem, medicine, food and fibre species; protecting sacred sites; or improving passage though Country.

Collection of forest monitoring data

The Victorian Forest Monitoring Program (VFMP) is a statewide forest monitoring information system that has been developed to assess and monitor the extent, state and sustainable development of Victorian forests in a timely and accurate manner (Suitor et at 2016). It provides baseline data for long-term trend detection and prediction of type and severity of future changes, so that management options can be developed and evaluated in time to be effective. The VFMP ground plot network comprises a total of 804 field plots. In the 2019-20 data collection season, Gunaikurnai and Dja Dja Wurrung Traditional Owners are participating in the data collection and will advise on ways to align the program with cultural health metrics and promote self-determination.

Case study: Involvement in State forest management activities

Across the state there are a range of land management activities administered by Traditional Owner groups. For example, a Memorandum of Understanding between DELWP Far South West and Gunditj Mirring Traditional Owners Aboriginal Corporation (GMTOAC) has been

established to help deliver works on Country and outline any exchange of services. These include:

- General firefighting training provided to Budj Bim Rangers
- Provision of refresher training throughout the year on emergency equipment, use of GPS units and radios
- Provision of technical expertise and equipment in undertaking feral pig trapping on Indigenous Protected Area land to protect cultural heritage values and assist in the overall control of feral pigs
- Creation of a casual bank of employees by GMTOAC; casual employees have recently been involved in undertaking feral cat density surveys as part of Biodiversity Response Planning. This bank of employees will be utilised for future pest and weed projects
- Provision of training to GMTOAC and Budj Bim rangers in chainsaw and use of agricultural chemicals
- DELWP has also been assisting GMTOAC to undertake traditional planned burns on Indigenous Protected Area land.

Indicator 6.5d: Resilience of forest-dependent Indigenous communities to changing social and economic conditions

Indigenous community participation in the forest industry is important for the maintenance of their traditional values and cultural use of forests. It also contributes to the viability of the forest industry. This indicator measures the extent to which Aboriginal communities are involved in the forest industry, by understanding and monitoring their participation.

Although the resilience of Indigenous communities to changing social and economic conditions is hard to quantify, this indicator uses three measures of involvement of Aboriginal Victorians in the forestry industry:

- Student enrolments and completions in forestry programs between 2014 and 2017, for government-funded services and courses
- Proportion of Aboriginal employment among employees in the forest industry, by RFA region, derived from Australian Bureau of Statistics (ABS) census data
- Proportion of Aboriginal employment in forest-dependent Indigenous communities.

Further information on this is reported under Indicator 6.5c

Table 57: Aboriginal enrolments in forestry and wood industry government-funded vocational education and training programs in Victoria, 2013–17

Year	Certificate II	Certificate III	Certificate IV	Diploma	Total Aboriginal students	Total students	Proportion
2013	97	90	0	0	187	2,144	9 per cent
2014	44	65	0	0	109	1,294	8 per cent
2015	16	24	0	0	40	1,123	4 per cent

2016	38	37	0	0	75	1,254	6 per cent
2017	39	36	0	0	75	838	9 per cent

Source: Commissioner for Environmental Sustainability Victoria (2019).

Table 57 shows a 60 per cent decrease between 2013 and 2017 of the total number of Aboriginal students enrolled in government-funded vocational education and training programs related to forest and wood products industries. per cent

Summary and future management of Indigenous heritage values

Victoria's forest management system provides a framework for the protection of Indigenous heritage values through Commonwealth and Victorian legislation, agreements, policies and procedures.

There is 2.8 million hectares of land in the Indigenous estate in the Victorian RFA regions, 1.9 million hectares of which is forested. This area comprises 30 per cent of the total forest area in the Victorian RFA regions.

Of the 1.9 million hectares of forested area, 375,166 hectares (5 per cent) per cent) are under joint management covered by formal Traditional Owner agreements. There are also a number of informal management regimes on both public and private land that grant Traditional Owners access to protect cultural heritage. Leasehold/Aboriginal co-managed land by Registered Aboriginal Parties accounts for 15 million hectares on public and private land, and almost 33,000 hectares of private forests are informally managed by Traditional Owner Groups.

Forest and fire management planning in Victoria involves cooperation and partnership between DELWP and Traditional Owner groups across the state to share knowledges and manage cultural values. Partnerships between Traditional Owners and land management authorities have strengthened, particularly over the least five years, and through these partnerships cultural burning and traditional fire practice is being revitalised and rediscovered.

Traditional Owner groups are producing their own strategic planning documents such as Country plans, which outline their aspirations for management of Country. The Victorian Government is also working with Traditional Owners to increase involvement in data collection from VFMP plots.

Under the modernised Victorian RFAs, current protections and management of Indigenous heritage values will be maintained, and built on.on. The modernised RFAs include stronger consideration of the values, rights and involvement of Traditional Owners in land and fire management. The Victorian Government will continue to work with Traditional Owners to increase their involvement in decision making in land planning, and to gain a better understanding of the values that are important to them. Extensive engagement and collaboration have been undertaken with Traditional Owners and other Aboriginal Victorians leading up to the extension of the Victorian RFAs, and the Victorian Government has ensured that there is appropriate consideration of these values in the extended Victorian RFAs.

Economic values

Victoria's forests provide economic benefits across a range of values, from timber harvesting and associated industries, recreation and tourism, water purification, support to non-timber forest industries such as honey, and many others. Sustainable forest management defines the principles by which forests are appropriately utilised to maintain their full range of environmental, social and economic values. This chapter presents information about the management and outcomes of forest management that contribute economics benefits to the state.

At the national level, Australia uses the international Montréal Process criteria and indicators as the basis framework for monitoring and measuring how well our forests are being managed.

Criteria 2 and 6 of the Montréal Process are concerned with economic values. Specifically, these criteria address 'Maintenance of productive capacity of forest ecosystems' (Criterion 2) and 'Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies' (Criterion 6).

This section includes the following Montréal Process indicators:

- Indicator 2.1a – Native forest available for wood production, area harvested, and growing stock of merchantable and non-merchantable tree species
- Indicator 2.1b – Age class and growing stock of plantations
- Indicator 2.1c – Annual removal of wood products compared to the volume determined to be sustainable for native forests and the future yields for plantations
- Indicator 2.1d – Annual removal of non-wood forest products compared to the level determined to be sustainable
- Indicator 2.1e – The area of native forest harvested and the proportion of that effectively regenerated, and the area of plantation harvested and the proportion of that effectively re-established
- Indicator 6.1a – Value and volume of wood and wood products
- Indicator 6.1b – Values, quantities and use of non-wood forest products
- Indicator 6.1c – Value of forest-based services
- Indicator 6.1d – Production and consumption and import/export of wood, wood products and non-wood products
- Indicator 6.1e – Degree of recycling of forest products
- Indicator 6.2a – Investment and expenditure in forest management
- Indicator 6.2b – Investment in research, development, extension and use of new and improved technologies.

Overview of regulatory setting for sustainable forest management

In Victoria, DELWP, among its other land management responsibilities, acts as the environmental regulator for native forests on public land, with the responsibility of monitoring

timber harvesting and other primary industry operations to ensure they are compliant with regulatory requirements. This is achieved through a mixture of investigations, field inspections and field and forest audits.

Further detail on Victoria's forest management system, including policy and regulatory settings, is available in the *Overview of Victoria's Forest Management System* (DELWP 2020).

Commercial regulation and governance of timber harvesting

VicForests is a state-owned enterprise established in 2003 by Order in Council under the *State-Owned Enterprises Act 1992* (Vic.). In accordance with the Order in Council, the functions of VicForests are to 'operate in a framework consistent with Victorian Government policies and priorities', with a commercial focus that aims to maximise the long-term economic returns to Victoria. VicForests is responsible for the sustainable harvest, regrowing and commercial sale of timber from Victoria's State forests, on behalf of the Victorian Government. Sustainable harvest involves harvesting of forest products in accordance with the *Code of Practice for Timber Production 2014*, which includes compliance with the Forest Management Zoning Scheme and other prescriptions, based on the capacity of the forest to produce timber volume while maintaining the functioning of the forest. VicForests' board reports to the Victoria's Minister for Agriculture, as the responsible minister.

The Department of Jobs, Precincts and Regions (DJPR) has oversight of VicForests to ensure it is meeting its corporate obligations. DJPR is also responsible for advising the Minister for Agriculture on the timber industry, timber industry policy and the management of timber resources. The Minister for Agriculture makes the Allocation Order, which in effect is the licence for VicForests to harvest timber, and sets the overall forest area potentially available for harvesting.

The Department of Treasury and Finance (DTF) undertakes functions on behalf of the Treasurer, as the sole shareholder of VicForests. DTF monitors VicForests' corporate governance, in cooperation with DJPR.

Indicator 2.1a: Native forest available for wood production, area harvested, and growing stock of merchantable and non-merchantable tree species

This indicator reports the capacity of forests to sustainably produce wood to meet society's needs into the future. The area of native forest available for wood production, the nature of the growing stock, and the area harvested over time provide means to demonstrate the sustainability of forest management.

Statewide overview of resource availability

State forest accounts for 3.2 million hectares (or 40 per cent) of Victoria's 7.89 million hectares of public land. These forests are managed according to Victoria's forest management system and the forest management zones that define the activities that are permitted within them. Principally, this includes the application of the General Management Zone, Special Management Zone and Special Protection Zone, with the latter forming the informal component of the CAR reserve. Exclusions under the *Code of Forest Practice for Timber production 2014* are also considered as informal protection areas according to the JANIS criteria. These are areas such as steep (>30°) or stream-side buffers.

Broadly, the three primary forests zones are defined as:

- **Special Protection Zone** (SPZ) – managed for conservation with no timber harvesting permitted; this zone is designed to link and complement established conservation reserves
- **Special Management Zone** (SMZ) – managed to conserve specific features where timber production is permitted under certain conditions
- **General Management Zone** (GMZ) – managed for multiple uses including timber production.

2.75 million hectares of forest is zoned under GMZ, SMZ and SPZ, with the remaining area listed as No Zone (see Table 58). While timber harvesting could technically be allocated (under an Allocation Order) within nearly 2 million hectares of GMZ and SMZ, only a fraction of this area is commercially suitable for timber harvesting.

Table 58: Total area (gross hectares) of State forest (as a land tenure) per zone in each RFA region in 2018

Forest management zone	Central Highlands	East Gippsland	Gippsland	North East	West	Total RFA areas
General Management Zone	274,000	409,000	539,000	491,000	101,000	1,814,000
Special Management Zone	21,000	64,000	13,000	25,000	38,000	161,000
Special Protection Zone	95,000	111,000	254,000	173,000	142,000	775,000
Total all zones	**390,000**	**584,000**	**806,000**	**689,000**	**281,000**	**2,750,000**

Data source: Data derived from DELWP corporate library FMZ100. Area of 'No Zone' not recorded.

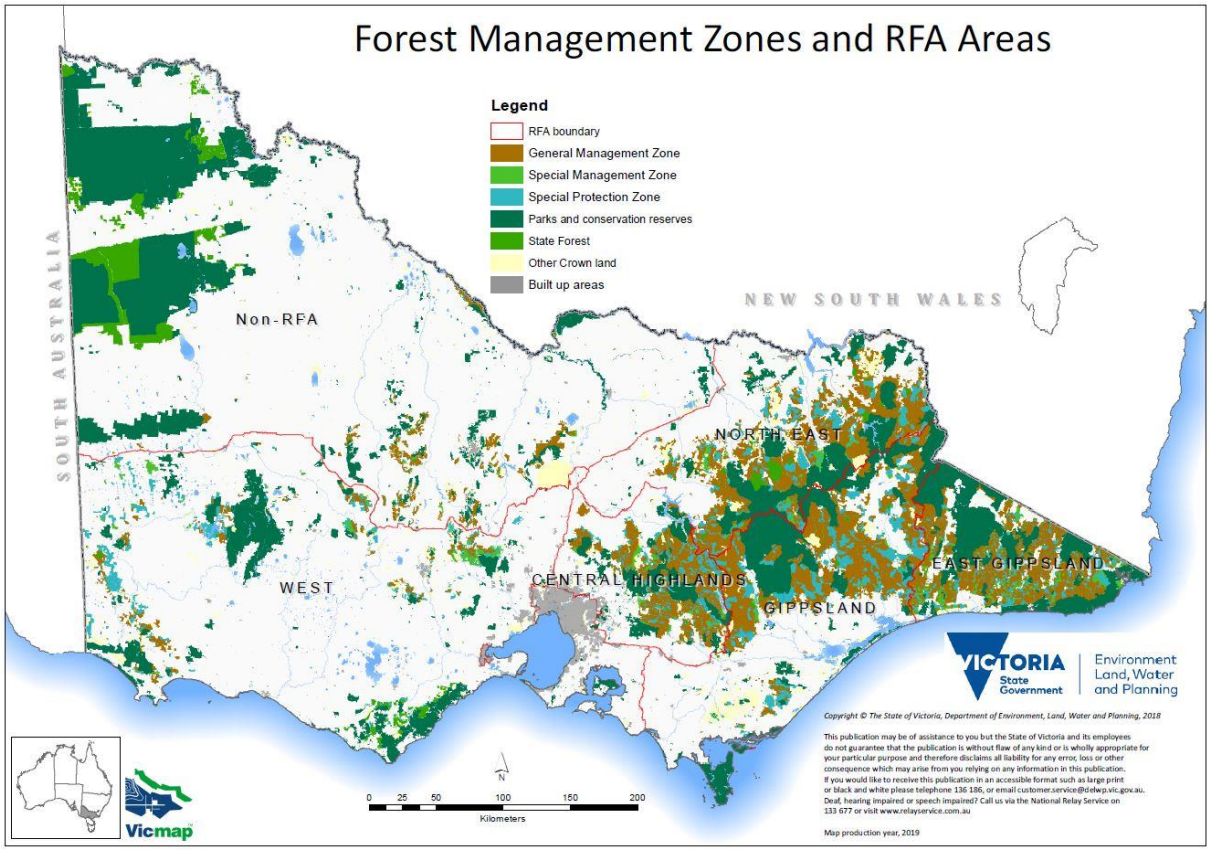

Figure 32: Forest management zones across Victoria

Net harvestable area

In 2019, VicForests reported the area suitable for timber production (of D+ sawlog) in the east of the state at 462,000 hectares (Table 59).

Table 59: Area ('000 ha) of State forest in eastern Victoria available and suitable for timber production by RFA in 2019

	Ash			Mixed species				
RFA region	Suitable	Potentially Suitable	Not Suitable	Suitable	Potentially Suitable	Not Suitable	Total	Total suitable
Central Highlands	67	1	4	59	48	25	204	115
East Gippsland	4	0	0	222	61	84	371	226
Gippsland	34	3	3	38	99	158	335	72
North East	21	3	4	17	96	131	272	38
Total	**126**	**7**	**11**	**336**	**304**	**401**	**1,182**	**462**

Data source: VicForests (2019).

In 1999, the area suitable for timber production for the east of the state was over 820,000 hectares (Table 60). The impact of successive mega-fires in productive forest areas since 2003 has decreased the area available for timber harvesting. Similarly, the reservation of productive forest areas for species conservation has reduced the total available area. The VicForests Resource Outlook cites the following factors as to why there has been a reduction in the Resource Outlook 2016–17 from the previous level predicted:

- increased protection for the Leadbeater's Possum and other threatened species
- the decrease in available forest due to resource fragmentation as a result of the proximity and density of Leadbeater's Possum populations
- increased protection of old-growth forest; and
- the removal of forest from the model that VicForests considers unlikely to be able to be accessed due to community and/or market concerns.

The potential impact from bushfires has obvious implications for the timber supply; however, this has not been modelled within the Resource Outlook 2016-17 and is therefore not noted in the above points.

In addition to increased protections for threatened species, effect of bushfire, increased protections for different forest types and the cessation of commercial harvesting in the Otways area of the West RFA in 2008, Victoria's total area available and suitable for harvesting timber has more than halved since the commencement of the RFAs 20 years ago.

Table 60: Net productive area for commercial forest types across RFA regions (1999 CRA)

RFA	Central Highlands	East Gippsland	Gippsland	North East	West	Total
Net Productive Area (ha) for Commercial Forest Types	225,216	225,548	253,810	120,050	174,600	999,224

Note: The net productive area for commercial forest types was based on information in the NRE Hardwood Area Resource Information System (HARIS) database. HARIS provided a standing volume for sawlog and residual roundwood for the Mature and Over-mature (M/OM)2 forests, within areas of GMZ and SMZ.

Source: Information derived from the CRAs accessed via the ABARES website.

Change in productive area across RFA regions

While the data presented in the tables above reflect a net productive area for commercial forest types, the methods used to calculate these areas are likely to be different, and consequently, only broad assumptions can be made regarding the variation between the data presented in Table 59 and Table 60.

Available areas in Central Highlands, Gippsland and the North East have all decreased by more than half, while East Gippsland has remained relatively stable.

Commercial timber production in native forest in the West RFA region is now limited to minor products, such as fenceposts and firewood, and a limited volume of sawlogs. This process is managed through VicForests' Timber Utilisation Plan, as it is not subject to the Allocation Order (VicForests 2017). This harvesting is often limited to local demand, and may be coordinated with other forest management activities, such as roading or removal of dangerous trees. The silvicultural systems used are varied; calculating net harvested area and available area is challenging due to these variations.

Public native forest harvest area and by silviculture regime

Averaging the five years following 2004–05 (6,398 hectares), and the five years preceding 2016–17 (3,399 hectares), the average total harvest area has reduced by almost 50 per cent (Table 61). In the years preceding 2004–05, harvest areas were recorded based on their gross area figures and therefore were not comparable.

Table 61: Harvest area (net hectares) 2004–05 to 2016–17, by RFA area

Season	Central Highlands	East Gippsland	Gippsland	North East	West	Total
2004–05	1,447	3,456	848	518	0	6,269
2005–06	1,459	3,157	898	540	504	6,558
2006–07	1,151	2,920	1,116	397	383	5,967
2007–08	1,810	2,735	1,774	486	492	7,297
2008–09	1,423	2,732	1,318	128	296	5,897
2009–10	2,486	2,387	138	47	141	5,199
2010–11	1,712	2,521	662	64	4,596	9,555
2011–12	1,530	2,085	617	35	132	4,399
2012–13	1,431	1,328	473	99	234	3,565
2013–14	1,378	1,150	471	168	88	3,255
2014–15	1,538	995	433	65	136	3,167
2015–16	1,657	658	490	114	641	3,560
2016–17	1,446	724	680	136	461	3,447
Total	**20,467**	**26,846**	**9,917**	**2,797**	**8,105**	**68,132**

Data source: DELWP corporate library Lastlog100 layer

Table 62 to Table 66 show net area harvested by regime type for each of the five RFA areas. The harvesting regimes have been consolidated from wider-range harvesting categories – for example, Clearfelling includes the Regrowth Retention Harvesting (RRH) method (VicForests n.d.). Salvage regimes involve the recovery of wood products from forest that has been severely affected by a natural event, usually a large fire. Selection regimes involve the harvest of individual or small clumps of trees from a much broader area, so net harvested areas may not accurately reflect the amount of wood products harvested in these systems. Other harvesting includes firewood cutting, road construction and other seldom-used techniques. As described elsewhere, there has been a general decrease in harvesting area in the data period, reflecting changing resource availability.

Central Highlands RFA

The Central Highlands RFA has shown a relatively stable level of harvesting area over the reporting period, with notable increases in 2007–08, and 2009–10, mostly attributable to increased salvage logging following landscape-level bush fires in the previous fire season.

Table 62: Net area harvested by regime, Central Highlands RFA, 2004–05 to 2016–17 (area ha)

Season	Clearfelling	Salvage	Seed Tree	Selection	Thinning	Other/ unknown	Total
2004–05	1,085	0	241	0	85	37	1,447
2005–06	933	0	272	0	247	7	1,459
2006–07	742	4	206	0	190	8	1,151
2007–08	761	164	178	247	449	10	1,810
2008–09	718	376	137	0	192	0	1,423
2009–10	663	1,569	145	0	108	1	2,486
2010–11	577	839	272	0	23	2	1,712
2011–12	988	81	389	0	70	2	1,530
2012–13	1,027	0	274	0	129	0	1,431
2013–14	980	0	331	0	50	17	1,378
2014–15	1,179	6	345	8	0	0	1,538
2015–16	1,184	0	473	0	0	0	1,657
2016–17	860	12	552	21	1	0	1,446
Total	**11,696**	**3,051**	**3,815**	**276**	**1,544**	**85**	**20,467**

Notes:
Clear fall = Clearfelling, Regrowth Retention Harvesting. Salvage = Clearfelling salvage. Selection = Group (or Gap) Selection, Single Tree Selection. Seed tree = Seed Tree (includes retained overwood). Thinning = Thinning from Above, Thinning from Below. Other = Reforestation harvesting, Road Alignment - Construction, Road Alignment - Improvement, dangerous tree removal, firewood fallen, unknown, blanks.

Data source: DELWP corporate library Lastlog100 layer

East Gippsland RFA

Data from East Gippsland shows a progressive decline in harvested area. The reduction in available markets, particularly for pulp logs, has contributed to this decline, affecting the viability of several sawmills and precipitating their closure in some cases. This was reflected in the revision of VicForests' Resource Outlook, which has reduced the amount of timber available for harvesting in East Gippsland.

Table 63: Net area harvested by regime, East Gippsland RFA, 2004–05 to 2016–17 (area ha)

Season	Clearfelling	Salvage	Selection	Seed Tree	Thinning	Other/ unknown	Total
2004–05	101	0	0	2,311	1,021	23	3,456
2005–06	62	0	0	2,084	1,011	1	3,157
2006–07	86	0	0	1,964	863	7	2,920
2007–08	3	20	27	1,828	842	14	2,735
2008–09	9	23	26	1,993	674	8	2,732
2009–10	0	0	0	1,711	676	0	2,387
2010–11	0	326	0	1,952	152	91	2,521
2011–12	33	66	1	1,576	409	0	2,085
2012–13	235	0	0	876	215	2	1,328
2013–14	164	0	0	824	161	0	1,150
2014–15	18	3	0	908	65	0	995
2015–16	0	7	0	629	21	1	658
2016–17	0	0	1	658	65	0	724
Total	711	444	56	19,314	6,175	147	26,846

Data source: DELWP corporate library Lastlog100 layer.

Gippsland RFA

The Gippsland RFA area has seen an overall decline in harvesting area, with the exception of increases due to salvage logging in the period 2006–09. This reflects the review of VicForests' Resource Outlook, following the large bushfires of the 2000s.

Table 64: Net area harvested by regime, Gippsland RFA, 2004–05 to 2016–17 (area ha)

Season	Clearfelling	Salvage	Selection	Seed Tree	Thinning	Other/ unknown	Total
2004–05	590	0	0	245	9	4	848
2005–06	392	0	0	451	38	17	898
2006–07	513	258	0	268	45	33	1,116
2007–08	342	959	0	214	244	14	1,774
2008–09	240	577	13	333	151	5	1,318
2009–10	14	17	27	80	0	0	138
2010–11	299	39	0	324	0	0	662
2011–12	344	0	0	215	58	0	617
2012–13	194	0	0	204	76	0	473
2013–14	209	0	0	141	121	0	471
2014–15	232	0	0	201	0	0	433
2015–16	268	0	0	198	20	3	490
2016–17	339	0	0	182	159	0	680
Total	3,974	1,850	40	3,054	922	76	9,917

Data source: DELWP corporate library Lastlog100 layer.

North East RFA

The North East RFA has also shown a general decline over the reporting period, again due to a decline in areas suitable for timber production following large fires in the 2003, 2007 and 2009 seasons and a reduction in demand from the closure of several sawmills.

Table 65: Net area harvested by regime, North East RFA, 2004–05 to 2016–17 (area ha)

Season	Clearfelling	Salvage	Selection	Thinning	Seed Tree	Other/ unknown	Total
2004–05	515	0	0	0	0	3	518
2005–06	469	0	36	0	33	2	540
2006–07	220	0	177	0	0	0	397
2007–08	90	201	117	0	78	0	486
2008–09	74	12	24	0	16	2	128
2009–10	38	0	7	0	0	2	47
2010–11	20	0	0	44	0	0	64
2011–12	35	0	0	0	0	0	35
2012–13	72	0	0	0	27	0	99
2013–14	116	0	0	0	52	0	168
2014–15	65	0	0	0	0	0	65
2015–16	78	0	33	0	3	0	114
2016–17	58	0	66	0	13	0	136
Total	1,851	213	459	44	221	9	2,797

Data source: DELWP corporate library Lastlog100 layer.

West RFA

The West RFA has low levels of timber production harvested in low-intensity selection and thinning regime coupes. It includes silvicultural treatments to improve the health of the forest as well as providing a source of high-value durable timbers in addition to fencing, firewood and other residual forest products. The anomalous increase in area in 2010–11 is due to a change in recording procedures that saw a backlog of previously unrecorded data recorded in that year. In this way, the anomaly does not reflect a significant increase in harvesting area. Clearfelling in the 2005–08 seasons represents production in the Otway Ranges, prior to cessation of logging and declaration of the Great Otways National Park and Otways Forest Parks. No salvage harvesting has carried out in the West RFA over this time.

Table 66: Net area harvested by regime, West RFA, 2005–06 to 2016–17

Season	Clearfelling	Selection	Thinning	Seed Tree	Other/ unknown	Total
2005–06	152	5	347	0	1	504
2006–07	140	100	127	16	0	383
2007–08	247	13	215	16	0	492
2008–09	0	173	123	0	0	296
2009–10	0	62	79	0	0	141
2010–11[a]	0	658	3,938	0	0	4,596
2011–12	0	0	27	0	105	132
2012–13	0	111	123	0	0	234
2013–14	9	0	80	0	0	88
2014–15	7	71	55	0	4	136
2015–16	6	37	476	0	123	641
2016–17	5	158	292	0	6	461
Total	565	1,388	5,881	32	239	8,105

a High values due to a change in recording procedures.

Data source: DELWP corporate library Lastlog100 layer.

Indicator 2.1b: Age class and growing stock of plantations

This indicator collates the area and growing stock of native and exotic species plantations to assess the volume of timber that Australia's plantation forests can supply now and into the future. It also looks back at what occurred in the past. Age class information was not available at the time of reporting.

Data derived from initial RFAs in the CRA datasheets, specific to plantations, was generally unavailable, with only the West RFA classified by plantation type (Table 67). Plantation data for the Central Highlands and the North East RFA regions was sourced from the EVC representation. No further details were provided on the lack of plantation data in the CRAs; however, the absence of data leads to the assumption that the data did not exist or was not available at the time the CRAs were published.

Table 67: Plantation area for softwood and hardwoods across RFA regions as reported in the CRA documents (1996–99)

		RFA					
		East Gippsland	Gippsland	Central Highlands	North East	West	Total
Plantation Area (ha)		NA	85,700	10,320	65,400	64,352	225,772
Plantation Type	Softwood	NA	NA	NA	59,310	54,888	114,198
	Hardwood	NA	NA	NA	NA	14	14
	Undefined	NA	NA	NA	NA	9,450	9,450

Data source: Information derived from the CRAs accessed via the ABARES website.

Statewide overview

Current data on Australia's commercial plantation estate is collated in the National Plantation Inventory (NPI) and reported in the ABARES *Australian plantation statistics* publication series as well as the ASOFR series. The *Australian plantation statistics* series comprises a five-yearly comprehensive update based on spatial data and an annual update based on tabular data. The reports in the series, including the latest five-yearly update *Australian plantations statistics 2016*[29] and *Australian plantations statistics update 2019*[30] support strategic forest industry planning and decision-making by presenting information on total plantation area, new planting and plantation ownership.

Information derived from the NPI showed in 2015 there was 421,000 hectares of plantations in the five Victorian RFA regions, representing the largest area of commercial hardwood and softwood plantations in Australia's states and territories. This comprises 222,000 hectares of softwood plantation, 199,000 hectares of hardwood plantation and 1,000 hectares of unknown or mixed species plantation.

[29] data.daff.gov.au/data/warehouse/aplnsd9ablf002/aplnsd9ablf201608/AustPlantationStats_2016_v.1.0.0.pdf
[30] agriculture.gov.au/SiteCollectionDocuments/abares/publications/AustPlantationStats_2019_v.1.0.0.pdf

Figure 33 outlines the trends over the past 18 years related to Victoria's plantation estate. The area of land identified as commercial softwood plantation remains fairly stable at around 220,000 hectares from 1999 to 2017. This contrasts with commercial hardwood plantation which saw a significant increase due to managed investment schemes (MIS) in the early 2000s. Over this period, hardwood (predominantly *Eucalyptus globulus*) plantations doubled in the 10 years from the 1999–2000 financial year, from 101,500 to 203,000 hectares. Following the demise of the MIS in 2010–11, this trend began to ease and by 2014–15 the estate began to retract, most prominently in areas where marginal plantation projects established through the MIS were not replanted. This equated to a net retraction of approximately 11,000 hectares compared to the maximum, with declines expected to continue in some MIS regions.

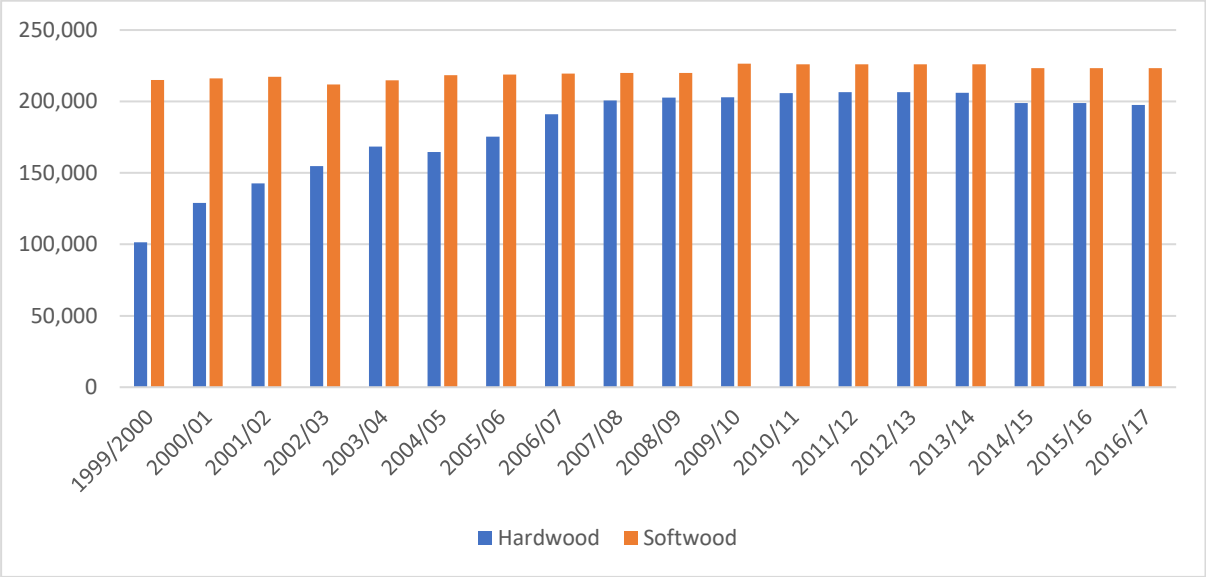

Figure 33: Plantation areas in Victoria, 1999–2000 to 2016–17

Source: ABARES (2007); ABARES (2018a).

Over the same time that Victoria's plantation area plateaued, the annual establishment of new plantations reduced sharply from a peak of approximately 38,000 hectares in 1999–2000, while limited new plantation area has been established since the 2012–13 financial year.

In response, the Victorian Budget 2017–18 included $110 million to be invested in growing Victoria's plantation supply through the establishment of plantations in the Latrobe Valley. As a first step towards delivering this initiative, planting of native blue gum seedlings was undertaken in August 2019 at three Crown land sites near Maryvale in the Latrobe Valley. Work is under way to identify further appropriate sites for new plantations, and planting at additional sites will continue in 2020. These plantings are just a first step, and the government is developing a broader Plantations Investment Strategy to provide a long-term approach for its work with industry to leverage plantation investment and establishment.

Area of plantations in Victorian RFA regions

Data from 2015 shows the area of plantations across the Victorian RFA regions. West Victoria has the largest plantation extent, with 257,000 hectares. Of the remaining plantation extent, 89,000 hectares is in Gippsland; 56,000 hectares, the North East; 12,000 hectares, the Central

Highlands; and 6 thousand hectares, East Gippsland. Information from previous years in the NPI showed a total of 300,000 hectares of plantations were in the Victorian RFA regions in 2001, 380,000 hectares in 2005 and 428,000 hectares in 2011 (Table 68).

Also of note, the proportion of hardwood to softwood has significantly increased, most markedly since the MIS stimulated investment in blue gum plantations. In 2015, around 47 per cent of Victoria's plantations were hardwood. Almost all plantations (over 99 per cent– both hardwood and softwood – are within RFA regions, with the greatest area in the West RFA region (61 per cent per cent) followed by Gippsland (21 per cent per cent) and the North East (13 per cent per cent). Plantation types in the West are 38 per cent softwood, whereas Gippsland plantations are around two-thirds softwood, and North East plantations are almost all softwood.

Table 68: Area of plantations in Victoria, by RFA region (2001, 2005, 2011, 2015)

RFA region	Plantation type			
	Hardwood ('000 ha)	Softwood ('000 ha)	Unknown or mixed ('000 ha)	Total plantation ('000 ha)
		2001		
Central Highlands	0	10	0	10
East Gippsland	1	3	0	4
Gippsland	26	53	0	80
North East	0	49	0	49
West Victoria	71	85	1	157
Total 2001	**99**	**199**	**2**	**300**
		2005		
Central Highlands	1	11	0	13
East Gippsland	0	2	0	3
Gippsland	32	56	1	90
North East	3	53	1	57
West Victoria	126	91	1	218
Total 2005	**163**	**213**	**4**	**380**
		2011		
Central Highlands	3	9	0	12
East Gippsland	3	2	0	6
Gippsland	36	60	1	96
North East	3	54	0	58
West Victoria	160	95	1	256
Total 2011	**205**	**221**	**2**	**428**
		2015		
Central Highlands	4	9	0	12
East Gippsland	4	2	0	6
Gippsland	29	59	1	89
North East	3	53	0	56
West Victoria	159	99	0	257
Total 2015	**199**	**222**	**1**	**421**

Note: Area figures reported may differ slightly from those reported in ASOFR 2018 due to the conversion of the vector format used in the NPI to the raster format used in ASOFR 2018. Totals may not tally due to rounding.

Source: NPI Dataset, ABARES 2016.

Indicator 2.1c: Annual removal of wood products compared to the volume determined to be sustainable for native forests and future yields for plantations

This indicator measures the harvest levels of wood products in relation to sustainable and predicted yields. These yields are outlined for both native and plantation timber.

Native timber

Timber harvesting in State forest is regulated under a management framework, which at its highest level is informed by the *Sustainable Forests (Timber) Act 2004*. The Act prescribes the process whereby timber resources on Crown land are allocated to VicForests via an Allocation Order. VicForests is required to comply with any conditions in the Allocation Order and Timber Release Plans, as well as complying with the *Code of Practice for Timber Production 2014*, which limits harvesting operations to a defined sustainable harvest level. Figure 34 illustrates the regulatory framework.

On 7 November 2019, the Victorian Government announced a Victoria's forest industry will transition fully from native timber to plantation feedstock by 1 July 2030. The announcement represented the largest area of native forest protected from timber harvesting in more than 20 years with the immediate protection of all remaining old growth forest and more than 96,000 hectares of State forest inhabited by Greater Gliders, Leadbeater's Possum and other threatened species.

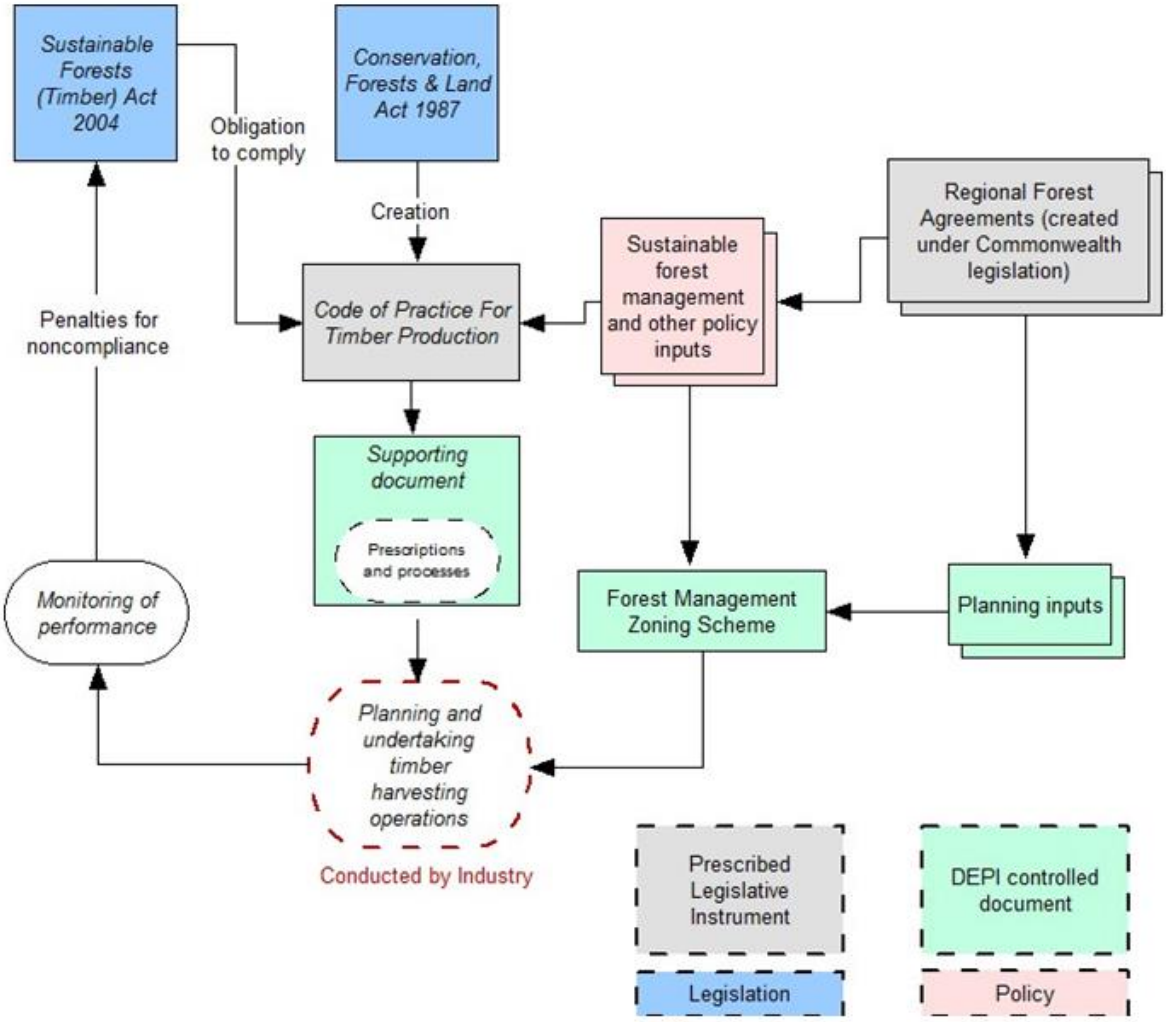

Figure 34: Framework for sustainable forest management and sustainable timber production (Source: DEPI now administered as DELWP).

Sustainable yield, wood supply modelling and harvest limits

Determining the sustainable yield in native forests requires complex modelling. It is underpinned by diverse data inputs (such as species mix, topography, aspect, etc.), sub-models, constraints, and adjustment factors (such as changes in the area and resource available through bushfires, increases in SPZs or SMZs or land tenure). More subtle influences, such as climate and other disturbances to the forest system, can also affect the sustainable yield that can be applied to native forests at local, regional or statewide scale.

Australia's State of the Forests Report 2018 defines sustainable yield as the:

> annual yield of high-quality sawlogs from multiple-use public native forests … that can be removed each year while ensuring maintenance of the functioning of the native forest system as a whole and the supply of wood products in perpetuity.
>
> (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018, p. 17)

Put simply, it is a measure of how much wood can be harvested from a forest over a long period of time, while maintaining wood supply levels and meeting sustainable use objectives for the forest (NSW Department of Primary Industries 2018). It is not static and requires regular updating through reconciliation with actual timber yields to ensure accuracy, currency and to account for changes in the level of timber resource available for harvesting.

Forests Act 1958 *and references to sustainable yield in Regional Forest Agreements*

From the commencement of the RFAs until 2004, the *Forests Act 1958* (Vic), required a review of the sustainable yield every five years, or other such time within that five years as was considered appropriate, at a Forest Management Area (FMA) level. In the event of there being changes (or not) to the sustainable yield, the Governor in Council would be advised, and a revised sustainable yield level set.

Sections 52A–C of the Act specified that, over the longer term, for each timber supply period the level of timber harvested from an FMA should not exceed the sustainable yield specific to that area, with any changes to be applied gradually and in line with the *Code of Practice for Timber Production 2014*.

All RFAs (via clause 45(e) of the Central Highlands RFA, clause 46(c) of the Gippsland and West RFAs, clause 45(c) of the North East RFA and clause 34 of the East Gippsland RFA), committed Victoria to 'implement the Integrated Forest Planning System and Statewide Forest Resource Inventory (SFRI) in time for the next review of sustainable yield due in 2001'. Through clause 71 of the Central Highlands RFA, the Parties acknowledged that the Agreement was expected to provide as a minimum the current legislated sustainable yield of D+ sawlogs (415,000 m3 per annum) from the Dandenong, Central and Central Gippsland Forest Management Areas (FMAs) for the next twenty years, but recognised that sustainable yield levels in Victoria are subject to periodic review.

In the CRA documents, the total legislated sustainable yield determined for the whole of the state (where RFAs were in place, but excluding East Gippsland where data was not available) was 801,314 cubic metres/year, of which about half was from the Central Highlands. It should

be noted that legislated sustainable yield volumes were recalculated when the initial RFAs were signed and have been regularly remodelled to account for fire and other disturbances to wood supply.

Table 69: Legislated Sustainable yield of D+ logs across RFA regions (CRA)

RFA	Central Highlands	East Gippsland	Gippsland	North East	West	Total
Sustainable Yields of Sawlogs (D+ Logs m^3/year)	415,000	NO DATA	319,000	66,500	814	801,314

Note: D+ Log grade information: http://www.vicforests.com.au/static/uploads/files/vicforests-instructions-code-of-procedure-log-buyer-log-specifications-v2-5-wfrf.pdf

Data source: Information derived from the CRAs accessed via the ABARES website.

It should be noted, that all references to sustainable yield, or the requirements for it to be calculated within the Act, specifically sections 52A–E, were repealed in 2004. The specific requirement for a sustainable yield as provided for under the *Forests Act 1958* was replaced by sustainability requirements under the *Sustainable Forests (Timber) Act 2004*.

The Sustainable Forests (Timber) Act 2004

The *Sustainable Forests (Timber) Act 2004* (SFT Act) was introduced as part of a broad program of reforms for Victoria's forest and timber industry, including the creation of VicForests in 2003. VicForests is a state-owned enterprise responsible for the sustainable harvest, regeneration and commercial sale of timber from Victoria's public forests on behalf of the Victorian Government.

The SFT Act provides a legislative framework for sustainable forest management and sustainable timber harvesting in State forests. Among other things, it permits the allocation of timber to VicForests from areas of State forest available for timber harvesting. Part 2 section 5 of the SFT Act outlines the principles for ecologically sustainable forest development, underpinned by section 11, which enables the Minister to establish a sustainability charter, and section 12, which specifies VicForests' is required to respond to such a charter.

Since 2004, VicForests has operated under the SFT Act (and other relevant legal requirements) and has worked with government agencies and other stakeholders to achieve its corporate objectives within this framework.

Eastern Victoria

The Allocation Order

The allocation and vesting of timber resources to VicForests, for the purpose of harvesting and selling of the resources, is authorised through an Allocation Order (AO) issued by the Minister for Agriculture under Part 3, s. 13 of the SFT Act. The Allocation Order 2013 was last amended in April 2019 and applies only to State forest east of the Hume Highway where timber harvesting is a permitted forest use in all areas identified as GMZ or SMZ according to the Forest Management Zoning Scheme.

Harvest area limits

The AO specifies the area limits that VicForests may harvest in a defined time period. The first AO was released in August 2004 with subsequent amendments made in 2007 and 2010 to allow for salvage harvesting of major fire affected areas.

The first AO specified the maximum area able to be harvested for each forest type for each five-year period over the following 15 years. The maximum harvest areas listed in the order were calculated based on meeting the timber supply schedule at that time and based on nett harvest area, that is, the actual footprint of the harvest area.

From May 2010, changes were made to the method for defining harvest area limits. The AO outlines the five-year harvest area limit. This is calculated as the gross total area divided by the notional rotation age (83 years for ash and 112.6 years for mixed species) multiplied by five to convert to a five-year forest area limit. In this instance, gross harvest area is the total allocated area of the coupe and includes areas that can, and cannot or will not, be harvested – that is, areas protected under the *Code of Practice for Timber Production 2014* and those where the timber available is not commercially suitable or commercially viable.

Table 70 and Table 71 show the annual total areas harvested in eastern Victoria compared with the five-yearly harvest limits defined by the AOs applicable for the corresponding periods. It is important to note that the actual area harvested has always been less than the five-year harvest area limits would allow.

Table 70: Harvest vs maximum Allocation Order area, 2004–05 to 2008–09

	Actual harvested area (nett ha)						AO maximum area for period (ha)	per cent of Allocation
Forest type	2004–05	2005–06	2006–07	2007–08	2008–09	Total		
Ash	1,271	1,078	850	1,022	933	5,154	7,810	66
Mixed species	2,520	2,701	2,325	2,366	2,424	12,336	21,660	57

Note: Additional 6, 110 ha (of an approved allocation order of 56,540 ha) harvested to salvage timber from on fire affected stands.

Source: DSE (2010).

Table 71: Harvest vs maximum Allocation Order area, 2009–10 to 2012–13

	Actual harvested area (gross ha)					AO Maximum harvest area for period (hectares) (5 yrs)	per cent of Allocation
Forest type	2009–10	2010–11	2011–12	2012–13	Total (4 yrs)		
Ash	3,712	2,776	3,238	2,594	12,629	17,400	71
Mixed species	5,880	5,032	3,525	2,724	9,332	71,800	24

Notes: The coupe area listed above includes forest stands impacted by fire.
A gross area harvest figure retrospectively applied for 2009-10.
Four years only due to new AO being issued on 1 October 2013.

Source: Department of Economic Development, Jobs, Transport and Resources (DEDJTR) (2017). Internal

Table 72: Harvest vs maximum Allocation Order area, 2013–14 to 2016–17

Forest type	Actual harvested area (gross hectares) 2013–14	2014–15	2015–16	2016–17	2017–18	Total	AO Maximum harvest area for period (ha)	per cent of Allocation
Ash	2,090	2,273	2,583	2,386	1,988	11,319	14,200	80
Mixed species	2,034	2,820	2,847	3,003	3,638	14,344	70,000	20

Source: VicForests (2018a).

The current AO (revised April 2019) specifies a gross five-year harvest area limit of 14,200 hectares for ash forest type, and 70,000 hectares for mixed species forest type (Table 72).

Timber resource planning

A Timber Release Plan (TRP) is VicForests' strategic plan that identifies the likely location and extent of timber harvest operations over the next three years.

Prior to October 2013, the process for allocating and vesting the timber resource in VicForests involved two-steps; requiring both an AO and subsequent approval of a TRP by the then Minister for Agriculture and Primary Industries. DPI reviewed the SFT Act in 2012, and it was amended in 2013 to enable a one-step allocation process, whereby once the Minister for Agriculture has issued and gazetted the AO vesting the timber resource to VicForests, VicForests develops and publishes a TRP. The TRP no longer forms part of the approval, issue or gazettal process.

Using the location and extent of the timber resources and the harvest area limits set by the AO, VicForests is then develops wood supply models and Resource Outlooks.

VicForests' strategic wood supply models

To meet the requirements of the SFT Act, in addition to supporting its own operational, commercial and forest management activities, VicForests has developed, and now maintains, a strategic wood supply model. This model is critical to providing VicForests, industry and government with Resource Outlooks.

Figure 35: Strategic wood supply model and Resource Outlook process

Source: VicForests (http://www.vicforests.com.au/planning-1/resource-outlook-2017).

The strategic wood supply model is used to evaluate timber supply over a 100-year period and is updated regularly. The results inform future sales contracts and guide harvesting in the landscape.[31]

VicForests' strategic wood supply model relies upon a range of systems and processes to develop forecasts of the volumes of timber able to be sustainably supplied from the available forest in the medium and long term.

In simple terms, the process considers how much forest is available, how much timber is currently contained in these forests, how much it is predicted to grow over time and how much timber is likely to be produced by the time of expected harvest.

The strategic wood supply model is updated regularly to account for changes in the resource base (as was formerly the case when calculating sustainable yield) and includes market conditions in the short to medium term. It includes:

- changes to the forest description (what the forest looks like)
- harvesting, bushfires and other events that can alter the age and structure of the forest
- data about the forest structure and mix of tree species (derived from remote sensing)
- information about the amount of timber that may be produced by monitoring current timber harvesting activity
- changes to the available area due to regulatory and policy decisions.

Various scenarios are tested to determine likely impacts on the quantity of timber that can be harvested, future timber supply and long-term sustainability. Risk factors that have the potential to impact on timber resource availability are also included and built into the model.

The overall trajectory of harvest volumes in more recent times has been decreasing, with harvest volumes in 2018 approximately 800, 000 cubic metres less than those in 2005. A significant reduction in harvest volumes is apparent after the 2009 Black Saturday bushfires. However, in 2010 there was a spike in volume from salvage harvesting in the Central Highlands and East Gippsland. Since 2013, overall volumes have remained largely stable as a requirement to honour existing supply commitments. The volume data is supplied in full in appendix 8.

VicForests' Resource Outlook

VicForests' Resource Outlook is a forecast that indicates how much sawlog timber is able to be commercially supplied from the State forests in eastern Victoria in the medium term on a sustainable basis. It is used by VicForests to guide the volume of timber that is made available to the market based on species group – ash and mixed species.

VicForests updates the Resource Outlook before releasing timber in a significant timber sales event. Similarly, the Resource Outlook is normally updated after significant events that could change the resource base (such as bushfires) and which may have resulted in changes to the

31 VicForests http://www.vicforests.com.au/planning-1/resource-outlook-2017, viewed 2 August 2019

assumptions used to that underpin the strategic model. VicForests' most recent Resource Outlook was published in 2017.

Independent reviews of VicForests' sustainable wood supply model and Resource Outlook process

Since 2010, when the Victorian Government delegated responsibility for determining harvest volumes to VicForests, the outlined process has been reviewed for its reliability, durability and accountability by both the Victorian Auditor-General's Office (December 2013) and the Victorian Environmental Assessment Council (VEAC) (April 2017). On each occasion, the methodology, processes, assumptions, interpretation and reporting has been analysed in significant detail to determine both general compliance with the SFT Act and associated legislation, codes and prescriptions, but also to identify and provide advice on areas for improvement.

In its assessment report, VEAC identified that the modelling approach used by VicForests is widely used for modelling estimated sustainable fibre and wood supply levels and applies industry-standard modelling tools, makes appropriate assumptions and produces reasonable estimates resulting in a wood supply modelling process that is rigorous and repeatable. VEAC's views were consistent with the Auditor-General's review of Victoria's strategic wood supply modelling process that found that the modelling approach is sound, the assumptions that underpin the approach are appropriate, and the sustainable harvest levels are reasonable.

Harvest volumes

The volume of D+ sawlogs harvested from eastern Victoria RFA regions has decreased from 532, 300 cubic metres in 2004–05 to 230, 800 cubic metres in 2018–19, as outlined in Figure 36. The calculated sustainable yield over the corresponding period has also declined from 517, 400 cubic metres in 2004–05 to 253, 000 cubic metres. This apparent decline is in part because the 2008 JoSHL forecast included all timber that could be environmentally sustainably harvested, whereas subsequent sustainable harvest level determinations were only for the merchantable portion of that timber. Declines in the resource outlook are also due to changes in resource availability as harvestable areas have been reduced through the impacts of fire and zoning changes for the protection of Baw Baw Frog and Leadbeater's Possum (including the ongoing reservation of Leadbeater's Possum colonies and including an allowance for future detections).

When compared across the total period (harvest years 2004–05 to 2018–19), cumulative harvest volumes have not exceeded the cumulative sustainable yield for the period. Only two seasons, 2004–05 and 2017–18, recorded harvest levels that exceeded the sustainable yield applicable to that year, but these were balanced by lower harvest levels in other years. These overcuts, each equivalent to less than 5 per cent of the corresponding sustainable yield, enabled VicForests to balance contracted commitments over the life of sales agreements.

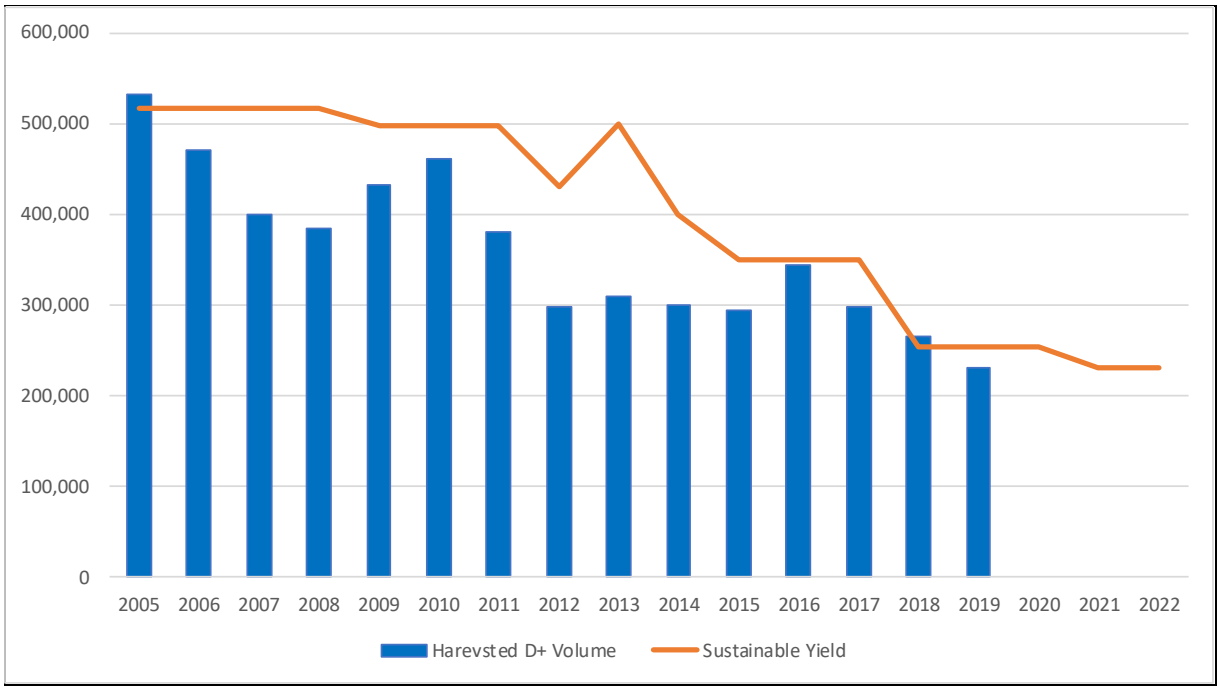

Figure 36: Harvest volume and sustainable yield 2005–19

Source: VicForests Resource Outlooks from 2011, 2012, 2013, 2014, 2016–17, pre-2011: Joint sustainable Harvest Levels (JoSHL). (NB 2008 JoSHL figures were calculated on a different basis from subsequent sustainable yield levels.)

Western Victoria

Context

The AO does not cover the western areas of Victoria. The allocation of timber resources is instead subject to a different method of determination, allocation and approval process to that undertaken in eastern Victoria. In the west, the Timber Utilisation Plan (as outlined below on page 202) applies to State forest covered by the West Victoria RFA but also areas in the north-west where there is no RFA in place (Figure 37).

The products derived from harvested areas in western Victoria are often specialised in nature and cannot be readily sourced elsewhere. The operations are small in scale and are driven by local demand.

The West Victoria RFA was signed in March 2000, encompassing the Portland, Otways and Midlands FMAs, the southern half of the Horsham FMA and a small section of the Central FMA. Since then, harvesting has ceased in the Portland (2003) and Otways (2008) FMAs, is limited in the Horsham FMA and is restricted only to a small area within the Midlands FMA.

As outlined previously, all references to sustainable yield, or the requirements for it to be calculated, within the *Forests Act 1958* were repealed in 2004 and replaced by the *Sustainable Forests (Timber) Act 2004*.

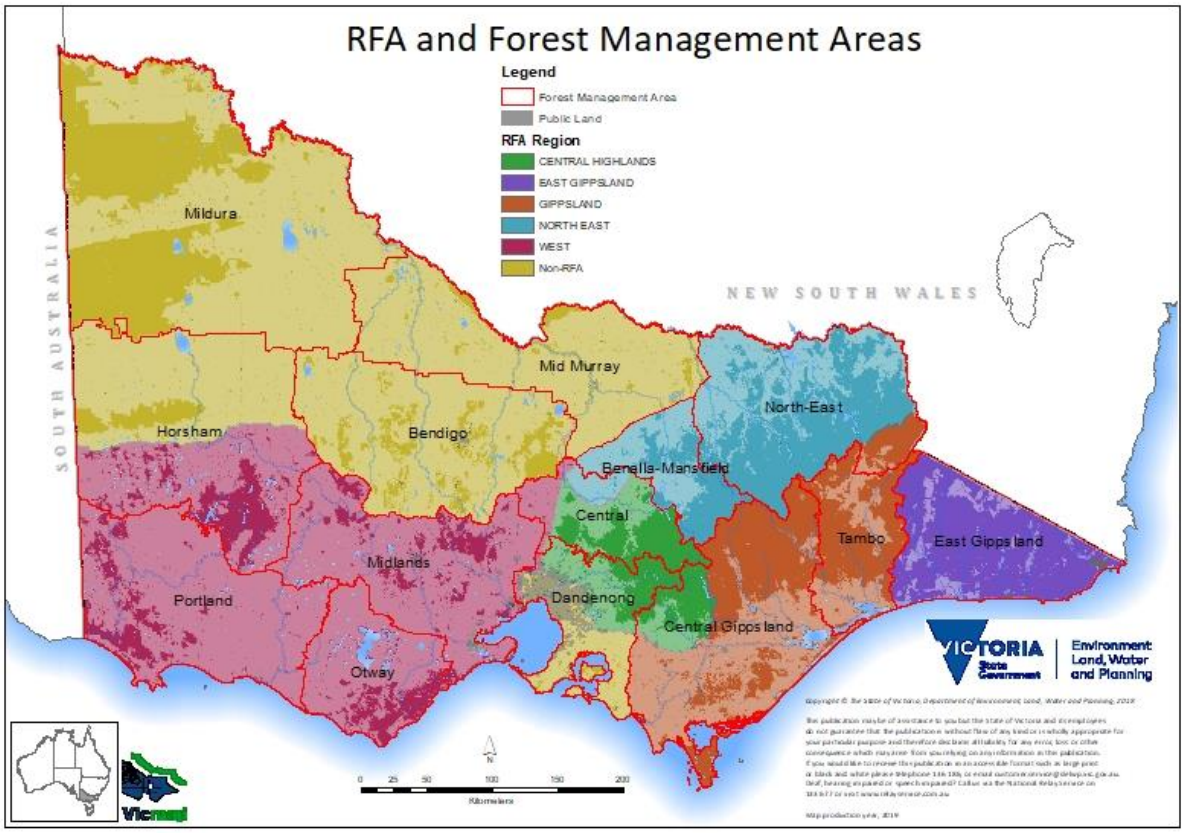

Figure 37: Forest Management Areas and RFA areas

Source: DELWP Corporate spatial data library.

Sustainable yield estimates

Section 72 of the West Victoria RFA (March 2000) outlined that 77,900 cubic metres of D+ sawlogs could be expected to be provided annually made up of 40,000 cubic metres (Midlands), 27,000 cubic metres (Otways), 10,000 cubic metres (Portland) and 900 cubic metres (Horsham).

In 2002, revised D+ sawlog estimated sustainable resource for all western Victoria (including those areas not covered by the RFA) were determined as outlined in Table 73 below. Timber resource information by FMA – including forest area available for timber production, eucalypt species (Red Gum/Box-Ironbark/Sugar Gum/mixed species), growth stage and standing volume estimates – was used as the basis for determining the estimated sustainable resource.

Table 73: 2002 estimate of sawlog sustainable yield – western Victoria

FMA[a]	State forest area	Estimated D+ sawlog sustainable resource (m^3/year)
Otways		27,100
Portland		7,600
Horsham		900
Midlands	Wombat	7,000
	Mt Cole	800
	Other	800
TOTAL		**44,200**

a Mid-Murray FMA is not covered by the western Victoria RFA.

Source: Review of Commercial Forestry Management in Western Victoria, DEPI, August 2013.

As a result of the cessation of forest harvesting in the Otways and Portland FMAs and in advance of delegating responsibility for forest utilisation in western Victoria to VicForests, a revised estimate of sustainable harvest levels was made in 2013, as outlined in Table 74. This was based on a desktop assessment that accounted for updated data availability and changes in area available for harvesting from the identification and allocation of new environmental conservation areas and amendments to forest management plans.

Table 74: 2013 estimate of sawlog sustainable yield – western Victoria

FMA[a]	State forest area	Estimated D+ sawlog sustainable resource (m^3/year)
Otways		0
Portland[b]		6,600
Horsham		400
Midlands[c]	Wombat	0
	Mt Cole	1,500
	Other	1,000
TOTAL		**9,500**

Notes:
a Mid-Murray FMA is not covered by the western Victoria RFA
b Minimal harvesting only
c Sawlog no longer harvested

Source: Review of Commercial Forestry Management in Western Victoria, DEPI, August 2013

Wood and Timber Utilisation Plans

Since November 2014, VicForests has been responsible for Community Forestry Operations, specifically managing the harvesting, regeneration and sale of wood from public land in

western Victoria. Community Forestry Operations provide the opportunity for local products to be sourced and utilised locally under forest produce licences issued by VicForests under delegation from the Minister for Agriculture and in accordance with the *Forests Act 1958* (Vic).

Prior to that time, timber harvesting was the responsibility of DEPI (now DELWP), whereby coupes identified and planned for harvesting were placed on a three-year Wood Utilisation Plan (WUP) based on the sustainable yield outlined in the RFA and the licence commitments of processors in the region.

To make a clear distinction between areas approved under the former arrangements and those approved by VicForests, the WUP has been replaced by the Timber Utilisation Plan (TUP). The TUP, like the WUP, lists VicForests' planned harvesting and regeneration activities for a period of up to five years. It is updated annually to maintain VicForests' ability to meet supply commitments in the short and medium term.

Harvest volumes

Harvesting operations under TUP are generally applied for small-scale forestry operations and service the community need. Table 75 provides information on the harvest volumes in the West RFA.

Table 75: Harvest volumes in the West RFA

Year	Fencing (each)	Firewood (m^3)	Sawlog (m^3)	Residuals (m^3)	Residual log (lineal m)
2008	2,164	1,782	496	96	442
2009	1,718	3,109	308	109	329
2010	392	3,064	585		226
2011	2,923	3,540	838	290	506
2012	1,084	4,846	382	147	740
2013	1,176	6,379	922	100	893
2014	259	8,067	1,417	81	1,770
2015	1,257	7,307	1,040	34	1,641
2016	1,135	8,632	1,285	85	848
2017	704	6,282	1,247	839	1,009
2018	274	7,797	1,430	1,155	658

Note: Data from Mildura, Bendigo and Mid-Murray FMA not included as they are outside the WEST RFA area.

Source: VicForests (2019).

Plantation timber

In 2017–18, approximately 7.8 million cubic metres of plantation timber was harvested in Victoria. Approximately 46 per cent of this was hardwood and 54 per cent, softwood (ABARES 2019). This generally aligns with the proportion of plantations that are hardwood (47 per cent per cent) and softwood (53 per cent). Almost all hardwood logs are used for pulp (over 99 per cent per cent) and 51 per cent of softwood harvest volume is processed as sawlog. As a proportion of Victoria's total plantation harvest, 45 per cent is hardwood pulplogs, 28 per cent is softwood sawlogs and 26 per cent is softwood pulplogs (Table 76).

The volume of plantation logs harvested from each RFA region is unknown as these figures are calculated through ABARES plantation statistics, which do not disaggregate into RFA regions. In the absence of volume estimate, we may consider the proportional area based on volume, where around 60 per cent comes from the West RFA region, around 20 per cent from Gippsland, and around 15 per cent from the North East. However, without information on the maturity of plantations and expected harvest date it is difficult to accurately attribute an annual harvest volume to each region.

Table 76: Plantation timber harvest volume, 2017–18

Plantation type	Grade	Harvest volume (m^3)	per cent of total plantation type harvest volume	per cent of total harvest volume
Hardwood	Sawlog	32,982	1	<1
	Pulplog	3,544,230	99	45
	Other	0	0	0
Softwood	Sawlog	2,168,339	51	28
	Pulplog	2,014,549	47	26
	Other	79,028	2	1
Total		**7,839,128**		

Source: ABARES 2018a Forest and wood product statistics

Indicator 2.1d: Annual removal of non-wood forest products compared to the level determined to be sustainable

This indicator assesses the sustainability of harvesting of non-wood forest products. This includes herbaceous plants and tree ferns, tree components (such as seed, leaves or bark), mineral extraction and honey.

Plant material (non-timber)

The handling of protected flora[32] is regulated by DELWP to ensure that any harvesting or loss is ecologically sustainable. Under the FFG Act, a Protected Flora Licence or Permit from one of the regional offices of DELWP is required in order to collect protected native plants or undertake activities on public land which might kill, injure or disturb protected native plants.

In most cases, licence or permit applications are successful. However, DELWP may place conditions on the licence or permit, such as restricting the amount of protected flora that can be taken, the area from which it can be taken or the collection methods that can be used. In the case of works, DELWP may place conditions on a licence or permit which serve to avoid or minimise the loss of protected flora or to make good any disturbance caused.

Other forest products

For other forest produce, a Forest Produce Licence is required and DELWP is responsible for licensing relevant items. While the Minister for Energy, Environment and Climate Change and the Minister for Agriculture both have the delegation to issue Forest Produce Licences for forest produce (mentioned above) in the GMZ/SMZ, the collection of forest produce in SPZ areas is not permitted. DELWP, on behalf of the Minister for Energy, Environment and Climate Change, issues Forest Produce Licences for non-wood forest products in areas where such activities are permitted, generally in mixed-use forest outside SPZ.

A non-exhaustive list of licences granted for non-wood forest products is provided in Table 77; however, information on ceiling levels for licence provision is not recorded.

32 Protected Flora list https://www.environment.vic.gov.au/__data/assets/pdf_file/0011/50420/201706-FFG-protected-flora-list.pdf

Table 77: Register of Forest Produce Licences issued by RFA

Forest Produce Type	Commercial or Minor	Application Date	Quantity	Units	Royalty ($/unit)	RFA
Grass Tree Fronds	Commercial	2016	1,000	Bunches	2.1	West
		2017	1,000		2.2	
		2018	1,000		2.24	
Seed Capsules - *E. nitens*	Commercial	2016	200	kg	11.09	Gippsland, Central Highlands
		2017	200		11.09	
		2018			11.56	
Seed Capsules - *E. bosistoana*	Commercial	2016	100	kg	2.46	East Gippsland
		2018	50		2.46	
Firewood Salvage - VicRoads	Commercial	2017	Salvage	tonnes	11.8	East Gippsland
		2019	300		14.3	
Seed Capsules - *E. cypellocarpa*	Commercial	2017	20	kg	11.09	East Gippsland
Seed Extracted	Commercial	2018	150	kg	40.05	Central Highlands
Seed Capsules - *E. globoidea*	Commercial	2018	50	kg	2.46	East Gippsland
Leaf material - *E. radiata*	Minor	2019	2	kg	Waived	Central Highlands

Source: Office of Deputy Secretary – Regional Services – Fire and Land State-wide Coordination (Contact: Judy L Alexander)

Earth resources

Earth Resources Regulation is Victoria's regulator of exploration, mining, quarrying, petroleum, recreational prospecting and other earth resource activities. It operates within DJPR and undertakes the assessment and authorisation of earth resource projects in close collaboration with other regulators and agencies within the Victorian Government. Regulation protects local communities and the environment, thus facilitating the safe provision of business and job opportunities across the five RFA regions.

There are a range of tenement types that require licensing across Victoria (Table 78). The number of both exploration and mining licences have decreased since 2011–12, while prospecting and retention licensing has increased.

Table 78: Mineral tenement licences current as at 30 June 2018 for Victoria

Tenement type	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
Exploration licences	280	326	298	285	326	311	271	247	211	180	200
Mining licences	240	236	211	216	208	212	191	171	170	162	156
Prospecting Licences	n/a	n/a	n/a	n/a	1	13	31	41	51	54	59
Retention Licences	n/a	n/a	n/a	n/a	n/a	1	1	8	11	15	20
Totals	520	562	509	501	535	537	494	467	443	411	435
per cent Change year on year					+2.9	+0.4	-8.0	-5.5	-6.0	-6.4	+5.8

Source:, DJPR 2018

Between 2011–12 and 2017–18, the total area of Victoria covered by mineral exploration licences has steadily decreased (Figure 38).

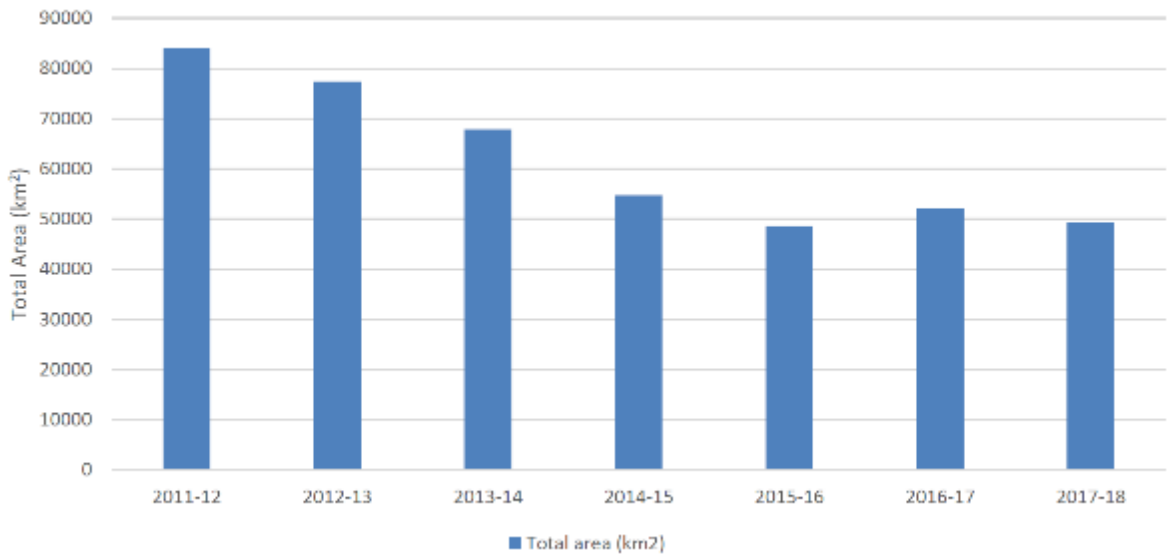

Figure 38: Total area of Victoria covered by mineral exploration licences

Source: DJPR 2018

The total mineral, extractive and petroleum revenue payable has increased substantially from $57.2 million in 2012–13 to $103.1 million in 2017–18 (Table 79) This has been due to the near doubling of royalties to be paid in the same time period, from $51.9 million to $99.1 million.

Table 79: Mineral, extractive and petroleum revenue payable ($A Millions), 2012–13 to 2017–18

Year	Fees and charges	Rent	Royalty	Mine stability levy	Total
2012–13	1.0	3.0	51.9	1.3	57.2
2013–14	1.1	2.6	45.1	1.3	50.1
2015–16	0.7	2.0	47.7	1.4	51.8
2016–17	0.7	1.4	83.1	1.4	86.6
2017–18	0.8	1.7	99.1	1.5	103.1

Source: DJPR 2018

The royalty revenue component is further explored in Table 80, showing that the total mineral extractive and petroleum sector royalties payable have also nearly doubled over the same period. Of all the sectors, coal mining royalties were the highest and demonstrated the largest increase, from $36.6 million in 2012–13 to $84 million in 2017–18.

Table 80: Mineral, extractive and petroleum sector royalties payable in the financial year ($A Millions) for Victoria, 2012–13 to 2017–18

Year	Coal	Minerals	Extractive	Petroleum	Total
2012–13		43.5	8.3	0.1	51.9
2013–14		40.6	4.4	0.1	45.1
2015–16	36.6	5.7	6.2	0.1	47.7
2016–17	66.9	6.1	5.9	4.2	83.1
2017–18	84	5.6	6.2	3.2	99.1

Source: DJPR 2018

Indicator 2.1e: The area of native forest harvested and the proportion of that effectively regenerated, and the area of plantation harvested and the proportion of that effectively re-established

This indicator reports on the extent of native forest harvested and the success of regeneration on harvested sites. The government's forest management framework provides the basis under which these operations occur.

VicForests is responsible for ensuring native forest coupes are successfully regenerated post-harvest, as defined under the *Code of* Practice *for* Timber Production *2014*.

The *Management Standards and Procedures for timber harvesting operations in Victoria's State forests 2014*, incorporated in the Code*,* lists the minimum regeneration standards required. The standards outline three regeneration features:

1. minimum 65 per cent of plots stocked (standard intensity)
2. no discrete unstocked areas greater than one hectare in even aged stands, or greater than 2 hectares in uneven aged stands
3. at least 10 acceptable seedlings/coppice of those eucalypt species present on the site prior to harvesting must be present on the regenerated site.

The Code also lists the survey techniques that must be followed by the harvest manager to confirm regeneration success. The surveys are to be undertaken 15 to 30 months after seedfall and/or sowing in even aged stands, and 15 to 36 months after seedfall in uneven aged stands.

Where stocking health or early growth is inadequate, remedial work must be conducted as soon as practicable and within five years of the previous regeneration attempt to obtain adequate regeneration. Further assessment must be undertaken following remedial treatment to ensure that it has been successfully regenerated. Figure 39 indicates that for most years' regeneration is largely achieved but for a small proportion that requires a final regeneration survey. Those areas that still require a regeneration survey are carried over to the next year. This means that, as defined by legislation, 100 per cent of coupe area will be surveyed and regeneration will be achieved on those coupes as per the specifications outlined in the Code.

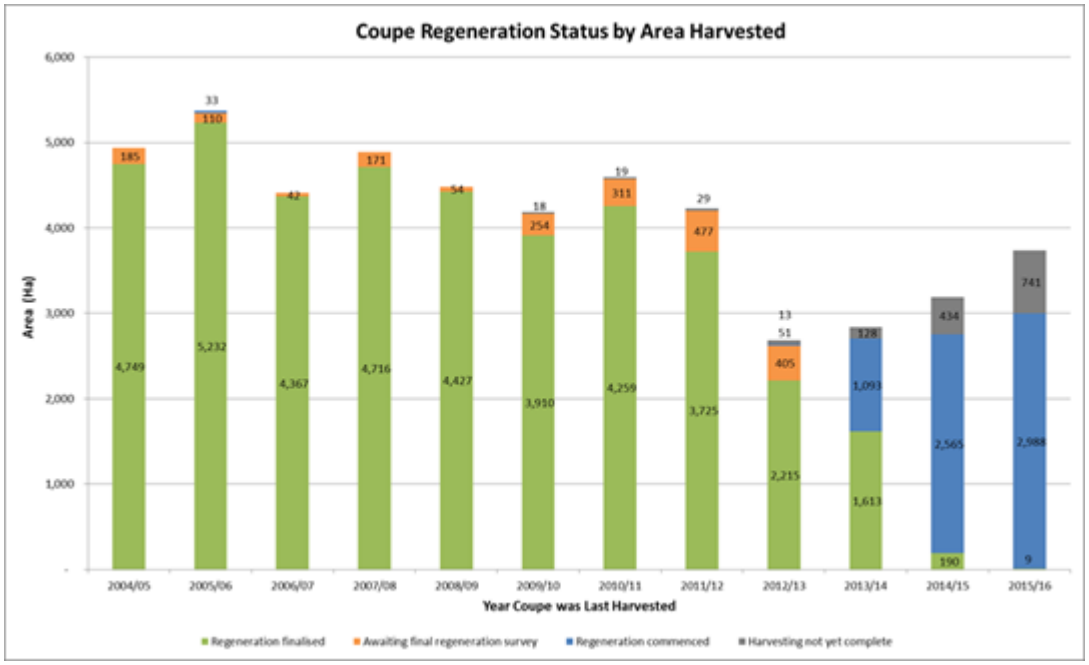

Figure 39: VicForests managed coupes – regeneration status of area harvested

Source: VicForests corporate data

Re-establishment of the plantation estate

Following from the expansion of the hardwood plantation estate after the MIS scheme, many areas have not been replanted and have returned to their previous land uses. Jenkin (2018) estimates that, nationally, over 100,000 hectares have not been replanted in the period between 2005–06 and 2015–16, generally in areas where plantations were established on marginal sites. The area of softwood plantation in Australia, however, expanded by 35,648 hectares over the same period, but this has been limited since 2015–16. The ABARES plantation statistics for Victoria (Table 68 and Figure 40) illustrates the decline in plantation establishment.

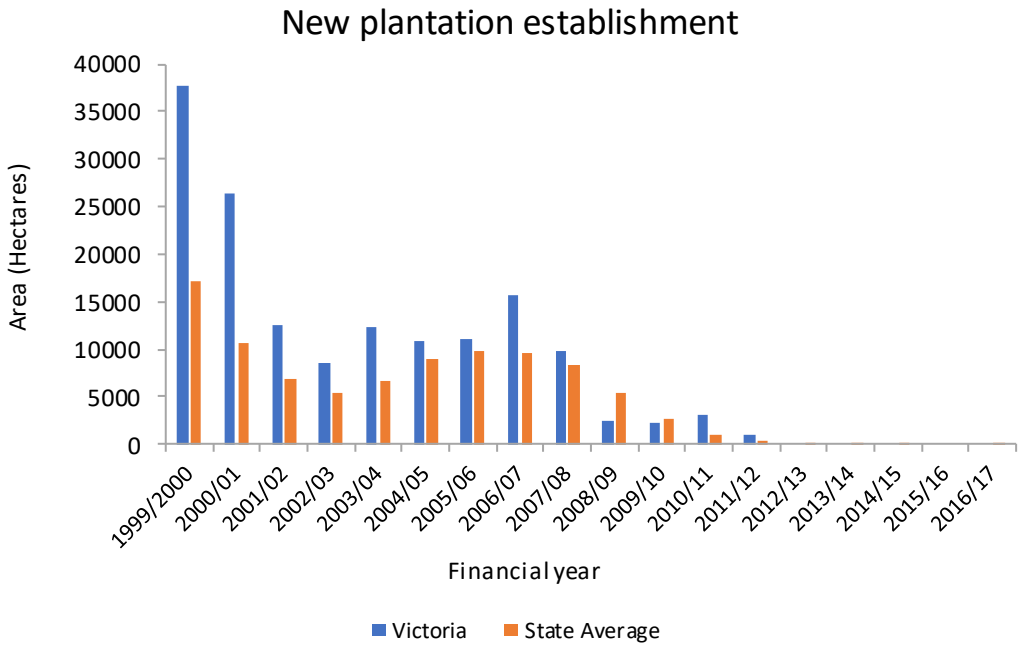

Figure 40: Additions to Victoria's plantation estate, 1999–2000 to 2016–17, against the average area of all other states

Source: Australian Department of Agriculture and Water Resources ABARES (2018a).

Indicator 6.1a: Value and volume of wood and wood products

This indicator presents information on the value and volume of wood and wood products that are directly generated by the forest and wood products industries.

VicForests manages its resource to achieve maximum utilisation from harvest to deliver maximum economic return. In this way, its operations provide three types of timber: sawlog, pulplog and other wood (VEAC 2017, p. 20) where a single log may yield multiple products. Sawlog is high-quality timber from the lower to middle part of the tree trunk. Depending on its quality, sawlog can be used in products from pallets and roofing battens to furniture and flooring. Pulpwood can be from the branches and upper trunk, in addition to lower trunk sections that are not of sawlog quality. Pulpwood is primarily used to make paper and cardboard. A small amount of wood may be used for other purposes such as firewood, posts and poles.

Log and pulp prices have been relatively stable since 2007-08. The spike in "hardwood plantation saw and veneer logs" may be due to the limited size of this market, accounting for only 4 per cent of total harvested hardwood plantations logs (ABARES 2018b). The average increase in log price index between 2007-08 and 2016-17 was 20 per cent with the highest increase being for softwood pulplogs at 46 per cent.

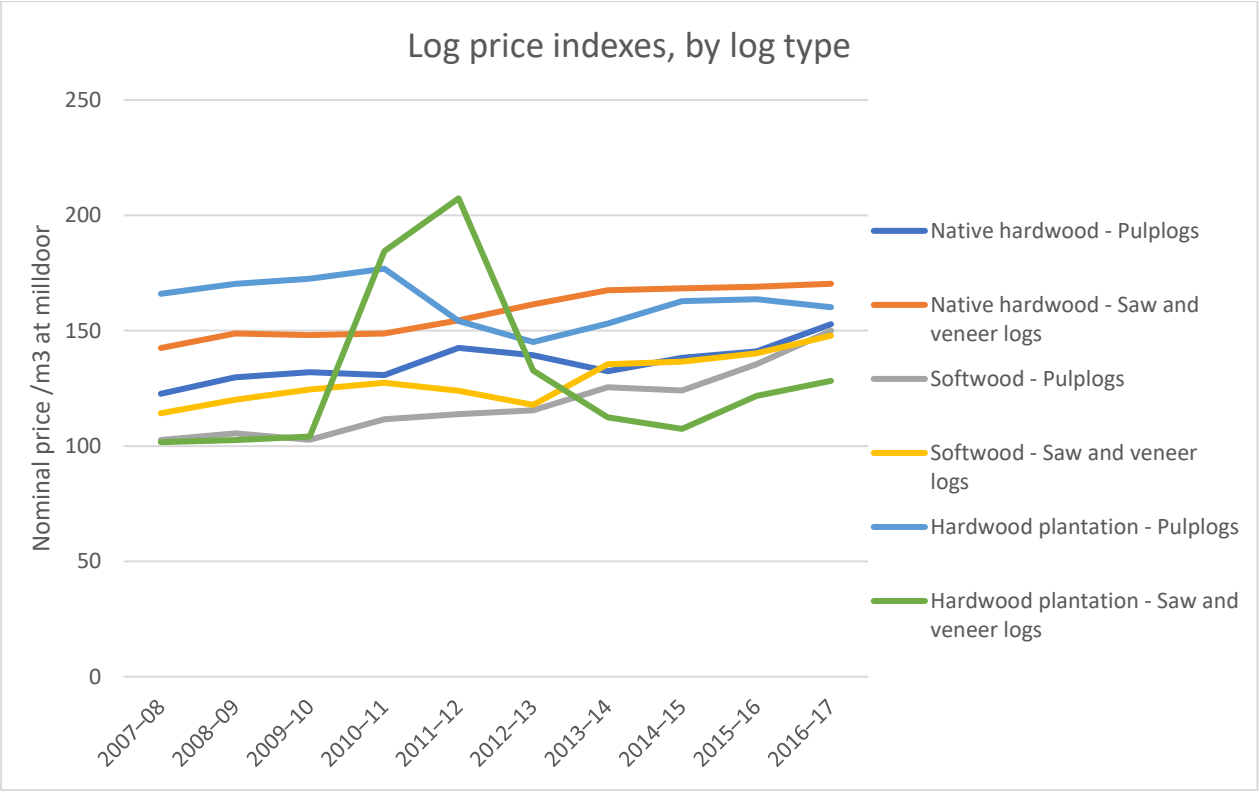

Figure 41: Index of nominal prices paid per cubic metre at mill door

Note: Base year 1999–00 = 100. Excludes other log types such as posts, poles, fencing and firewood removals.

Sources: ABARES 2019

Native timber

In 2018, the Central Highlands accounted for approximately 75 per cent of all native forest harvested volume (Table 81). The volume of native logs harvested across four RFA regions (West RFA excluded) has decreased over time. Since 2005, total harvest volume has decreased by an average of 3 per cent per year, with the most significant decrease in East Gippsland (Figure 42). Harvest volumes for the West RFA have not been included as levels of commercial harvesting in that region have been relatively low and largely for community purposes since 2008.

Table 81: Native forest harvest volume and sales stumpage revenue, 2018

RFA region	Harvest volume[a] (m^3)	Per cent of total harvest volume (per cent)	Sales stumpage revenue[a] ($)	Per cent of total sales stumpage revenue (per cent)
Central Highlands	867,488	75	21,043,987	75
East Gippsland	141,163	12	3,037,723	11
Gippsland	112,700	10	3,084,502	11
North East	33,114	3	1,046,897	4
Total	**1,154,465**	**100**	**28,213,109**	**100**

a Gross timber harvest volume and sales stumpage revenue across all species and grades.

Source: VicForests corporate data

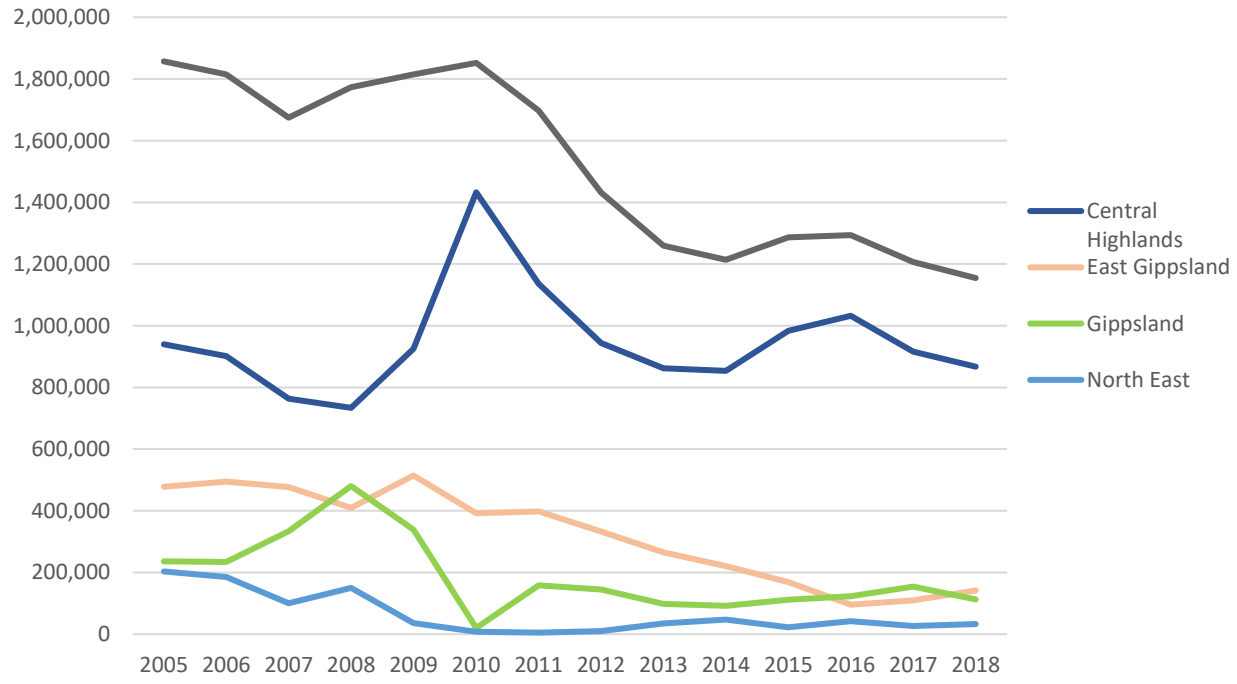

Figure 42: Native forest log timber harvest volumes (m^3), by Victorian RFA region, 2005–18

Note: Data represents gross timber harvest volumes across all species and grades.
Spikes in volume caused by salvage operations after bushfires in 2006 and 2009.

Source: VicForests corporate data

In 2018, stumpage revenue for native timber sales was $28 million across four RFA regions (Central Highlands, East Gippsland, Gippsland and North East) (Table 81). Of this, $22.3 million is sales stumpage revenue from sawlog ($16 million from ash and $6.3 from mixed species) and $5.7 million from pulplog ($3.1 million from ash and $2.6 million from mixed species). The Central Highlands RFA region contributes around three-quarters of total stumpage revenue,

followed by East Gippsland and Gippsland (both 11 per cent per cent). This broadly aligns with the average volume of timber harvested from each RFA region.[33]

In 2018, almost 70 per cent of stumpage revenue was from ash, with the remainder from mixed species. The proportion of total stumpage revenue produced by ash is higher than the proportion of total harvest volume that is ash. This is because ash logs have a higher market value than those of mixed species. Over 55 per cent of stumpage revenue is contributed by ash in the Central Highlands and this is predominantly from sawlog grade timber.

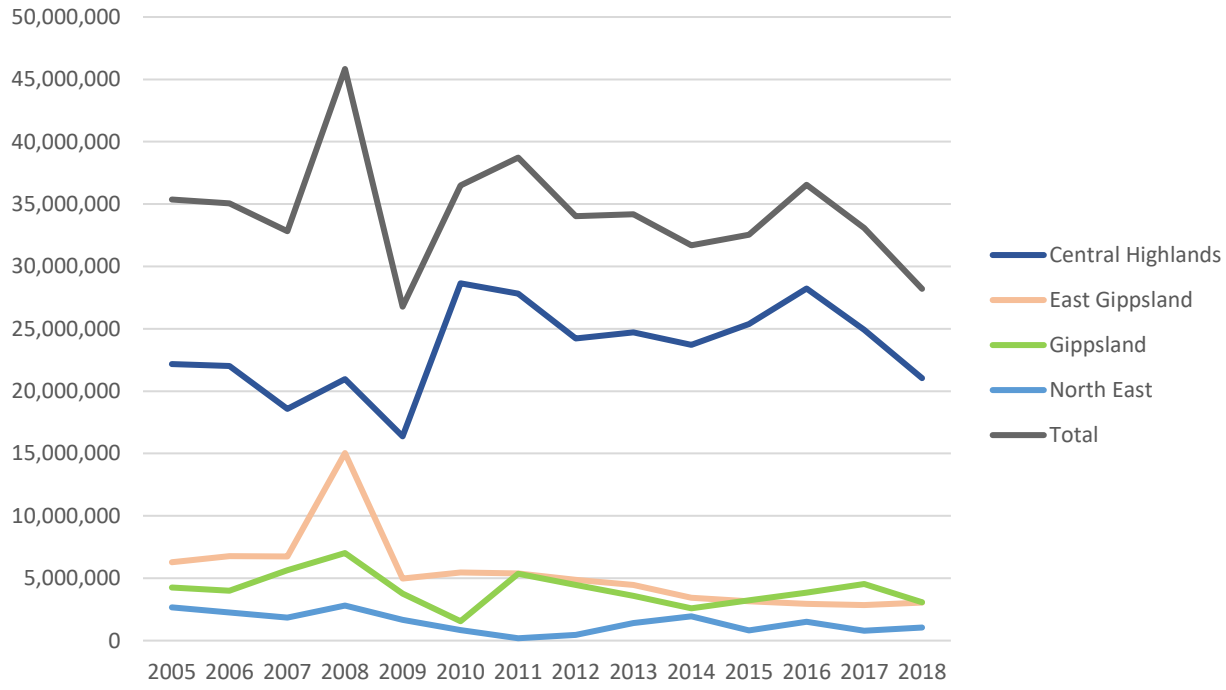

Figure 43: Native forest timber sales stumpage revenue ($), by Victorian RFA region, 2005–18

Note: Gross sales stumpage revenue across all species and grades.
Spikes in revenue caused by salvage operations after bushfires in 2006 and 2009.

Source: VicForests corporate data

33 Note that harvest volumes in a year do not align with sales volumes and therefore stumpage revenue in any year due to the influence of placing timber in storage for later sale.

Plantation

The volume of plantation logs harvested from each RFA region is unknown as these figures are calculated through ABARES plantation statistics, which do not disaggregate into RFA regions. The vast majority of plantations in Victoria are privately managed.; HVP Plantations is the major operator, with over 170 thousand hectares of softwood and hardwood plantation across the state, or approximately 40 per cent of the state's total plantation area. Softwood operators OneFortyOne and Australian Bluegum Plantations have significant assets in the Green Triangle in far west Victoria and south eastern South Australia, while Midway is the primary hardwood grower and processer in the Colac–Otway region, with facilities in Portland and Geelong.

The volume of plantation timber harvested across Victoria has increased significantly over the past decade. Since 2007–08 total plantation harvest volume has grown by an average of 6 per cent per year. This has been driven predominantly by an increase in the volume of hardwood pulplog harvested (Figure 44).

Table 82: Plantation timber harvest volume, Victoria, 2017–18

Plantation type	Grade	Harvest volume (m^3)	per cent of total plantation type harvest volume	per cent of total harvest volume
Hardwood	Sawlog	32,982	1	<1
	Pulplog	3,544,230	99	45
	Other	0	0	0
Softwood	Sawlog	2,168,339	51	28
	Pulplog	2,014,549	47	26
	Other	79,028	2	1

Source: ABARES 2019

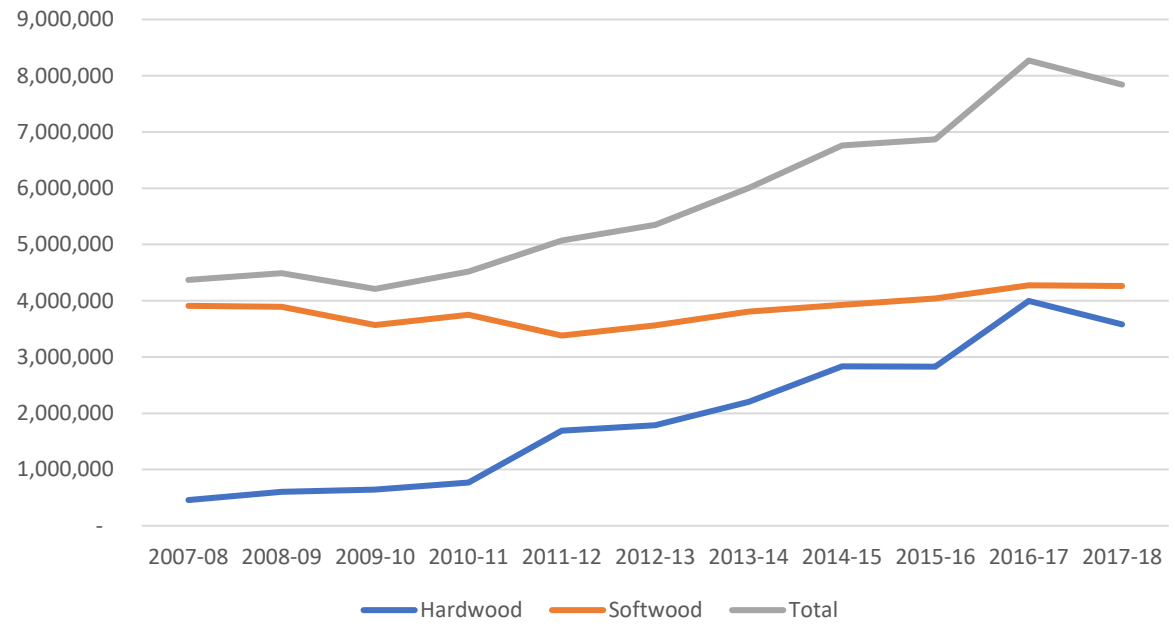

Figure 44: Plantation timber harvest volumes (m^3), Victoria, 2007–08 to 2017–18

Source: ABARES 2019

Firewood

In Victoria, firewood is provided from forests directly to the public for domestic use (known as domestic firewood). This occurs in designated collection areas managed by DELWP and Parks Victoria, and does not form part of the AO. There is an autumn collection season (1 April to 30 June) and a spring collection season (1 September to 30 November). A household is not allowed to collect more than 16 cubic metres a financial year, and a person is not allowed to collect more than 2 cubic metres in a day. It is illegal to sell wood from public collection areas or to use wood in a commercial business. Firewood is also collected for direct domestic use from forests on private land.

Firewood is also harvested from forests by businesses who then sell it on to households and businesses (this is known as commercial firewood). Although not a primary purpose of its operations, firewood is extracted from public forests by VicForests as a by-product of timber harvesting in the east of the state, or under community forestry harvesting operations in the West RFA.[34] Firewood is also produced from plantations and farm forestry on private land. Table 83 outlines the different sources of domestic and commercial firewood from public and private land in Victoria. The sources that are available in a particular area vary across the state.

34 VicForests 'Fact sheet: Commercial firewood sales', available at: http://www.vicforests.com.au/static/uploads/files/vicforests-firewood-fact-sheet-wfjpybkftntp.pdf

Table 83: Sources of domestic and commercial firewood from public and private forests in Victoria

Forest type	Domestic firewood	Commercial firewood
Public forests	Natural falls By-product from DELWP and Parks Victoria forest and fire management operations By-product from VicForests harvesting operations Collection alongside local municipal roads where permitted by councils	VicForests harvesting operations
Private forests	Natural falls or tree cutting on private properties	Primary or by-product of plantations and farm forestry

Firewood consumption in Victoria

Wood is the main source of heating for around 10 per cent of all Victorian households and around 25 per cent of regional households (Table 84) (ABS 2014). In 2008, around 4,700 regional households used wood for ovens and for heating water (ABS 2008). For some Victorians, free firewood is the only source of affordable fuel. In this way, domestic firewood plays an important role in supporting vulnerable households in parts of Victoria.

In 2010, it was estimated that Victorians use about 600,000 cubic metres of firewood each year, with around 13 per cent coming from public land (DSE 2010, pp. 1–3). A typical household in Victoria that uses firewood for heating was estimated to consume between 1 and 9 cubic metres per year (ibid., p. 3). Durable, slow-burning and charcoal-producing wood is preferred for firewood (such as red gum, ironbark, box and some mixed species) over faster-burning, ash-producing wood (such as ash species).

Table 84: Victorian households that use wood as main source of heating, 2014

Household type	Total number	per cent of households
Regional	159,900	24.9
Melbourne	65,300	4.1
Total	**228,100**	**10.2**

Source: ABS 2016

Domestic firewood

It is estimated around 40,000 cubic metres of firewood is provided to the public from State forests across Victoria's RFA regions each year (DELWP 2018). The volume provided to the public includes firewood from natural falls, and by-product from DELWP forest and fire management operations or VicForests harvesting operations in some parts of the state.

Since the permit system for firewood collection was abolished in 2011, volume estimation is derived from estimating natural falls and historic firewood collection data. The figures presented are based on intelligence and estimations from the district level and represents the best available information on firewood volumes.

The quantity of firewood collected for domestic use from forests on private land is unknown, though it may be significant. A survey of firewood use in northern Victoria found that only 25per cent of firewood-dependent households collected firewood exclusively on public land (DELWP 2018). It was estimated that around 14,000 cubic metres of firewood is provided annually from private property along the Murray River in Victoria and New South Wales.

Illegal removal of firewood

In Victoria, there are restrictions on the volume, location and type of wood that can be collected. Firewood is illegally removed from public land each year, with DELWP and Parks Victoria undertaking compliance activity. In an environmental-economic accounting framework, illegal take would conceptually be included in the flow of ecosystem services, as it represents a flow from the environment to people. Strictly, the framework does not consider whether society deems an ecosystem service flow legal or illegal. However, the unsustainable removal of firewood results in degradation of the underlying ecosystem asset (the forest).

Reducing unsustainable take (e.g. through enforcement) would reduce the flow of firewood from forests to the community, but it would improve the condition of forests (the ecosystem asset). This may result in increased flows of other ecosystem services and benefits such as habitat for species, climate regulation or opportunities for recreation. It may also help maintain a flow of firewood into the future, rather than exhausting supply and encouraging the felling of standing timber. Consequently, in some cases, reducing the flow of firewood (by reducing illegal/unsustainable take) may increase the overall benefit to the community from a forest.

Commercial firewood

Some of the timber harvested by VicForests from State forests is commercially purchased and used for firewood, and the quantity and value of this is captured in the assessed native timber harvest volume. Across the state, VicForests sold around 50,000 cubic metres of 'other' wood products in 2017–18, which is predominantly firewood (VicForests 2018b, p. 13). To avoid double counting, these figures are not analysed again here.

The quantity of commercial firewood produced from plantations and farm forestry is unknown, though it is expected to be significant.

A valuation of firewood can be estimated using market prices, while acknowledging this method is simple and does not account for the potential of alternative fuel sources. Market prices for firewood can vary widely depending on the type of wood and the sale location. Using northern Victoria as an example, firewood retails for around $100–160 per cubic metre plus delivery.[35] This suggests that if households were to purchase firewood equivalent to the volume collected from public land, it would cost at least $4.5–-7.3 million. This figure is likely to be

conservative as firewood prices in Melbourne are significantly higher, in the order of $340 per tonne + delivery) for Redgum, and $310 per tonne + delivery for mixed species.

Inputs to domestic firewood provision from public land should be subtracted from the market price to isolate the value contributed by forest ecosystems. Domestic firewood collection is subsidised by the Victorian Government, which funds planning and administration of firewood collection areas. Costs have been estimated at around $12 per cubic metre for State forests (DELWP 2018). Subtracting this from the market price gives a value of around $90-150 per cubic metre, or around $4–6.8 million in total. This represents the value of the ecosystem service of firewood provision. Note that this is a lower bound estimate as it does not include firewood collection from private forests or commercial firewood.

Indicator 6.1b: Values, quantities and use of non-wood forest products

This indicator enables socio-economic benefits to be monitored by ascertaining trends in quantities, values and usage of non-wood forest products against management objectives.

Non-wood products provide a range of economic benefits for Victorian communities. They support livelihoods, particularly in rural and regional areas, and provide government revenues for public services including forest management, profits to businesses and income to forest owners. The value of non-wood products reflects the scale of these benefits. This measure enables socio-economic benefits to be monitored and to ascertain trends for comparison with management objectives.

The Victorian Government seeks royalties from revenue-generating activities carried out on public land. A register of Forest Produce Licences issued by DELWP is maintained by DELWP's Environmental Compliance Unit. The produce outlined in Table 85 provides an example of some of the types of produce and their quantities taken across the RFA regions between 2016 and 2019. However, this is not an exhaustive list, and data on sustainable rates of harvest is not available. DELWP regulates the number of licences provided to ensure they are not over-allocated, with respect to historic allocation; it also seeks advice from regional staff on the impact of activities associated with the leases. Royalty rates per unit have marginally increased each year for the period 2015–16 to 2018–19 (as shown in the tables below).

Further reporting on non-timber forest products is collated under Indicator 6.c below.

Table 85: Minor forest produce (non-wood), licensed by DELWP

Product	East Gippsland				Gippsland				Central Highlands				North East				West			
Royalty ($ per Unit/year)	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19
Dead tree fern trunks (each)	48.02	49.22	50.25	51.31	48.02	49.22	50.25	51.31	48.02	49.22	50.25	51.31	48.02	49.22	50.25	51.31	48.02	49.22	50.25	51.31
Dodder-laurel Vine (kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.69	0.71	0.72	0.74
Dogwood and native cherry (bunch)	0.35	0.36	0.367	0.37	0.35	0.36	0.367	0.37	0.35	0.36	0.367	0.37	0.35	0.36	0.367	0.37	0.35	0.36	0.367	0.37
Eucalypt branches for floral arrangements (bunch)	10.54	10.8	11.03	11.26	10.54	10.8	11.03	11.26	10.54	10.8	11.03	11.26	10.54	0.36	0.367	0.37	10.54	0.36	0.367	0.37
Everlasting (1 cm bunch)	8.92	9.14	9.34	9.53	8.92	9.14	9.34	9.53	8.92	9.14	9.34	9.53	8.92	10.8	11.03	11.26	8.92	10.8	11.03	11.26
Grass Tree Fronds (bunch)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.1	2.15	2.2	2.24
Grasses (bunch)	5.21	5.34	5.45	5.57	5.21	5.34	5.45	5.57	5.21	5.34	5.45	5.57	5.21	5.34	5.45	5.57	5.21	5.34	5.45	5.57
Gum Leaf residue from eucalypt oil distillation (m3)	1.87	1.92	1.962	2	1.87	1.92	1.962	2	1.87	1.92	1.962	2	1.87	1.92	1.962	2	1.87	1.92	1.962	2
Gum Leaves (bunch)	8.92	9.14	9.34	9.53	8.92	9.14	9.34	9.53	8.92	9.14	9.34	9.53	8.92	9.14	9.34	9.53	8.92	9.14	9.34	9.53
Gum Tips (kg)	10.35	10.61	10.83	11.06	10.35	10.61	10.83	11.06	10.35	10.61	10.83	11.06	10.35	10.61	10.83	11.06	10.35	10.61	10.83	11.06
Heath Flowers (bunch)	8.6	8.82	9	9.19	8.6	8.82	9	9.19	8.6	8.82	9	9.19	8.6	8.82	9	9.19	8.6	8.82	9	9.19
Live tree ferns (each)	4.48	4.59	4.69	4.79	4.48	4.59	4.69	4.79	4.48	4.59	4.69	4.79	4.48	4.59	4.69	4.79	4.48	4.59	4.69	4.79

Product	East Gippsland				Gippsland				Central Highlands				North East				West			
Morels (kg)	9.75	10	10.2	10.429	9.75	10	10.2	10.429	9.75	10	10.2	10.429	9.75	10	10.2	10.429	9.75	10	10.2	10.429
Myrtle Beech fronds (bunch)	17.48	17.92	18.29	18.68	17.48	17.92	18.29	18.68	17.48	17.92	18.29	18.68	17.48	17.92	18.29	18.68	17.48	17.92	18.29	18.68
Red Stringybark Leaf (bunch)	172.26	176.57	180.27	184.06	172.26	176.57	180.27	184.06	172.26	176.57	180.27	184.06	172.26	176.57	180.27	184.06	172.26	176.57	180.27	184.06
Salt (kg)	4.73	4.85	4.95	5.05	4.73	4.85	4.95	5.05	4.73	4.85	4.95	5.05	4.73	4.85	4.95	5.05	4.73	4.85	4.95	5.05
Seed - Capsules for Pot Purri (kg)	58.5	59.96	61.22	62.51	58.5	59.96	61.22	62.51	58.5	59.96	61.22	62.51	58.5	59.96	61.22	62.51	58.5	59.96	61.22	62.51
Seed Extracted (kg)	38.27	39.23	40.05	40.9	38.27	39.23	40.05	40.9	38.27	39.23	40.05	40.9	38.27	39.23	40.05	40.9	38.27	39.23	40.05	40.9
Seed-E. nitens/E. denticulata	10.82	11.09	11.32	11.56	10.82	11.09	11.32	11.56	10.82	11.09	11.32	11.56	10.82	11.09	11.32	11.56	10.82	11.09	11.32	11.56
Seed-Green Caps-Other (kg)	2.4	2.46	2.51	2.565	2.4	2.46	2.51	2.565	2.4	2.46	2.51	2.565	2.4	2.46	2.51	2.565	2.4	2.46	2.51	2.565
Thrypotomene cuttings for propagation (bunch)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Source: Office of the Deputy Secretary – Regional Services – Fire and Land Statewide Coordination (Judy Alexander, Regional Manager, Environmental Compliance)

Table 86: Minor forest produce (Extractives), licensed by DELWP

Product (m^3)	East Gippsland				Gippsland				Central Highlands				North East				West			
Royalty in $ per Unit	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19
Basalt - Crushed, Broken Stone	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62		1.7	1.73
Basalt - Dimension Stone/Slab	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76
Basalt - Uncrushed, Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Clay - Fine, Kaolin/Bentonite	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Clay - Used for Common Purpose	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Granite - Crushed, Broken Stone	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Granite - Dimension, Stone/Slab	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76
Granite - Uncrushed, Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Gravel, Low Grade Pit	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Gravel, Low Grade River	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Hornfels - Crushed, Broken Stone	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Hornfels - Uncrushed, Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Limestone - Crushed, Broken	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Limestone - Dimension Stone	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76
Limestone - Uncrushed, Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Marble - Dimension Stone/Slab	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76
Quartz - Crushed, Broken	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Quartz - Dimension Stone/Slab	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76
Rhyodacite - Crushed, Broken	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Rhyodacite, Uncrushed, Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Sand - High Grade, Processing	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73

Product ($m^{3)}$	East Gippsland				Gippsland				Central Highlands				North East				West			
Sand - Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Sandstone - Crushed, Broken	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Sandstone - Dimension Stone	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76	9.13	9.36	9.55	9.76
Sandstone, Uncrushed, Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Schist - Crushed, Broken Stone	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Scoria - Crushed, Broken Stone	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Scoria - Uncrushed, Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Sediments - Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Shale - Crushed, Broken Stone	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Shale - Uncrushed, Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Shell grit	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Slate - Dimensional Stone	9.13	9.35	9.55	9.76	9.13	9.35	9.55	9.76	9.13	9.35	9.55	9.76	9.13	9.35	9.55	9.76	9.13	9.35	9.55	9.76
Soil - Incl. Loam/Filling	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73
Tuff - Low Grade	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73	1.62	1.66	1.7	1.73

Source: Office of the Deputy Secretary – Regional Services – Fire and Land Statewide Coordination

Table 87: Minor forest produce (Wood), licensed by DELWP

Product (m3)	East Gippsland				Gippsland				Central Highlands				North East				West			
Royalty in $ per Unit	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19
Bark or Bark-Soil Mixture (excluding Wattle bark)	4.18	4.28	4.37	4.45	4.18	4.28	4.37	4.45	4.18	4.28	4.37	4.45	4.18	4.28	4.37	4.45	4.18	4.28	4.37	4.45
Burls (fallen trees only - tonnes)	262.6	269.1	274.8	280.6	262.6	269.1	274.8	280.6	262.6	269.1	274.8	280.6	262.6	269.1	274.8	280.6	262.6	269.1	274.8	280.6
Bush Sawn and Split (Fencing) Timbers - Common Species 0.6m-3.6m (Heavy Grade 211-320cm2)*	0.48 - 4.98	0.49 - 5.10	0.50-5.21	0.51-5.32	0.48 - 4.98	0.49 - 5.10	0.50-5.21	0.51-5.32	0.48 - 4.98	0.49 - 5.10	0.50-5.21	0.51-5.32	0.48 - 4.98	0.49 - 5.10	0.50-5.21	0.51-5.32	0.48 - 4.98	0.49 - 5.10	0.50-5.21	0.51-5.32
Bush Sawn and Split (Fencing) Timbers - Durable Species 0.6m-3.6m (Heavy Grade 211-320cm2)*	0.87-12.71	0.89-13.028	0.91-13.30	0.93-13.58	0.87-12.71	0.89-13.028	0.91-13.30	0.93-13.58	0.87-12.71	0.89-13.028	0.91-13.30	0.93-13.58	0.87-12.71	0.89-13.028	0.91-13.30	0.93-13.58	0.87-12.71	0.89-13.028	0.91-13.30	0.93-13.58
Charcoal (tonnes)	12.8	13.12	13.4	13.68	12.8	13.12	13.4	13.68	12.8	13.12	13.4	13.68	12.8	13.12	13.4	13.68	12.8	13.12	13.4	13.68
Craftwood (<45cm - >=45cm CDUB)	45.4-77.99	46.54-79.94	47.51-81.62	48.51-83.33	45.4-77.99	46.54-79.94	47.51-81.62	48.51-83.33	45.4-77.99	46.54-79.94	47.51-81.62	48.51-83.33	45.4-77.99	46.54-79.94	47.51-81.62	48.51-83.33	45.4-77.99	46.54-79.94	47.51-81.62	48.51-83.33

Product (m3)	East Gippsland				Gippsland				Central Highlands				North East				West			
Didgeridoo Timber	10.59	10.85	11.08	11.32	10.59	10.85	11.08	11.32	10.59	10.85	11.08	11.32	10.59	10.85	11.08	11.32	10.59	10.85	11.08	11.32
Tea tree/wattle for fencing stakes	5.73	5.87	6	6.12	5.73	5.87	6	6.12	5.73	5.87	6	6.12	5.73	5.87	6	6.12	5.73	5.87	6	6.12
Fruit Tree Props (Common-Durable)	6.05-7.35	6.20-7.53	6.33-7.69	6.46-7.85	6.05-7.35	6.20-7.53	6.33-7.69	6.46-7.85	6.05-7.35	6.20-7.53	6.33-7.69	6.46-7.85	6.05-7.35	6.20-7.53	6.33-7.69	6.46-7.85	6.05-7.35	6.20-7.53	6.33-7.69	6.46-7.85
Hewn Timber - Durable Species (0-9m)	102-145.19	104.55-148.82	106.75-151.95	108.99-155.14	102-145.19	104.55-148.82	106.75-151.95	108.99-155.14	102-145.19	104.55-148.82	106.75-151.95	108.99-155.14	102-145.19	104.55-148.82	106.75-151.95	108.99-155.14	102-145.19	104.55-148.82	106.75-151.95	108.99-155.14
Hewn Timber - Common Species (0-10.5m)	67.74-101.61	69.43-104.15	70.89-106.34	72.38-108.57	67.74-101.61	69.43-104.15	70.89-106.34	72.38-108.57	67.74-101.61	69.43-104.15	70.89-106.34	72.38-108.57	67.74-101.61	69.43-104.15	70.89-106.34	72.38-108.57	67.74-101.61	69.43-104.15	70.89-106.34	72.38-108.57
Hewn Timber - Common Species (Yellow Stringybark) (0-18m)	84.69-198.43	86.81-203.39	88.63-207.66	90.49-212.02	84.69-198.43	86.81-203.39	88.63-207.66	90.49-212.02	84.69-198.43	86.81-203.39	88.63-207.66	90.49-212.02	84.69-198.43	86.81-203.39	88.63-207.66	90.49-212.02	84.69-198.43	86.81-203.39	88.63-207.66	90.49-212.02
Round (Fencing) Timbers - Common Species (375-399mm diameter*) (1m-6m)	9.69-66.25	9.93225-67.91	10.14-69.33	10.35-70.79	9.69-66.25	9.93225-67.91	10.14-69.33	10.35-70.79	9.69-66.25	9.93225-67.91	10.14-69.33	10.35-70.79	9.69-66.25	9.93225-67.91	10.14-69.33	10.35-70.79	9.69-66.25	9.93225-67.91	10.14-69.33	10.35-70.79
Round (Fencing) Timbers - Durable Species (1m-	10.83-134.09	11.10-137.44	11.33-140.33	11.57-143.28	10.83-134.09	11.10-137.44	11.33-140.33	11.57-143.28	10.83-134.09	11.10-137.44	11.33-140.33	11.57-143.28	10.83-134.09	11.10-137.44	11.33-140.33	11.57-143.28	10.83-134.09	11.10-137.44	11.33-140.33	11.57-143.28

Product (m3)	East Gippsland				Gippsland				Central Highlands				North East				West			
6m) 375-399mm diameter*																				
Roundwood for Stepping Blocks	0.55	0.56	0.58	0.59	0.55	0.56	0.58	0.59	0.55	0.56	0.58	0.59	0.55	0.56	0.58	0.59	0.55	0.56	0.58	0.59
Tea tree/wattle for rustic furniture	11.3	11.58	11.83	12.07	11.3	11.58	11.83	12.07	11.3	11.58	11.83	12.07	11.3	11.58	11.83	12.07	11.3	11.58	11.83	12.07
Sawdust (rotted)	11.36	11.64	11.89	12.14	11.36	11.64	11.89	12.14	11.36	11.64	11.89	12.14	11.36	11.64	11.89	12.14	11.36	11.64	11.89	12.14
Shingles (Cut and prepared per 100 pieces)	6.88	7.05	7.2	7.35	6.88	7.05	7.2	7.35	6.88	7.05	7.2	7.35	6.88	7.05	7.2	7.35	6.88	7.05	7.2	7.35
Sleeper Offcuts	1.51	1.55	1.58	1.61	1.51	1.55	1.58	1.61	1.51	1.55	1.58	1.61	1.51	1.55	1.58	1.61	1.51	1.55	1.58	1.61
Wattle Bark	125.6	128.8	131.5	134.2	125.6	128.8	131.5	134.2	125.6	128.8	131.5	134.2	125.6	128.8	131.5	134.2	125.6	128.8	131.5	134.2
Wood Chop Logs	3.05	3.13	3.19	3.26	3.05	3.13	3.19	3.26	3.05	3.13	3.19	3.26	3.05	3.13	3.19	3.26	3.05	3.13	3.19	3.26

Source: Office of the Deputy Secretary – Regional Services – Fire and Land Statewide Coordination

Indicator 6.1c: Value of forest-based services

This indicator measures a range of forest-based services, which have been classified as provisioning, regulating or cultural. Forest-based services provide economic values and contribute to the sustainability of forests by providing significant social and environmental benefits.

Understanding trends in the economic value of benefits associated with the full range of ecosystem services provided by forests will assist decision-makers to prioritise investment and consider competing interests in the management of forests. An environmental-economic accounting framework has been employed by DELWP to classify and measure the extent of Victoria's forest assets and flows of ecosystem services which provide benefits (market and non-market) to people.

For this report, an economic accounting process was undertaken for a range of forest values, and the results of these studies are outlined in Table 88. As these studies provide only an assessment of current annual benefits, they do not indicate how ecosystem services and benefits may change over time and the potential trade-offs under different forest management scenarios. However, study findings could be used to inform scenario analysis and decision-making on the management of Victoria's forests into the future.

Table 88: Monetary flows of ecosystem services from forests in RFA regions (2018 estimate unless otherwise stated)

	Central Highlands	East Gippsland	Gippsland	North East	West	Total	Confidence in valuation
Ecosystem services							
Provisioning services							
Water ($ million)	311-806	11	95-96	261	96	774-1,270	Medium
Native timber ($ million)	21	3	3	1	-	28	High
Plantation timber ($ million) (a)	n.a.	n.a.	n.a.	n.a.	n.a.	54	Medium
Firewood ($ million) (b)	n.a.	n.a.	n.a.	n.a.	n.a.	43,650	Low
Honey ($ million)	n.a.	n.a.	n.a.	n.a.	n.a.	3-4.5	Low
Fodder	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Regulating services							
Water flow regulation ($ million)	n.a.	n.a.	n.a.	n.a.	n.a.	97	Low

	Central Highlands	East Gippsland	Gippsland	North East	West	Total	Confidence in valuation
Soil retention ($ million)	655-1,216	0-1,736	460-1,668	1,759-2,834	179-568	3,054-8,021	Low
Carbon sequestration ($ million) (a)	356	399	1,019	704	528	3,006	Medium
Carbon storage	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Pollination ($ million)	n.a.	n.a.	n.a.	n.a.	n.a.	0.8-1	Low
Cultural services							
Recreation ($ million) (a)	n.a.	n.a..	n.a.	n.a.	n.a.	905	Medium
Abiotic services							
Minerals	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	

n.a. indicates data not available at the RFA region level

(a) Plantation timber data is for 2017-18, carbon data is for 2017, tourism data is aggregated from 2016-17 data (parks) and 2019 data (State forests)

(b) Firewood collected by households from State forests

Water services

Forests ecosystems provide a number of key water services:

- water provision
- water quality regulation (erosion prevention)
- water flow regulation (flood mitigation).

For the purposes of this study, the service is deemed to be provided when water yield from forests enters a water distribution system, not when it is supplied to customers. The total quantity and value of water provision from Victoria's forests is assessed, rather than the difference in water provision compared to a counterfactual land use or disturbance scenario. Further water yield information is provided in 4.1d.

Quantification of service

Water yield from forests is dynamically modelled from 2008 to 2018 and used to derive annual water yield for each RFA region. Figure 45 shows average annual water yield (for the modelled time period of 2008 to 2018) across Victoria's RFA regions for both forest and non-forest areas. Yield ranges from less than 1 megalitre per hectare per year (in large areas of the West and Gippsland regions), to more than 10 megalitres per hectare per year (in small areas of the North East RFA region).

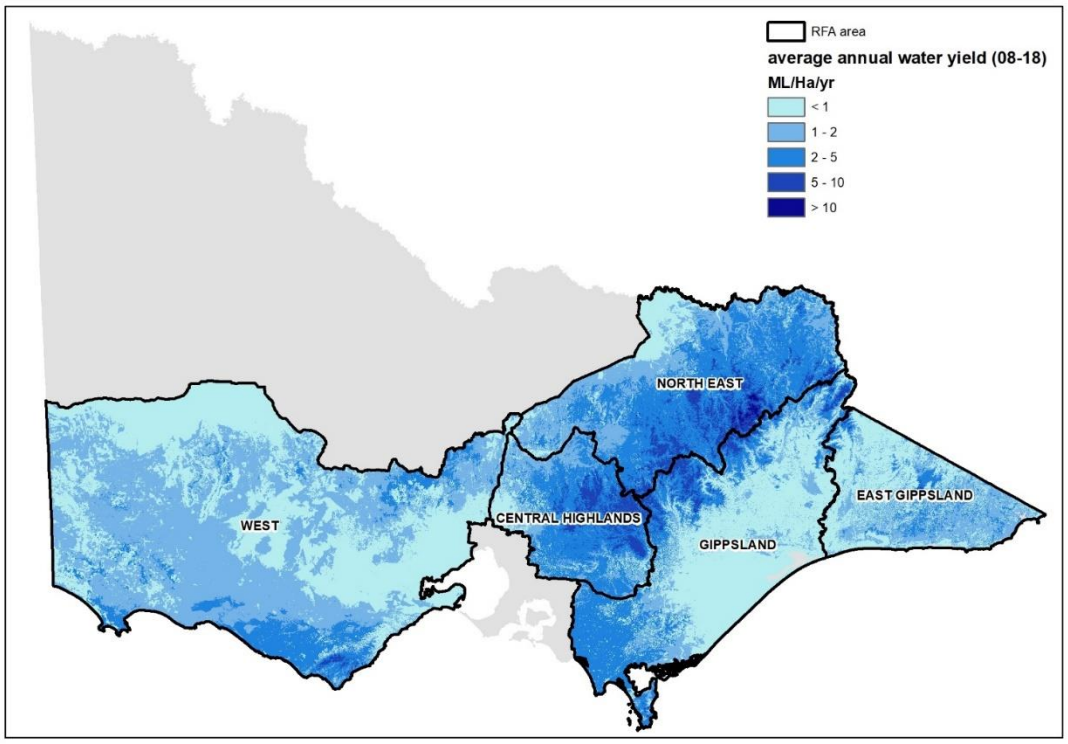

Figure 45: Average annual water yield across Victoria's RFA regions, 2008–18

Source: DELWP internal Ensym modelling

Figure 46 shows the annual water yield from forests across Victoria's RFA regions from 2008 to 2018, and the underlying data is presented in Table 90. Yield from non-forest areas is not included. High rainfall years in 2010, 2012 and 2016 are clearly visible in the data. Water yield

is most significant in the North East RFA region, which accounts for almost 40 per cent% of total water yield over the decade. This is followed by the Gippsland and Central Highlands RFA regions, although in terms of average yield per hectare the Central Highlands is comparable with the North East.

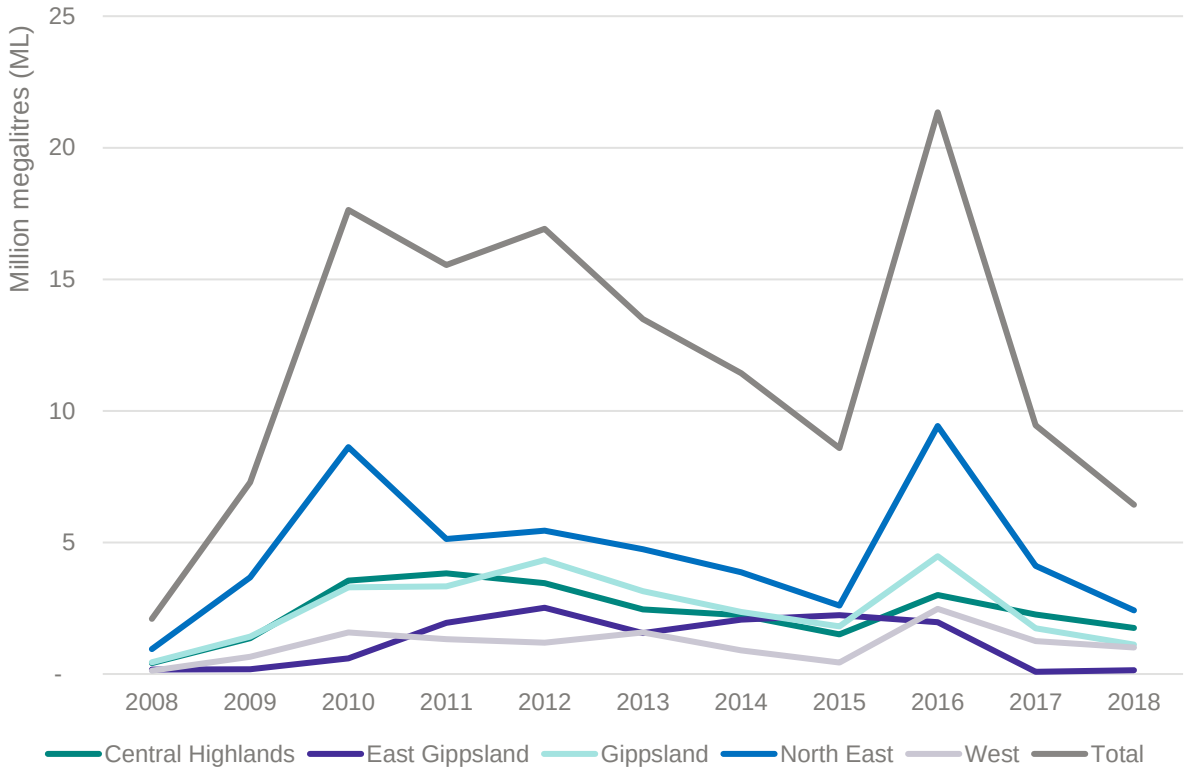

Figure 46: Annual volume of water yield from forests across Victoria's RFA regions, 2008–18

Source: DELWP internal Ensym modelling

RFA regions have different profiles in terms of the destination of water yield from forests – Table 89 provides a snapshot of 2018. The Central Highlands is the only RFA region which provides significant volumes of water to Melbourne's reservoirs. It also provides significant volumes to the northern Victoria system, which supplies Goulburn-Murray irrigation areas.

Around two-thirds of water yield from the North East RFA region goes to the northern Victoria system, and the remainder goes to unregulated systems.[36] Around a quarter of water yield from the Gippsland RFA also goes to the northern Victoria system, and around a third goes to the Thompson/Macalister irrigation area.

36 Regulated systems are water systems where the flow of the river is regulated through the operation of major storages or weirs to secure water supplies. Unregulated systems are river systems where no major dams or weir structures have been built to regulate the supply, or extraction, of water for consumptive use.

Table 89: Destination of water yield from forests in 2018

RFA region	Destination of water yield
Central Highlands	23 per cent to Melbourne system 27 per cent to northern Victoria declared system 10 per cent to other regulated systems 40 per cent to unregulated systems
East Gippsland	100 per cent to unregulated systems
Gippsland	31 per cent to Thompson/Macalister declared system 26 per cent to northern Victoria declared system 43 per cent to unregulated systems
North East	66 per cent to northern Victoria declared system 34 per cent to unregulated systems
West	4 per cent to northern Victoria declared system 2 per cent to Werribee declared system 16 per cent to other regulated systems 77 per cent to unregulated systems

Valuation of benefit

Figure 47 shows the annual value of water yield from forests across Victoria's RFA regions from 2008 to 2018, and the underlying data is presented in Table 90. The value of water fluctuates from year to year, driven by changes in the volume of water yield and changes in water prices. On average, the value of water yield is greatest for the North East RFA region, averaging $487 million per year from 2008 to 2018. This is largely due to the significant volume of water yield in this region. Total water yield from the Central Highlands also has a high value, averaging $390 million per year over the decade. This reflects the significant volume of water yield from forests in this region, but also that around a quarter of yield from the Central Highlands goes to Melbourne's reservoirs and has a high value.

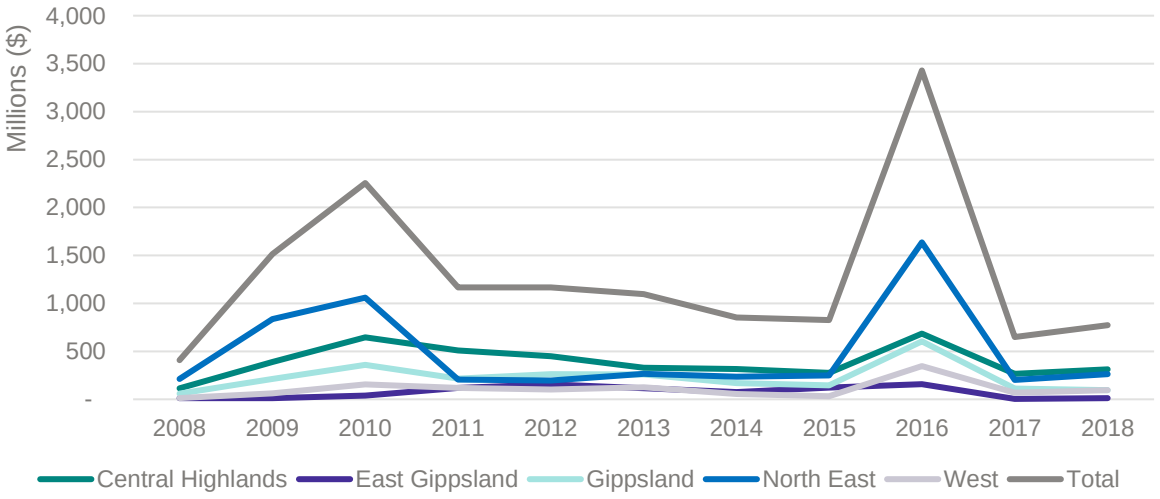

Figure 47: Annual value of water yield from forests across Victoria's RFA regions, 2008–18

Source: DELWP internal Ensym modelling

Table 90: Volume of water yield from forest areas by RFA region ('000 megalitres)

RFA region	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Central Highlands	413	1,358	3,544	3,825	3,451	2,459	2,239	1,512	2,998	2,262	1,748
East Gippsland	16,500	186	599	1,942	2,517	1,554	2,069	2,238	1,971	83	145
Gippsland	446	1,416	3,289	3,326	4,327	3,149	2,356	1,808	4,477	1,735	1,116
North East	947	3,667	8,627	5,125	5,442	4,744	3,870	2,597	9,425	4,113	2,414
West	126	656	1,576	1,321	1,187	1,582	901	434	2,475	1,255	1,010
Total	**2,096**	**7,284**	**17,636**	**15,540**	**16,924**	**13,488**	**11,434**	**8,589**	**21,346**	**9,449**	**64,32**

Source: DELWP internal Ensym modelling

Table 91: Value of water yield from forest areas by RFA region ($ '000'000)

RFA region	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Central Highlands	114	390	645	508	450	330	317	277	685	264	311
East Gippsland	10	12	37	120	156	116	76	123	158	4	11
Gippsland	59	214	358	216	262	258	168	144	604	113	95
North East	212	837	1,060	205	196	265	234	249	1,636	201	261
West	13	63	156	119	102	127	57	33	346	69	96
Total	**408**	**1,515**	**2,256**	**1,168**	**1,165**	**1,096**	**852**	**826**	**3,429**	**651**	**774**

Source: DELWP internal Ensym modelling

Water quality regulation (erosion prevention)

Forests improve water quality by naturally filtering and purifying it, reducing the amount of soil sediment, pollutants and organic matter that would otherwise reach waterways. In this study, the service forests provide in preventing erosion is assessed. To do this, a counterfactual scenario is constructed where forests do not exist and landcover is pasture. This allows assessment of how much sediment is eroded under the forest scenario compared to the no-forest counterfactual.

Quantification of service

Figure 48 shows average annual erosion (for the modelled time period of 2008 to 2018) across Victoria's RFA regions for both forest and non-forest areas. Yield ranges from less than 0.1 tonne of sediment per hectare per year in large parts of the state to more than 5 tonnes per hectare per year in some small areas of the North East.

Figure 49 shows the increase in average annual erosion that occurs under a counterfactual scenario where forests do not exist and landcover is pasture. The modelled increase in erosion ranges from 0 to more than 5 tonnes of sediment per hectare per year. There are significant increases in erosion in parts of the North East and Gippsland RFA regions (alpine area and Wilsons Promontory) as well as the Central Highlands and East Gippsland RFA regions. This illustrates the significant role forests play in preventing sediment erosion.

Compared to a no-forest scenario, forests across the five RFA regions prevent, on average, 9.6 million cubic metres of gross sediment erosion per year. Forests prevent a portion of this, 1.6 million cubic metres of sediment, from discharging into major river systems each year. Table 92 presents the results of this modelling – the annual volume of sediment erosion to major waterways avoided under a forest scenario by RFA region.

The volume of avoided sediment erosion varies significantly from year to year, depending on the severity and timing of rainfall events. On average, erosion prevented by forests is greatest in the North East RFA region, both in terms of total quantity of sediment avoided and quantity avoided per hectare. This is followed by East Gippsland and Gippsland. The total quantity of erosion prevented by forests in the Central Highlands is lower but is comparable with Gippsland and East Gippsland in per hectare terms. The quantity of erosion prevented in the West RFA region is low in total quantity and per hectare terms; this is largely due to low relief terrain and less rainfall resulting in lower erosion rates.

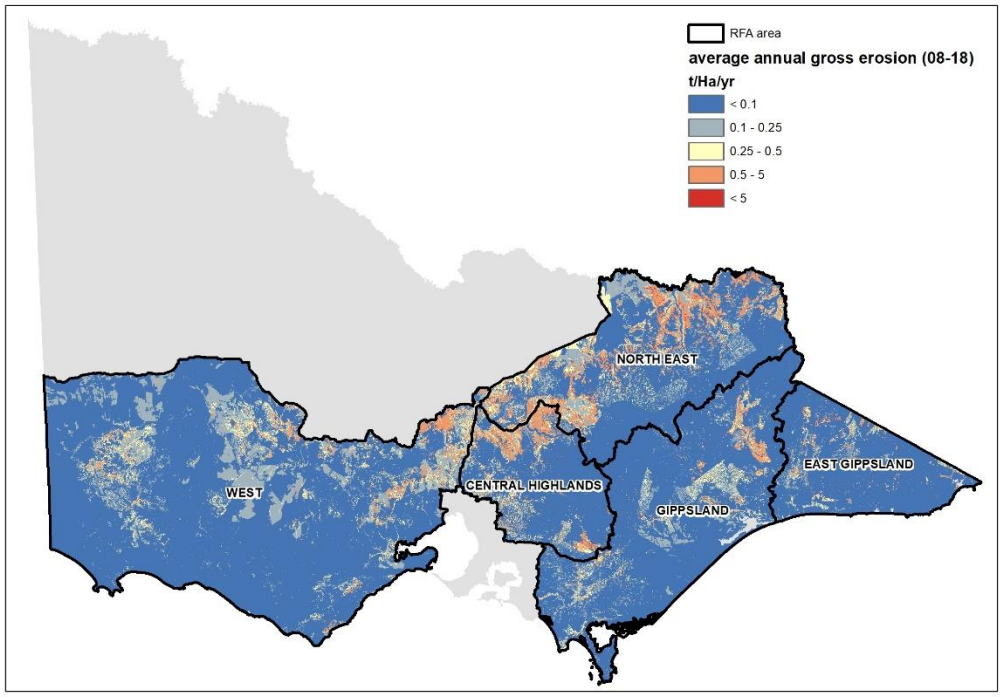

Figure 48: Average annual erosion across Victoria's RFA regions, 2008–18

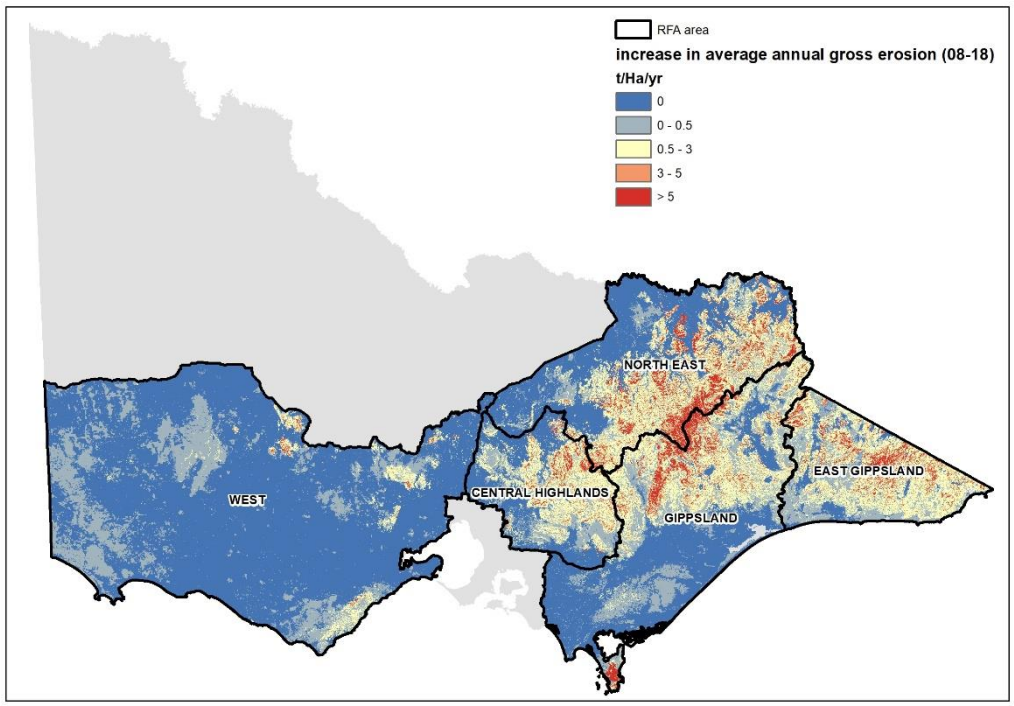

Figure 49: Increase in average annual erosion under a no-forest scenario (compared to the forest scenario), 2008–18

Source: DELWP internal Ensym modelling

Valuation of benefit

The service of water quality regulation (erosion prevention to major waterways) is valued based on an avoided-cost approach; that is, the cost of supplying an equivalent volume of water to replace water storage that is lost due to sediment accumulation.

Table 93 presents the valuation results. On average, the value of erosion prevention by forests is greatest in the North East RFA region. This is driven by the significant volumes of sediment avoided, and also by the value of water in the northern Victorian declared system. Erosion prevention also has a high value in the Central Highlands, reflecting the high value of avoided sediment accumulation in reservoirs that supply Melbourne's water. Erosion prevention has a very low value in East Gippsland, which is due to sediment being avoided in unregulated systems, rather than regulated systems with infrastructure such as dams. This low value should be treated with caution because, as discussed above, sediment in these systems may still have impacts on producers, households and the environment.

Table 92: Volume of sediment erosion to major waterways avoided under a forest scenario by RFA region (cubic metres)

RFA region	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Central Highlands	394,783	18,309	242,503	501,377	337,796	116,137	49,163	15,062	133,281	151,123	26,054
East Gippsland	187,526	13,820	534,232	489,422	952,098	416,830	244,520	323,830	293,780	20,569	53,293
Gippsland	781,261	32,265	681,310	740,824	1,102,519	459,301	133,621	96,164	503,904	187,023	56,413
North East	854,099	31,591	872,244	1,297,452	1,641,543	528,678	163,447	102,727	433,192	237,893	105,715
West	24,439	3,971	59,582	239,486	63,409	11,123	3,697	76,000	25,063	43,343	16,672
Total	2,242,108	99,957	2,389,871	3,268,561	4,097,365	1,532,070	594,448	613,783	1,389,220	639,950	258,147

Source: DELWP internal Ensym modelling

Table 93: Value of sediment erosion to major waterways avoided under a forest scenario by RFA region ($)

RFA region	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Central Highlands	740,882	57,718	550,919	1,233,238	802,167	311,452	116,512	38,717	307,586	307,877	65,864
East Gippsland	147	4	492	306	602	183	191	44	175	37	37
Gippsland	365,355	14,980	364,968	468,239	648,536	140,275	65,400	45,327	170,333	88,343	27,597
North East	1,052,109	36,401	1,115,409	1,670,567	2,089,964	640,355	239,269	118,744	408,322	260,808	118,968
West	17,850	4,292	85,673	386,495	66,280	18,929	2,494	81,303	25,960	45,371	33,546
Total	2,176,343	113,394	2,117,461	3,758,845	3,607,549	1,111,194	423,865	284,135	912,376	702,434	246,012

Source: DELWP internal Ensym modelling

Agriculture (grazing)

Agricultural production from public forests is typically restricted by government policy for the use of public land. The Victorian Government issues leases and licences for exclusive and non-exclusive use of public land in areas where a particular land use is permitted and in accordance with the specific legislation applicable to the land.

Existing capacity for agricultural use of forest on public land has been mapped using spatial data on licences for private use of public land.[37] Spatial analysis reveals types of licences that intersect with areas of forest extent and may support agricultural production (see Figure 50); these are:

- grazing licences – allowing grazing of livestock on public land;
- water frontage and riparian management licences – allowing access to waterways for agricultural use (such as stock access to water) or recreational use; riparian management licences ensure waterway access is managed to both protect and improve the riparian environment, and typically attract a reduced licence fee; and
- unused roads licences – allowing owner/occupiers of adjoining private land to access unused roads on public land for agricultural purposes.

There are around 14,100 licences covering forests within Victoria's RFA regions (not including beekeeping licences) – see Table 93. These licences cover almost 500,000 hectares of forest, or 8per cent of total forest across Victoria's RFA regions. Most of the forest area licensed is for grazing purposes (89 per cent of total forest area licensed), with smaller areas licensed for unused road access, water frontage access and riparian management and other uses.

The largest area of forest covered by licences is in the Gippsland RFA region (300,000 hectares). The West RFA region has the greatest number of licences containing forest (4,700), although the total area of forest licensed is quite low (11,000 hectares). This is likely due to the West RFA region having a large number of unused road licences which intersect with the mapped forest extent boundary.

Grazing licences represent large portions of the total forest areas licensed in the East Gippsland, Gippsland and North East RFA regions (Figure 50). It should be noted that the number of licences issued and area licensed is an indicator of *opportunity* for use of public forests. It is does not show whether forests are actually being used for grazing or other agricultural purposes. However, licences are a source of revenue to the state regardless of whether licensed areas are being occupied by stock or not.

37 Department of Environment, Land, Water and Planning dataset: Crown land tenure - general licences

Table 94: Licences covering forest areas

RFA region	Number of licences	Area of forest licensed (ha)
Central Highlands	1,728	5,783
East Gippsland	630	44,354
Gippsland	2,756	301,147
North East	4,067	132,126
West	4,950	10,980
Non-RFA	4,695	44,000
Total RFA	14,131	494,391
Total Victoria	**18,826**	**538,391**

Notes: Includes grazing licences, water frontage and riparian management licences, unused road licences and miscellaneous licences that interest with forest extent mapping.
Figures exclude any non-forest area components of licences.

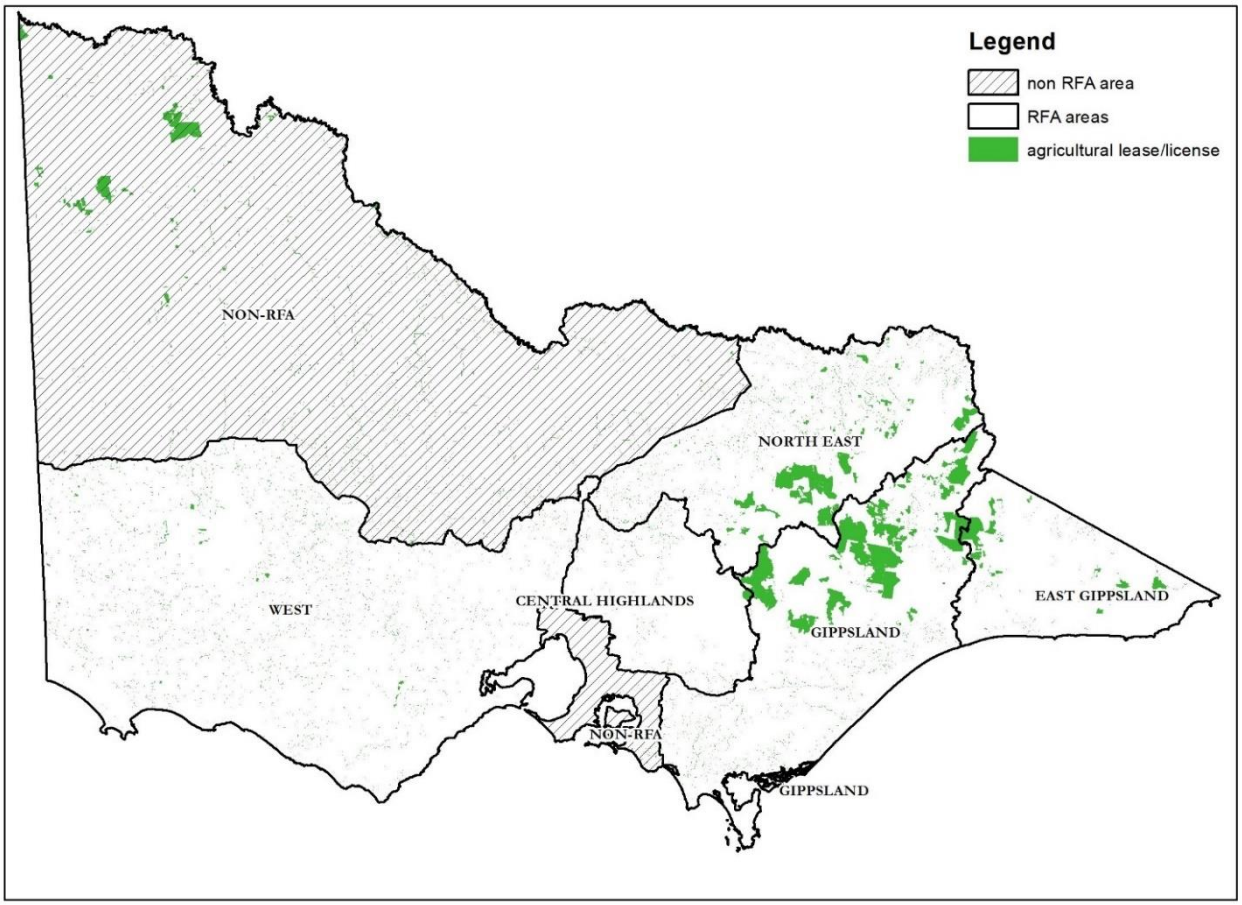

Figure 50: Victorian agricultural licences covering forest areas

Source: DELWP corporate data

Honey provision

Honey production is heavily dependent on forest ecosystems for floral resources that sustain bee populations. Nationally, native flora has been estimated to support 70 per cent to 80 per cent of honey production (Gibbs & Muirhead 1998, p. 37). Eucalypts are by far the most common source of nectar and pollen.

Forest ecosystem extent (Figure 51) provides a broad indicator of provision of habitat for bees. The maintenance of forest ecosystem extent and condition is crucial to supporting bee populations, without which the ecosystem service of honey provision would decline.

There are 4,485 licensed apiary sites on public land across Victoria.[38] Fifty-five per cent of sites are in RFA regions, with the largest number in the West RFA region (22 per cent of total sites) followed by Gippsland (13 per cent).

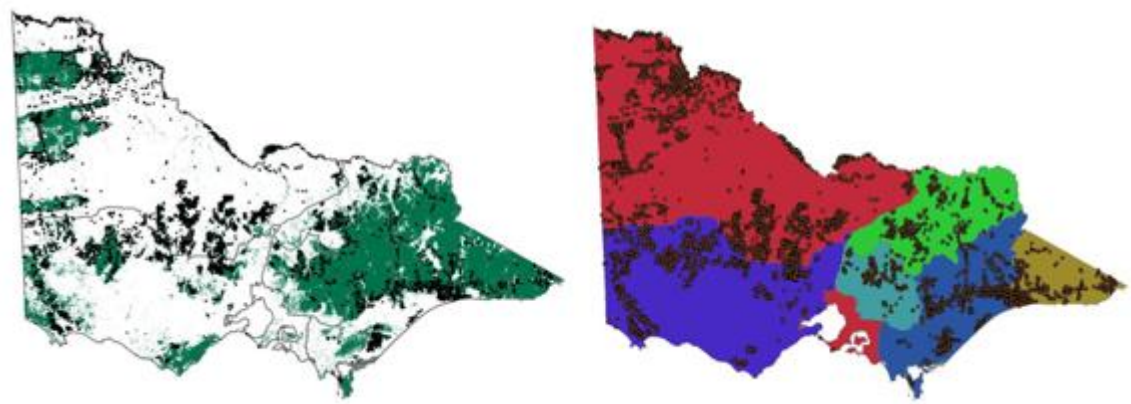

Figure 51: Apiary sites and forest extent (left) and in RFA regions (right)

Source: DELWP corporate data

Although all apiary sites in this dataset are on public land, for a small number of these sites the nearest forest is on private land. Data on the number and location of hives on private land is not available; however, in 2001 it was estimated that 30 per cent of hives were located on private land (Centre for International Economics 2005, p. 141).

Apiary sites are not always licensed, and licensed sites may not always be occupied by hives. Occupation is dependent on nearby floral resources, which are seasonal and variable. Although occupation is sporadic, apiarists tend to retain sites to ensure access. A hive of bees may be moved several times a year.

38 Department of Environment, Land, Water and Planning dataset: Apiary rights and bee farm and range licences

Table 95: Apiary sites by RFA region and average distance of sites from forest

RFA region	Sites	per cent of total (per cent)	Average distance from forest (m) [a]
Central Highlands	170	4	0
East Gippsland	349	8	5
Gippsland	586	13	26
North East	363	8	14
West	1,007	22	239
Non-RFA	2,010	45	287
Total RFA	2,475	55	-
Total Victoria	**4,485**	**100**	**-**

a A distance of 0 metres indicates that apiary sites are *within* forest areas.

Source: DELWP

A survey conducted by ABARES found that, in 2014–15, 58 per cent of honey produced in Victoria was derived from public land, with 40 per cent from State forests and 11 per cent from national parks (van Dijk, Gomboso & Levantis 2016). Eight per cent was derived from other public land, 19 per cent from crops and 23 per cent from other private land (Table 96). This suggests that, at a minimum, 50 per cent of Victorian honey is derived from forested areas (State forests and parks).

However, the proportion is likely higher because 'other public land' and 'other private land' could also include forested areas. For the purposes of this analysis, an upper bound of 70 per cent has been used. This assumes that all 'other public land' and half of 'other private land' is forested area.

The ABARES survey found that there were 68,200 registered hives in Victoria, and it estimates an average annual honey production of 59.4 kilograms per hive. This equates to total production of around 4,000 tonnes of honey per year. Earlier estimates of Victoria's honey production are of a similar magnitude. In 2015 it was estimated that Victoria produces around 4,250 tonnes of honey per year, around 17 per cent of Australia's honey production (DELWP & Parks Victoria 2015, p. 73; DSE 2012c). Applying the estimate that 50–70 per cent of Victorian honey is derived from forested areas suggests that 2,000 to 2,800 tonnes of honey can be attributed to forests. Based on the proportion of apiary sites in RFA regions (55 per cent), the volume derived from forests in RFA regions is around 1,000–1,500 tonnes per year.

Given the assumptions made around the use of apiary sites in RFA regions, confidence in the precision of this estimate is low, and it should be considered an indicative estimate only. For the same reason, the quantity of honey attributable to each RFA region cannot be estimated with confidence. However, the number of apiary sites in each RFA region is an indicator of

access to floral resources and suggests that the West and Gippsland RFA regions are particularly important areas for beekeeping.

Table 96: Proportion of honey produced, by land type, Victoria, 2014–15

Land type	Proportion (per cent)
Public land	
State forests	40
National parks	11
Other public land	8
Total public land	**58**
Private land	
Crops (without paid pollination)	16
Crops (with paid pollination)	3
Other private land	23
Total private land	**42**

Source: ABARES 2016

Valuation of service

Honey provision can be valued using market information reported in the ABARES survey. Analysis of survey data suggests that average cash receipts per kilogram of honey were around $6.30 per kilogram and average cash costs were $3.40 per kilogram in 2014–-15. The difference is $2.90 per kilogram of honey, or $2,900 per tonne. Applying this to the volume of honey derived from forests in RFA regions suggests that the industry is valued at $3.0–4.5 million per year. This represents the value contributed by forest ecosystems.

Pollination

Native and introduced pollinators support agricultural activity which provides benefits to producers and consumers of agricultural products. Pollinators also support the maintenance of forests and other ecosystems.

Pollination of horticultural/agricultural crops is highly dependent on access to adequate seasonal floral resources from across the general landscape, including native forests. Providers of paid pollination services typically strengthen and/or rest bee colonies by placing hives in or near areas of native vegetation, including both state and private forests. Hives are then transported to agricultural areas to pollinate specific crops (such as Victoria's almond orchards).

Almonds are the most common crop that uses paid pollination services in Victoria, with 94 per cent of pollination service providers supplying almond crops (Table 97). Around 20 per cent of

pollination service providers supply oilseed crops (such as canola), and 10 per cent supply other fruit crops (apples, stone fruits, etc.).

Paid pollination services have increased over the past decade, with over 50 per cent of Victorian beekeepers providing paid pollination services in 2014–1; this is up from under 40 per cent in 2006–07. Around 14 per cent of Victorian beekeeping businesses not offering paid pollination services in 2014–15 planned to commence in the next five years, and over 55 per cent offering paid pollination services planned to expand.

Table 97: Types of crops pollinated by paid pollination service providers, Victoria, 2014–15

Proportion of pollination service providers pollinating crop (per cent)	
Almonds	94
Cherries	4
Pome fruits	7
Other fruit	11
Oilseeds	18
Vegetables	4
Other	6

Note: Beekeeping businesses can pollinate multiple types of crops throughout a given year.

Source: ABARES. 2016

Valuation of services

The contribution of forests to paid pollination services can be valued using market information reported by ABARES. In 2014–15, Victorian beekeepers received an average of $27,000 for paid pollination services. This suggests an average payment of around $70 per hive (as beekeepers reported an average of 380 hives). Although, as not all beekeepers offer paid pollination services, the average payment per hive used for paid pollination services would be higher.

The average annual cash costs per beekeeping business in Victoria are $109,500 (van Dijk, Gomboso & Levantis 2016). Attributing a portion of these costs to pollination services, in line with the proportion of average cash receipts that are for pollination services (13 per cent), suggests average annual cash costs for pollination services of around $15,000 per business. This results in an average cash profit (cash receipts less cash costs) of $12,000 per business. Applying this to the number of commercial beekeeping businesses in Victoria (220) (van Dijk, Gomboso & Levantis 2016, p. 3), the reliance of beekeeping businesses on forested areas (50–70 per cent – see Table 96) and the proportion of apiary sites in RFA regions (55 per cent), the value contributed to paid pollination services by forests in RFA regions is estimated at around $750,000 to $1,050,000 per year. Given the extrapolation of data and assumptions made around the use of apiary sites in RFA regions, confidence in the precision of this estimate is low, and it should be considered an indicative estimate only.

This valuation method represents a lower bound estimate of the value of pollination services, as it is based on the market value of paid pollination services, rather than the benefit that pollination (both commercial and wild) provides to producers and consumers of agricultural products.

However, a 2018 study by Curtin University modelled the impact of a supply shock (due to the absence of pollination) on 53 honeybee pollination dependent agricultural crops, and estimated the economic value of pollination in Victoria as between $3.2 billion and $9.0 billion (Karasinski 2018). This is the highest estimate of all states and territories which likely represents the composition of agricultural crops grown in Victoria (such as almonds), and the volume and price of agricultural production. This is likely an upper bound estimate of the value of pollination, as it is based on the sudden loss of crops due to the absence of pollination.

Avoiding double counting

Note that there is likely to be substantial overlap between honey provision and pollination services. For example, incidental pollination by bees is a positive externality of honey production. To avoid double counting, benefits from honey provision and benefits from pollination should always be reported separately.

Minerals

Extraction of mineral resources on public land is regulated by the *Mineral Resources (Sustainable Development) Act 1990* (Vic.). Forest areas often contain mineral resource deposits and consequently are an important source of revenue for business and government.

Recreational prospecting and fossicking are permitted in State forests and in certain parks. Recreational prospectors and fossickers must purchase a Miner's Right. This allows the holder of the right to remove and keep minerals discovered on Crown land or private land (where the landowner has given permission).

There are also 227 mining licences across Victoria,[39] covering around 65,000 hectares (Table 98). Just under half (44 per cent) are within the five RFA regions and 37 per cent are within, or intersect with, forest areas in RFA regions. Gippsland has the highest number of licences that intersect with forests (35), covering over 6,600 hectares of forest. The West RFA region has 27 licences that intersect with forest, covering over 6,300 hectares of forest.

39 The purpose of a mining licence is to undertake mining and activities leading to or ancillary to mining. While exploration can be undertaken on a mining licence, ''exploration only' will only be permitted in very limited circumstances. These circumstances include a temporary mine closure, during which further exploration is undertaken to identify mineral resources required to recommence mining.

Table 98: Current mining licences

RFA region	Total number of licences	Total area licensed (ha)	Number of licences in forests	Area of forest licensed (ha)	per cent total licences in forests	per cent total area licensed that is in forests
Central Highlands	10	1,031	9	1,009	90	98
East Gippsland	1	2	1	2	100	100
Gippsland	43	20,820	35	6,723	81	32
North East	14	720	13	642	93	89
West	33	15,177	27	6,364	82	42
Non-RFA	126	27,027	70	4,866	56	18
Total RFA	101	37,749	85	14,738	84	39
Total Victoria	**227**	**64,776**	**155**	**19,604**	**68**	**30**

Source: DJPR dataset: Current mining licences and leases

Cultural connection and heritage

Forests provide ecosystems, landscapes and sites of historical significance that Victorian, Australian and global communities value as part of their heritage. Forests provide immense cultural and spiritual connection to Traditional Owners and Aboriginal communities, as well as providing cultural and heritage value to non-Aboriginal Victorians.

The cultural value of forests to Traditional Owners and Aboriginal communities is not quantified in this study, though this value can conceptually sit within an ecosystem accounting framework. The RFA modernisation program is partnering with Traditional Owners, as the original custodians of Victoria's land and waters, to support and facilitate Traditional Owners to capture information about their values (including tangible and intangible values). Ecosystem accounting is a developing field, and there is scope for cultural values to be meaningfully incorporated into ecosystem accounting frameworks in Victoria in the future.

Quantification of service and valuation of benefit

Non-Aboriginal heritage value has previously been estimated for Victoria's parks (DELWP & Parks Victoria 2015, p. 119). For a significant number of visitors to Victoria's parks, historic heritage is their primary reason for visiting. This is reflected in the activities undertaken by visitors to parks, including visiting historic places. In 2009, 55 per cent of the population had visited a heritage place managed by Parks Victoria within the previous 12 months.

A 2009 survey found that 60 per cent of Victorian households would support a yearly charge to maintain heritage places in parks. These survey results have been used to estimate a value range for the maintenance of park-related heritage of $6–23 million per year. These estimates are thought to be a lower bound of the value people place on park-related heritage and is indicative only.

Recreation service: tourism, enjoyment and health and wellbeing

There were over 42.33 million visits to state and national parks in 2016–17 (Parks Victoria 2018). This figure includes 25.52 million visits from Melbourne residents, 14.31 million from regional Victorians, 1.4 million from interstate travellers and 660,000 from international visitors. There is limited information available specific to State forests, where information is available on built assets but not on visitation. Consequently, this analysis draws on existing visitation data from parks and should not be considered representative of State forests and the whole of Victoria's public forests.

Quantification of service and valuation of benefit

In 2015, a study estimated the economic contribution of tourism associated with Victorian parks added $1 billion to the Victorian economy and support 13,800 full-time equivalent (FTE) jobs. This study focused on parks, so would overestimate economic contribution of *forests* in parks, as forests are only part of the reason people visit parks. People are also motivated by attributes such as rivers, ocean and mountain landscapes. However, forests and other native vegetation in landscapes are a key reason people visit parks and State forests.

Contribution of park tourism to regional economies and employment was estimated based on Victorian tourism regions[40] (Table 99). Although tourism regions do not align with RFA regions, a rough overlay gives an indication of park tourism associated with each RFA region – see Table 99.. This suggests that the largest economic contribution of park tourism is in western Victoria – over $200 million. The Grampians (contributing over $100 million) and the Great Ocean Road area (contributing over $80 million) are significant drivers of this. The total economic contribution of park tourism in RFA regions is roughly around $450 million.

Indirect economic benefit of parks to the government can also be considered through health benefits. The *Valuing Victoria's parks* report estimates that over 750,000 people visit state and national parks each year specifically to do physical exercise. Based on the avoided healthcare costs and productivity impacts associated with physical activity, the value of health and wellbeing benefits has been estimated at $118 million year (DELWP & Parks Victoria 2015, pp. 110–11).

Table 99: Economic contribution of park tourism, 2010–11

RFA region	Nearest tourism region[a]	Gross value added $ million	FTE employment	per cent of regional economy
Central Highlands	Yarra Valley and Dandenong Ranges	85	1,103	0.3
East Gippsland and Gippsland	Gippsland	82	1,112	0.3
North East	Victoria's High Country	56	779	0.8
West	Grampians	102	1,164	0.4

40 Victoria has 12 tourism regions which form the bases of the National Visitor Survey and International Visitor Survey published by Tourism Research Australia.

	Great Ocean Road	87	1,235	0.3
	Daylesford and the Macedon Ranges	23	269	0.2
	Goldfields	17	240	0.1
	Total	229	2,908	
Non-RFA	Melbourne	433	6,130	0.1
	Mornington Peninsula	47	639	0.2
	Phillip Island	20	219	0.5
	Murray	71	894	0.2
	Total	571	7,882	
Total RFA		452	5,902	
Total Victoria		1,021	13,783	

a Note that tourism regions and RFA regions do not align exactly. Consequently, the economic contribution of park tourism in each RFA region should be considered a rough alignment only.

Source: DELWP analysis based on Deloitte 2014 (Unpublished).

Habitat

Forest ecosystems provide living spaces for plants and animals and support the maintenance of biodiversity. This provides benefits to people who simply value the existence of biodiversity and species. Habitat is also strongly linked to other services such as recreation and tourism, as people visit forest areas to experience a particular habitat or see a certain species.

Provision of habitat has not been valued in monetary terms for this study. Stated preference techniques could be used to derive Victorians' willingness to pay for the existence of forests (conservation of habitat and species). For example, a 2007 study undertaken for VEAC found that households in Melbourne and Bairnsdale were willing to pay $1.45 and $3.29 respectively per year for 20 years for a 1,000 hectare increase in area of healthy Murray River Red Gum forest (URS 2007). The same study found that households in Melbourne and Bairnsdale were willing to pay $11.16 and $8.10 respectively per year for 20 years for a 1,000 hectare increase in area of protected rainforest, and 65 cents and 33 cents respectively for a 1,000 hectare increase in area of protected old-growth forest This does not mean that particular communities should bear financial responsibility for habitat conservation, but rather demonstrates that different communities (and people within communities) may place greater value on certain areas of forest.

Willingness to pay for environmental impacts (such as increased area or quality of habitat) can vary significantly depending on the impacts being surveyed, the location of impacts, and the demographics of survey respondents. The quality of results is also highly dependent on the rigour of survey design and implementation.

Carbon sequestration and storage

Forest ecosystems sequester (capture) carbon dioxide from the atmosphere and store it (known as a carbon sink) as organic carbon in plant biomass (trunks, branches, foliage and roots) and soil. Carbon stored in plant biomass and soils is a stock. The sequestration and emission of carbon from a forest ecosystem's carbon balance is known as the carbon flow. The carbon balance, regardless of scale, will vary over time but, generally, will be equal to the sum of carbon both sequestered and emitted from a forest ecosystem. Forests sequester and store large amounts of carbon in biomass and soils over long time periods, which contributes to the overall carbon balance for the planet, regulating both local, regional and broadscale climate and mitigating climate change.

Carbon is emitted to the atmosphere from forest ecosystems due to disturbances such as fire, the senescence of trees and the natural breakdown of vegetation and soils. The carbon balance is also altered when timber is removed from forest ecosystems through harvesting, noting that carbon can be stored in solid wood products (such as building materials or furniture).

The beneficiary of climate regulation services is the Victorian community, as well as the global community more broadly, who experience reduced impacts of climate change.

Quantification of carbon storage

Biomass data has been used to calculate stock of above-ground carbon across Victoria's forests. This includes living and dead above-ground biomass, but not below-ground biomass (root systems) or soil carbon, largely due to difficulties and expense in extracting and quantifying root biomass as well as the representativity of point sampling for soil carbon. Biomass data was supplied from the VFMP and was created by integrating Landsat satellite time series with Victoria's forest monitoring and forecasting framework. A conversion factor of 0.47 is used to convert biomass to carbon (Gifford 2000).

In 2017, an estimated 1.1 billion tonnes of carbon was determined to be stored in above-ground biomass in State forests on public land across Victoria's RFA regions; this is around 4 billion tonnes of carbon dioxide equivalent (CO_2e).[41] Carbon stocks fluctuate from year to year, driven by disturbance events such as bushfires or removal of carbon through timber harvesting. From 1988 carbon stocks have averaged 1.1 billion tonnes, with a high of 1,141 million tonnes in 1989 and a low of 937 million tonnes in 2007.[42] There were significant bushfires in 2006–07 which contributed to this reduction in carbon stocks, particularly in the Gippsland RFA region and the North East RFA region, as can be seen in Figure 52. The impact of other major bushfire seasons can be seen in the data, such as the 2003 bushfires in Gippsland and the North East, the 2009 bushfires in the Central Highlands, and the 2014 bushfires in East Gippsland. There has been a steady increase in carbon stocks over the past decade, driven by increases in Gippsland and the North East. However, this trend may be impacted by the 2018–19 bushfire season which saw significant fires in Gippsland.

41 1 tonne of carbon = 3.664 tonnes of carbon dioxide equivalent. See Department of the Environment and Energy 2017.

42 Note that there is a gap in the dataset, with data unavailable for 1999, 2000, 2001 and 2002.

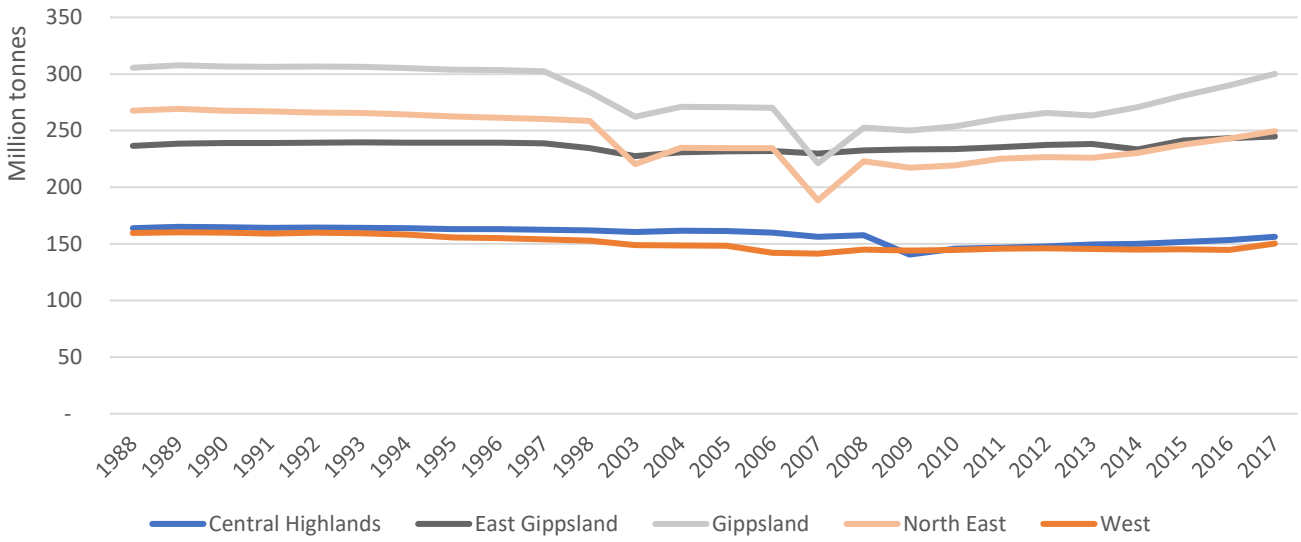

Figure 52: Above-ground carbon on public land by RFA region, 1988–2017

Note: Data is not available for 1999, 2000, 2001 and 2002.

Source: DELWP Ensym modelling (Unpublished)

Figure 53 shows the distribution of above-ground carbon stocks on public land across Victoria in 2017. It shows the significant density of carbon storage in forests in the east of the state, and in the Otway Ranges in the West RFA region. Figure 54 shows the change in above-ground carbon stocks in forest areas between 2006 and 2007, a period of significant bushfire activity and loss of forest carbon stocks. The 2007 fire extent is also mapped. The reduction in carbon stocks from the 2007 Alpine fires is clearly evident. The map also shows carbon stocks in the Grampians in the West RFA region recovering from the 2006 fires.

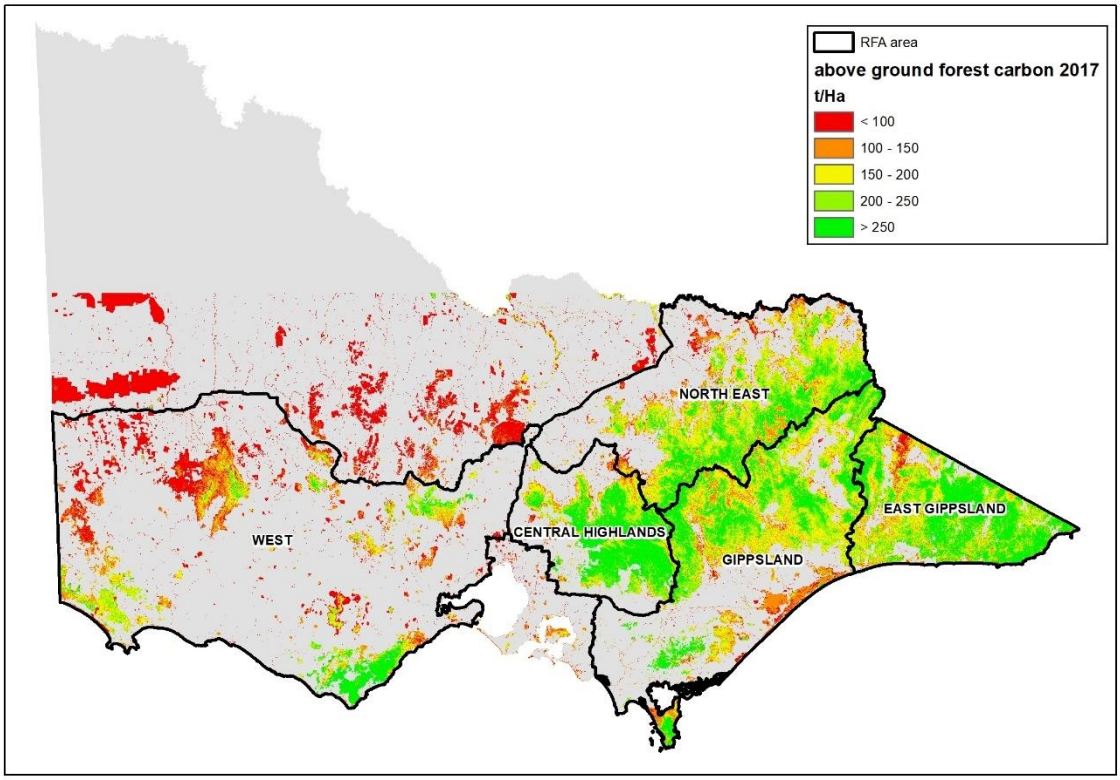

Figure 53: Above-ground carbon on public land, 2017

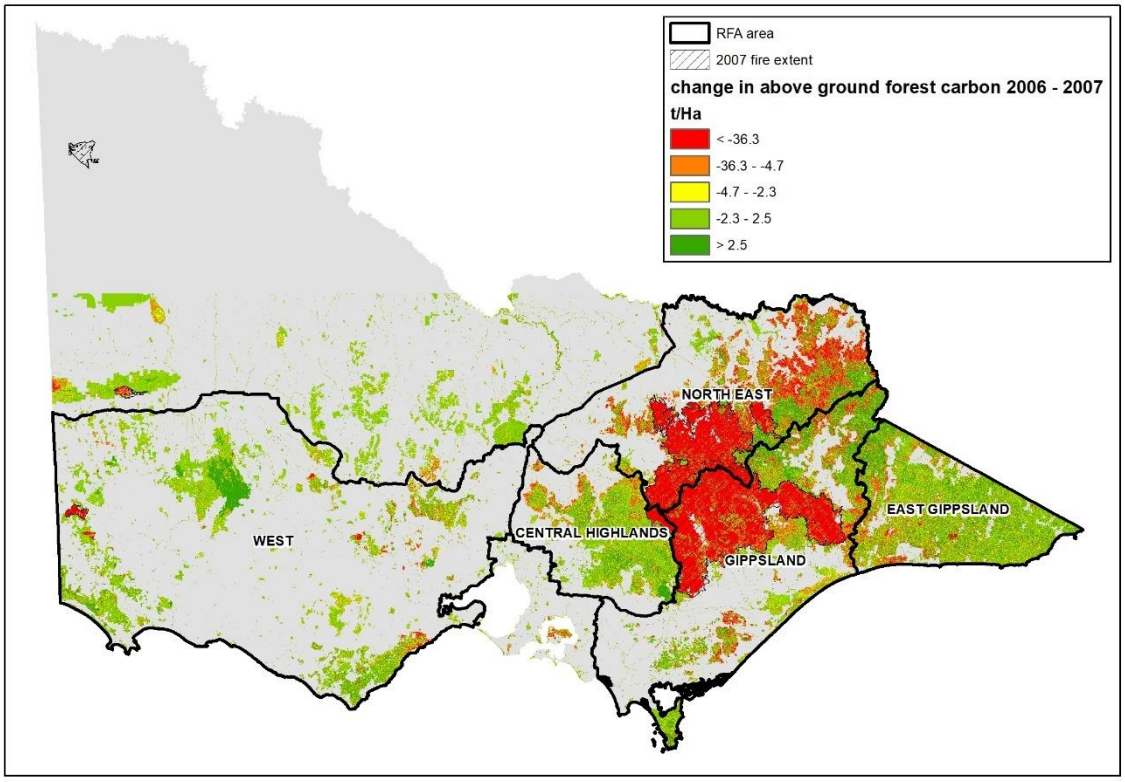

Figure 54: Change in above-ground carbon on public land between 2006 and 2007

Source: DELWP Ensym modelling (Unpublished)

Table 97 reports the quantity of above-ground biomass, carbon and carbon dioxide equivalent (CO2e) on public land across the five RFA regions in 2017, the most recent year of data available. Gippsland has the highest carbon stock on public land (around 300 million tonnes in 2017), followed by North East and East Gippsland (both around 250 million tonnes of carbon in 2017). However, Gippsland, East Gippsland and the North East RFA regions have larger areas of forest on public land than the Central Highlands and West RFA regions.

Central Highlands has the highest average above-ground carbon stock per hectare of forest on public land (250 tonnes per hectare in 2017), followed by East Gippsland (232 tonnes per hectare in 2017). This is likely driven by composition and age of species in these RFA regions.

Table 100: Above-ground biomass and carbon on public land 2017

Region	Total biomass (tonnes)	Total carbon (tonnes)	CO2e (tonnes)	Carbon per hectare (tonnes)
Central Highlands	332,262,052	156,163,164	572,181,835	250
East Gippsland	521,012,249	244,875,757	897,224,774	232
Gippsland	638,676,349	300,177,884	1,099,851,767	206
North East	531,181,572	249,655,339	914,737,162	199
West	319,645,024	150,233,161	550,454,303	145
Total	2,342,777,246	1,101,105,306	4,034,449,840	203

Source: DELWP Ensym modelling (Unpublished)

Valuation of carbon storage

Carbon stocks can be valued by applying a dollar value to each tonne of carbon dioxide equivalent (CO2e). One tonne of carbon is equal to 3.664 tonnes of CO2e (DoEE 2017). The values used in this analysis are:

- Lower bound –- $12 per tonne of CO2e
- Central –- $20 per tonne of CO2e
- Upper bound –- $59 per tonne of CO2e

In the absence of a clear carbon price in Australia, these values have been derived from a median of existing international carbon market values. Values were obtained from the World Bank Carbon Pricing Dashboard data, with a central value bounded by upper and lower values to support sensitivity testing. [43]

The estimated total value of carbon stock in forests across Victoria's RFA regions (for aboveground biomass) is around $81 billion, with a lower and upper bound of around $48 billion and $238 billion. These values represent the total value of carbon stock, rather than an annual value. That is, if all carbon stored in Victorian forests was released, the cost to offset emissions would be $81 billion. These values represent the total value of *above-ground* carbon

43 World BankBank Carbon Pricing Dashboard: http://carbonpricingdashboard.worldbank.org/map_data

stock *within the public forest boundary*. They do not account for carbon stocks in timber removed from forest areas. The value of carbon stock in each RFA region is outlined in Table 101. Note that the value of a set quantity of carbon stock is expected to increase over time, as CO2e market prices are projected to increase.

Table 101: Value of above-ground carbon stocks on public land 2017

Region	Carbon dioxide equivalent (CO2e) (tonnes)	$ billion		
		Lower	*Central*	*Upper*
Central Highlands	572,181,835	6.9	11.4	33.8
East Gippsland	897,224,774	10.8	17.9	52.9
Gippsland	1,099,851,767	13.2	22.0	64.9
North East	914,737,162	11.0	18.3	54.0
West	550,454,303	6.6	11.0	32.5
Total Victoria	**4,034,449,840**	**48.4**	**80.7**	**238.0**

Air quality

Forests provide the ecosystem service of air quality regulation, as trees and other native vegetation help filter a number of air pollutants. They intercept and trap airborne particles and absorb other pollutants such as carbon monoxide, sulphur dioxide and nitrogen dioxide.

This ecosystem service provides benefits to people through improved amenity and health outcomes. The links between human exposure to poor air quality and its effects on human health are an increasing focus for research and policy development. There is an increasing body of evidence demonstrating that air pollution is associated with adverse health effects, including impacts on premature mortality and effects on the cardiovascular and respiratory systems (Environment Protection Authority Victoria 2018).

The quantity of pollutants filtered by forest ecosystems and the value of benefits to people have not been estimated for this study due to the absence of data. While quantity estimates for some pollutants emitted to the atmosphere are available for Victoria,[44] data on the quantity of pollutants removed from the atmosphere by forests is not available.

Benefits from air quality regulation could be valued based on avoided health impacts, such as the avoided cost of medical treatment. This would require information on the quantity of pollutants filtered by forests and the avoided health impacts associated with this.

44 The DoEEDoEE publishes National Pollution Inventory data which includes emissions to the atmosphere.

Indicator 6.1d: Production and consumption and import/export of wood, wood products and non-wood products

This indicator measures the ratio of import to export consumption of forest-based products in Victoria and Australia. Consumption trends over time provide a measure of the ability of Australian forest and timber industries, through both domestic production and importation, to meet Australian society's demand for forest-based products and the industries' contribution to the economy. This includes a range of wood products, from structural-grade timbers to woodchips, pa per and pa per board.

In 2017–18, Australia imported $5.6 billion of wood and wood products – an increase of about 26 per cent compared to 2007–08 (Figure 55). In the same year, Australia exported $3.6 billion of wood and wood products – an increase of 45 per cent compared to 2007–08. On average, the trade deficit for wood and wood products has remained at just under 50 per cent over the last 10 years.

Figure 55: Import/export trend in wood products in Australia, 2007–08 to 2017–18

Data source: Australian Department of Agriculture and Water Resources ABARES (2019).

Victorian breakdown

For Victoria, ABARES provides a breakdown of import/export trade deficit data of secondary wood products (SWP) by value, which provides some indication of trends in trade deficit of wood products. SWP include wooden furniture, prefabricated buildings and printed articles. The printed articles include newspapers, printed books, magazines, journals and other printed paper products.

The value of SWP imported to Victoria has increased significantly, by about 46 per cent, from $0.676 billion to $1.001 billion between 2007–08 and 2017–18 (Figure 56).

By contrast, the value of SWP exported has decreased by 15 per cent, from $0.097 billion to $0.082 billion. The sharp rise in import value is mainly due to imports of wooden furniture (up by 200 per cent) and prefabricated buildings (up by 400 per cent). This has contributed to the widening of the Victorian trade deficit for SWP by about 57 per cent between 2007–08 and 2017–18.

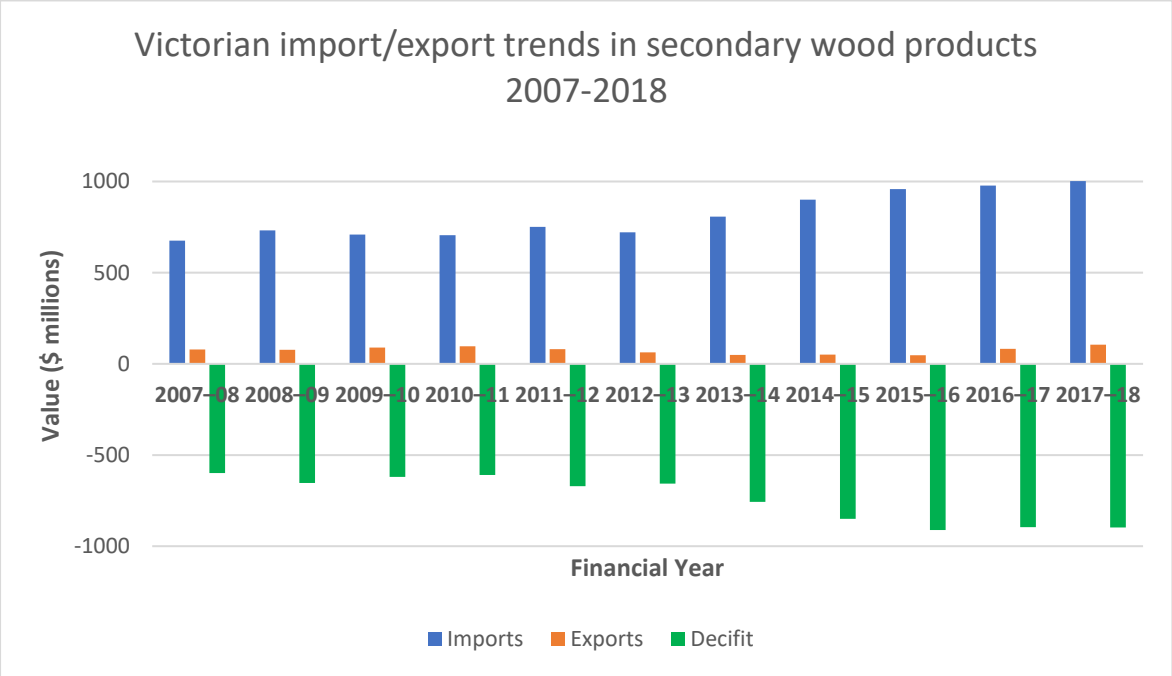

Figure 56: Import/export trends in SWP in Victoria, 2007–08 to 2017–18

Data source: Australian Department of Agriculture and Water Resources ABARES (2019).

Indicator 6.1e: Degree of recycling of forest products

This indicator measures the extent to which recycling or reuse of forest products occurs. As global demand for forest products increase, there is a growing need to meet societal demands for recycling of forest products.

Figure 57 shows a 28 per cent increase in recycling of forest-derived products between 2008–09 and 2016–17, with the largest contributor being paper and paperboard. Timber product recycling specifically increased by 15 per cent over the same period (Sustainability Victoria 2017).

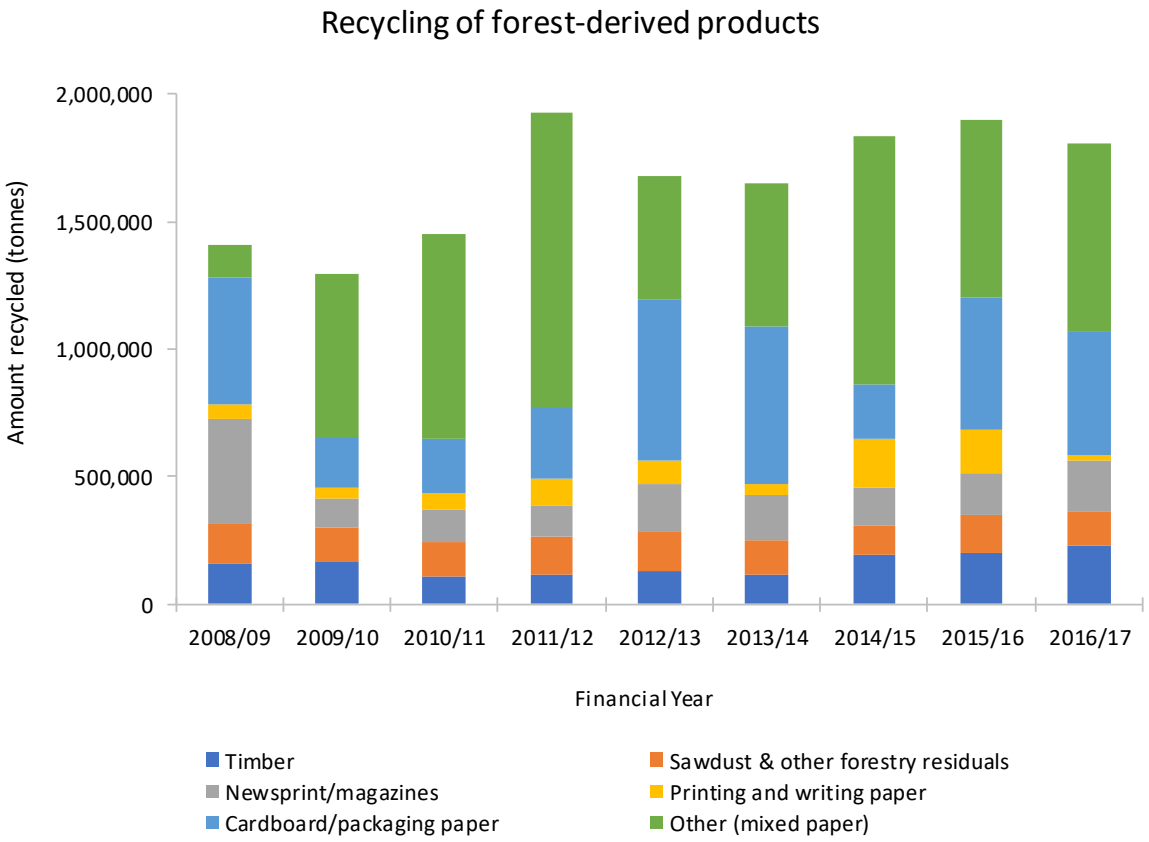

Figure 57: Recycling of various forest-derived products in Victoria, 2008–09 to 2016–17

Data source: Sustainability Victoria (2018).

Considering recycling rates as a proportion of total use, the waste recovery rate for forest-derived products has fluctuated, between 42 per cent and 54 per cent for wood and timber (average 49 per cent), and between 66 per cent and 78 per cent for paper and paperboard (average 73 per cent) between 2008–09 and 2016–17 (Figure 58). Victoria's rate for paper and paperboard waste recovery is much higher than the national average of 60 per cent (DoEE 2016). Data for national waste recovery rates of wood and timber products were not found.

Sustainability Victoria forecasts that waste recovery rates for paper and paperboard, and organic materials (including wood and timber), will continue to increase, with potential

fluctuations, in line with past trends (Sustainability Victoria 2018). It is therefore likely that Victoria will continue to have a high rate of waste recovery.

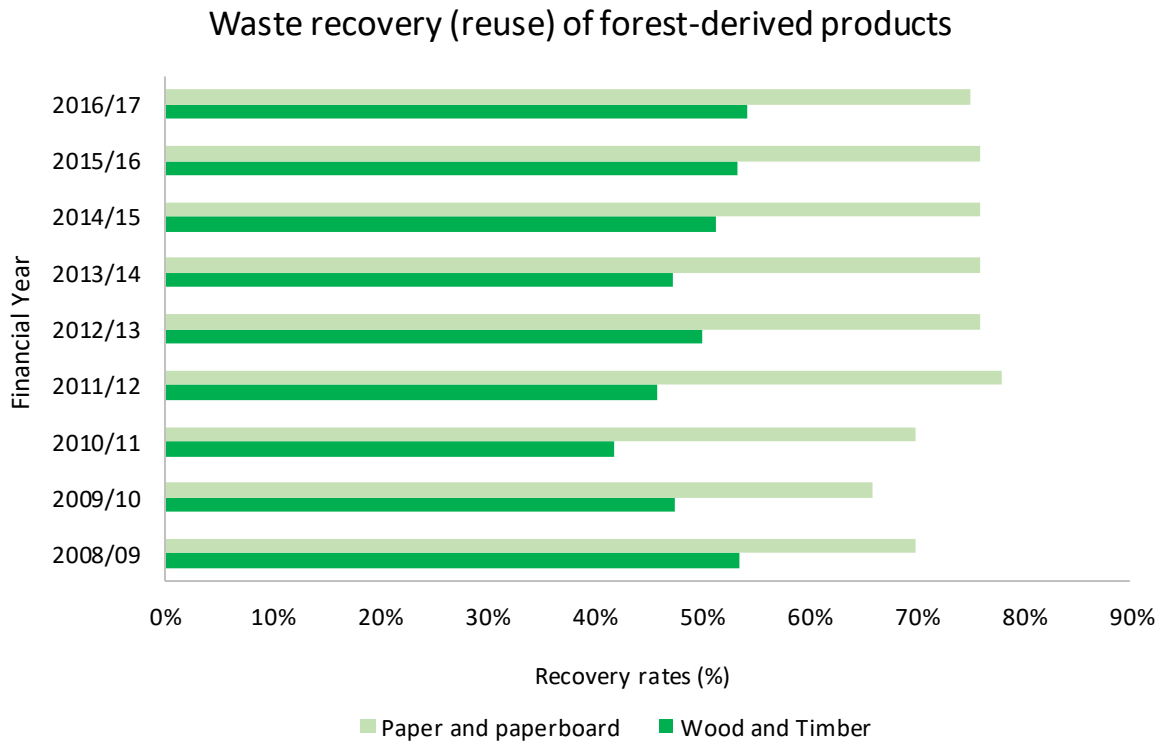

Figure 58: Waste recovery rates for forest-derived products in Victoria, 2008–09 to 2015–16

Note: Waste recovery is defined as the use of waste as an input material to create new products.

Data source: Sustainability Victoria (2018)

Indicator 6.2a: Investment and expenditure in forest management

As described in the VSOFR 2018:

> The agency responsible for managing natural resources, including State forests, in Victoria has changed several times during the reporting period. In April 2013, the Department of Sustainability and Environment merged with the Department of Primary Industries to form the Department of Environment and Primary Industries (DEPI). In January 2015, DELWP, which has broad responsibility for Victoria's natural environments (including forest management, and fire and emergency management), was created following a government restructure. Together with Parks Victoria and VicForests, DELWP is responsible for managing Victoria's parks and reserves, and State forests. VicForests is a separate government-owned business responsible for the harvest, commercial sale and regrowing of wood from Victoria's State forests.
>
> (Commissioner for Environmental Sustainability Victoria 2019, p. 164)

As can be seen in Table 102, Victorian Government expenditure on managing Victoria's public land has increased over the five reported years. Fire management costs decreased slightly in 2016–17, due largely to a quieter fire season. Conservation and recreation spending have seen significant increases, reflecting increased government priorities in these areas.

Table 102: Victorian Government expenditure on forest management, 2012–13 to 2016–17

	Expenditure ($ millions)				
Expenditure category	2012–13	2013–14	2014–15	2015–16	2016–17
Forest and fire management	383.5	382.3	347.8	396.5	372.3
Conservation and recreation	199.0	199.3	298.9	328.2	369.8
Total	**582.5**	**581.6**	**646.7**	**724.7**	**742.1**

Data source: Commissioner for Environmental Sustainability Victoria (2019, p. 164)

Table 103 shows the forest management expenditure on general maintenance, capital roading and capital bridge works between 2012–13 and 2016–17, as delivered through the public land management authority (DELWP). Total expenditure decreased across the period, particularly on maintenance work. This was due in part to decreasing timber production and available production areas, which reduced the maintenance works required for State forests, and parks and reserves.

Table 103: Victorian Government forest management expenditure on maintenance, capital roading and capital bridges, 2012–13 to 2016–17

	Expenditure ($ millions)				
Expenditure category	2012–13	2013–14	2014–15	2015–16	2016–17
Maintenance	16.0	16.8	12.6	9.0	7.9
Capital roading	0.2	0.7	0.4	0.3	0.2
Capital bridges	2.2	2.4	2.6	3.2	1.4
Total	**18.3**	**19.9**	**15.5**	**12.5**	**9.5**

Data source: Commissioner for Environmental Sustainability Victoria (2019, p. 164)

VicForests' expenditure in production has decreased 28 per cent since 2011 (Table 104). Production expenses comprise costs primarily incurred with external contractors, contracted to harvest standing timber and haul the resultant logs to the point-of-sale, normally the buyer's facility.

Conversely, however, employee benefits, primarily staff salaries and associated benefits and expenses, remained relatively stable at around $14–15 million per year.

VicForests' roading expenses, which have remained relatively stable since 2012, relate to costs VicForests pays to use the network for the haulage of timber. 'Other operating expenses' generally represent day-to-day running costs incurred in normal operations and are recognised as an expense in the reporting period in which they are incurred.

Table 104: Summary of VicForests expenses incurred in the delivery of services

Expense Type ('000)	Year							
	2011	2012	2013	2014	2015	2016	2017	2018
Production	101,985	90,917	73,682	73,171	73,683	75,500	74,413	73,041
Employee benefits	14,102	13,752	13,924	13,719	12,841	13,793	13,938	15,569
Roading	7,052	6,666	5,932	4,796	6,806	6,534	6,457	6,622
Other operating expenses	8,800	No data	6,373	6,506	8,333	NA	8,378	7,108

Source: VicForests annual reports available at http://www.vicforests.com.au/about-vicforests/corporate-reporting-1/corporate-reports

Indicator 6.2b: Investment in research, development, extension and use of new and improved technologies

Forests provide a wide range of opportunities for research, and the knowledge gained from forests contributes to the broader knowledge of the community about nature, culture and heritage. Land managers, such as DELWP and Parks Victoria, recognise the importance of research in forests to ensure that management is informed by good science and evidence.

Forests provide opportunities for schools, tertiary institutions and the community to gain a greater appreciation and understanding of nature, culture and heritage through formal and informal programs. For example, Parks Victoria's Research Partners Program encourages research to be undertaken in parks through collaboration with universities and other research institutions.[45]

Data on education and research is more prevalent for parks than for State forests. On average, 215 research permits are issued in parks each year and 183,000 people participate in parks-related education programs (DELWP & Parks Victoria 2015, p. 117).

In an assessment of Parks Victoria's Research Partners Program, it was determined that each dollar of Parks Victoria research funding resulted in approximately six dollars of leveraged research funding from partners. Some of these benefits could include productivity or efficiency gains in the management of native species or development of genetic material for medical research.

Government investment in research, development, and education

Investment outlined in Table 105 is limited to annual investments in forest management research and development (R&D) and education. This equates to $39 million invested since 2010–11 (an average of about $5.6 million per year). The annual data includes research payments but does not split payments for multi-year research projects. This is reflected in 2013–14, when the University of Melbourne received a total payment against multiple multi-year projects.

Between 2010–11 and 2016–17, six agencies and research organisations received funding. Consistently, the largest investment – $25 million over seven years (64 per cent of the overall investment) – was provided to the University of Melbourne. The second-largest was to the VFMP, which received about $5.9 million over seven years (15 per cent of the overall investment).

The Victorian Government also contributed 20 per cent of overall investments ($7.8 million) to the ARI and the Bushfire and Natural Hazards Cooperative Research Centre (CRC). Investment in R&D by VicForests in 2015–16 was approximately $161,000. All states and territories that manage public production forests also contribute to R&D through a forest growers levy, which supports the delivery of programs by Forest and Wood Products Australia.

45 See https://parkweb.vic.gov.au/park-management/environment/research-and-scientific-management/research/research-partners-program

Table 105: Victorian Government investment in forest management R&D and education, 2010–11 to 2016–17

	Expenditure ($)							
Research provider	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	Total
The Arthur Rylah Institute	975,000	710,000	430,000	836,273	232,244	655,397	281,493	4,120,407
The University of Melbourne	3,200,000	3,100,000	2,920,000	5,890,000	3,235,000	3,665,000	3,025,000	25,035,000
VFMP	727,000	1,253,000	750,000	800,000	830,000	830,000	740,000	5,930,000
CRC for Forestry	50,000	50,000						100,000
Bushfire and Natural Hazards CRC	213,000	746,000	200,000	875,000	550,000	200,000	880,000	3,664,000
Toolangi Forest Discovery Centre	48,393	52,115						100,508
VicForests						161,000		161,000
Total	**5,213,393**	**5,911,115**	**4,300,000**	**8,401,273**	**4,847,244**	**5,511,397**	**4,926,493**	**39,110,915**

Data source: DELWP corporate data

Summary and future management of economic values

There has been significant change in the structure and management of timber harvesting in the Victorian productive forest estate over the life of the Victorian RFAs. Bushfires, protection of additional areas in response to new threatened species detections, and various policy changes have decreased the area of public forest available for production forestry.

The area available for timber harvest (net harvestable area) in eastern Victoria reduced from 820,000 hectares at the time of the CRAs to 460,000 hectares in 2017. The decrease in forest area available for harvest has been attributed to the effect of a number of large bushfires and the resulting competition for forest required for species conservation or to protect sensitive vegetation such as rainforests and old-growth forests. The VicForests Resource Outlook illustrates the reduction in resource availability over time.

With harvesting significantly reduced in the West Victorian RFA region following the cessation of commercial harvesting operations in the Otway Ranges in 2008, the total area available and suitable for timber harvesting has more than halved since the commencement of the RFAs.

The volume of timber from native forests has also decreased over the period of the Victorian RFAs. The volume of D+ sawlogs harvested from eastern Victoria RFA regions decreased from 532,300 cubic metres in 2004–05 to 230,800 cubic metres in 2018–19. Pulpwood production has decreased at a similar rate to sawlog production since 2004–05. However, the production of other products, such as low-grade logs, has increased. Since 2005 the Central Highlands RFA region has accounted for approximately 75 per cent of all harvested volume from State forests.

As of 2015 there were 421,000 hectares of plantation forest in the five Victorian RFA regions. This comprises 222,000 hectares of softwood, 199,000 hectares of hardwood and 1,000 hectares of unknown or mixed species plantations. The area of softwood plantation has remained fairly stable, rising from 212,000 hectares in 1999–2000 to 226,000 in 2016–17; however, the area of hardwood plantation has increased significantly over the period of the RFAs, largely due to MISs in the early 2000s when the hardwood plantation area grew from 101,500 hectares in 1999–2000 to its peak of 203,000 hectares in 2010–11. Hardwood plantation area has not increased since the demise of the MIS in 2010–11, and it has declined where plantations established as part of the MIS in marginal areas were not replanted. No new hardwood plantation areas have been established since 2012–13.

The volume of wood harvested from Victorian plantation forests has increased significantly over the last 10 years, largely driven by the maturation of hardwood plantations managed for pulp logs. The gross output value of Victoria's plantation timber harvest was $604 million in 2017–18, derived from harvest of 7.8 million cubic metres of plantation timber, of which 46 per cent was hardwood and 54 per cent softwood. In support of the plantation industry, in 2017–18 the Victorian Government committed $110 million to develop 550 hectares of plantation forest in the Latrobe Valley.

The Victorian Government makes available approximately 45,000 cubic metres of firewood from State forests in the RFA regions each year. VicForests also produces firewood for sale,

and together this provides the primary source of heating for 10 per cent of all Victorian households and 25 per cent of regional Victorian households.

Victoria's publicly owned native forests are available for a range of uses, including recreation, non-wood forest products, provision of ecosystem services, sequestration of carbon and research. The tourism and recreation sector is estimated to contribute $450 million to the economy each year within national parks alone.

Forest contributions to other ecosystem services provide considerable value, particularly for Melbourne's reservoirs and the broader effect on water quality regulation. Similarly, climate mitigation and carbon sequestration, along with pollination services, air quality regulation and pest and disease control, are all reliant on healthy forests. These will continue to be important components of the broader services provided by forests in Victoria. Forests, both those in reserves and those currently managed for timber production, are becoming increasingly important elements of the visitor economy.

Investment and expenditure on forest management in Victoria's RFA regions is ongoing and is strongly influenced by market conditions. Investment in R&D is returned in improved understanding of forests and better forest management.

On 7 November 2019, the Victorian Government announced a $120 million Native Forest Transition Package to support Victoria's forest industry to move away from native timber by 2030. The announcement represented the largest area of native forest protected from timber harvesting in more than 20 years with the immediate protection of all remaining old growth forest and more than 96,000 hectares of State forest inhabited by Greater Gliders, Leadbeater's Possum and other threatened species.

Modernised and extended Victorian RFAs will provide regulatory certainty to the timber industry to 2030 while it makes this transition.

Over the coming years, it is expected that a number of new forest industries will emerge, including growth in markets for nature-based and cultural tourism, carbon sequestration, biomass, wood pellets and engineered products.

Social values

This section includes the following Montréal Process indicators:

- Indicator 6. 3a – Area of forest available for general recreation/tourism
- Indicator 6.3b – Range and use of recreational/tourism activities available
- Indicator 6. 4d – The importance of forests to people
- Indicator 6. 5a – Direct and indirect employment in the forest sector
- Indicator 6. 5b – Wage rates and injury rates within the forest sector
- Indicator 6. 5c – Resilience of forest-dependent communities to changing social and economic conditions

Indicator 6.3a: Area of forest available for general recreation/tourism

This indicator measures the area of forest available for use by the community for recreation and tourism. This provides an indication of the emphasis placed by society on the management of forests for recreation and tourism.

Analysing the area and quality of forests actively used for recreation and tourism assists in understanding future priorities for the Victorian RFA regions. It provides information on how forests within the RFA regions are utilised for the recreational needs of all communities and on what contribution the forests make to the tourism sector. An area of forest is considered available for tourism and recreational purposes if there are no formal prohibitions on access for recreation and tourism activities.

Victoria's State forests are managed in accordance with a range of values, including recreation, tourism, conservation and timber production. State forests are zoned for the management of multiple forest uses. The areas available for recreation and tourism uses in the RFA regions are made up of State forests, parks and reserves (DEPI 2014d).

As reported in the initial CRAs, the Central Highlands had a State forest coverage of approximately 389,800 hectares, while East Gippsland had approximately 637,000 hectares, Gippsland had 806,000 hectares, the North East had 718,700 hectares, and West Victoria had 411,000 hectares.

According to VSOFR 2018, Victoria has 7. 89 million hectares of public land (excluding marine and coastal areas). Parks and reserves account for 3.7 million hectares and State forests account for 3.2 million hectares; both have approximately 3 million hectares of forest cover (Commissioner for Environmental Sustainability Victoria 2019). In Victoria, about 97 per cent of parks and conservation reserves and 99 per cent of State forest are available for recreation purposes. From 2004 to 2018, overall available areas for recreation and tourism activities increased by approximately 12.4 per cent (Commissioner for Environmental Sustainability Victoria 2019).

The area actively utilised for recreation and tourism by the public is much less than the 99 per cent available, due largely to the topography, remoteness, and lack of road and trail

infrastructure in State forests (DEPI 2014d and Commissioner for Environmental Sustainability Victoria 2019).

Table 106: Forest area available for recreation and tourism in Victoria for years 2000, 2008, 2013 and 2018

Forest area	2000	2008	2013	2018
Multiple-use forests ('000 ha)	663	3,049	2,964	3,100
Nature conservation reserve ('000 ha)	2,957	3,230	3,214	NA

Data Source: State of the Forests Reports

There has been some minor change of land use from State forest into protected areas, although this has caused minimal impact on the amount of land available for recreational and tourism purposes (Commissioner for Environmental Sustainability Victoria 2019).

Recreational activities may be temporarily or permanently restricted in state and multiple-use forests for a variety of reasons. Temporary closure may occur due to the protection of flora and fauna, prescribed burning, harvesting activities, public events, protection of water catchments and infrastructure, biosecurity control, harvesting operations, and in response to natural disturbances. Permanent closure may be for reasons such as scientific research, conservation areas, water catchments, significant Aboriginal cultural heritage sites and defence training areas.

Forest management zones were originally developed in the forest management plan for each RFA region completed as part of the CRA assessments.

The recreational activities permitted in each area depend on the specific management zone objectives. Most recreational activities are allowed in GMZ. In SPZ and SMZ certain restrictions can apply for natural and cultural management purposes.

Forest management plans relate to State forest. They outline the types of visitor and community activities that are permissible and the general conditions of use that apply. In forests that are not covered by a forest management plan, the responsible forest management agency will set the policies and indicate the types of permitted recreation and tourism activities and the conditions of use (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018). DELWP has commissioned market research into State forest visitor numbers (currently under way). This has been focused on what visitors want from State forests and how satisfied they are with their visit. Market research into four-wheel-drive use in State forest has also been commissioned by DELWP for 2019. These studies have been commissioned to address a gap in existing understanding of visitor numbers to State forest.

Indicator 6.3b: Range and use of recreation/tourism activities available

This indicator assesses the range and number of recreation and tourism facilities provided in forests, their level of use and their contribution to the broader tourism sector. Appropriate and well-managed facilities help to optimise visitor satisfaction as well as minimising environmental impacts associated with recreation and tourism. The type of recreation and tourism infrastructure that is available in a forest may influences the forests' volume of use and accessibility and the type of experience it provides.

Analysis of the range and use of forests available for recreation and tourism assists in understanding what emphasis society places on managing forests for recreation and tourism uses. It also helps in understanding the extent to which forest management is providing for the recreational needs of local and regional communities.

There are a number of different recreational and visitor activities undertaken in Victoria's forests. According to the 2017–18 Parks Victoria Annual Report, in that reporting, 14 million people took part in at least one nature-based activity (Parks Victoria 2018).

Victorian State forests provide for a wide range of recreation and tourism activities and typically provide for opportunities that are free-of-charge to the public (Montréal Process Implementation Group for Australia and NFI Steering Committee, 2018). There is an absence of visitor and use data for State forests, therefore the most accurate way to understand the demand for various activities is through the number of facilities provided for recreation and tourism activities (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018).

In 1994–95 the total number of visitor days to State forests was just over 3 million, with the CRAs reporting that there was a strong public view that forests should remain in reserves and not be converted into national parks in order to allow greater access for recreational use. In 1995–96 tourism contributed about 4 per cent of Victoria's gross state product, and the Central Highlands, for example, accounted for 5.1 per cent of visitors to Victoria's forests.

The CRAs reported that the West RFA region was the most popular tourist destination, with over 3.5 million visitors in 1995, and the Central Highlands receiving over 2.5 million visits in 1994–95. The North East RFA region received approximately 1.5 million visitors in 1995. The Gippsland RFA region received 937,000 visitors in 1995, and the East Gippsland RFA region received approximately 600,000 visitor days in 1995–96.

Victoria's forests, particularly those within the RFA regions, provide for a broad range of recreation and tourism activities (Table 109). Some of the most common across the state include walking, mountain-bike riding, camping, fishing, picnicking and four-wheel driving (DEPI 2014d). There are various facilities that cater for these recreational activities, such as campgrounds, day visitor areas, walking tracks, mountain-bike trails, visitor information infrastructure, roads and parking areas (Commissioner for Environmental Sustainability Victoria 2019).

Table 107: Recreation sites and tracks within State forests across RFA regions

	RFA				
	East Gippsland	Gippsland	Central Highlands	North East	West
No. recreation sites	21	67	104	134	48
No. recreational activities accommodated at these sites					
Camping	8	51	68	93	24
Picnic	17	54	49	59	39
Horse riding	1	1	4	2	1
Trail bike	0	1	9	1	4
Heritage sites	6	12	12	12	4
Fishing	5	7	9	38	6
Hang-gliding	0	0	0	3	4
No. recreation tracks	32	52	58	33	38

Data source: Recweb_sites spatial layer. Corporate Spatial Data Library (CSDL)

Over the reporting period of the ASOFR 2018, the number of all Victorian tourism and recreation facilities increased by an average of 9 per cent, except for roads promoted as touring routes, which saw a notable increase. There were also notable increases in tracks for horse riding and dog walking and sites used for fishing (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018). According to the VSOFR 2018, there has been an increase in the network of mountain-bike trails due to greater investment driven by the increased popularity of mountain-biking (Commissioner for Environmental Sustainability Victoria 2019). Victorian State forests have also seen a significant increase in four-wheel-driving tracks and touring routes, largely due to better promotion of existing roads and attractions (Commissioner for Environmental Sustainability Victoria 2019).

Recreational users of State forests also contribute to feral species management control. In 2017 an estimated 106,275 deer were harvested in Victoria during the deer-hunting season by recreational hunters (Commissioner for Environmental Sustainability Victoria 2019).

The *Victorian 4WD strategy 2017–2021* (DELWP 2017e) aims to increase the recreational and regional economic benefit that four-wheel driving delivers to greater Victoria by better utilising our extensive and nationally significant 45,000 kilometres of recreational roads and tracks. The vision for the strategy is: 'Four-wheel driving in Victoria provides fantastic benefits for people, communities and nature.'

The strategy will guide the work of Victoria's ministerially appointed Four Wheel Drive Advisory Committee and all partner organisations over the next five years in delivering the strategic vision for four-wheel driving in Victoria. Five initiatives have been identified to achieve the strategic outcomes:

1. Providing a 4WD 'Experience'

2. Effective education
3. Strengthening partnerships
4. Strategic marketing and communications
5. Sustainable solutions.

Table 108: Activities recorded within Victorian State forests for years 2003, 2008, 2013 and 2017

Activity	Year			
	2003	2008	2013	2017
Day visitor areas	300	227	261	250
Camp grounds	280	226	249	255
Total recreational sites			398	389
No. short walks (<3 km)	53		113	91
No. medium walks (3-8 km)		44	51	
No. day trails (8-12 km)	14		12	15
No of overnight walks (>12 km)	17		11	6
Walking trails (km)	550	715	742	787
Mountain-biking trails (km)			334	423
Horse-riding trails (km)			71	112
Four-wheel-driving touring routes (km)			251	2,128
Scenic drives (km)			403	449
Trail-bike touring routes (km)			58	340
Fishing (no. of managed sites)		33	54	67
Driving (km of roads)		1,700	620	2,917
Events or festivals		152	195	170

Data Source: Commissioner for Environmental Sustainability (2019)

There was major investment in forest tourism and recreation from 2008, through re-building infrastructure following the bushfires in 2009 and major floods in 2010–11. Roughly 20 per cent of State forest visitor assets were replaced as a result of the 2009 bushfires (DEPI 2014d).

Victoria launched an improved asset management system (RecWeb) for State forests in 2005. This system accurately captures spatial and textual data for recreational sites and tracks. The increased ability to capture existing sites and tracks largely explains the increase in recreational sites and of walking tracks captured between 2006 and 2013 (DEPI 2014d). This trend fell slightly in 2017, when the number of total recreational sites fell from 398 in 2013 to 389 in 2017 (Commissioner for Environmental Sustainability Victoria 2019). This decline is attributed

to data maintenance issues that result in periodic changes to the dataset, with some sites being consolidated or added based on improved data captures. In some cases, sites are retired while others are added, which contributes to the minor changes in total number of sites (Table 109).

Table 109: Sites and tracks available in forests for recreation and tourism activities

	State forest				Parks and conservation reserves			
Activity	2003	2008	2013	2017	2003	2008	2013	2017
Day visitor areas	300	227	261	250	790	668	752	757
Camp grounds	280	226	249	255	252	599	680	
Total recreational sites			398	389	1,042	1,267	1,432	
Short walks (<3 km) – Number	53		113	91	811			
Medium walks (3-8 km) – Number	51		44	51	204			
Day trails (8-12 km) – Number	14		12	15	50			
Overnight trails (>12 km) – Number	17		11	6	35			
Walking trails (km)	550	715	916	787		3,700	3,700	3,700
Mountain-biking trails (km)			334	423				
Horse-riding trails (km)			71	112				
Four-wheel-driving touring routes (km)			251	2,128				
Scenic drives (km)			403	449				
Trail-bike touring routes (km)			58	340				
Fishing (no. of managed sites)		33	54	67				
Driving (km of roads)		1,700	620	2,917				
Events or festivals		152	195	170				

Source: Commissioner for Environmental Sustainability Victoria 2019

Facilities in State forests are managed by DELWP. DELWP uses a Levels of Service (LOS) framework across public land sites and infrastructure to provide information for the strategic management of visitor services across the forest estate. This provides for better establishment and delivery of services and infrastructure to meet the needs of visitors. It also guides the management of public land (Commissioner for Environmental Sustainability Victoria 2019). A high LOS means a highly serviced site and a very basic LOS is a site with low ranger presence and supporting visitor infrastructure. Sites and tracks across State forests fall within the 'mid' to 'basic' LOS categories (Commissioner for Environmental Sustainability Victoria 2019). The recreation asset dataset describes assets related to recreation sites or trails (such as toilets,

viewing platforms, picnic shelters, etc.) within State forest. This dataset provides valuable information to promote these assets for public use as well as assisting staff in their management of these assets. These assets are represented in Figure 59, according to RFA region.

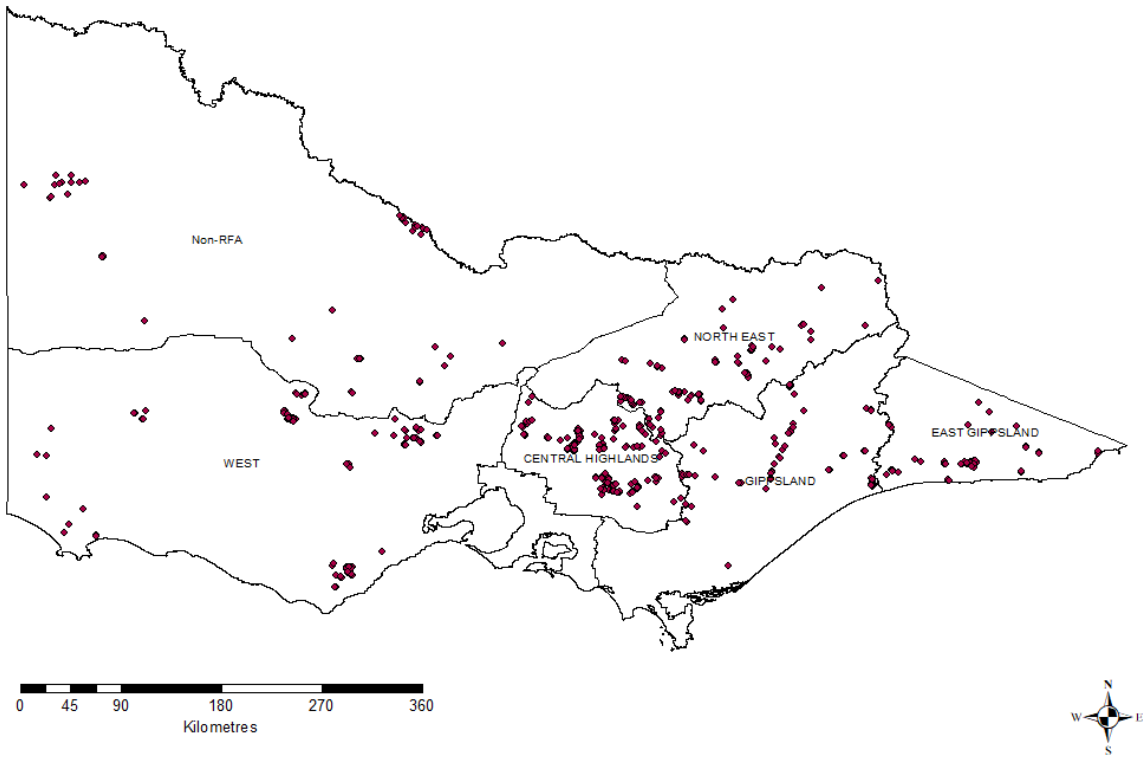

Figure 59: Recreation assets within State forests across RFA regions

Case study: 'More to Explore' app

On 11 December 2018, Forest Fire Management Victoria released an app called 'More to Explore'. The app aims to provide information to help people make the most of Victoria's 3.2 million hectares of State forest and the network of roughly 400 visitor sites and 250 recreational trails. Visitors are able to access maps, site descriptions and opening times; get directions to the site; access GPS guidance; and download maps for offline use.

Due to the 'More to Explore' app, Victoria's State forests have never been easier to explore. Even if visitor sites are likely to be in areas of limited phone range, users have the ability to download maps to their device to enable offline navigation and find their location using the device's GPS functions.

In 2019 the app will receive additional improvements, such as:

- advanced search/filter options
- upgraded tips and safety information
- improved news and notifications information
- hunting information (to show where hunting is permitted).

The More to Explore app is an example of the government's drive to develop intuitive ways to facilitate better visitor experiences through innovative technologies and better public communications.

Indicator 6.4d: The importance of forests to people

Social data collected through research programs or community engagement can identify the values of the public, which can then be incorporated in policy and management. Some examples of community engagement methods used to collect this data are:

1. Participatory mapping at a scale that enables local community members to identify special places (valued entities) and link these to valued attributes.
2. Value frameworks to record qualitative social data:
    - for example, in community drop-in sessions or focus groups, record responses under Valued attribute categories and
    - categorise the qualitative 'reasons' given in the online participatory mapping according to valued attributes.
3. Increase the efforts to understand Cultural valued attributes (Indigenous and Non-Indigenous), particularly contemporary activities and events that maintain cultural traditions.
4. Seek an understanding of future trends in Experiential and Recreational activities in forests through surveys and online Participatory mapping.
5. Increase efforts to understand Social-Economic valued attributes by updating the Social Impact Assessments (SIA) undertaken for the original RFA process, especially in areas likely to be affected by RFA decisions. This should include both quantitative analysis (e.g. demographic) and qualitative analysis (e.g. resident experiences) of social trends, impacts of past decisions and anticipated future impacts.

RFA modernisation program and Forest Management System reform

DELWP is engaging with all Victorians to support the delivery of the RFA modernisation program. This involves engaging with the community through a comprehensive, genuine and inclusive engagement process. This engagement aims to identify the diverse values of communities and uses of Victoria's forests and will be used to shape the modernisation of Victoria's RFAs and forest management system. This includes developing a vision and strategy for a future-ready, responsive forest management system. Outcomes of the engagement have informed the negotiation of the RFAs with the Commonwealth, the strategic direction for future forest management in Victoria and the reform of Victoria's regulatory framework and forest management planning.

Overview of the engagement process

The Victorian and Australian governments want to understand the community's views on opportunities to improve the five Victorian RFAs. Public input has directly informed this process.

Independent consultation: modernisation of the Victorian Regional Forest Agreements (Jackson 2019) was developed to provide an explanation of what the Victorian RFAs are, how they operate, and how effective they have been, in addition to recommending areas for their improvement. The Victorian and Australian governments have sought the views of the public on these and other areas for potential improvement by posing a series of overarching questions and more targeted questions. The questions from the survey are outlined in Table

110. They are to be answered with reference to the independent consultation paper (Jackson 2019).

Table 110: RFA modernisation engagement survey

	Survey Questions
General	What changes have you seen in the RFA regions?
	What should the Victorian RFAs aim to achieve over the next 20 years?
	What are the potential improvements you think should be made?
	How could the potential improvements in the consultation paper help modernise the Victorian RFAs?
	Do you have any views on which potential improvements are most important?
Theme 1	EFSM
	How do you use forests in your region
	How could the RFAs better provide for multiple forest uses (i.e. recreation, conservation, livelihood and economy)?
	What are your views on existing environmental protections afforded across the entire forest estate (including parks, reserves and State forests) through the RFAs?
	How could the environmental protections be improved?
	What opportunities could the RFAs provide to support access to and traditional use of forests by Traditional Owners and Aboriginal people?
	How could the RFAs enable the legal rights of Traditional Owners to partner in land management and seek economic and cultural opportunities to be realised in future forest management?
Theme 2	THE LONG-TERM STABILITY OF FORESTS AND FOREST INDUSTRIES
	How could the RFAs consider climate change and other large-scale natural disturbances (including bushfires)?
	How could the RFAs better address industry sustainability?
	How could the RFAs encourage investment and new market opportunities for forest-based industries (including the forests and wood products industry, tourism, apiary and emerging markets such as carbon)?
Theme 3	GOVERNANCE AND MANAGEMENT OF VICTORIA'S FORESTS
	How can the RFAs support the adaptive management of Victoria's forests in response to emerging issues (e.g. major bushfires) and opportunities (e.g. emerging industries)?
	What areas of research would better equip us to sustainably manage Victoria's forests?
	How could RFA monitoring, review (including five-yearly reviews) and reporting arrangements be improved?

Contextual research

Integration of community values into the RFA assessments

The University of Melbourne's School of Ecosystem and Forest Sciences conducted a number of research projects between 2002 and 2018 (Ford et al. 2009, Kendal et al. 2015, Ford et al. 2015, Ford et al. 2013, Anderson et al. 2018, Ford et al. 2017) on how the Victorian public values forests and public land. These research findings have been synthesised to inform RFA modernisation and forest planning. Values have become more prominent in social research and forest decision-making as a way of representing what is important about forests for members of the public and stakeholders. Over recent decades, there has been investment in research into the values of the public; this means there is now an evidence base which is relevant to modernising RFAs and forest management planning.

Values refers broadly to what is important to members of the public and how this relates to what is considered in decision-making. Through this research, values are defined at three levels – Core values[46], Valued Entities[47] and Valued Attributes[48] – to explore people's valuing of forests.

In the most recent study (Ford et al. 2019), in-depth interviews were held with 36 individual members of the public who held diverse views about natural forests in Victoria. Results from these interviews were then used in developing a large-scale survey that was distributed throughout Victoria and completed by 915 people. Interviews enabled a detailed understanding of the breadth of ways in which people value forests. The subsequent survey then measured the relative importance of these values within a larger population.

The results, in descending order of importance, are the attributes of forests most valued by the community, according to Mean and Standard Deviation SD (Survey Rating between 1 and 7; n=915):

- Natural (Mean 6.3, SD 0.86)
- Experiential (Mean 5.5, SD 1.06)
- Setting (Recreation) (Mean 5.5, SD 1.06)
- Cultural (Mean 5.7, SD 1.04)
- Learning (Mean 5.7, SD 1.04)
- Productive (Mean 4.7, SD 1.40)
- Socio-economic (Mean 4.7, SD 1.40)

The results of the survey methods found that Natural Valued Attributes are rated most important on average (Mean 6.3) and have the lowest standard deviation (SD 0.86), meaning there is a level of consensus about the importance of this attribute. Productive/Socio-economic Attributes of forests are least important to members of the public (Mean 4.7) and have the highest standard deviation (SD 1.40), meaning views about the importance of this attribute are most diverse. Cultural/Learning and Experiential/Setting Attributes of forests are

46 Core values are what is important in people's life, such as valuing the biosphere, social justice or tradition. These deeply held values help to explain why people value particular attributes of entities.

47 Valued entities are tangible landscape elements that can be mapped and managed.

48 Valued Attributes are qualities of entities that help explain why they are important to people.

of similar importance and are positioned in between the higher importance of Natural Attributes and the lower importance of Productive/Social-Economic Attributes.

Explicitly comparing Valued Attributes of the public with the objectives of policies, and then incorporating the Valued Attributes with the objectives, can help to achieve inclusivity, transparency and accountability in decision-making. For RFA decision-making, these research results are an appropriate framework to incorporate in decision-making objectives.

Indicator 6.5a: Direct and indirect employment in the forest sector

This indicator measures the level of direct and indirect employment in the Victorian forest sector. Employment is an important measure of the contribution of forests to viable communities and to the economy.

Direct employment

The forest and wood products industry

According to a study by Schirmer et al. (2018), in 2017 the Victorian forest industry generated 14,475 direct jobs up to and including secondary processing. This analysis excluded the Green Triangle region that covers south-west Victoria and south-east South Australia, where there is a significant plantation estate of blue gum and radiata pine which was analysed in a separate report. Of the 14,475 direct jobs, 5,115 are attributable to primary production (jobs associated with growing and harvesting forests) and primary processing, where logs are first processed into products such as sawn timber, woodchips, pulp and paper. The remaining 9,360 jobs are generated through secondary processing, where those primary products are sold for value adding into a range of products such as furniture, wooden framing, cabinets or joinery and paper/cardboard packaging products). Of the 5,115 direct jobs generated up to the point of primary processing, 1,639 were generated by the native forest industry, 2,437 by softwood plantations and 457 by hardwood plantations.

When looking at the Green Triangle region, 611 of the 2,594 direct jobs generated by the forest industry, up to and including secondary processing, were based in Victoria (Schirmer et al. 2017). All of these jobs were dependent on the plantation sector.

Employment trends over time

For the period prior to 2009, there is limited employment data available for Victoria's forest industries; however, ABS data from the census, held every five years, indicated an 8.5 per cent increase in employment between 1996 and 2001 and a fall by 2.1 per cent between 2001 and 2006 (Schirmer et al. 2013).

Census data from 2006 and 2016 showed that employment across the Victorian forest and wood products industry reduced from 26,587 in 2006 to 19,039 in 2016 (a decline of 28.4 per cent per cent) (Figure 60) (Schirmer et al. 2018).

This trend was not consistent across the whole forest industry. An increase in harvesting and haulage from hardwood plantations contributed to a 22 per cent increase in employment in the primary production part of the industry between 2011 and 2016. This compares with a 29 per cent reduction in employment in wood and paper product manufacturing across the same time period. These trends were also reflected at the national scale (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018).

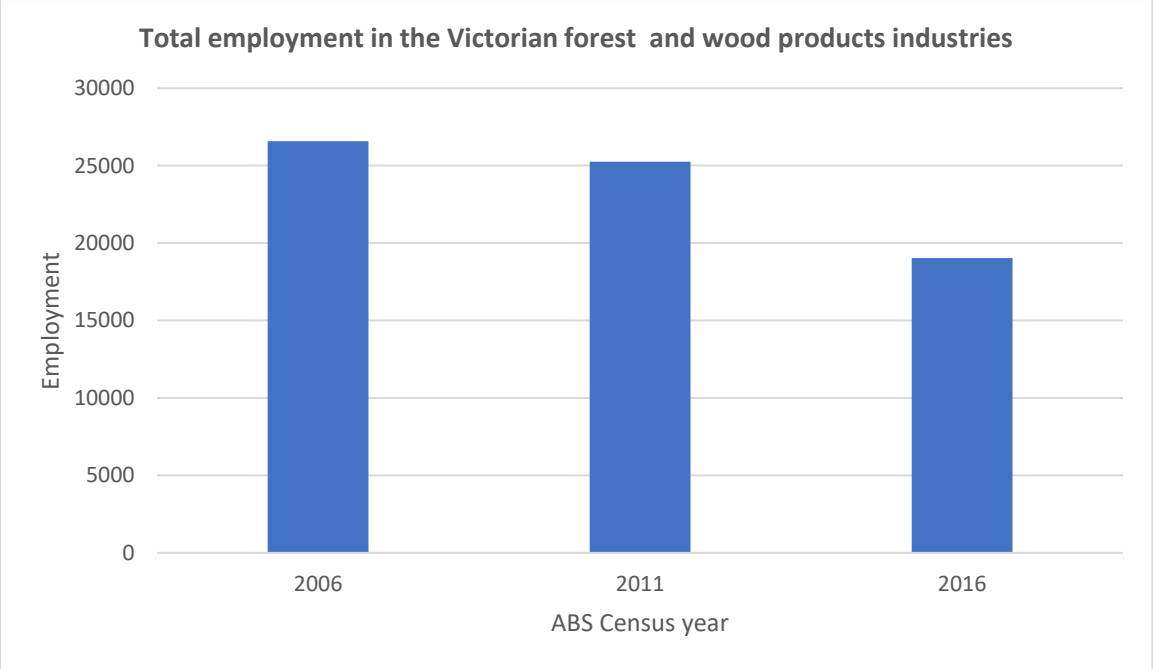

Figure 60: Total employment in the Victorian forest and wood products industries for 2006, 2011 and 2016

The decline in employment across the Victorian forest and wood product industry has been the result of a number of changes in the industry. The collapse of the largest MISs and the associated restructure of the industry through changes to ownership in the plantation sector, along with improvements in processing and manufacturing efficiency through technological advancements (e.g. consolidation of processing facilities or increased mechanisation or automation) contributed to reduced employment across the industry.

Environmental impacts, such as major bushfire events (e.g. Black Saturday 2009) and the impacts to resource access and availability, are expected to have also contributed to job losses (Victoria SOFR 2013; Schirmer et al. 2013).

Employment by RFA regions

In seven local government areas (LGAs) (Alpine, Benalla, Colac–Otway, East Gippsland, Latrobe, Wangaratta and Wellington), over 2 per cent of the workforce was employed in the forestry and wood products industry (Schirmer et al. 2018). These seven LGAs are within the RFA regions.

Table 111 illustrates the estimates from Schirmer et al. (2018) of the direct jobs up to and including primary processing that are generated by native forest timber harvested from Victoria's RFA regions. It should be noted that not all primary processing jobs generated as a result of harvesting in a specific RFA region will be located in that region. Logs are frequently transported out of the RFA region they were harvested in to be processed.

Table 111: Estimated number of jobs dependent on native forest sourced from Victoria's RFA regions

RFA region	Employment generated[a]
Gippsland	190 – 210
Central Highlands	1,060 – 1,170
East Gippsland	230 – 260
West	30 – 40
North East	70 – 80

a Dependent on resource availability (volume and type of logs harvested) (Schirmer et al. 2018)

Wood harvested from native forests across the RFA regions also generates employment opportunities in areas outside the RFA regions, mainly in secondary processing both within and outside Victoria (Schirmer et al. 2013, 2018). Both studies did not estimate the number of jobs generated in secondary processing specific to timber harvested from native forests.

Generation of jobs is dependent not only on the volume of wood harvested but also on the type of processing involved in value-adding of the wood into a specific product. For example, logs harvested for export woodchip production generate less employment than logs harvested for sawn timber or for domestic paper production (Schirmer et al. 2018).

Indirect employment

Indirect employment is defined as the jobs in industries that are generated by, and support, the forestry sector or benefit from the spending of forest businesses and employees, which in turn generate further spending throughout the economy. Examples are fuel, maintenance, retail trade, legal and accounting services.

Schirmer et al. (2018) estimate that an additional 10,581 'flow-on', or indirect, jobs were generated in other industries as a result of activities up to and including primary processing (excluding the Green Triangle).

Non-wood forest products and services

Victorian forests, including both plantations and native forests, also provide for a variety of non-wood forest products and socio-economic activities sectors including grazing, beekeeping, ecotourism, mineral extraction and various recreational activities including bike riding, bushwalking, four-wheel driving and hunting.

Employment associated with these activities is classified by ABS in non-forestry categories that cannot be isolated.

Future focus

Schirmer et al. (2018) reported on a survey of forest industry businesses about market and business conditions. A major issue reported by over 88 per cent of all Victorian forestry businesses surveyed was the lack of suitably qualified and capable workers making it

challenging to meet recruitment requirements. Analysis of ABS data also suggested the forest industry's workforce is aging slightly more rapidly than that of other industries.

Forest industry businesses also reported that government regulation, rising input costs, increasing cost of labour, lack of investment in industry and issues with sufficient certification were significant challenges. The challenges facing forest businesses varied significantly depending on the industry sector: native forest-dependent businesses reported government regulation, softwood plantation-dependent businesses reported difficulty maintaining competitiveness with other businesses, and hardwood plantation-dependent businesses' reported difficulty obtaining labour. These indicate that there is some uncertainty in the industry which may influence employment conditions and numbers in future.

Indicator 6.5b: Wage rates and injury rates within the forest sector

This indicator measures the level of wage and injury rates in the forest sector. A sustainable industry will ensure high levels of workforce health and welfare and wage rates that are comparable with national averages for other occupations.

Wage rates

Individuals aged 65 and under typically receive the majority of their income from a salary or wages earned from a job. Information on wage rates in the forest sector adds to an understanding of employment opportunities in the sector and the contribution that the sector makes to the economy.

Knowing about industry wage rates is also important to employers, including those who run commercial businesses. Earnings paid to employees typically represent a significant component of operating costs. Changes in wages can affect the productivity of a business and its competitiveness in a global market. Changes in average earnings can also reflect the impact of the economic cycle on the labour market, or sectors within the labour market (ABS 2016).

The national minimum wage is set at $740.80 per 38-hour week or $38,521.60 per year before tax (Fair Work Commission 2019). The original concept of a minimum wage was an income sufficient to support a wage earner in 'reasonable and frugal comfort'[49]. Wage levels above the minimum wage provide individuals with more economic discretion. Individuals on higher wages have greater life choices than those on lower wages, including the opportunity to become financially secure more quickly.

Victorian forest industry workers in 2016 earned higher incomes compared to workers employed in other industries (Schirmer et al. 2018). While some of this difference was attributed to higher rates of full-time work in the forest industry compared to other sectors, forest industry workers are less likely to earn low incomes than those in other sectors.

Information from the Victorian State of the forests report 2018

As of 2016, workers in the forest industry generally earn a higher wage than the average salary for the region. Only 16 per cent of forest industry workers earn less than $649 per week; this is almost half the proportion of the overall employed labour force earning less than $649 per week. This can be considered largely due to the high percentage of full-time workers in the forest industry. However, when the workforce is narrowed to only full-time workers, forest industry workers were still less likely to earn a lower wage than in other industries (Commissioner for Environmental Sustainability Victoria 2019). Workers in the Green Triangle region earn higher incomes than the average in the rest of Victoria (Schirmer et al. 2018). A similar pattern can be found for workers who earn more than $1,299 per week: 38 per cent of workers in the forest industry are paid more than this amount, compared to 30 per cent of the overall employed labour force.

[49] See the Harvester Case and Higgins ruling; https://en.wikipedia.org/wiki/Harvester_case#

Injury rates

Work-related injuries have a wide-ranging impact at both an individual and macro-economic level.

Between 2011–12 and 2016–17 the total number of injuries in the forest industry decreased by about 23 per cent per cent, mainly due to a 50 per cent reduction in injuries in the paper and product manufacturing industry (Commissioner for Environmental Sustainability Victoria 2019). The wood product manufacturing sector led the rate of injuries, followed by pulp, paper and converted paper product manufacturing sector (Table 113). The number of claims in the forestry and logging sector remained stable, and the wood product manufacturing sector fluctuated, but broadly fell between 2011 and 2017.

Table 112 Number of injury insurance claims in the forest industry (forestry and logging, wood product manufacturing and pulp, paper and converted paper product manufacturing) 2011–17

Industry sector	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17
Forestry and logging	12	18	18	18	21	18
Wood product manufacturing	381	370	280	321	368	338
Pulp, paper and converted paper product manufacturing	205	146	124	135	129	107
Total	**598**	**534**	**422**	**478**	**518**	**463**

Source: Commissioner for Environmental Sustainability (2019)

Table 113: Comparison of serious injury claims in the forest sector with all other industries at a national level

	Serious claims (total number), by industry sector			Incidence rate (rate per 1,000 employees)			Frequency rate (rate per million hours worked)		
Year	Forestry & logging	Wood & paper	All industries	Forestry & logging	Wood & paper	All industries	Forestry & logging	Wood & paper	All industries
2008–09	290	1,860	134,675	23.7	33.5	13.6	12.9	17.5	8.2
2009–10	270	1,845	131,170	21.2	33.1	13	11.8	17.5	7.8
2010–11p	210	1,815	127,335	17.1	32.6	12.2	9.9	16.9	7.3
per cent change	28 per cent	2 per cent	5 per cent	28 per cent	3 per cent	10 per cent	23 per cent	3 per cent	11 per cent

Notes: p -2010–11 preliminary data. Includes claims in the reference year and accepted by the date at which the data was collected.
per cent change – is the percentage reduction from 2008/09 to 2010/11

Source: Safe Work Australia (2013) Compendium of Workers' Compensation Statistics Australia 2010-11

Indicator 6.5c: Resilience of forest-dependent communities to changing social and economic conditions

This indicator provides a measure of the extent to which forest-dependent communities can successfully respond and adapt to change. Resilient (forest-dependent) communities will adapt to changing social and economic conditions, ensuring they remain viable into the future.

This indicator considers only the dependence of communities on the forest and wood products industries, and not on other forest activities or services such as tourism or grazing.

The *Report on progress with implementation of the Victorian Regional Forest Agreements (RFAs) –period 3: 2009–2014* stated that: 'the RFAs provide for increased certainty for … forest-dependent communities' (DELWP 2017d, p. 1).

The VSOFR 2013 articulated that:

> Forest dependent communities are generally found in close proximity to forests and are often relatively small. Larger population centres tend to have less dependency on a single industry or sector (and so greater resilience to economic change) because of their larger economic base, greater economic diversity and alternative employment opportunities.
>
> (DEPI 2014d, p. 176)

Contextual research

Case study: post-impact study of Orbost

Orbost is a rural town in East Gippsland which depends on native timber harvesting and processing as the main industry of the area. Decreased industry access to native forests over time (Figure 61), as a result of changing policy directions, has caused a decline in the timber industry in Orbost.

Qualitative research was conducted in April 2019 (Saberton 2019) to understand how the people of Orbost have experienced and adapted to changes since the social impact assessment of the original East Gippsland RFA of 1997. The decline of the timber industry was considered the most significant event for the town, and it had flow-on effects for most people and businesses in Orbost. Other events that were considered significant for the town – including the creation of a bypass, the removal of public services and the extension of national parks – were all outcomes of government decisions. Most people responded to these changes by diversifying their income through taking on second jobs or changing industries. Lack of employment resulted in some people leaving the town in search of work and taking their families with them. This caused a reduction in house prices, which resulted in an influx of retired and elderly people moving into the town. Although many people spoke about tourism as a future major industry of the town, the change in demographics indicates that an older-age-friendly town is a more realistic future.

Changes in industry access to native timber resources is a notable disturbance faced by forest-dependent towns. There is limited understanding in the literature of how past events have affected towns and the resilience of the people who live in them.

Figure 61: Changes in harvest volume (in '000 m^3) of sawlog in Victoria and East Gippsland, compared to events and stages of societal groups of Orbost in the adaptive cycle

Note: (K = conservation, Ω = collapse and α = reorganisation).

Source: Saberton (2019).

Independent reviewer's report

A key finding from the independent reviewer's report for the third five-yearly review of the Victorian RFAs was that:

> … the community has widely differing views with respect to desired outcomes from the native forests, and these competing views continue to cause debate and conflict over the management of the forests.
>
> (Wilkinson 2017, p. 6).

This would indicate that there is a degree of uncertainty among the community on the level of dependence that is derived from the forests. There were also submitters to the independent reviewer's report who believed the native forest industry did not provide many jobs.

Socio-economic impacts of the forest industry Victoria

In 2018, Forest and Wood Products Australia and the Australian Government Department of Agriculture and Water Resources commissioned a study on the socio-economic impacts of the forest industry in Victoria, excluding the Green Triangle. The report produced from this study provides some detail on the resilience of forest-dependent communities (Schirmer et al. 2018).

Until this report was produced in 2018, there was little information on the dependence of communities on the forest industry. The results of the report suggest that those living in

regions with higher dependence on the forest industry are just as likely to rate their community as highly liveable, friendly, safe and aesthetically pleasant as those living in nearby communities with less dependence on the forest industry (Schirmer et al. 2018). They do not, however, view the forest industry as positively as they view other industries operating in their local community: while recognising the employment contribution made by the industry, few perceive the industry as having positive impacts on other aspects of community life, and a significant proportion report concerns about effects of the industry on roads and local landscapes (Schirmer et al. 2018).

Of those living in communities with higher dependence on the forest industry, most reported that the forest industry was important to their local community, including 60 per cent of those who lived in the Central Highlands and Gippsland LGAs of East Gippsland, Latrobe, Murrindindi, Wellington and Yarra Ranges; 47 per cent of those living in the North Central LGAs of Alpine, Benalla and Wangaratta; and 58 per cent of those living in the Western Victorian LGA of Colac–Otway (Schirmer et al. 2018).

As shown in Figure 62, those who lived in LGAs with high forest industry dependence were much more likely to identify the forest industry as an important industry in their local community than those who lived in regions with little forest industry activity (Schirmer et al. 2018).

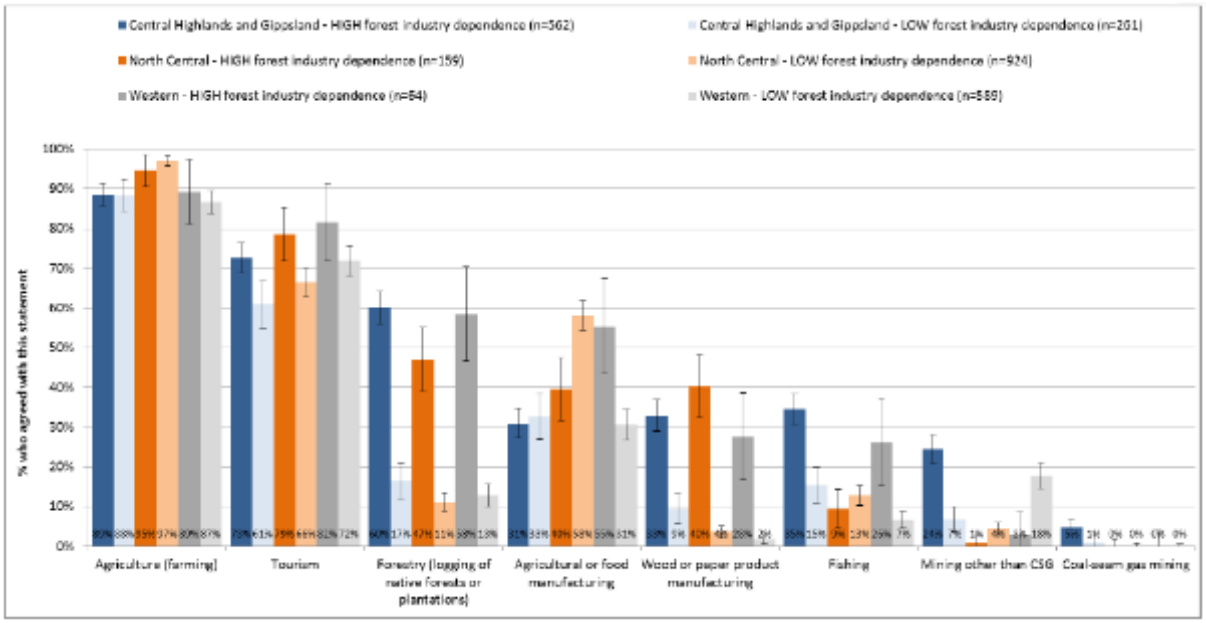

Figure 62: Proportion of residents who views the forest industry as an 'important industry' in their local community

Source: Schirmer et al. (2018).

This report quantifies the employment and economic activity generated by the forest industry and identifies the communities in which the industry generates a significant proportion of local jobs. The analysis shows that, overall, the number of jobs generated by the industry has declined significantly since 2006, although employment generated by hardwood plantations has grown since 2012, as per Table 114 below (Schirmer et al. 2018).

Table 114: Forest industry employment recorded in the ABS Census of Population and Housing over time

Region	LGA (2017)	Jobs in forestry, logging, services to forestry					Jobs in Wood and paper product manufacturing (primary and secondary processing)					Total forest industry dependent jobs recorded in Census (includes wholesaling)				
		2006	2011	2016	Change 2006-2011 (per cent)	Change 2011-2016 (per cent)	2006	2011	2016	Change 2006-2011 (per cent)	Change 2011-2016 (per cent)	2006	2011	2016	Change 2006-2011 (per cent)	Change 2011-2016 (per cent)
Central Highlands and Gippsland	Bass Coast	10	3	19			35	48	24	37	-50	77	97	75	26	-23
	Baw Baw	68	55	83	-19	51	200	171	166	-15	-3	288	263	288	-9	10
	East Gippsland	149	145	131	-3	-10	232	186	152	-20	-18	403	347	260	-14	-25
	Latrobe	182	156	228	-14	46	1,285	1,097	965	-15	-12	1,504	1,300	1,112	-14	-14
	Mansfield	22	14	17	-36	21	26	12	13	-54	8	53	26	36	-51	38
	Mitchell	21	12	4	-43		172	180	148	5	-18	220	207	172	-6	-17
	Mornington Peninsula	27	41	37	52	-10	383	361	235	-6	-35	577	571	415	-1	-27
	Murrindindi	62	47	35	-24	-26	134	45	36	-66	-20	215	95	78	-56	-18
	Nillumbik	7	14	12		-14	267	233	131	-13	-44	337	305	187	-9	-39
	South Gippsland	28	32	20	14	-38	64	67	58	5	-13	106	116	80	9	-31
	Wellington	132	128	126	-3	-2	255	272	310	7	14	418	406	423	-3	4
	Yarra Ranges	85	94	92	11	-2	810	703	481	-13	-32	1,156	1,028	787	-11	-23
	TOTAL	793	741	814	-7	10	3,863	3,375	2,721	-13	-19	5,354	4,761	3,912	-11	-18

North Central	Alpine	64	80	61	25	-24	243	165	179	-32	8	307	248	181	-19	-27
	Benalla	12	17	21	42	24	173	175	152	1	-13	185	199	182	8	-9
	Campaspe	11	0	3			63	70	35	11	-50	90	76	48	-16	-37
	Greater Shepparton	0	0	7			174	138	98	-21	-29	238	176	140	-26	-20
	Indigo	11	8	9			90	81	64	-10	-21	104	92	59	-12	-36
	Mildura	3	0	4			92	82	68	-11	-17	104	103	91	-1	-12
	Wangaratta	36	30	32	-17	7	220	201	225	9	12	266	237	269	-11	14
	Wodonga	18	16	26	-11	63	272	195	187	-28	-4	301	229	231	-24	1
	Other LGAs	39	32	66	-18	106	193	163	186	-16	14	248	209	290	-16	39
	TOTAL	194	183	216	-6	18	1,520	1,270	1,123	-16	-12	1,843	1,569	1,406	-15	-10
West	Colac–Otway	63	57	87	-10	53	280	315	185	13	-41	360	384	362	7	-6
	Other LGAs	156	131	209	-16	60	1,761	1,768	1,140	0	-36	2,228	2,208	1900	-1	-14
	TOTAL	219	188	297	-14	58	2041	2,083	1,429	2	-31	2,588	2,592	1974	0	-24
Melbourne	TOTAL	216	265	358	23	35	12,475	11,605	7,708	-7	-34	16,802	16,331	11,747	-3	-28
TOTAL VIC	Excl. SW Victoria	1,422	1,377	1,685	-3	22	19,899	18,333	12,981	-8	-29	26,587	25,253	19,039	-5	-25

Source: Schirmer et al. (2018)

Table 115, which is sourced from the ASOFR 2018, shows the adaptive capacity of Victorian LGAs in comparison to other Australian LGAs, that are dependent on the forest and wood products industries, as well as changes since 2001. Communities which have direct employment in the forest sector that is greater than 2 per cent are considered to be dependent on the forest and wood products sector. In four LGAs in Victoria, employment in forest and wood products industries increased from 2011 to 2016, although total employment declined. Large proportional increases in forest and wood products industries employment occurred in south-west Victoria (Glenelg) (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018).

Table 115: Local government areas dependent on forest and wood products industries

LGA	Number of people employed in forest and wood product industries, 2016	Proportion of workforce employed in forest and wood products industries, 2016	Change in forest and wood products industries employment (per cent) [a]			Change in total employment (all industries) (per cent)	Adaptive Capacity (2016)		
			2001–06	2006–11	2011–16	2011–16	Economic diversity index[b]	Community wellbeing index[c]	Capital resources index[d]
NSW									
Snowy Valleys	903	15.84	-2.3	-4.3	1.7	-7	0.44	0.72	0.55
Oberon	320	15.24	8.7	-9.2	-16.9	-7	0.47	0.75	0.60
Kyogle	92	2.99	-46.6	14.4	-31.9	-8.1	0.45	0.72	0.57
Clarence Valley	400	2.37	15.6	-12.1	-29.5	-3	0.88	0.72	0.57
Bellingen	97	2.06	-31.4	1*	-8.5*	1.3	0.85	0.80	0.57
NT									
West Arnhem	27	2.04	-100*	-	-12.9*	-36.1	0.46	0.7	0.53
Qld									
Gympie	627	3.76	-0.1*	-10.4	-14	-1.5	0.81	0.71	0.54
SA									
Mount Gambier	1,143	10.18	-3.3	-20.1	-6.5	-0.1	0.86	0.72	0.53
Wattle Range	456	9.40	-8.7	-33.1	-16.9	-7.4	0.35	0.80	0.54
Grant	333	8.91	-0.7*	-15.9	-8.5*	-2.9	0.37	0.80	0.54

LGA	Number of people employed in forest and wood product industries, 2016	Proportion of workforce employed in forest and wood products industries, 2016	Change in forest and wood products industries employment (per cent) [a]			Change in total employment (all industries) (per cent)	Adaptive Capacity (2016)		
			2001–06	2006–11	2011–16	2011–16	Economic diversity index[b]	Community wellbeing index[c]	Capital resources index[d]
Tas.									
Dorset	173	7.09	2.3*	-51.9	-20.3	-5.6	0.3	0.67	0.51
Derwent Valley	212	5.77	0.6*	-28.3	-15.5	-1.4	0.85	0.73	0.55
George Town	96	4.64	-25.9	7.9*	41.2	-12.3	0.72	0.69	0.53
Circular Head	144	4.18	14.9	-17.9	-38.5	-4.2	0.30	0.78	0.54
Central Highlands	27	3.43	-14*	-22.4	-28.9	-2.6	0.19	0.66	0.49
Huon Valley	141	2.3	-5.9	14.1	-40	1.2	0.61	0.73	0.55
Waratah/Wynyard	112	2.19	0.4*	-59.3	19.1	-8.1	0.77	0.68	0.51
Vic.									
Alpine	239	4.53	-20.6	-20.7	-2.4*	0.8	0.76	0.85	0.60
Latrobe	1,189	4.19	11.0	-14.5	-4.9	-4	0.75	0.62	0.54
Colac–Otway	378	4.14	4.6	8.8	2.4*	-1.8	0.63	0.79	0.58
Benalla	178	3.29	-29.9	2.1*	-8.2	-8.2	0.77	0.72	0.58
Wellington	443	2.58	43.7	3.9	9.9	-1.9	0.64	0.74	0.56
Glenelg	190	2.4	-10.4	-55.8	52	-7.7	0.58	0.73	0.55
Wangaratta	253	2.09	-9.9	-9.1	9.5	-2.1	0.83	0.83	0.63

LGA	Number of people employed in forest and wood product industries, 2016	Proportion of workforce employed in forest and wood products industries, 2016	Change in forest and wood products industries employment (per cent) [a]			Change in total employment (all industries) (per cent)	Adaptive Capacity (2016)		
			2001–06	2006–11	2011–16	2011–16	Economic diversity index[b]	Community wellbeing index[c]	Capital resources index[d]
WA									
Nannup	38	7.25	110.3	-11.5*	-29.6	-10	0.44	0.83	0.61
Manjimup	274	6.85	-43.9	-22.7	0.4*	-4.4	0.39	0.83	0.61
Bridgetown-Greenbushes	58	3.14	-7*	-30.1	-37.6	-3.1	0.53	0.83	0.61
Donnybrook-Balingup	66	2.75	13.4	-23.7	-7*	0.2	0.48	0.76	0.57
Dardanup	135	2.18	36.8	-17.5	2.3*	3.6	0.78	0.76	0.57
Wyndham-East Kimberley	66	2.15	106.3	127.3	-12*	-14.9	0.73	0.71	0.56
AUSTRALIA [e, f]	51,983	0.51	-3.4	-14	-24.2	3.9	1	0.75	0.55

Source: Montréal Process Implementation Group for Australia and NFI Steering Committee (2018)

Notes:

-, not calculated as previous value zero

* Change of 10 or fewer individuals

a 2001, 2006 and 2011 data have been adjusted to align with 2016 LGA boundaries.

b The economic diversity index is calculated from ABS census data and measures the variety of employment sectors in an LGA on a scale between 0.0 and 1.0, with a score of 1.0 indicating the same diversity as the Australian economy (high diversity). Economic diversity index cannot be aggregated above LGA scale.

c Community wellbeing index scores from 2016 Regional Wellbeing Survey datasets rescaled to between 0.0 (relatively low wellbeing) and 1.0 (relatively high wellbeing).

d Capital resources index constructed by ABARES from 2016 Regional Wellbeing Survey data by averaging the scores under financial capital, human capital, institutional capital, social capital, physical capital and natural capital, for each LGA or region including the LGA (see Table 6.53). A score of 0.0 indicates relatively low capital and a score of 1.0 indicates relatively high capital.

e All LGAs in Australia, not just those dependent on forest and wood products industries.

f Employment changes for 2001–06 and 2006–11 differ to those reported in SOFR 2013 because of a change in industry classification for the forest sector.

LGAs are considered to be dependent on the forest and wood products industries when direct employment in the sector is at least 2 per cent of total workforce employment, and the community contains more than 20 workers employed in these industries. The Australian Capital Territory is not listed because employment in forest and wood products industries is below 2 per cent of total workforce employment (there are no LGAs within the ACT).

Source: ABARES calculations based on ABS (2016b), ABS Customised reports on census data for 2001, 2006, 2011 and 2016, and 2016 Regional Wellbeing Survey data tables (canberra.edu.au/research/faculty-research-centres/ceraph/regional-wellbeing/survey-results/2016-survey-results/2016-results-by-rda-and-lga) Aboriginal employment in Victoria's forestry industry

Victoria's forestry industry has the lowest Aboriginal employment rate of all states and territories. In 2016, Victoria was the only state with less than 1 per cent Aboriginal employment in the forest industry, meaning that Aboriginal communities in Victoria are less reliant on the forestry industry than those in other states (ABS 2016).

This report defines forest-dependent Aboriginal communities as Aboriginal people living in LGAs with a *higher-than-state average of Aboriginal employment in the forestry industry, as a subset of total Indigenous employment in all industries* (Table 116). In Victoria, nine LGA's were found to be forest-dependent Aboriginal communities, with five of these LGAs within the RFA regions (Table 117). These Aboriginal communities have all experienced a gradual decrease in involvement in the forestry industry and are less resilient to changes in the forestry industry than those in other regions, due to their previous reliance on the industry as a source of employment.

Table 116: Proportion and total numbers of Aboriginal employment in the forestry industry, by RFA region, 2006–16

	Gippsland			East Gippsland			Central Highlands			North East			West		
Employment	2006	2011	2016	2006	2011	2016	2006	2011	2016	2006	2011	2016	2006	2011	2016
Total no. employed – Aboriginal and/or Torres Strait Islanders	7	3	10	14	15	12	16	4	38	13	13	38	23	31	34
Total no. employed – non-Aboriginal	2,135	1,872	1,973	365	336	285	6,676	6,668	5,219	1,561	1,278	1,454	5,718	5,827	5,136
Proportion of Indigenous employment in forestry industry	0.33 per cent	0.16 per cent	0.50 per cent	3.69 per cent	4.27 per cent	4.04 per cent	0.24 per cent	0.06 per cent	0.73 per cent	0.83 per cent	1.01 per cent	2.55 per cent	0.40 per cent	0.53 per cent	0.66 per cent

Source: ABS 2016

Table 117: Proportion of Aboriginal employment in the forestry industry, compared to total Aboriginal employment in all industries, in 9 LGAs where higher proportion than state average was found

RFA	LGA	2006	2011	2016
Central Highlands	Knox	4.96 per cent	2.80 per cent	3.45 per cent
East Gippsland	East Gippsland	7.49 per cent	5.54 per cent	4.11 per cent
West	Glenelg	8.20 per cent	7.84 per cent	3.20 per cent
	Hume	4.02 per cent	3.98 per cent	1.97 per cent
North East	Wodonga	2.68 per cent	2.67 per cent	1.95 per cent
Non-RFA	Greater Dandenong	1.78 per cent	1.30 per cent	3.14 per cent
	Monash	1.88 per cent	2.12 per cent	1.49 per cent
	Greater Shepparton	0.78 per cent	0.70 per cent	1.39 per cent
	Kingston	5.13 per cent	2.07 per cent	1.31 per cent
Total employment all industries		1.53 per cent	1.13 per cent	0.94 per cent

Source: Commissioner for Environmental Sustainability Victoria (2019)

The *Victorian Aboriginal economic strategy 2013–2020* was developed by the Victorian Government to deliver stronger outcomes in education, training and employment across government and the private sector. Despite a significant increase in Aboriginal employment across all industries, this strategy has not produced any improvements in Aboriginal participation in the forestry industry.

Having access to native forests and traditional land has been recognised as improving individual wellbeing and community resilience by allowing Aboriginal people to practice and maintain cultural values. It is understood, however, that dependence of Aboriginal communities on native forests is variable based on local social, cultural and economic context, and therefore differs between communities.

Summary and future management of social values

Submissions made to RFA reviews and throughout the process to extend the Victorian RFAs demonstrate the range of views and values in the community relating to forests and the range of uses that forests are subject to. Forests are valued for income, job security, recreation and broader values such as renewable resources, biodiversity and the provision of clean air and water. Forests are important for recreational activities and attracting visitors to regional Victoria. Forest values have become more prominent in social research and forest decision-making as a way of representing what is important about forests.

In Victoria, 97 per cent of parks and conservation reserves and 99 per cent of State forests are available for recreation, and this area has been increasing over the last 15 years. The area actively used for recreation is much less than that available and while there has been changes in land use over the period of the RFAs, these have caused minimal impact to the amount of land available for recreation. Victoria's forests offer a wide range of recreation activities, including walking, mountain-bike riding, camping, fishing, picnicking and four-wheel driving. A range of facilities caters for these activities, and the number of facilities has increased over the period of the RFAs. The promotion of certain roads as touring routes or four-wheel drive tracks saw a marked increase in their use. The Victorian Government has also developed a four-wheel drive strategy which aims to increase the regional and economic benefits from this activity up to and post 2021.

Victoria invested significantly in forest tourism and recreation from 2008 until 2011, particularly in relation to replacement of sites after the 2009 bushfires. Sites have been better captured in an improved asset management system and the Victorian Government has also released an app to promote recreation in State forests. Extended RFAs will support continued recreational activities on public land in Victoria.

Employment in the Victorian forest industry has decreased during the period of the RFAs due to a number of changes in the forest and wood products industry. The collapse of MIS along with efficiencies in manufacturing have had significant impact. Environmental impacts are also expected to affect employment. However, it is also important to note that wood harvested in forests within the RFA regions also generates employment opportunities outside the RFA regions, particularly in secondary processing. Forest industry workers in 2016 earned higher incomes compared to workers in other industries and were more likely to work full-time.

Those living in communities with a higher dependence on the forest industry identify that the industry is important to their local communities. Communities with a high dependence on the forest industry remain just as liveable as those with little dependence on the industry. The extension of RFAs in Victoria will continue to provide certainty for forest-dependent communities and continue to support community resilience and employment. Continued collection of socio-economic data is critical to supporting communities and ongoing policy development. The Victorian RFAs seek to maintain a stable regulatory environment and continue to ensure that Victoria's forests remain accessible to a wide range of users.

Principles of ecologically sustainable management

As a party to the National Forest Policy Statement (NFPS), Victoria is committed to the principles of ecologically sustainable development. The Victorian RFAs define ecologically sustainable forest management (ESFM) as 'forest management and use in accordance with the specific objectives and policies for ecologically sustainable development as detailed in the National Forest Policy Statement'.

For the purposes of this report, 'ecologically sustainable management' in para. (a) of the definition of 'RFA' at s. 4 of the RFA Act is taken to be synonymous with ESFM as used in the Victorian RFAs. The internationally agreed Montréal Process criteria and indicators for reporting on sustainable forest management were agreed to be the framework for reporting on sustainability in Australia (refer to clause 49 of the current West Victoria RFA, as an example). The framework for ESFM covers all of the matters listed in para. (a) of the definition of 'RFA' in the RFA Act, and therefore provides the performance criteria for the assessment in this report.

The Parties agreed in the five Victorian RFAs that ESFM is an objective that requires a long-term commitment to continuous improvement and that the key elements for achieving it are:

1. the establishment and maintenance of a CAR reserve system
2. the development of internationally competitive forest products industries
3. an integrated and strategic forest management system capable of responding to new information.

This section includes the following Montréal Process indicators:

- Indicator 7.1a – Extent to which the legal framework supports the conservation and sustainable management of forests
- Indicator 7.1b – Extent to which the institutional framework supports the conservation and sustainable management of forests
- Indicator 7.1c – Extent to which the economic framework supports the conservation and sustainable management of forests
- Indicator 7.1d – Capacity to measure and monitor changes in the conservation and sustainable management of forests
- Indicator 7.1e – Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services
- Indicator 3.1.a – Scale and impact of agents and processes affecting forest health and vitality
- Indicator 5.1a – Contribution of forest ecosystems and forest industries to the global greenhouse gas balance

Indicator 7.1a: Extent to which the legal framework supports the conservation and sustainable management of forests

This indicator outlines the support that the legal system gives to the sustainable management of forests. A legal system that ensures transparency and public participation in policy and decision-making processes supports the continuous improvements in sustainable forest management.

Forest management in Victoria is subject to both Commonwealth and state laws which have evolved as a result of ongoing work to improve the balance between environmental and economic demands, and in response to other factors affecting resource availability, and economic and social needs.

The NFPS, signed by the Commonwealth, and state and territory governments, has underpinned Australian forest policy. It outlines agreed objectives and policies for the future of Australia's public and private forests. It aims to coordinate forest management while maintaining the tradition of managing public and private native forests for multiple uses.

Commonwealth legislation

Commonwealth legislation that supports the conservation and sustainable management of forests includes:

- the EPBC Act –which encapsulates and promotes the principles of ecologically sustainable development and provides for the Commonwealth Minister for the Environment to assess likely significant impacts to nationally protected matters
- the *Export Control Act 1982* (Cth) – which establishes a broad framework for the regulation of goods for export and recognises RFAs in allowing unprocessed wood and woodchip export when sourced from native forestry operations in an RFA region (this is also permitted from plantations which have an approved Code of Practice to satisfactorily protect environmental and heritage values)
- the RFA Act – which legislates for the creation and operation of RFAs; these agreements provide a streamlined approach to satisfying Commonwealth environmental legislative requirements for conducting sustainable productive forest management.

Victorian legislation

Victoria has a suite of 27 pieces of legislation supporting the conservation and sustainable management of forests. The core regulatory framework and primary legislation that supports forest management is:

The *Sustainable Forests Timber Act 2004* provides a framework for sustainable forest management and sustainable timber harvesting in Victoria's State forests. The Act contains three key components for the management of Victoria's forests:

- the *Sustainability Charter for Victoria's State forests*, which sets the objectives for sustainable forest management in Victoria

- the VSOFR, which works to monitor and assess the state's performance in achieving objectives for sustainable forest management in Victoria
- the AO, which provides for the sustainable allocation and use of timber resources from State forests.

The *Forests Act 1958* provides for the management of State forests, including the development of working plans (currently represented by forest management plans and fire management plans) to maintain and improve State forests, and for licensed occupations including grazing, beekeeping and the sale of forest produce.

The *Conservation, Forests and Lands Act 1987* provides a framework for a land management system and makes administrative, financial and enforcement provisions to protect land, water and wildlife prior to the commencement of harvesting or construction activities. The aims of this Act are met through the approval of the TRP process and compliance with the *Code of Practice for Timber Production 2014*.

The *Flora and Fauna Guarantee Act 1988* is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. It aims to conserve all of Victoria's native plants and animals and provides for the listing of Victoria's threatened plant and animal species, ecological communities and potentially threatening processes, including the requirement for the preparation of action statements.

The *National Parks Act 1975* establishes the statutory basis for the protection, use and management of national parks, state and wilderness parks and conservation reserves in Victoria. Under the Act, the key objectives of national and state parks are to:

- permanently protect the natural environment (including wilderness areas and remote and natural areas), natural biodiversity and particular features
- provide for scientific research and study
- protect certain designated water supply catchment areas and their water quality in specified national parks
- provide for the use of the parks for enjoyment, recreation or education consistent with conserving those values.

The *Parks Victoria Act 2018* replaces the *Parks Victoria Act 1998*. Previously Parks Victoria acted as a service agency to the Victorian Government. The new Act re-created Parks Victoria as a strengthened statutory authority with a broad range of direct powers, reporting directly to the Minister for Energy, Environment and Climate Change.

The *Traditional Owner Settlement Act 2010* establishes a framework that allows the Victorian Government to recognise Traditional Owners and certain rights in Crown land. To access these rights, Traditional Owner Groups can enter into a Recognition and Settlement Agreement with the state. This agreement provides a basis for provision for specific Crown land to be returned to Aboriginal ownership under a form of land title called Aboriginal title.

Collectively, these acts underpin the legislative framework for the forest management system in Victoria. In addition, the secondary legislation listed below has an impact on land management in Victoria:

- *Aboriginal Heritage Act 2006*
- *Aboriginal Lands Act 1991*
- *Catchment and Land Protection Act 1994*
- *Climate Change Act 2017*
- *Crown Land (Reserves) Act 1978*
- *Environment Effects Act 1978*
- *Environment Protection Act 1970*
- *Environment Protection Act 2017*
- Forests (Fire Protection) Regulations 2014
- Forests (Recreation) Regulations 2010
- *Forests (Wood Pulp Agreement) Act 1996*
- *Heritage Rivers Act 1992*
- *Land Act 1958*
- *Land Conservation (Vehicle Control) Act 1972*
- *Planning and Environment Act 1987*
- *Reference Areas Act 1978*
- *Road Management Act 2004*
- *Safety on Public Land Act 2004*
- *Victorian Plantations Corporation Act 1993*
- *Water Act 1989*
- *Wildlife Act 1975.*

Indicator 7.1b: Extent to which the institutional framework supports the conservation and sustainable management of forests

This indicator examines the institutional frameworks that support sustainable forest management. Institutional frameworks provide mechanisms for engagement of the wider community in the process of continuous improvement and sustainable forest management.

This includes institutional and administrative arrangements that have been put in place for enforcement and compliance with the legal regulatory framework, decision-making in relation to forestry resource management, and community engagement in the broader process of sustainable forest management.

This section outlines the Victorian Government's overarching vision and strategic plan for sustainable forest management, the roles and responsibilities of relevant Victorian agencies and their respective policy mechanisms that contribute towards achieving this vision.

Strategic planning

Strategic planning for State forests in Victoria is reflected principally in DELWP's forest management plans (FMPs). There are nine FMPs in Victoria, established under the *Forests Act 1958* and developed progressively as the RFAs were developed. The FMPs in Victoria are:

- Forest Management Plan for the East Gippsland Forest Management Area 1995 and amended by the East Gippsland Forest Management Plan Amendment 1997
- Forest Management Plan for the Midlands Forest Management Area 1996
- Forest Management Plan for the Central Highlands 1998
- Forest Management Plan for the North East 2001
- Forest Management Plan for the Mid-Murray Forest Management Area 2002
- Gippsland Forest Management Plan 2004
- Forest Management Plan for the Floodplain State Forests of the Mildura Forest Management Area 2004
- Bendigo Forest Management Plan 2008
- Portland and Horsham Forests: Forests Management Plan 2010.

Development of these FMPs was supported through the CRAs. The CRAs also directly informed the development of a CAR reserve system for Victoria through the RFAs.

Forest harvesting on private land must be consistent with the *Code of Practice for Timber Production 2014* (Code), and landowners must prepare a property vegetation plan for the removal of native vegetation on private land. The Code also incorporates Management Guidelines for Private Native Forests and Plantations 2014, which provide means for achieving mandatory actions and operational goals. Failure to follow the management guidelines does not itself constitute non-compliance with the Code; rather, the guidelines support or expand the Code. Local government is responsible for ensuring compliance with the Code and DELWP provides additional management guidelines to assist local government to interpret the Code and monitor Code compliance.

The *Code of Practice for Timber Production 2014*

The legislative framework for forest management is supported by regulatory instruments, including codes of practice, particularly the *Code of Practice for Timber Production 2014*.

The Code is the primary regulatory instrument that applies to commercial timber production in both public and private native forests and plantations in Victoria. The Code is made by the Minister for Energy, Environment and Climate Change, under Part 5 of the *Conservation, Forests and Lands Act 1987*.

The purpose of the Code is to provide direction to the managing authority for timber harvesting operations in State forest – notably, VicForests and its contractors – to deliver sound environmental performance when planning for and conducting commercial timber harvesting operations. It seeks to ensure that this is done 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
- enhances public confidence in the management of timber production in Victoria's forests and plantations.

The Code applies to commercial timber harvesting on both public and private land in Victoria. Silvicultural tending, regeneration, rehabilitation and roading activities associated with commercial harvesting are also subject to this Code. Timber harvesting operations in State forests are required to comply with the Code.

The Code is based on 'Code Principles', which express the broad outcomes of the intent of the Code for each aspect of sustainable forest management. The six Code Principles were developed from the internationally recognised Montréal Process criteria and are consistent with the objectives of the *Sustainability Charter for Victoria's State forests*. The Code Principles are:

- 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 Code incorporates the *Management Standards and Procedures for timber harvesting operations in Victoria's State forests 2014* (MSP), which provide standards and procedures to instruct managing authorities, harvesting entities and operators in interpreting the requirements of the Code.

Timber harvesting operations in State forests are required to comply with the Code, including the MSP. This is required under licences and authorities issued under the *Conservation, Forests and Lands Act 1987*, the *Forests Act 1958* and the *Sustainable Forests (Timber) Act 2004*, as well as the Victorian Planning Provisions that require the Code to be considered as relevant (as specified in clause 14.01-3S). Compliance with the Code in State forest is monitored by authorised officers appointed by the Secretary to DELWP.

The *Planning Standards for Timber Harvesting Operations in Victoria's State Forests 2014* constitute an appendix to the MSP and describe management actions for protection of values. Prescriptions in relation to threatened species protections, previously stated in FMPs and action statements, were transcribed directly into the Planning Standards with the revision of the Code in 2014. These standards provide non-binding guidance to the Secretary to DELWP in discharging its forest functions in respect of forest planning.

Sustainability Charter for Victoria's State forests

The Victorian Government developed a Sustainability Charter for Victoria's State forests in 2006. In accordance with the *Sustainable Forests (Timber) Act 2004*, the charter sets out objectives, consistent with the principles of ecologically sustainable development, for the sustainability of forests and the sustainability of the timber harvesting industry. These obligations have been aligned with the Montréal Process for sustainable forest management and the principles of ecologically sustainable development.

Through the charter, the DSE (now DELWP) and VicForests (the body responsible for timber harvesting in Victoria) committed to managing Victoria's State forests in accordance with the following objectives:

- to maintain and conserve biodiversity in State forests
- to maintain and improve capacity of forest ecosystems to produce wood and non-wood products
- to promote healthy forests by actively managing disturbance
- to maintain and conserve the soil and water resources of State forests
- to maintain and better understand the role of Victoria's State forests in global carbon cycles
- to maintain and enhance socio-economic benefits of State forests to Victorian communities
- to ensure Victoria's legal, institutional and economic frameworks effectively support the sustainable management of State forests.

These commitments and associated obligations are reported on through Victoria's five-yearly State of the Forests Report.

Future of our forests: modernisation of Victoria's forest management system

The Victorian Government has committed to modernising its forest management system[50] over the next four years. The program will deliver:

- a vision for the future management of our forests
- a strategy for the management of State forests
- modernisation and extension of the Victorian RFAs
- reform of environmental regulation of timber harvesting operations
- development of new FMPs across the state, including greater integration across tenures and between forest and fire management.

Relevant Victorian agencies: roles and policy mechanisms

The following Victorian agencies work towards providing the institutional framework that supports the conservation and sustainable management of the Victorian forested estate.

Roles and responsibilities of each of these agencies, including their respective regulatory, decision-making and other policy mechanisms, are broadly outlined below.

The **Department of Environment, Land, Water and Planning** (DELWP) is responsible for climate change, energy, environment, water, forests (including bushfire management), planning, and local government. It manages Victoria's 3.2 million hectares of State forest and provides policy guidance for a further 3.7 million hectares of parks and conservation reserves.

The **Department of Jobs, Precincts and Regions** (DJPR) brings together many of the areas driving Victoria's economic development and job creation including transport and ports, investment attraction and facilitation, trade, innovation, regional development, small business and services to sectors such as agriculture, the creative industries, resources and tourism. It is also the department responsible for the administering the AO on behalf of the Minister for Agriculture and provides oversight of VicForests, including monitoring and advising on its compliance with corporate governance requirements.

Parks Victoria is a statutory authority designated under the *Parks Victoria Act 2018* and reports to the Victorian Minister for Energy, Environment and Climate Change. Parks Victoria manages an estate of more than 4 million hectares for the purpose of conservation of biodiversity. Parks Victoria is responsible for the management of the national parks estate, and for the purpose of the RFA process, the formal protected area component of the CAR reserve.

VicForests is a state-owned business responsible for the sustainable harvest, regrowing and commercial sale of timber from public forests on behalf of the Victorian Government.

Emergency Management Victoria leads emergency management in Victoria by maximising the ability of the emergency management sector to work together and to strengthen the capacity of communities to plan for, withstand, respond to and recover from emergencies.

[50] (https://www2.delwp.vic.gov.au/futureforests/about/about)

Local government in Victoria administers private forest management. Policy support for private forestry is provided by **DJPR**.

The **Office of the Conservation Regulator** (OCR) was established by DELWP in early 2019 following an independent review of timber harvesting regulation in Victoria's public native forests. The OCR oversees regulatory functions in conservation and environment in Victoria through:

- educating the community about the laws governing conservation and environment protection in Victoria
- providing guidance and support to encourage compliance
- monitoring compliance with regulatory requirements and taking enforcement action against non-compliance.

The Chief Conservation Regulator leads the OCR and is accountable for decision-making supporting the delivery of DELWP's key regulatory outcomes including:

- protected natural and heritage values
- the equitable and safe access to public land and use of natural resources.

An Independent Regulation Advisory Panel has been established to provide the Chief Conservation Regulator with independent expert advice on best practice approaches to regulating.

Indicator 7.1c: Extent to which the economic framework supports the conservation and sustainable management of forests

This indicator examines the extent to which government policies support the conservation and sustainable management of forests.[51] Government policies on investment, taxation and trade influence the level of investment in forest conservation, forest establishment and timber processing.

Many of the factors that affect the economic framework in relation to sustainable management of forests occur at the state or national level. These factors have been actively reported on over the life of the Victorian RFAs in five-yearly SOFRs, as well as in Victorian reporting.

Investment

Australia has stringent controls over land-use changes and industrial development that aim to protect environmental, cultural and amenity values. These controls generally apply equally to all land-use change and developments. Provided those values are protected, private investment in the forest and forest products industries in Australia is generally free from industry-specific legal and regulatory constraints. Australia's foreign investment policy aims to encourage foreign investment that is consistent with community and economic interests. Foreign investment in Australia is regulated primarily through a regime established under the *Foreign Acquisitions and Takeovers Act 1975* (Cth).

Competition

Australia's National Competition Policy has led to several reforms that affect the competitive climate for Australian forest-based industries, including that commercial state-owned forest entities be competitively neutral with the private sector. VicForests was established in 2003. It is a state-owned business and functions as a commercial entity in the competitive marketplace. VicForests is required to act in a commercially prudent manner, maximising long-term economic returns to the state rather than delivering short term profits, and report annually on profitability.

Taxation

Prior to 2002, the tax treatment of forestry activities as primary production created unintended inequities for small-scale private investments in forestry due to the seasonal and long-term nature of forestry, and its associated irregular cash flows. Key issues were:

- inability to offset upfront establishment payments in managed schemes in the payment year
- immediate tax liability created by forward contracts for timber harvesting rights
- tax bracket creep with no mechanism to average large harvest incomes over the plantation life cycle.

51 Prior to 2005 effects of the economic framework on sustainable forest management were reported under indicators which were then enumerated as 7.3a and 7.3b.

In 2002, a 12-month pre-payment rule was introduced to address the offset issue for investors in prospectus-based forestry schemes. This was the only significant tax treatment for forestry investments in managed schemes that was different to investment in other sectors at that time. This rule lasted until 30 June 2008.

Managed investment schemes

In July 2007, new taxation arrangements for investment in forestry MISs came into effect as a result of Plantations for Australia: the 2020 Vision, a strategic partnership between the Australian, state and territory governments and the timber industry. The aim was to enhance regional wealth creation and international competitiveness by increasing Australia's plantation resources, trebling the 1997 area of commercial tree crops by 2020.

The global financial crisis proved the tipping point for this policy arrangement and precipitated a collapse of several large MISs in 2009 and 2010. Examination of the MIS period has exposed many flaws in the foundation and fundamental process of the scheme and provided valuable, if not costly, learning experience.

Adjustment programs

A joint Victorian and Australian government adjustment package of $42.6 million was provided to assist forest industry businesses to adjust to changes in resource availability in the transition to new arrangements under the Victorian RFAs. The four components of the package were:

- industry development assistance
- rescheduling assistance
- business exit assistance
- worker assistance.

A further program of industry adjustment was run by the Victorian Government, which allocated $80 million to assist forest workers and communities adjust to changes in resource availability. Industry adjustment support included a voluntary licence reduction program, industry transition taskforce and a workers assistance package which included an industry restructure package, training assistance, relocation assistance and job placement assistance.

Following further reservation of forest areas in the West Victoria and Gippsland RFA regions, the Victorian Government provided additional funding to facilitate improvements in the productive capacity of public native forests, establish hardwood plantations and support forest-based initiatives that generate significant employment opportunities in regional Victoria.

Trade policies

Throughout the RFA period, Australian trade policy has continued to support trade liberalisation to improve access for Australian exports in global markets, as well as Australian access to imports. Improved market access has been facilitated through global and multilateral efforts and through the use of free trade agreements. Australia is a member of the World Trade Organization, which facilitates multilateral trade negotiations and ensures that the rules of

international trade are correctly applied and enforced. Free trade agreements are increasingly important to the forest-based industries.

Investment in environmental services

The Australian Government's Emissions Reduction Fund (ERF), established under the *Carbon Credits (Carbon Farming Initiative) Act 2011* (Cth), allows businesses to earn carbon credits for storing carbon or reducing greenhouse gas emissions. ERF project participants have an opportunity to sell their emissions reductions to the government through competitive reverse auctions.

Effectiveness of the economic framework

The effectiveness of the economic framework was not explicitly assessed on a holistic basis prior to the ASOFR 2013. The inclusion of these metrics with data from 2006 provided a baseline for future analysis of the effectiveness of the economic framework in relation to production forests, management of conservation reserves, bushfires and Indigenous-managed lands.

The majority of measures remained consistent between 2006 and 2016 with the exception of understanding and processes relating to Indigenous-managed land, and conservation reserve processes which showed decline. Notably no items were ranked below partially effective, and no items showed significant improvement in ranking over the period.

State investments

Since 2013, several state government investments have affected Victorian native forests. The Victorian Budget 2013–14 committed $13 million to improve tourism in national parks, State forests and on public land. There is no current assessment of the effect of private sector investment. In 2013–14, DJPR gave grants of $620,000 to a number of wood processing facilities as part of the Regional Growth Fund. Limited benchmarks and targets have meant that the only quantifiable outcomes for this initiative were in relation to financial returns or employment.

Indicator 7.1d: Capacity to measure and monitor changes in the conservation and sustainable management of forests

This indicator examines the capacity of forest owners and agencies to measure and monitor changes in the forest and the impact of forest activities. A comprehensive measurement and monitoring program provides the basis for forest planning to support sustainable management.

Monitoring and reporting

Victoria produces a five-yearly State of the Forests Report which reports on sustainable forest management in the state. This fulfils reporting requirements set out for the Secretary to DELWP in the *Sustainable Forests (Timber) Act 2004*, which states that the minister must determine criteria and indicators for sustainable forest management, and must determine the reporting requirements, including the frequency at which such reports are to be made, being a period not less than every five years.

Victoria has adopted a set of criteria and indicators for sustainable forest management to monitor and assess the State's performance in achieving its objectives in relation to a range of environmental, economic and social indicators. These criteria and indicators are closely aligned with Australia's Sustainable Forest Management Framework of Criteria and Indicators and the international reporting standards developed under the Montréal Process Working Group. This provides a framework that Victoria uses to evaluate progress towards the objectives set out in the Sustainability Charter and to improve openness, accountability and community engagement in forest management (DEPI 2014d).

The VFMP has been developed to assess and monitor the state and condition of flora and ecosystems of Victoria's public forest estate and to help observe ecosystem response to forest disturbance over time (Suitor et al., 2016). The VFMP provides baseline data for long-term trend detection and prediction of type and severity of future changes, so that management options can be developed and evaluated in time to be effective.

Australian and international standards

VicForests is certified to the Responsible Wood Standard, which is endorsed by the Program for the Endorsement of Forest Certification. Operations conforming to this Standard are in line with best-practice sustainable forest management and meet environmental, economic, social and cultural requirements that support sustainable management. VicForests is also a member of the FSC and is working towards achieving the FSC Controlled Wood Standard through its FSC 2020: VicForests Controlled Wood Roadmap.

Certification allows wood users to know that the timber they are buying has been grown and harvested legally from a sustainable source, and that the company producing the timber is a sustainable and efficient forest manager.

Policy development

There are a number of policies being implemented by the Victorian Government to enhance ESFM. These include:

- *Protecting Victoria's environment – biodiversity 2037*, which sets out a 20-year vision and goals for biodiversity conservation in Victoria;
- review of the FFG Act to more effectively protect biodiversity in the face of existing and emerging threats; and
- amendments to the regulation of native vegetation to provide better consideration of biodiversity elements in decision-making.

In 2017, the Victorian Government accepted VEAC recommendations that the following be undertaken within five years:

- State forests be administered under one Act;
- the *National Parks Act 1975* be expanded to include revised categories of national parks, conservation parks, nature reserves, marine protected areas and other categories and overlays classified as protected areas, to become the 'National Parks and Conservation Reserves Act'; and
- a new public land Act be developed to replace the current *Land Act 1958*, *Crown Land (Reserves) Act 1978* and *Forests Act 1958*.

Indicator 7.1e: Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services

This indicator reports on the scientific understanding of Australian forest ecosystem characteristics and functions needed to underpin sustainable forest management. Research, inventory and the development of assessment methodologies provide the basis for sustainable forest management.

For this indicator, forestry research and development (R&D) covers research in relation to commercial management and protection of forests, including environmental and ecological considerations. It also includes forest products R&D such as production runs in mills, but not work on final product development (e.g. furniture production). This indicator is closely aligned to 6.2b, which monitors the investment in, and the adoption of, new or improved technologies in forest management and in forest-based industries.

National capacity for Australian forestry R&D

While research is fundamental to supporting development and improvement in all aspects of forest management, production and sustainability, several recent publications have highlighted the significant decline in national forestry R&D capacity and capability (Kile et al. 2014; Turner & Lambert 2015). Reasons for the reduction in funding for R&D associated with commercial forestry include the declining relative contribution of the forest industry to the national economy, reduced government involvement in the forestry industry, corporate restructuring and increased international ownership.

Resource allocation for research priorities in nature conservation reserves is generally funded by state-based agencies or through universities that have received project grants, with specific and targeted interests focused on biodiversity and conservation issues. State conservation

agencies are frequently being restructured and forced to have a greater reliance on securing competitive external funding.

Forest products research is broadly considered in terms of utilisation of products from forests (i.e. primary processing, pulp and paper, engineered wood products, bioenergy). National R&D capacity in this area has also declined, notably with the demise of the contribution of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to wood products research. While there has been a decline in forestry R&D by government agencies, a small number of new university-based forestry and/or forest products research centres have recently been established, for example, the Forest Industries Research Centre at the University of the Sunshine Coast and the National Centre for Future Forest Industries at the University of Tasmania established under the National Institute for Forest Products Innovation.

Nationally, the number of staff (scientists, technicians, support staff and graduate students) involved in forestry and products research was about 276 in 2013 compared with 794 in the mid-1980s (Turner & Lambert 2015).

Victorian capacity for forestry R&D associated with State forests

DELWP has designed its current research program to develop improved capacity and evidence base to manage impacts of fire (natural and managed), climate variability and forest management regimes on water quantity and quality, biodiversity values, carbon assets and other social and economic values. It will also investigate the vulnerability and resilience of Victoria's public forests. It will do this through:

- applying an integrated understanding of multiple forest values for adaptive forest management
- investigating the effects of fire, climate and management on the vulnerability and resilience of Victorian forests
- understanding and managing Victoria's forest carbon
- assessing water security from Victoria's forested catchments in the face of climate variability/climate change and fire
- understanding interactions between fire, landscape pattern and biodiversity; and
- assessing social, economic and community safety values of forests in fire-prone landscapes.

Between 2006–7 and 2011–12, the Victorian Government invested approximately $29 million in forest-related research, development and education (an average of $4.8 million per year) (DEPI 2014d). The number of forest researchers employed by the Victorian Government fell from 21.9 FTE in 2011–12 to 17.9 in 2015–16. Research in Victoria is focused on native forests, with an emphasis on fire ecology, fauna ecology and sustainable forest management. Staff conducting research are employed by DELWP, ARI and VicForests (Commissioner for Environmental Sustainability Victoria 2019).

ARI is an applied ecological research centre with an emphasis on plants, animals and biodiversity issues. ARI is the Victorian Government's ecological research institute and is a

branch within the Biodiversity Division and Energy, Environment and Climate Change Group of DELWP.

Victorian capacity for forestry R&D associated with national parks and reserves

Parks Victoria manages national parks and reserves on behalf of the Victorian Government. It has established a collaborative research program known as the Parks Victoria Research Partners Program (RPP). The RPP includes a formal panel of 10 university and other research organisations, plus other informal research associations that bring together park managers and scientists to undertake applied research that addresses park management problems and improves understanding of environmental and social park management issues.

Since 2010 the RPP has completed or commenced around 140 partnership projects. These include being a partner/collaborator on 13 Australian Research Council Linkage projects. Each one dollar of Parks Victoria's research funding has leveraged more than six dollars of additional funding. Many of these research projects involve land management and policy partners from both government and non-government organisations.

The RRP has undertaken a number of actions to address environmental issues, including:

- monitoring the existing and potential distribution and management of weeds, introduced predators and introduced herbivores
- identifying key habitats for threatened flora and fauna
- improving understanding of fire ecology requirements (in partnership with DELWP)
- better understanding the diet and impacts of native and introduced herbivores
- better understanding coastal and catchment processes
- mitigating impacts of pathogens
- managing the impacts of overabundant native fauna
- improving habitats for native flora and fauna (such as ecological thinning)
- marine habitat mapping
- collating inventory of flora, fauna and habitat to guide management planning.

It has also tackled social science questions such as testing of new spatial technology for community involvement in park planning and developing tools to measure visitor and community benefits of parks and assessment of visitor impacts.

Forestry R&D within Victorian universities

Research relating to forests and forestry which is funded by the Victorian Government is carried out by, and in collaboration with, a number of research agencies, universities and CRCs. These include: ARI, the CSIRO, the University of Melbourne, the Australian National University, La Trobe University, the University of Ballarat and various CRCs including the eWater CRC, Bushfire and Natural Hazards CRC and the CRC for Forestry.

Research has continued on all themes and priorities listed in the Victorian RFAs. The importance of ESFM and the development of appropriate mechanisms to monitor and continually improve management practices have remained central to the research carried out

in Victoria. In addition to the themes listed in the RFAs, research has also continued on issues relating to climate change and carbon sequestration.

DELWP's investment in R&D has a positive contribution to employment, with 26.3 FTE academics working in forest research and development in Victoria. The Integrated Forest and Ecosystem Research program at the University of Melbourne and the Bushfire and Natural Hazards CRC are examples of such research initiatives which focus on forest hydrology, fire behaviour, fire ecology, sustainable forest management and forest health (Commissioner for Environmental Sustainability Victoria 2019).

Wherever possible, reports are made publicly available and articles may also be published in peer-reviewed journals.

Indicator 3.1a: Scale and impact of agents and processes affecting forest health and vitality

This indicator identifies the scale and impact of forest health on a variety of processes and agents, both natural and human-induced. Through the regular collection of this information, significant changes to the health and vitality of forest ecosystems can be monitored and measured.

Operational aspects of this indicator involve maintaining Victoria's forest ecosystem health and vitality through pest and weed monitoring and control, including insect pests, invertebrate pests and fungal diseases. Such practice follows the principles of ESFM, which requires that forests are managed in an environmentally appropriate, socially beneficial, and economically viable manner, and meet the needs of the present without compromising the needs of future generations (Holvert & Muys 2004, Washburn & Miller 2003).

Tree canopy condition

Forest health and vitality are related to a number of natural disturbances, including fire, invasion of non-native species, floods, disease outbreak and climatic events such as windstorms, extreme temperatures and droughts. These disturbances are an important natural process; however, there have been recent shifts in the frequency, scale and intensity of the agents that cause disruption in forest health and vitality (Commissioner for Environmental Sustainability Victoria 2019). Forest health and vitality was not reported in Victoria until the VSOFR 2013.

Forest canopy condition is used globally as an indicator of forest health. In the VSOFR reports, canopy condition is presented by three measures: mortality, crown dieback and defoliation (Table).

Table 118: Canopy condition of Victorian forests

Canopy condition	2013 (per cent)	2018 (per cent)
Tree mortality	19.5	14.3
Crown dieback	23.7	20.3
Defoliation	18.2	23.3

It is difficult to identify significant differences between bioregions and between parks, reserves and State forests, except for the Victorian Volcanic Plains, where a higher mortality rate was identified in State forests in 2018 (Commissioner for Environmental Sustainability Victoria 2019). Mortality was particularly high in the VSOFR 2013 in the Australian Alps and South Eastern Highlands bioregions, which were recovering from significant bushfires (DEPI 2014d).

Area of bushfires

Since the RFAs were signed 20 years ago, Victoria has experienced a number of large-scale bushfire events. Lightning has been responsible for the largest area burned despite being a small percentage of the total number of fire ignitions (DEPI 2014d). Unattended campfires account for a large proportion of the fires reported on public land. The total area affected by bushfire between 2000 and 2017 is shown Figure 63 and Figure 64.

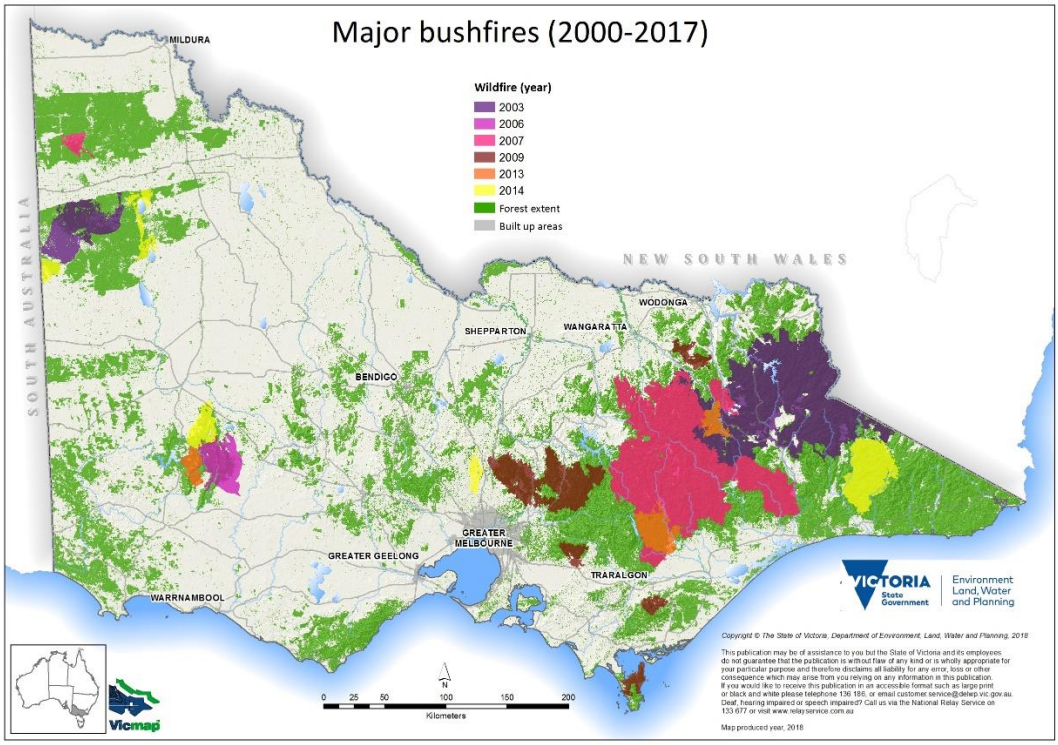

Figure 63: Major bushfires in Victoria 2000–2017

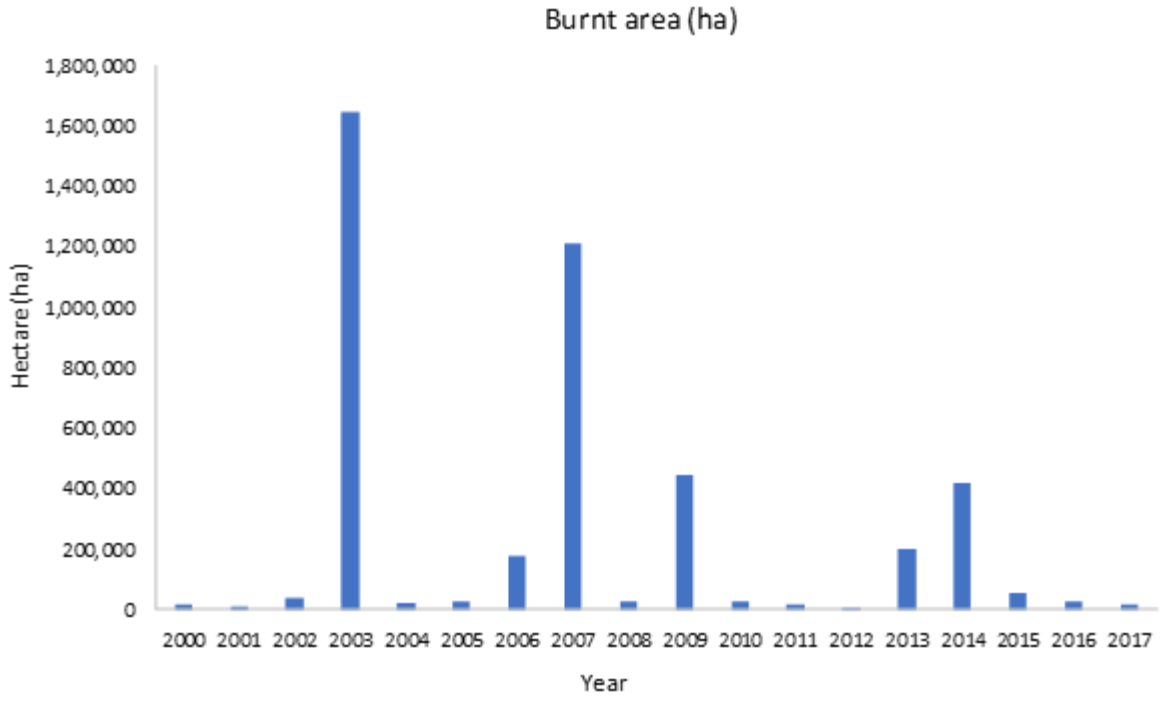

Figure 64: Total area affected by bushfires, 2000–2017

Climate

Australia is predicted to experience warmer temperatures, altered rainfall patterns, more-severe droughts, more-intense rain events and more heatwaves over the course of the 21st century (CSIRO 2018; Montréal Process Implementation Group for Australia and NFI Steering Committee 2018)

Forest health and vitality are related to climatic patterns and events, and are affected by rainfall deficit and extreme temperatures which impact mortality, defoliation and withering in trees and understorey vegetation. High temperatures and drought can also augment fire activity, and forests in drought stress are more susceptible to infection and insect invasion.

The Victorian climate has been warming since the 1950s with every year since 2013 among the top-ten warmest on record in Victoria. Both daytime and overnight temperatures have increased in this time.

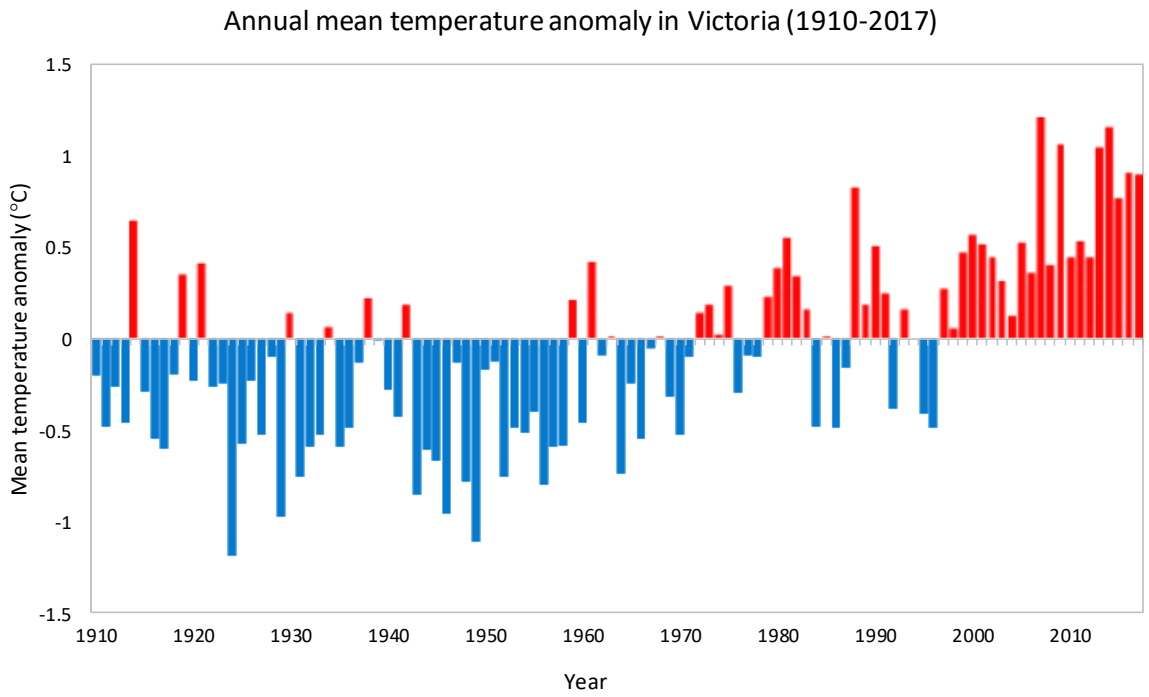

Figure 65: Victorian mean temperature anomaly, 1910–2017

Human-induced disturbance

Invasive species

Vertebrate pests include both introduced species that have become introduced and established as wild populations and native species that can be damaging in some situations. Many introduced pest species have colonised large tracts of Australia and Victoria and their impacts have become significant. The adverse effects in forests include preying on or competing with native fauna, providing vectors for pathogens, contributing to soil erosion or spread of weeds and direct damage to plants by browsing, trampling or rubbing.

More than 2,800 exotic plant species are recorded as pests in Australia (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018). Few of these are the subject of widespread control or eradication measures. Data on weed species and control methods in Victoria is limited.

Insects and pathogens

Giant pine scale (*Marchaline hellenica*) is a sap-sucking pest that attacks trees in the Pinaceae family, including *Pinus. radiata*. It was first detected in early 2015 in Adelaide and Melbourne. While the Adelaide infestation was successfully eradicated, the Melbourne infestation was larger and unable to eradicate. While it has not been found in any other part of Australia, it poses a risk to Australia and Victoria's softwood plantation industry.

Psyllids were the most damaging insect pests affecting native forests in 2011–16, particularly causing large-scale defoliation in river red gum (*Eucalyptus camaldulensis*) forests in Victoria. Large outbreaks of cup-moth (*Doratifera* spp.) in Victoria that commenced in 2006–11 abated

and forests have recovered well (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018)

The introduced pathogens *Phytophthora cinnamomi* (phytophthora root-rot) and *Austropuccinia psidii* (myrtle rust) are the most damaging diseases in native forests because of the broad suite of highly susceptible species that they affect. Myrtle rust is the most significant pathogen threat to native forests and is now found in much of its predicted climatically optimal range. There are 380 native species known to be hosts of this pathogen (Montréal Process Implementation Group for Australia and NFI Steering Committee 2018). Basic mapping of phytophthora is carried out in Victoria and consists of testing and field surveillance and a risk assessment model developed to help determine the recommended hygiene conditions.

Planned burns

Managing forest fuels helps to reduce the amount of fuel available to a bushfire, which can decrease its intensity and rate of spread. In 2010 the Victorian Government committed to expand the area covered by planned burns each year, as a result of the report by the 2009 Victorian Bushfires Royal Commission. In 2016 this approach changed from a hectare-based approach to a risk-based approach for bushfire management. Planned burns aim to fulfil the ecological requirements of flora and fauna and limit the effects of large-scale bushfires.

Indicator 5.1a: Contribution of forest ecosystems and forest industries to the global greenhouse gas balance

Forest ecosystems and forest industries contribute in a number of positive ways to the global greenhouse balance. When forests are managed sustainably, they generate harvested wood products (HWPs) which also play a significant role in the global greenhouse balance, primarily via carbon storage in long-lived products and in landfills, and also by displacing the use of more greenhouse-intensive materials.

However, these interactions between forest ecosystems and/or forest industries and the global greenhouse balance were not as apparent 20 years ago when the RFA was signed, and it has been only since the 2007 United Nations Climate Change Conference in Bali (UNFCCC COP 13) that international negotiations have focused on the role of natural forests in storing carbon (Mackey et al. 2008). The original RFA documents highlighted a number of areas of research to be targeted to improve knowledge. Since then a number of studies have addressed many of the gaps originally identified, including a strong focus on the life cycle of carbon in HWPs. The majority of the forest-based studies have been conducted in production forests (both native and plantations).

Natural forests are more resilient to climate change and disturbances than plantation forests because of their genetic, taxonomic and functional biodiversity (Mackey et al. 2008). The estimation of forest biomass and carbon has improved with the development of species-specific and generic allometric relationships for a number of important tree species (e.g. Keith et al. 2000; Paul et al. 2013, 2014 and 2016; Montagu et al. 2005; Ximenes et al. 2005a, 2005b, 2008, 2018). There is a better understanding also of the longevity of biomass in root systems following tree harvest (Ximenes et al. 2008). Carbon dynamics in forest ecosystems are affected by the impacts of climate change. These may include more-frequent and more severe bushfires, increased incidence of pests and diseases and also changes in growth dynamics due to increased CO_2 levels in the atmosphere. The impact of natural disturbances such as bushfires on the greenhouse balance of forest ecosystems in Victoria may lead to large emission pulses for a particular year. However, these emissions are typically offset over time by the carbon sequestered when the burnt forests regrow.

When forests are managed for production, a large proportion of the biomass is left in the forests as residues. The carbon dynamics of HWPs has been the focus of a number of studies that have significantly improved knowledge of the role wood products play in climate change mitigation efforts, including carbon flows in sawmills, product substitution impacts and the fate of carbon in HWPs in landfill (Ximenes et al. 2015, 2016, 2017). These studies have highlighted the importance of understanding the carbon implications of the use of HWPs – addressing one of the key gaps identified in the original RFAs. For example, it is widely accepted now that HWPs in landfills represent a carbon reservoir, with minimal likely loss of carbon. This understanding has been reflected in the progressive change in the decay factor adopted in the national greenhouse gas inventory, from 50 per cent in 2006 to 10 per cent in 2016 (DOEE 2017).

Given the complex nature of the carbon dynamics in forests and HWPs, it is important to adopt a life-cycle-assessment approach in their assessment, taking into account what the atmosphere actually sees (i.e. actual flows and uptakes of greenhouse gases). This approach is typified by a life-cycle assessment conducted for typical houses built in Sydney (Ximenes and Grant 2013), which analysed the greenhouse gas implications of an increase in the use of HWPs in the residential sector. It has also been adopted in studies of the greenhouse balance of native forest management (Ximenes et al. 2016). Ximenes et al. (2016) quantified the greenhouse gas impact of a range of different alternative scenarios related to the management of native forests in New South Wales and Victoria, with greenhouse gas benefits associated with most of the scenarios analysed.

There is insufficient, systematic data available that can be used to estimate the total contribution of forest ecosystems and forest industries in the RFA regions and Victoria as a whole to the global greenhouse balance consistently since 1999. However, Victoria models biomass in the native forests in parks, reserves and State forests. The VSOFR 2018 estimates the average carbon per hectares across forest lands ranging between 33 to 334 tonnes per hectare.

Total carbon stored in forests and harvested wood products in Victoria from 2001 to 2016 is shown in Table . With the exception of Flinders, total carbon per hectare is 40 per cent higher on average in State forests than in parks and reserves, due to larger total plant biomass on State forests. The higher prevalence of old-growth trees restricted for harvest in State forests relative to younger stands may contribute to better carbon storage (Commissioner for Environmental Sustainability Victoria 2019). The following factors also play a role:

- Parks and reserves often contain non-forest areas (e.g. the Australian Alps bioregion includes areas above the tree line).
- State forests are managed to achieve higher stocking rates.
- Carbon from large dead trees in the Australian Alps reserves is higher comparative to the rest of the bioregions because of fires in 2003, 2007 and 2009 producing at least two times more carbon from large dead trees than in other bioregions.

Table 119: Total carbon stored in forests and harvested wood products in Victoria, 2016

Forest category	2016 (Mt)
Native forests	
Non-production native forests	1,661
Production native forests	279
Total native forests	*1940*
Other forests	
Post 1990 environmental plantings	2
Total other forests	*2*
Plantations	
Softwood plantations	33
Hardwood plantations	33
Total plantations	*66*
Forests total	**2008**
Harvested wood products	
Wood products in use	23
Wood products in landfill	11
Harvested wood products total	*34*
Total forests and harvested wood products	**2042**

Source: ASOFR 2018

In 2017 the Victorian Government's *Climate Change Act 2017* established a target of net-zero greenhouse gas emissions by 2050. The Act also requires five-yearly interim emissions reduction targets to meet the long-term target. The forest sector is a net sink of carbon emissions, except in years of major bushfire (Figure 66) (e.g. 2003, 2007 and 2009). Carbon is primarily sequestered by afforestation and reforestation (including post-harvest regrowth), and sequestration from forest management has increased since 2011 due to vegetation projects funded by the ERF. In 2016, about 10 per cent of total carbon emissions were sequestered by forest-related activities (afforestation, reforestation, forest management and revegetation). Many of the forest management options proposed internationally are already being implemented in public forests in Victoria. Where actions are not being implemented it is due to technical, economic, social or scientific challenges (Keenan & Nitschke 2016).

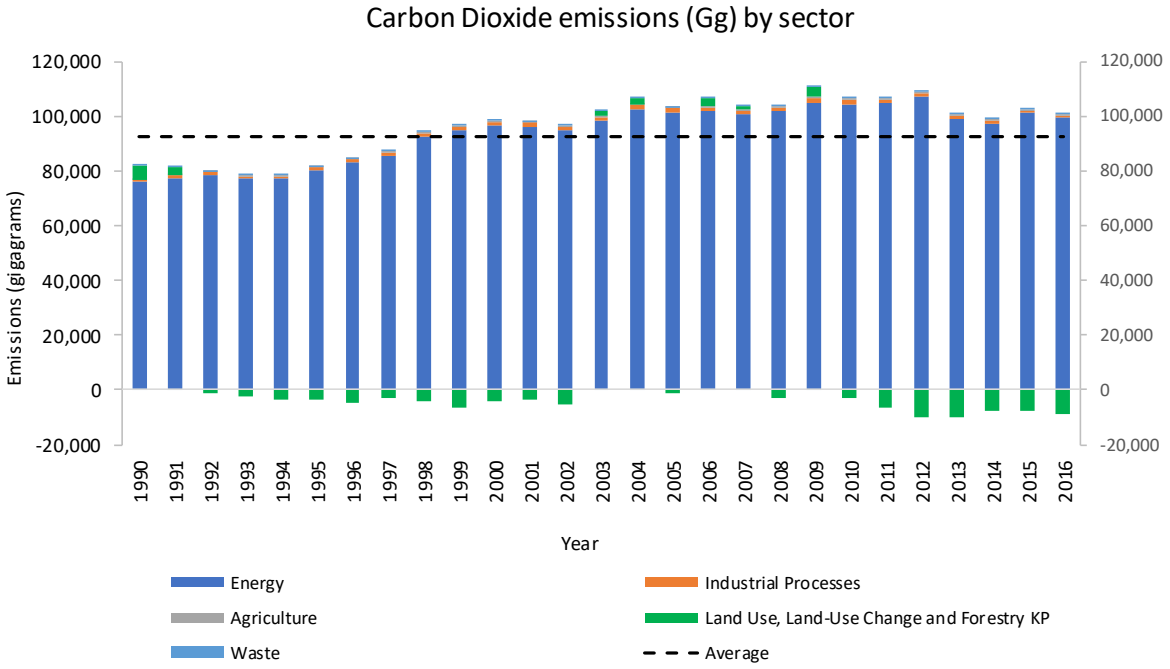

Figure 66: GHG inventory (carbon dioxide) trend by sector in Victoria, 1990–2016

Data source: Australian Government, Australian Greenhouse Emissions Information System

In the future, it is likely that, due to increased temperatures and extended droughts, the number of high fire danger days will increase, thus increasing the frequency and/or intensity of bushfires. This will depend on fuel loads, future wind patterns and topography. The number of days of high or extreme fire danger ratings are likely to increase by 4–25 per cent by 2020 and 15–70 per cent by 2050, with higher fire danger in spring, summer and autumn that will shift any periods suitable for fuel reduction burning into winter (Keenan & Nitschke 2016).

Current research

Through the Integrated Forest and Ecosystem Research Agreement with the University of Melbourne, Victoria is investing in research for 'Understanding and managing Victoria's forest carbon'. Temperate forests like those in Victoria are an important component of the global forest carbon sink and Australia has made international commitments to report anthropogenic changes in that sink in line with efforts to mitigate climate change. Therefore, it is important that we understand the size of our forest carbon assets (i.e. how much carbon is stored), how resilient those assets are to emerging fire and climate regimes and how risks to carbon assets can best be identified and managed. This project aims to address key knowledge gaps relevant to the estimation of the largest carbon assets (live trees and soil) and the resilience of those assets to changing climate and fire regimes. These data and relationships will be integrated into a carbon-modelling framework, which will be used to identify risks and opportunities in forest carbon management.

Through the RFA assessment process Victoria is undertaking an economic assessment of the current benefits of Victoria's forests, which will include valuation of the benefits of climate change mitigation through carbon sequestration and storage. The project will use an

environmental-economic accounting framework to identify and describe ecosystem services produced by Victorian forests, and value the benefits they provide to people. This will include determining the quantity of carbon stored in Victorian forests and how this has changed over time. Researchers will model and map this across Victoria by RFA region and apply economic valuation techniques to calculate the monetary value of the benefits carbon storage provides people in Victoria and globally.

Emissions Reduction Fund: plantations

Plantations can also contribute significantly to the global net greenhouse emissions via additional carbon sequestration, especially if planted in lands that have been previously cleared for another use.

The Emissions Reduction Fund (ERF) is one of the Australian Government's key mechanisms to achieve its greenhouse gas emission abatement targets. The ERF rewards abatement in a number of industry sectors using specific methods, and in 2017 a new method was approved to reward carbon abatement in new plantation establishment (under certain conditions) and also in conversion from short to long-rotation plantations.

The plantation method presents an opportunity for plantations to obtain credits for carbon abatement. Projects in areas with greater than 600 mm average rainfall are ineligible, unless they fit within certain exemptions. This 'water rule' seeks to manage the impact that plantations have on water availability. Industry claims that challenges in meeting exemptions to the water rule constrain access to carbon credits for plantation projects. As part of its September 2018 National Forest Industries Plan, the Commonwealth Government committed to review the water rule.

Summary of future management of the principles of ecologically sustainable forest management

The Australian and Victorian governments (the Parties) had regard to CRAs and the principles of ESFM of forests in the development of the Victorian RFAs. In the five Victorian RFAs, the Parties have agreed that ESFM is an objective which requires a long-term commitment to continuous improvement and that the key elements for achieving it are: the establishment of a CAR reserve system; the development of internationally competitive forest products industries; and integrated, complementary and strategic forest management systems capable of responding to new information. These three elements have been delivered and are being maintained and enhanced where possible in the modernised Victorian RFAs. This chapter has provided a further assessment of the ecologically sustainable management of forests in the Victorian RFA regions.

Victoria's forest management system is implemented by an institutional and regulatory system that is adaptable to changing circumstances. Victoria's legal and institutional framework is complex, but Victoria has committed to streamlining and simplifying this framework. It established an Office of the Conservation Regulator, and details of this can be found online.[52] Victoria is currently also undertaking a review of its forest management system that will ensure that it remains contemporary, fit for purpose and reflects modern management priorities.

The Victorian RFAs implement an extensive CAR reserve system for the conservation of forest and non-forest vegetation communities in perpetuity. They also ensure that ESFM on the public and private estate is practised, providing for wood and non-wood products for industry development, as well as ecosystem services and other societal benefits.

Research and development capacity in forestry has decreased over the last 20 years in Australia (Turner & Lambert 2015). The Australian Government continues to fund forestry research through contributions to Forest and Wood Products Australia and the National Institute for Forest Products Innovation. The Victorian Government funds forestry research internally through ARI, plus through partnerships with a number of Victorian universities and research organisations.

Research on climate change and carbon dynamics in forests has greatly improved our understanding of forests' contribution to global carbon cycles since the signing of the Victorian RFAs. Forests in the Victorian RFA regions will continue to be impacted by climate change, which may include more frequent and severe droughts and bushfires, increased incidence of pests and diseases and changes to growth dynamics.

Plantations can also contribute significantly to the global greenhouse balance via additional carbon sequestration, especially if planted on lands that have been previously cleared for another land use or by converting existing short-rotation plantations to long rotations. There are also opportunities for ERF payments for these actions into the future.

52 DELWP Office of the Conservation Regulator https://www2.delwp.vic.gov.au/our-department/regulator

ESFM is an objective which requires a long-term commitment to continuous improvement. The extended Victorian RFAs will continue to provide for ESFM in the Victorian RFA regions. The Victorian RFAs will continue to commit the Parties to the key elements of ESFM, including the maintenance of the CAR reserve system and an integrated, complementary and strategic forest management system capable of responding to new information.

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Appendices

1. Old growth by EVC for 2019

Table 1.1 Representative conservation of Old Growth Forest in the CAR Reserve System in the Central Highlands RFA Region[a] as at 2019.

Ecological Vegetation Class	Area EVC (ha)	Percent of EVC as Old Growth (%)	Area Old Growth (ha)	Percent of Old Growth Forest in the CAR Reserve System				
				Dedicated Reserve	Informal[b]	Prescription[c]	Private land covenants[d]	Total
Cool Temperate Rainforest	4,668	7%	315	96%	4%	0%	0%	100%
Damp Forest	170,255	0.3%	439	51%	43%	2%	0%	96%
Damp Heathy Woodland	7,120	1%	38	100%	0%	0%	0%	100%
Grassy Dry Forest	47,287	<1%	7	0%	98%	0%	0%	99%
Heathy Dry Forest	14,725	28%	4,054	18%	47%	19%	0%	84%
Heathy Woodland	2,168	33%	717	68%	3%	3%	0%	74%
Herb-rich Foothill Forest	137,335	<1%	43	6%	81%	5%	0%	91%
Montane Damp Forest	20,392	<1%	26	37%	48%	11%	0%	96%
Montane Dry Woodland	7,077	19%	1,365	5%	48%	24%	0%	77%
Montane Riparian Thicket	2,520	<1%	10	74%	15%	7%	0%	96%
Montane Wet Forest	46,516	1%	278	90%	10%	0%	0%	100%
Riparian Forest	34,844	<1%	111	14%	86%	0%	0%	100%
Shrubby Dry Forest	14,342	<1%	9	3%	94%	1%	0%	98%
Shrubby Foothill Forest	36,558	<1%	29	88%	10%	0%	0%	98%
Sub-alpine Woodland	7,742	<1%	9	99%	0%	0%	0%	99%
Wet Forest	116,803	1%	1,143	88%	10%	0%	0%	97%

a. The figures shown in this table are based on the 2019 version of Victoria's modelled extent of Old Growth Forest (MOG) and are therefore only approximate.

b. Informal Reserve includes broad areas and linear elements of SPZ greater than 100 metres and other informal reserves.

c. This comprises those elements of GMZ and SMZ protected by prescriptions.

d. Private Land Covenants includes areas protected under conservation covenants under the *Victorian Conservation Trust Act 1972* and Land Management Cooperative Agreements under the *Conservation Forests and Lands Act 1987*.

Table 1.2 Representative conservation of Old Growth Forest in the CAR Reserve System in the East Gippsland RFA Region[a] as at 2019.

Ecological Vegetation Class	Area EVC (ha)	Percent of EVC as Old Growth (%)	Area Old Growth (ha)	Percent of Old Growth Forest in the CAR Reserve System				
				Dedicated Reserve	Informal[b]	Prescription[c]	Private land covenants	Total
Banksia Woodland	39,395	13%	5,081	82%	12%	1%	0%	94%
Blackthorn Scrub	5,068	20%	1,023	73%	11%	5%	0%	89%
Clay Heathland	2,431	1%	15	0%	0%	7%	0%	8%
Coast Banksia Woodland	3,410	4%	149	100%	0%	0%	0%	100%
Coastal Dune Scrub/Coastal Dune Grassland Mosaic	3,264	6%	189	100%	0%	0%	0%	100%
Coastal Lagoon Wetland	843	1%	7	82%	18%	0%	0%	100%
Coastal Saltmarsh	1,214	0%	3	100%	0%	0%	0%	100%
Cool Temperate Rainforest	4,241	47%	1,995	75%	10%	14%	0%	99%
Cool Temperate Rainforest - former niche	4,241	58%	2,478	79%	9%	11%	0%	99%
Cut-tail Forest	46,015	21%	9,558	70%	13%	5%	0%	88%
Damp Forest	230,636	9%	19,856	48%	15%	12%	0%	75%
Dry Rainforest	26	12%	3	77%	0%	7%	0%	84%
Dry Rainforest - former niche	26	37%	10	84%	0%	3%	0%	87%
Dunes	1,896	0%	7	100%	0%	0%	0%	100%
Estuarine Wetland	844	1%	8	45%	30%	1%	0%	77%

Foothill Box Ironbark Forest	584	22%	130	90%	6%	2%	0%	98%
Gallery Rainforest	306	10%	30	33%	46%	18%	0%	97%
Gallery Rainforest - former niche	306	21%	64	33%	50%	12%	0%	96%
Grassy Dry Forest	27,896	5%	1,369	66%	1%	8%	0%	75%
Grassy Woodland	34,079	0%	17	97%	1%	0%	0%	98%
Heathy Dry Forest	1,925	3%	55	97%	0%	0%	0%	97%
Limestone Box Forest	6,413	5%	340	51%	28%	5%	0%	84%
Littoral Rainforest - former niche	49	28%	14	95%	0%	0%	0%	96%
Lowland Forest	261,564	3%	7,423	32%	20%	6%	0%	58%
Montane Damp Forest	13,200	4%	584	53%	16%	5%	0%	74%
Montane Dry Woodland	59,322	2%	927	55%	18%	3%	0%	77%
Montane Grassy Woodland	10,705	0%	12	50%	3%	5%	0%	58%
Montane Riparian Woodland	3,027	0%	4	21%	62%	6%	0%	88%
Montane Wet Forest	13,068	8%	1,096	83%	2%	3%	0%	89%
Riparian Forest	17,668	2%	346	40%	47%	3%	0%	90%
Riparian Scrub/Swampy Riparian Forest Mosaic	19,195	5%	876	77%	11%	3%	0%	91%
Riparian Shrubland	647	2%	12	68%	18%	0%	0%	86%
Rocky Outcrop Shrubland	1,602	6%	95	95%	0%	0%	0%	95%
Sand Heathland	98	4%	4	92%	0%	0%	0%	92%
Shrubby Dry Forest	220,970	8%	18,341	61%	7%	8%	0%	76%
Sub-alpine Treeless Vegetation	1,814	1%	9	54%	21%	1%	0%	76%
Sub-alpine Woodland	8,672	2%	167	58%	24%	0%	0%	83%
Tableland Damp Forest	5,026	23%	1,136	62%	18%	2%	0%	82%
Valley Grassy Forest	17,634	7%	1,215	22%	19%	17%	0%	57%
Warm Temperate Rainforest	13,686	21%	2,835	47%	23%	25%	0%	96%
Warm Temperate Rainforest - former niche	13,686	26%	3,510	51%	19%	24%	0%	94%
Water Body - estuary	6,175	0%	9	28%	0%	0%	0%	28%
Wet Forest	31,558	23%	7,333	79%	7%	4%	0%	89%

Wet Heathland	9,778	1%	99	48%	44%	1%	0%	92%
Wet Swale Herbland	781	0%	3	100%	0%	0%	0%	100%

a. The figures shown in this table are based on the 2019 version of Victoria's modelled extent of Old Growth Forest (MOG) and are therefore only approximate.

b. Informal Reserve includes broad areas and linear elements of SPZ greater than 100 metres and other informal reserves.

c. This comprises those elements of GMZ and SMZ protected by prescriptions.

d. Private Land Covenants includes areas protected under conservation covenants under the *Victorian Conservation Trust Act 1972* and Land Management Cooperative Agreements under the *Conservation Forests and Lands Act 1987*.

Table 1.3 Representative conservation of Old Growth Forest in the CAR Reserve System in the Gippsland RFA Region[a] as at 2019.

Ecological Vegetation Class	Area EVC (ha)	Percent of EVC as Old Growth (%)	Area Old Growth (ha)	Percent of Old Growth Forest in the CAR Reserve System				
				Dedicated Reserve	Informal[b]	Prescription[c]	Private land covenants	Total
Alpine Damp Grassland	598	0%	3	74%	9%	0%	0%	84%
Alpine Grassland	708	1%	4	46%	1%	0%	0%	47%
Alpine Grassy Heathland	1,175	1%	9	99%	0%	0%	0%	99%
Blackthorn Scrub	7,359	21%	1,518	41%	51%	3%	0%	94%
Clay Heathland	679	0%	3	49%	51%	0%	0%	100%
Cool Temperate Rainforest	3,658	1%	52	63%	15%	22%	0%	100%
Cool Temperate Rainforest - former niche	3,658	3%	110	74%	15%	11%	1%	100%
Creekline Herb-rich Woodland	935	10%	93	22%	68%	5%	0%	95%
Damp Forest	124,927	4%	4,619	37%	33%	12%	0%	82%
Damp Heathland/Wet Heathland Mosaic	637	1%	3	0%	100%	0%	0%	100%
Damp Heathy Woodland/Lowland Forest Mosaic	9,627	0%	8	93%	0%	0%	0%	93%

Damp Sands Herb-rich Woodland	17,985	0%	85	97%	0%	0%	0%	97%
Damp Sands Herb-rich Woodland/Lowland Forest Mosaic	8,336	0%	19	99%	0%	0%	0%	99%
Dry Rainforest	27	13%	3	68%	30%	2%	0%	100%
Dry Rainforest - former niche	27	31%	8	67%	27%	5%	0%	100%
Dry Valley Forest	21,329	1%	187	2%	38%	34%	0%	73%
Gallery Rainforest	42	8%	3	75%	14%	11%	0%	100%
Gallery Rainforest - former niche	42	25%	10	60%	27%	12%	0%	99%
Granitic Hills Woodland	3,973	4%	159	100%	0%	0%	0%	100%
Grassy Dry Forest	36,822	9%	3,442	7%	45%	25%	0%	77%
Grassy Dry Forest/Heathy Woodland Mosaic	530	2%	12	100%	0%	0%	0%	100%
Grassy Woodland	25,826	0%	74	75%	24%	0%	0%	99%
Heathy Dry Forest	86,653	13%	10,937	41%	23%	14%	0%	79%
Heathy Woodland	34,276	13%	4,500	65%	27%	0%	0%	92%
Herb-rich Foothill Forest	120,565	3%	3,532	54%	14%	21%	0%	90%
Limestone Box Forest	891	5%	43	11%	19%	0%	0%	30%
Lowland Forest	122,033	1%	984	48%	18%	6%	0%	72%
Lowland Herb-rich Forest	24,565	1%	213	4%	41%	12%	0%	57%
Montane Damp Forest	105,192	3%	3,233	47%	14%	18%	0%	79%
Montane Dry Woodland	130,837	4%	5,320	34%	21%	13%	0%	69%
Montane Grassy Shrubland	85	25%	21	0%	0%	0%	0%	0%
Montane Grassy Woodland	37,918	6%	2,363	14%	60%	4%	0%	79%
Montane Herb-rich Woodland	24,277	7%	1,768	56%	14%	22%	0%	92%
Montane Riparian Thicket	2,531	8%	203	18%	80%	0%	0%	99%
Montane Riparian Woodland	4,135	2%	69	9%	72%	10%	0%	91%
Montane Rocky Shrubland	3,168	0%	9	100%	0%	0%	0%	100%
Montane Wet Forest	11,691	14%	1,656	69%	7%	15%	0%	91%
Plains Grassy Forest	33,133	3%	1,107	15%	54%	1%	0%	70%
Riparian Forest	9,837	1%	85	49%	30%	13%	0%	92%

Riparian Scrub	10,014	8%	787	58%	31%	3%	0%	92%
Riparian Shrubland	2,914	1%	26	58%	14%	8%	0%	80%
Riparian Shrubland/Riverine Escarpment Scrub mosaic	#N/A	#N/A	4	100%	0%	0%	0%	100%
Riverine Escarpment Scrub	8,911	1%	73	34%	33%	12%	0%	79%
Rocky Outcrop Shrubland	1,808	38%	687	36%	64%	0%	0%	100%
Rocky Outcrop Shrubland/Rocky Outcrop Herbland Mosaic	9,434	0%	46	72%	6%	14%	0%	91%
Sand Heathland/Wet Heathland Mosaic	3,433	0%	3	100%	0%	0%	0%	100%
Sandy Flood Scrub	1,425	8%	111	98%	0%	0%	0%	98%
Sedge Wetland	1,713	3%	51	95%	3%	0%	0%	98%
Shrubby Damp Forest	68,292	3%	1,780	8%	44%	25%	0%	77%
Shrubby Dry Forest	267,828	6%	15,355	29%	25%	20%	0%	74%
Shrubby Foothill Forest	37,750	2%	660	25%	29%	15%	0%	69%
Shrubby Wet Forest	2,233	0%	11	0%	0%	51%	0%	51%
Sub-alpine Treeless Vegetation	3,028	1%	28	84%	9%	2%	0%	95%
Sub-alpine Woodland	53,446	7%	3,697	76%	3%	2%	0%	81%
Swamp Scrub	24,410	0%	10	48%	8%	9%	0%	64%
Tableland Damp Forest	10,913	4%	463	6%	37%	13%	0%	56%
Valley Grassy Forest	6,493	0%	26	59%	32%	2%	0%	93%
Valley Heathy Forest	1,228	29%	361	0%	100%	0%	0%	100%
Valley Slopes Dry Forest	1,933	3%	49	70%	26%	1%	0%	96%
Warm Temperate Rainforest	2,861	5%	145	27%	53%	20%	0%	100%
Warm Temperate Rainforest - former niche	2,861	10%	284	31%	50%	18%	0%	100%
Wet Forest	75,929	3%	2,004	58%	20%	10%	0%	89%
Wet Heathland	8,339	0%	5	42%	36%	0%	0%	78%

a. The figures shown in this table are based on the 2019 version of Victoria's modelled extent of Old Growth Forest (MOG) and are therefore only approximate.

b. Informal Reserve includes broad areas and linear elements of SPZ greater than 100 metres and other informal reserves.

c. This comprises those elements of GMZ and SMZ protected by prescriptions.

d Private Land Covenants includes areas protected under conservation covenants under the *Victorian Conservation Trust Act 1972* and Land Management Cooperative Agreements under the *Conservation Forests and Lands Act 1987*.

Table 1.4 Representative conservation of Old Growth Forest in the CAR Reserve System in the North East RFA Region[a] as at 2019.

Ecological Vegetation Class	Area EVC (ha)	Percent of EVC as Old Growth (%)	Area Old Growth (ha)	Percent of Old Growth Forest in the CAR Reserve System				
				Dedicated Reserve	Informal[b]	Prescription[c]	Private land covenants	Total
Alpine Coniferous Shrubland	57	8%	5	100%	0%	0%	0%	100%
Alpine Crag Complex	522	4%	23	100%	0%	0%	0%	100%
Clay Heathland	41	11%	4	100%	0%	0%	0%	100%
Damp Forest	48,109	7%	3,533	25%	19%	32%	0%	77%
Granitic Hills Woodland	26,251	13%	3,353	100%	0%	0%	0%	100%
Grassy Dry Forest	201,285	5%	9,144	41%	28%	13%	0%	81%
Heathy Dry Forest	89,042	8%	7,564	60%	17%	8%	0%	85%
Herb-rich Foothill Forest	450,347	7%	32,114	28%	23%	25%	0%	76%
Montane Damp Forest	39,922	7%	2,961	33%	10%	32%	0%	75%
Montane Dry Woodland	136,250	9%	12,689	40%	10%	25%	0%	75%
Montane Riparian Thicket	1,249	9%	110	34%	61%	0%	0%	95%
Riparian Forest	15,019	1%	218	24%	61%	0%	0%	85%
Riparian Forest/Swampy Riparian Woodland Mosaic	7,144	1%	101	22%	75%	0%	0%	97%
Rocky Outcrop Shrubland/Rocky Outcrop Herbland Mosaic	3,252	3%	91	69%	31%	0%	0%	100%
Shrubby Dry Forest	281,811	17%	47,035	30%	19%	24%	0%	73%
Sub-alpine Dry Shrubland	283	13%	38	100%	0%	0%	0%	100%
Sub-alpine Shrubland	2,189	0%	7	81%	0%	0%	0%	81%
Sub-alpine Treeless Vegetation	2,061	1%	29	56%	0%	3%	0%	59%
Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic	1,078	1%	6	100%	0%	0%	0%	100%
Sub-alpine Woodland	45,280	17%	7,778	85%	1%	2%	0%	88%
Swampy Riparian Woodland	3,702	3%	106	52%	46%	0%	0%	99%

Valley Grassy Forest	80,332	0%	19	42%	57%	0%	0%	100%
Wet Forest	6,677	13%	839	50%	19%	21%	0%	89%

a. The figures shown in this table are based on the 2019 version of Victoria's modelled extent of Old Growth Forest (MOG) and are therefore only approximate.

b. Informal Reserve includes broad areas and linear elements of SPZ greater than 100 metres and other informal reserves.

c. This comprises those elements of GMZ and SMZ protected by prescriptions.

d. Private Land Covenants includes areas protected under conservation covenants under the *Victorian Conservation Trust Act 1972* and Land Management Cooperative Agreements under the *Conservation Forests and Lands Act 1987*.

Table 1.5 Representative conservation of Old Growth Forest in the CAR Reserve System in the West RFA Region[a] as at 2019.

Ecological Vegetation Class	Area EVC (ha)	Percent of EVC as Old Growth (%)	Area Old Growth (ha)	Percent of Old Growth Forest in the CAR Reserve System				
				Dedicated Reserve	Informal[b]	Prescription[c]	Private land covenants	Total
Alluvial Terraces Herb-rich Woodland	12,179	1%	104	97%	3%	0%	0%	100%
Alluvial Terraces Herb-rich Woodland/Sedge Wetland Mosaic	30	9%	3	100%	0%	0%	0%	100%
Box Ironbark Forest	20,710	0%	101	95%	0%	0%	0%	95%
Brackish Sedgeland	488	1%	3	100%	0%	0%	0%	100%
Coast Gully Thicket	217	10%	21	74%	0%	0%	0%	74%
Coastal Headland Scrub	4,154	0%	12	98%	0%	0%	0%	98%
Cool Temperate Rainforest	3,978	9%	377	99%	0%	1%	0%	100%
Cool Temperate Rainforest - former niche	3,978	25%	1,001	96%	0%	1%	0%	97%
Creekline Herb-rich Woodland	5,050	0%	3	41%	59%	0%	0%	100%
Damp Forest	2,434	1%	23	96%	0%	0%	0%	96%
Damp Forest/Herb-rich Foothill Forest Mosaic	171	7%	13	100%	0%	0%	0%	100%
Damp Forest/Lowland Forest Mosaic	31	10%	3	100%	0%	0%	0%	100%
Damp Forest/Riparian Scrub Mosaic	11	100%	11	100%	0%	0%	0%	100%

Damp Heath Scrub	3,911	5%	200	92%	0%	0%	0%	92%
Damp Heathland	5,794	9%	511	30%	44%	0%	0%	75%
Damp Heathland/Damp Heathy Woodland Mosaic	15,515	2%	360	29%	67%	0%	0%	96%
Damp Heathland/Sand Heathland Mosaic	897	1%	10	0%	42%	0%	0%	42%
Damp Heathy Woodland	1,178	5%	63	3%	92%	0%	0%	95%
Damp Sands Herb-rich Woodland	70,250	2%	1,295	71%	16%	0%	0%	86%
Damp Sands Herb-rich Woodland/Heathy Woodland Mosaic	6,200	18%	1,131	100%	0%	0%	0%	100%
Damp Sands Herb-rich Woodland/Herb-rich Foothill Forest Mosaic	641	1%	8	45%	54%	0%	0%	99%
Damp Sands Herb-rich Woodland/Plains Grassy Woodland Mosaic	20,346	0%	3	0%	74%	0%	0%	74%
Damp Sands Herb-rich Woodland/Riparian Woodland Mosaic	416	3%	14	100%	0%	0%	0%	100%
Damp Sands Herb-rich Woodland/Seasonally Inundated Shrubby Woodland Mosaic	495	15%	73	98%	0%	0%	0%	98%
Damp Sands Herb-rich Woodland/Sedgy Riparian Woodland Mosaic	176	21%	37	95%	0%	0%	0%	95%
Damp Sands Herb-rich Woodland/Shallow Sands Woodland Mosaic	1,044	0%	3	21%	78%	0%	0%	98%
Damp Sands Herb-rich Woodland/Shrubby Woodland Mosaic	1,542	6%	96	93%	0%	0%	0%	93%
Dry Creekline Woodland	522	8%	41	49%	48%	0%	0%	97%
Escarpment Shrubland/Damp Sands Herb-rich Woodland Mosaic	431	1%	3	100%	0%	0%	0%	100%
Floodplain Thicket	2,924	0%	14	74%	15%	0%	0%	90%
Grassy Dry Forest	83,263	2%	1,502	74%	24%	0%	0%	97%
Grassy Dry Forest/Heathy Woodland Mosaic	2,800	1%	22	100%	0%	0%	0%	100%
Grassy Dry Forest/Rocky Outcrop Shrubland Mosaic	140	13%	18	100%	0%	0%	0%	100%
Grassy Woodland	66,061	0%	15	99%	0%	0%	0%	99%
Heathland Thicket	667	2%	15	87%	13%	0%	0%	100%
Heathy Dry Forest	119,194	8%	9,193	81%	17%	0%	0%	98%
Heathy Dry Forest/Damp Sands Herb-rich Woodland Complex	22	15%	3	100%	0%	0%	0%	100%

Heathy Dry Forest/Heathy Woodland Mosaic	469	14%	65	100%	0%	0%	0%	100%
Heathy Dry Forest/Riparian Scrub Mosaic	29	48%	14	98%	0%	0%	0%	98%
Heathy Dry Forest/Shrubby Woodland Mosaic	60	13%	8	100%	0%	0%	0%	100%
Heathy Dry Forest/Valley Grassy Forest Mosaic	434	22%	95	96%	0%	0%	0%	96%
Heathy Herb-rich Woodland	26,230	11%	2,898	39%	27%	0%	0%	66%
Heathy Herb-rich Woodland/Damp Sands Herb-rich Woodland Mosaic	1,074	6%	68	99%	1%	0%	0%	100%
Heathy Woodland	194,502	31%	60,992	52%	30%	0%	0%	82%
Heathy Woodland/Damp Heathland Mosaic	15,597	31%	4,793	13%	85%	0%	0%	98%
Heathy Woodland/Grassy Dry Forest Mosaic	1,377	13%	173	100%	0%	0%	0%	100%
Heathy Woodland/Heathy Herb-rich Woodland Mosaic	2,885	9%	267	0%	100%	0%	0%	100%
Heathy Woodland/Limestone Woodland Mosaic	3,415	3%	94	95%	0%	0%	0%	95%
Heathy Woodland/Plains Grassy Woodland Mosaic	1,377	4%	56	16%	84%	0%	0%	100%
Heathy Woodland/Sand Heathland Mosaic	5,774	27%	1,547	80%	19%	0%	0%	99%
Heathy Woodland/Seasonally Inundated Shrubby Woodland Mosaic	215	23%	48	0%	98%	0%	0%	98%
Heathy Woodland/Sedgy Riparian Woodland Mosaic	22	37%	8	99%	0%	0%	0%	99%
Heathy Woodland/Shrubby Woodland Mosaic	354	24%	84	100%	0%	0%	0%	100%
Heathy Woodland/Valley Grassy Forest Mosaic	199	41%	82	97%	0%	0%	0%	97%
Herb-rich Foothill Forest	95,173	0%	95	91%	5%	0%	0%	96%
Herb-rich Foothill Forest/Grassy Dry Forest Mosaic	7	43%	3	100%	0%	0%	0%	100%
Herb-rich Foothill Forest/Shrubby Foothill Forest Mosaic	9,243	0%	8	0%	0%	0%	0%	0%
Herb-rich Heathy Forest	431	47%	201	100%	0%	0%	0%	100%
Hills Herb-rich Woodland	25,867	6%	1,546	99%	0%	0%	0%	99%
Hills Herb-rich Woodland/Heathy Woodland Mosaic	765	4%	32	99%	0%	0%	0%	99%
Hills Herb-rich Woodland/Shrubby Woodland Mosaic	106	6%	6	100%	0%	0%	0%	100%
Lateritic Woodland	6,533	17%	1,082	59%	33%	0%	0%	92%
Lowland Forest	98,691	3%	3,063	90%	2%	0%	0%	92%

Lowland Forest/Grassy Dry Forest Mosaic	60	71%	42	96%	0%	0%	0%	96%
Lowland Forest/Heathy Dry Forest Mosaic	743	29%	216	98%	0%	0%	0%	98%
Lowland Forest/Riparian Forest Mosaic	25	48%	12	100%	0%	0%	0%	100%
Lowland Forest/Riparian Scrub Mosaic	10	54%	5	100%	0%	0%	0%	100%
Lowland Forest/Valley Grassy Forest Mosaic	1,196	7%	85	98%	0%	0%	0%	98%
Montane Rocky Shrubland	1,873	0%	6	100%	0%	0%	0%	100%
Plains Grassy Woodland	230,188	0%	122	40%	37%	0%	0%	77%
Plains Sedgy Woodland	3,745	2%	71	51%	46%	0%	0%	98%
Plains Woodland	77,667	0%	18	49%	31%	0%	0%	80%
Plains Woodland/Damp Sands Herb-rich Woodland Mosaic	3,182	0%	4	100%	0%	0%	0%	100%
Red Gum Swamp	22,706	0%	4	61%	0%	0%	0%	61%
Red Gum Wetland/Aquatic Herbland Mosaic	1,216	0%	3	76%	21%	0%	0%	98%
Riparian Forest	7,516	1%	77	93%	0%	0%	0%	93%
Riparian Scrub	5,424	12%	637	61%	38%	0%	0%	99%
Riparian Scrub/Sedgy Riparian Woodland Mosaic	426	28%	118	96%	0%	0%	0%	96%
Riparian Scrub/Swampy Riparian Forest Mosaic	5,067	5%	252	63%	0%	0%	0%	63%
Riparian Shrubland	189	10%	18	97%	0%	0%	0%	97%
Rocky Chenopod Woodland	1,159	12%	136	98%	0%	0%	0%	98%
Rocky Outcrop Herbland	10,027	6%	632	99%	0%	0%	0%	100%
Rocky Outcrop Shrubland	14,109	3%	476	91%	7%	0%	0%	98%
Rocky Outcrop Shrubland/Heathy Dry Forest Mosaic	147	4%	6	100%	0%	0%	0%	100%
Rocky Outcrop Shrubland/Heathy Woodland Mosaic	6	95%	6	100%	0%	0%	0%	100%
Rocky Outcrop Shrubland/Rocky Outcrop Herbland Mosaic	9,474	7%	684	100%	0%	0%	0%	100%
Sand Heathland	15,043	3%	417	81%	17%	0%	0%	98%
Sandstone Ridge Shrubland	651	1%	4	100%	0%	0%	0%	100%
Seasonally Inundated Shrubby Woodland	6,844	3%	189	86%	13%	0%	0%	99%
Seasonally Inundated Shrubby Woodland/Plains Sedgy Woodland Mosaic	2,016	15%	299	27%	34%	0%	0%	61%

Seasonally Inundated Shrubby Woodland/Sedge Wetland Mosaic	11	34%	4	100%	0%	0%	0%	100%
Sedge Wetland	3,424	2%	84	33%	64%	0%	0%	97%
Sedgy Riparian Woodland	8,166	8%	690	97%	2%	0%	0%	99%
Shallow Freshwater Marsh	3,317	0%	14	88%	7%	0%	0%	95%
Shallow Sands Woodland	23,002	1%	179	42%	27%	0%	0%	70%
Shallow Sands Woodland/Heathy Woodland Mosaic	891	2%	15	88%	12%	0%	0%	100%
Shallow Sands Woodland/Plains Sedgy Woodland Mosaic	17,551	1%	199	40%	47%	0%	0%	87%
Shrubby Dry Forest	10,463	4%	396	100%	0%	0%	0%	100%
Shrubby Foothill Forest	71,647	2%	1,216	93%	3%	0%	0%	96%
Shrubby Foothill Forest/Lowland Forest Mosaic	416	3%	12	100%	0%	0%	0%	100%
Shrubby Wet Forest	32,482	2%	634	84%	0%	0%	0%	84%
Shrubby Woodland	9,696	13%	1,301	99%	1%	0%	0%	100%
Shrubby Woodland/Alluvial Terraces Herb-rich Woodland Mosaic	250	25%	63	100%	0%	0%	0%	100%
Shrubby Woodland/Riparian Scrub Mosaic	98	4%	4	32%	0%	0%	0%	32%
Shrubby Woodland/Sedgy Riparian Woodland Mosaic	103	5%	6	97%	0%	0%	0%	97%
Stream Bank Shrubland	4,647	0%	22	95%	1%	0%	0%	96%
Swamp Scrub	11,264	0%	16	16%	83%	0%	0%	99%
Valley Grassy Forest	36,652	2%	815	96%	1%	0%	0%	98%
Valley Grassy Forest/Grassy Dry Forest Mosaic	140	39%	54	100%	0%	0%	0%	100%
Valley Grassy Forest/Herb-rich Foothill Forest Mosaic	9	93%	8	83%	0%	0%	0%	83%
Valley Grassy Forest/Shrubby Woodland Mosaic	23	15%	3	99%	0%	0%	0%	99%
Warm Temperate Rainforest - former niche	13	26%	3	100%	0%	0%	0%	100%
Wet Forest	40,329	5%	2,080	96%	0%	0%	0%	96%
Wet Heathland	8,192	2%	138	78%	9%	0%	0%	88%
Wet Heathland/Heathy Woodland Mosaic	4,665	20%	953	100%	0%	0%	0%	100%
Wet Sands Thicket	1,259	14%	172	66%	0%	0%	0%	66%

Alluvial Terraces Herb-rich Woodland	12,179	1%	104	97%	3%	0%	0%	100%

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b. Informal Reserve includes broad areas and linear elements of SPZ greater than 100 metres and other informal reserves.

c. This comprises those elements of GMZ and SMZ protected by prescriptions.

d. Private Land Covenants includes areas protected under conservation covenants under the *Victorian Conservation Trust Act 1972* and Land Management Cooperative Agreements under the *Conservation Forests and Lands Act 1987*.

2. EPBC Act listed threatened flora and fauna species known or likely to occur in Victorian RFA regions

Threatened flora

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Acacia caerulescens	Limestone Blue Wattle, Buchan Blue, Buchan Blue Wattle	Plant	EG, G	Vulnerable	16/07/2000	CA approved, RP approved
Acacia glandulicarpa	Hairy-pod Wattle	Plant	W	Vulnerable	16/7/2000	RP approved
Acacia phasmoides	Phantom Wattle	Plant	NE	Vulnerable	16/07/2000	RP approved
Amphibromus fluitans	River Swamp Wallaby-grass, Floating Swamp Wallaby-grass	Plant	CH, EG, G, NE, W	Vulnerable	16/07/2000	CA approved
Argyrotegium nitidulum	Shining Cudweed	Plant	G, NE	Vulnerable	16/07/2000	CA approved, RP approved
Asplenium hookerianum	Maidenhair Spleenwort	Plant	G	Vulnerable	16/07/2000	RP approved
Astelia australiana	Tall Astelia	Plant	CH, W	Vulnerable	16/07/2000	RP approved
Asterolasia phebalioides	Downy Star-bush	Plant	W	Vulnerable	16/7/2000	RP approved
Boronia galbraithiae	Aniseed Boronia, Galbraith's Boronia	Plant	G	Vulnerable	16/07/2000	CA approved, RP approved
Borya mirabilis	Grampians Pincushion-lily	Plant	W	Endangered	16/7/2000	RP approved
Brachyscome muelleroides	Mueller Daisy	Plant	NE	Vulnerable	16/07/2000	RP approved
Caladenia amoena	Charming Spider-orchid	Plant	CH	Endangered	16/07/2000	CA approved, RP approved
Caladenia audasii	McIvor Spider-orchid, Audas Spider-orchid	Plant	W	Endangered	16/7/2000	CA approved, RP approved

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Caladenia calcicola	Limestone Spider-orchid	Plant	W	Vulnerable	16/7/2000	RP approved
Caladenia colorata	Coloured Spider-orchid, Small Western Spider-orchid, Painted Spider-orchid	Plant	W	Endangered	16/7/2000	No CA or RP approved
Caladenia concolor	Crimson Spider-orchid, Maroon Spider-orchid	Plant	CH, NE	Vulnerable	16/07/2000	CA approved, RP approved
Caladenia cremna	Don's Spider Orchid	Plant	NE	Critically Endangered	12/02/2010	CA approved
Caladenia formosa	Elegant Spider-orchid, Blood-red Spider-orchid	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Caladenia fulva	Tawny Spider-orchid	Plant	W	Endangered	16/7/2000	CA approved, RP approved
Caladenia hastata	Melblom's Spider-orchid	Plant	W	Endangered	16/7/2000	CA approved, RP approved
Caladenia orientalis	Eastern Spider Orchid	Plant	G	Endangered	16/07/2000	CA approved, RP approved
Caladenia ornata	Ornate Pink Fingers	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Caladenia pumila	Dwarf Spider-orchid	Plant	W	Critically Endangered	30/9/2011	CA approved
Caladenia rosella	Rosella Spider-orchid, Little Pink Spider-orchid	Plant	CH	Endangered	16/07/2000	CA approved, RP approved
Caladenia sp. Kilsyth South (G.S.Lorimer 1253)	Kilsyth South Spider-orchid	Plant	CH	Critically Endangered	4/10/2001	CA approved, RP approved
Caladenia tensa	Greencomb Spider-orchid, Rigid Spider-orchid	Plant	W	Endangered	16/7/2000	CA approved, RP approved
Caladenia tessellata	Thick-lipped Spider-orchid, Daddy Long-legs	Plant	EG, G	Vulnerable	16/07/2000	RP approved
Caladenia versicolor	Candy Spider-orchid	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Caladenia xanthochila	Yellow-lip Spider-orchid	Plant	W	Endangered	16/7/2000	CA approved, RP approved
Callistemon forresterae	Forrester's Bottlebrush	Plant	EG	Vulnerable	16/07/2000	RP approved

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Callistemon kenmorrisonii	Betka Bottlebrush	Plant	EG	Vulnerable	16/07/2000	CA approved, RP approved
Callistemon wimmerensis	Wimmera Bottlebrush	Plant	W	Critically Endangered	31/3/2011	CA approved
Cassinia rugata	Wrinkled Cassinia, Wrinkled Dollybush	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Colobanthus curtisiae	Curtis' Colobanth	Plant	EG, G, NE	Vulnerable	16/07/2000	CA approved
Commersonia prostrata	Dwarf Kerrawang	Plant	G	Endangered	16/07/2000	RP approved
Correa lawrenceana var. genoensis	Genoa River Correa	Plant	EG	Endangered	16/07/2000	RP approved
Cryptostylis hunteriana	Leafless Tongue-orchid	Plant	EG	Vulnerable	16/07/2000	CA approved
Daviesia laevis	Grampians Bitter-pea	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Deyeuxia pungens	Narrow-leaf Bent-grass	Plant	EG	Vulnerable	16/07/2000	CA approved, RP approved
Dianella amoena	Matted Flax-lily	Plant	CH, G, W	Endangered	16/07/2000	RP approved
Dipodium campanulatum	Bell Flower Hyacinth Orchid	Plant	W	Endangered	21/5/2015	CA approved
Diuris basaltica	Small Golden Moths Orchid, Early Golden Moths	Plant	W	Endangered	16/7/2000	RP approved
Diuris fragrantissima	Sunshine Diuris, Fragrant Doubletail, White Diuris	Plant	W	Endangered	16/7/2000	RP approved
Diuris ochroma	Pale Golden Moths	Plant	G, NE	Vulnerable	16/07/2000	CA approved, RP approved
Dodonaea procumbens	Trailing Hop-bush	Plant	G, W	Vulnerable	16/07/2000	RP approved
Epilobium brunnescens subsp. beaugleholei	Bog Willow-herb	Plant	G	Vulnerable	16/07/2000	CA approved, RP approved

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Eriocaulon australasicum	Austral Pipewort, Southern Pipewort	Plant	W	Endangered	16/7/2000	RP approved
Eucalyptus aggregata	Black Gum	Plant	W	Vulnerable	17/11/2015	CA approved
Eucalyptus alligatrix subsp. limaensis	Lima Stringybark	Plant	NE	Endangered	26/02/2013	CA approved, RP approved
Eucalyptus cadens	Warby Range Swamp Gum	Plant	NE	Vulnerable	16/07/2000	CA approved, RP approved
Eucalyptus crenulata	Silver Gum, Buxton Gum	Plant	CH	Endangered	16/07/2000	CA approved, RP approved
Eucalyptus strzeleckii	Strzelecki Gum	Plant	CH, G	Vulnerable	16/07/2000	CA approved, RP approved
Euphrasia collina subsp. muelleri	Purple Eyebright, Mueller's Eyebright	Plant	CH, G, NE, W	Endangered	16/07/2000	CA approved, RP approved
Euphrasia crassiuscula subsp. glandulifera	Thick Eyebright	Plant	G, NE	Vulnerable	16/07/2000	CA approved, RP approved
Euphrasia eichleri	Bogong Eyebright	Plant	G, NE	Vulnerable	16/07/2000	CA approved, RP approved
Glycine latrobeana	Clover Glycine, Purple Clover	Plant	CH, EG, G, NE, W	Vulnerable	16/07/2000	RP approved
Grevillea bedggoodiana	Enfield Grevillea	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Grevillea celata	Colquhoun Grevillea, Nowa Nowa Grevillea	Plant	EG, G	Vulnerable	16/07/2000	CA approved, RP approved
Grevillea floripendula	Drooping Grevillea, Ben Major Grevillea	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Grevillea infecunda	Anglesea Grevillea	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Grevillea montis-cole subsp. brevistyla	Langi Ghiran Grevillea	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Haloragis exalata subsp. exalata	Wingless Raspwort, Square Raspwort	Plant	W	Vulnerable	16/7/2000	CA approved

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Hibbertia humifusa subsp. debilis	Dergholm Guinea-flower	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Hibbertia humifusa subsp. erigens	Euroa Guinea-flower	Plant	NE	Vulnerable	16/7/2000	CA approved, RP approved
Ixodia achillaeoides subsp. arenicola	Sand Ixodia, Ixodia	Plant	W	Vulnerable	16/7/2000	RP approved
Kelleria bogongensis	Kelleria	Plant	NE	Vulnerable	16/07/2000	CA approved, RP approved
Lachnagrostis adamsonii	Adamson's Blown-grass, Adamson's Blowngrass	Plant	CH, W	Endangered	16/07/2000	RP approved
Leiocarpa gatesii	Wrinkled Buttons	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Lepidium aschersonii	Spiny Pepper-cress	Plant	G, W	Vulnerable	16/07/2000	RP approved
Lepidium hyssopifolium	Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed	Plant	W	Endangered	16/7/2000	RP approved
Leucochrysum albicans subsp. tricolor	Hoary Sunray, Grassland Paper-daisy	Plant	W	Endangered	16/7/2000	RP approved
Lobelia gelida		Plant	NE	Vulnerable	16/07/2000	CA approved, RP approved
Nematolepis frondosa	Leafy Nematolepis	Plant	EG, G	Vulnerable	16/07/2000	CA approved, RP approved
Nematolepis squamea subsp. coriacea	Harsh Nematolepis	Plant	EG, G	Vulnerable	16/07/2000	CA approved, RP approved
Nematolepis wilsonii	Shiny Nematolepis	Plant	CH	Vulnerable	16/07/2000	CA approved, RP approved
Olearia astroloba	Marble Daisy-bush	Plant	G	Vulnerable	16/07/2000	CA approved, RP approved
Pelargonium sp. Striatellum (G.W.Carr 10345)	Omeo Stork's-bill	Plant	G	Endangered	21/12/2011	CA approved

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Pimelea pagophila	Grampians Rice-flower	Plant	W	Vulnerable	16/7/2000	CA approved, RP approved
Pimelea spinescens subsp. pubiflora	Wimmera Rice-flower	Plant	W	Critically Endangered	10/6/2009	CA approved
Pimelea spinescens subsp. spinescens	Plains Rice-flower, Spiny Rice-flower, Prickly Pimelea	Plant	W	Critically Endangered	1/5/2003	CA approved, RP approved
Poa sallacustris	Salt-lake Tussock-grass	Plant	W	Vulnerable	16/07/2000	CA approved, RP approved
Pomaderris brunnea	Rufous Pomaderris	Plant	EG	Vulnerable	16/07/2000	RP approved
Pomaderris cotoneaster	Cotoneaster Pomaderris	Plant	EG	Endangered	16/07/2000	RP approved
Pomaderris halmaturina subsp. halmaturina	Kangaroo Island Pomaderris	Plant	W	Vulnerable	16/07/2000	RP approved
Pomaderris pallida	Pale Pomaderris	Plant	EG	Vulnerable	16/07/2000	CA approved
Pomaderris sericea	Bent Pomaderris	Plant	EG	Vulnerable	16/07/2000	RP approved
Pomaderris subplicata	Concave Pomaderris	Plant	NE	Vulnerable	16/07/2000	CA approved, RP approved
Pomaderris vacciniifolia	Round-leaf Pomaderris	Plant	CH, G	Critically Endangered	24/01/2014	CA approved
Prasophyllum colemaniae	Lilac Leek-orchid	Plant	CH	Vulnerable	16/07/2000	CA approved
Prasophyllum correctum	Gaping Leek-orchid	Plant	G	Endangered	16/07/2000	RP approved
Prasophyllum diversiflorum	Gorae Leek-orchid	Plant	NE, W	Endangered	16/07/2000	CA approved, RP approved
Prasophyllum frenchii	Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid, Swamp Leek-orchid	Plant	CH, EG, G, W	Endangered	16/07/2000	RP approved

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Prasophyllum morganii	Mignonette Leek-orchid, Cobungra Leek-orchid, Dense Leek-orchid	Plant	G, NE	Vulnerable	16/07/2000	CA approved, RP approved
Prasophyllum petilum	Tarengo Leek Orchid	Plant	EG	Endangered	16/07/2000	RP approved
Prasophyllum spicatum	Dense Leek-orchid	Plant	W	Vulnerable	16/07/2000	RP approved
Prasophyllum suaveolens	Fragrant Leek-orchid	Plant	W	Endangered	16/07/2000	CA approved, RP approved
Prasophyllum subbisectum	Pomonal Leek-orchid	Plant	W	Endangered	16/07/2000	CA approved, RP approved
Prasophyllum validum	Sturdy Leek-orchid	Plant	CH, NE, W	Vulnerable	16/07/2000	RP approved
Prostanthera galbraithiae	Wellington Mintbush	Plant	G	Vulnerable	16/07/2000	CA approved, RP approved
Pseudocephalozia paludicola	Alpine Leafy Liverwort	Plant	CH	Vulnerable	16/07/2000	CA approved
Pterostylis basaltica	Basalt Greenhood	Plant	W	Endangered	16/07/2000	RP approved
Pterostylis cheraphila	Floodplain Rustyhood	Plant	W	Vulnerable	16/07/2000	RP approved
Pterostylis chlorogramma	Green-striped Greenhood	Plant	CH, EG, G, W	Vulnerable	16/07/2000	RP approved
Pterostylis cucullata	Leafy Greenhood	Plant	EG, G, NE, W	Vulnerable	16/07/2000	CA approved, RP approved
Pterostylis despectans	Lowly Greenhood	Plant	W	Endangered	16/07/2000	CA approved, RP approved
Pterostylis oreophila	Blue-tongued Orchid, Kiandra Greenhood	Plant	EG, G, NE	Critically Endangered	3/05/2012	CA approved
Pterostylis tenuissima	Swamp Greenhood, Dainty Swamp Orchid	Plant	G, W	Vulnerable	16/07/2000	RP approved
Pterostylis X aenigma	Enigmatic Greenhood	Plant	G	Endangered	16/07/2000	RP approved

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Pultenaea parrisiae		Plant	EG	Vulnerable	16/07/2000	CA approved
Pultenaea williamsoniana	Williamsons Bush-pea	Plant	W	Vulnerable	16/07/2000	CA approved, RP approved
Rutidosis leptorhynchoides	Button Wrinklewort	Plant	CH, W	Endangered	16/07/2000	RP approved
Sannantha crenulata	Fern-leaf Baeckea	Plant	NE	Vulnerable	16/07/2000	CA approved, RP approved
Sclerolaena napiformis	Turnip Copperburr	Plant	W	Endangered	16/07/2000	RP approved
Senecio behrianus	Stiff Groundsel	Plant	W	Endangered	16/07/2000	RP approved
Senecio macrocarpus	Large-fruit Fireweed, Large-fruit Groundsel	Plant	CH, W	Vulnerable	16/07/2000	RP approved
Senecio psilocarpus	Swamp Fireweed, Smooth-fruited Groundsel	Plant	CH, W	Vulnerable	16/07/2000	CA approved
Sphaerolobium acanthos	Grampians Globe-pea	Plant	W	Critically Endangered	7/12/2016	CA approved
Swainsona recta	Small Purple-pea, Mountain Swainson-pea, Small Purple Pea	Plant	NE	Endangered	16/07/2000	RP approved
Taraxacum cygnorum	Coast Dandelion	Plant	W	Vulnerable	16/07/2000	RP approved
Tecticornia flabelliformis	Bead Glasswort	Plant	W	Vulnerable	16/07/2000	RP approved
Thelymitra epipactoides	Metallic Sun-orchid	Plant	G, W	Endangered	16/07/2000	CA approved, RP approved
Thelymitra mackibbinii	Brilliant Sun-orchid	Plant	W	Vulnerable	16/07/2000	CA approved, RP approved
Thelymitra matthewsii	Spiral Sun-orchid	Plant	EG, G, W	Vulnerable	16/07/2000	RP approved
Thesium australe	Austral Toadflax, Toadflax	Plant	EG, G, NE	Vulnerable	16/07/2000	CA approved
Trichanthodium baracchianum	Dwarf Yellow-heads	Plant	W	Vulnerable	16/07/2000	CA approved, RP approved

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Westringia cremnophila	Snowy River Westringia	Plant	EG	Vulnerable	16/07/2000	CA approved
Xerochrysum palustre	Swamp Everlasting, Swamp Paper Daisy	Plant	CH, EG, G, W	Vulnerable	16/07/2000	RP approved
Zieria citriodora	Lemon-scented Zieria	Plant	G	Vulnerable	16/07/2000	RP approved

Notes:

1 RFA Regions: EG – East Gippsland, G – Gippsland, CH – Central Highlands, NE – North East, W - West
2 EPBC Act listing as at 28 July 2019
3 CA – Conservation Advice; RP – Recovery Plan

Source: Department of the Environment and Energy, Environmental Resources Information Network Species Profile and Threats Database

Threatened fauna

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Antechinus minimus maritimus	Swamp Antechinus (mainland)	Mammal	G, W	Vulnerable	05/05/2016	CA approved
Anthochaera phrygia	Regent Honeyeater	Bird	CH, EG, G, NE, W	Critically Endangered	8/07/2015	CA approved, RP approved
Aprasia parapulchella	Pink-tailed Worm-lizard, Pink-tailed Legless Lizard	Reptile	NE, W	Vulnerable	16/07/2000	CA approved
Bidyanus bidyanus	Silver Perch, Bidyan	Fish	NE	Critically Endangered	21/12/2013	CA approved
Botaurus poiciloptilus	Australasian Bittern	Bird	CH, EG, G, NE, W	Endangered	3/03/2011	CA approved
Burramys parvus	Mountain Pygmy-possum	Mammal	G, NE	Endangered	16/07/2000	CA approved, RP approved

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Calidris canutus	Red Knot, Knot	Bird	EG, G, W	Endangered*	5/05/2016	CA approved
Calidris ferruginea	Curlew Sandpiper	Bird	G, W	Critically Endangered*	26/05/2015	CA approved
Calidris tenuirostris	Great Knot	Bird	G, W	Critically Endangered*	05/05/2016	CA approved
Calyptorhynchus banksii graptogyne	Red-tailed Black-Cockatoo (south-eastern)	Bird	W	Endangered	16/7/2000	RP approved
Charadrius leschenaultii	Greater Sand Plover, Large Sand Plover	Bird	G, W	Vulnerable*	05/05/2016	CA approved
Charadrius mongolus	Lesser Sand Plover, Mongolian Plover	Bird	G, W	Endangered*	05/05/2016	CA approved
Crinia sloanei	Sloane's Froglet	Frog	NE	Endangered	04/07/2019	CA approved
Cyclodomorphus praealtus	Alpine She-oak Skink	Reptile	G, NE	Endangered	24/12/2009	CA approved
Dasyornis brachypterus	Eastern Bristlebird	Bird	EG	Endangered	16/07/2000	RP approved
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Mammal	EG, G, NE, W	Endangered	14/05/2004	RP approved
Delma impar	Striped Legless Lizard	Reptile	CH, NE, W	Vulnerable	16/07/2000	CA approved, RP approved
Euastacus bispinosus	Glenelg Spiny Freshwater Crayfish, Pricklyback	Crustacean	W	Endangered	15/2/2011	CA approved
Eulamprus tympanum marnieae	Corangamite Water Skink, Dreeite Water Skink	Reptile	W	Endangered	16/7/2000	RP approved
Galaxias fuscus	Barred Galaxias	Fish	CH, NE	Endangered	16/07/2000	RP approved

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Galaxias rostratus	Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow	Fish	CH, G, NE, W	Critically Endangered	5/05/2016	CA approved
Galaxiella pusilla	Eastern Dwarf Galaxias, Dwarf Galaxias	Fish	CH, G, W	Vulnerable	16/07/2000	RP approved
Grantiella picta	Painted Honeyeater	Bird	NE, W	Vulnerable	8/07/2015	CA approved
Gymnobelideus leadbeateri	Leadbeater's Possum	Mammal	CH, G	Critically Endangered	2/05/2015	CA approved, RP approved
Heleioporus australiacus	Giant Burrowing Frog	Frog	EG, G	Vulnerable	16/07/2000	CA approved
Hirundapus caudacutus	White-throated Needletail	Bird	CH, EG, G, NE, W	Vulnerable*	4/07/2019	CA approved
Hyridella glenelgensis	Glenelg Freshwater Mussel	Other	W	Critically Endangered	16/2/2011	CA approved
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern)	Mammal	CH, EG, G, W	Endangered	4/04/2001	CA approved
Lathamus discolor	Swift Parrot	Bird	CH, EG, G, NE, W	Critically Endangered	5/05/2016	CA approved, RP approved
Lichenostomus melanops cassidix	Helmeted Honeyeater, Yellow-tufted Honeyeater (Helmeted)	Bird	CH	Critically Endangered	6/11/2014	CA approved, RP approved
Limosa lapponica baueri	Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit	Bird	EG, W	Vulnerable	5/05/2016	CA approved
Liopholis guthega	Guthega Skink	Reptile	G, NE	Endangered	23/02/2011	CA approved
Litoria aurea	Green and Golden Bell Frog	Frog	EG, G	Vulnerable	16/07/2000	CA approved
Litoria booroolongensis	Booroolong Frog	Frog	NE	Endangered	18/12/2007	CA approved, RP approved

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Litoria littlejohni	Littlejohn's Tree Frog, Heath Frog	Frog	EG	Vulnerable	16/07/2000	CA approved
Litoria raniformis	Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog	Frog	CH, EG, G, NE, W	Vulnerable	16/07/2000	RP approved
Litoria spenceri	Spotted Tree Frog	Frog	CH, G, NE	Endangered	16/07/2000	CA approved, RP approved
Litoria verreauxii alpina	Alpine Tree Frog, Verreaux's Alpine Tree Frog	Frog	CH, EG, G, NE	Vulnerable	16/07/2000	CA approved
Maccullochella macquariensis	Trout Cod	Fish	NE	Endangered	16/07/2000	RP approved
Maccullochella peelii	Murray Cod	Fish	CH, NE, W	Vulnerable	3/07/2003	RP approved
Macquaria australasica	Macquarie Perch	Fish	CH, G, NE, W	Endangered	16/07/2000	CA approved, RP approved
Mastacomys fuscus mordicus	Broad-toothed Rat (mainland), Tooarrana	Mammal	CH, EG, G, NE, W	Vulnerable	5/05/2016	CA approved
Megascolides australis	Giant Gippsland Earthworm	Other	CH, G	Vulnerable	16/07/2000	RP approved
Miniopterus orianae bassanii	Southern Bent-wing Bat	Mammal	W	Critically Endangered	18/12/2007	CA approved
Mixophyes balbus	Stuttering Frog, Southern Barred Frog (in Victoria)	Frog	EG	Vulnerable	16/07/2000	RP approved
Nannoperca obscura	Yarra Pygmy Perch	Fish	W	Vulnerable	16/7/2000	RP approved
Nannoperca variegata	Variegated Pygmy Perch, Ewens Pygmy Perch, Golden Pygmy Perch	Fish	W	Vulnerable	16/7/2000	RP approved
Neophema chrysogaster	Orange-bellied Parrot	Bird	G, W	Critically Endangered	13/09/2006	RP approved

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Bird	G, W	Critically Endangered*	26/05/2015	CA approved
Pachyptila turtur subantarctica	Fairy Prion (southern)	Bird	EG, G, W	Vulnerable	16/07/2000	CA approved
Paralucia pyrodiscus lucida	Eltham Copper Butterfly	Insect	CH	Endangered	5/05/2016	CA approved
Pedionomus torquatus	Plains-wanderer	Bird	CH, NE, W	Critically Endangered	8/07/2015	CA approved, RP approved
Perameles gunnii Victorian subspecies	Eastern Barred Bandicoot (Mainland)	Mammal	W	Endangered	16/7/2000	RP approved
Petauroides volans	Greater Glider	Mammal	CH, EG, G, NE	Vulnerable	5/05/2016	CA approved
Petrogale penicillata	Brush-tailed Rock-wallaby	Mammal	EG, G	Vulnerable	16/07/2000	RP approved
Philoria frosti	Baw Baw Frog	Frog	CH, G	Critically Endangered	16/07/2000	CA approved RP approved
Potorous longipes	Long-footed Potoroo	Mammal	EG, G, NE	Endangered	16/07/2000	CA approved, RP approved
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	Mammal	EG, G, W	Vulnerable	16/07/2000	No CA or RP approved
Prototroctes maraena	Australian Grayling	Fish	CH, EG, G, W	Vulnerable	16/07/2000	RP approved
Pseudomys fumeus	Smoky Mouse, Konoom	Mammal	CH, EG, G, NE, W	Endangered	16/07/2000	RP approved
Pseudomys novaehollandiae	New Holland Mouse, Pookila	Mammal	G, W	Vulnerable	11/08/2010	CA approved
Pseudomys shortridgei	Heath Mouse, Dayang, Heath Rat	Mammal	W	Endangered	7/12/2016	CA approved

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Pteropus poliocephalus	Grey-headed Flying-fox	Mammal	CH, EG, G, NE, W	Vulnerable	6/12/2001	No CA or RP approved
Rostratula australis	Australian Painted-snipe, Australian Painted Snipe	Bird	G, W	Endangered	15/05/2013	CA approved
Synemon plana	Golden Sun Moth	Insect	CH, NE, W	Critically Endangered	3/12/2002	CA approved
Thaumatoperla alpina	Alpine Stonefly	Insect	G, NE	Endangered	31/03/2011	CA approved
Thinornis rubricollis rubricollis	Hooded Plover (eastern)	Bird	EG, G, W	Vulnerable	6/11/2014	CA approved
Tympanocryptis pinguicolla	Grassland Earless Dragon	Reptile	W	Endangered	16/07/2000	RP approved

Notes

1 RFA Regions: EG – East Gippsland, G – Gippsland, CH – Central Highlands, NE – North East, W - West
2 EPBC Act listing as at 28 July 2019
3 CA – Conservation Advice; RP – Recovery Plan
* Also listed as Migratory species

Source: Department of the Environment and Energy, Environmental Resources Information Network Species Profile and Threats Database

Migratory birds

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Actitis hypoleucos	Common Sandpiper	Bird	G, W	Migratory	9/08/2000	NA
Apus pacificus	Fork-tailed Swift	Bird	W	Migratory	9/08/2000	NA
Ardenna tenuirostris	Short-tailed Shearwater	Bird	G, W	Migratory	9/08/2000	NA

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Arenaria interpres	Ruddy Turnstone	Bird	G, W	Migratory	9/08/2000	NA
Calidris acuminata	Sharp-tailed Sandpiper	Bird	G, W	Migratory	9/08/2000	NA
Calidris alba	Sanderling	Bird	G, W	Migratory	9/08/2000	NA
Calidris melanotos	Pectoral Sandpiper	Bird	W	Migratory	9/08/2000	NA
Calidris ruficollis	Red-necked Stint	Bird	G, W	Migratory	9/08/2000	NA
Calidris subminuta	Long-toed Stint	Bird	W	Migratory	9/08/2000	NA
Charadrius bicinctus	Double-banded Plover	Bird	G, W	Migratory	9/08/2000	NA
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	Bird	G, W	Migratory	9/08/2000	NA
Gallinago megala	Swinhoe's Snipe	Bird	W	Migratory	9/08/2000	NA
Gallinago stenura	Pin-tailed Snipe	Bird	G, W	Migratory	9/08/2000	NA
Limicola falcinellus	Broad-billed Sandpiper	Bird	G, W	Migratory	9/08/2000	NA
Limosa lapponica	Bar-tailed Godwit	Bird	EG, G, W	Migratory	9/08/2000	NA
imosa limosa	Black-tailed Godwit	Bird	G, W	Migratory	9/08/2000	NA
Monarcha melanopsis	Black-faced Monarch	Bird	CH, EG, G, NE, W	Migratory	9/08/2000	NA
Motacilla flava	Yellow Wagtail	Bird	W	Migratory	9/08/2000	NA
Myiagra cyanoleuca	Satin Flycatcher	Bird	CH, EG, G, NE, W	Migratory	9/08/2000	NA
Numenius minutus	Little Curlew, Little Whimbrel	Bird	EG, W	Migratory	9/08/2000	NA

Scientific Name	Common Name	Class	RFA Region	EPBC Act listing	EPBC Act listing date effective	Status of conservation advice and recovery plans
Numenius phaeopus	Whimbrel	Bird	G, W	Migratory	9/08/2000	NA
Pandion cristatus	Eastern Osprey	Bird	W	Migratory	9/08/2000	NA
Phalaropus lobatus	Red-necked Phalarope	Bird	W	Migratory	9/08/2000	NA
Philomachus pugnax	Ruff (Reeve)	Bird	G, W	Migratory	9/08/2000	NA
Pluvialis fulva	Pacific Golden Plover	Bird	G, W	Migratory	9/08/2000	NA
Pluvialis squatarola	Grey Plover	Bird	G, W	Migratory	9/08/2000	NA
Rhipidura rufifrons	Rufous Fantail	Bird	CH, EG, G, NE, W	Migratory	9/08/2000	NA
Tringa brevipes	Grey-tailed Tattler	Bird	G, W	Migratory	9/08/2000	NA
Tringa glareola	Wood Sandpiper	Bird	G, W	Migratory	9/08/2000	NA
Tringa nebularia	Common Greenshank, Greenshank	Bird	G, W	Migratory	9/08/2000	NA
Tringa stagnatilis	Marsh Sandpiper, Little Greenshank	Bird	G, W	Migratory	9/08/2000	NA
Xenus cinereus	Terek Sandpiper	Bird	G, W	Migratory	9/08/2000	NA

Notes

1 RFA Regions: EG – East Gippsland, G – Gippsland, CH – Central Highlands, NE – North East, W - West
2 EPBC Act listing as at 28 July 2019
3 CA – Conservation Advice; RP – Recovery Plan
Source: Department of the Environment and Energy, Environmental Resources Information Network Species Profile and Threats Database

3. EPBC Act listed ecological communities

Community name	RFA region[1]	EPBC Act listing[2]	EPBC Act listing date effective	Status of conservation advice and recovery plans[3]
Alpine Sphagnum Bogs and Associated Fens	CH, EG, G, NE	Endangered	7/01/2009	CA approved, RP approved
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	W, G	Endangered	25/10/2018	CA approved
Gippsland Red Gum (*Eucalyptus tereticornis subsp. mediana*) Grassy Woodland and Associated Native Grassland	EG, G	Critically Endangered	7/01/2009	CA approved
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	W, CH	Critically Endangered	25/06/2009	CA approved
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	W, NE	Endangered	1/04/2010	CA approved
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	EG, G	Critically Endangered	10/10/2008	CA approved, RP approved
Natural Damp Grassland of the Victorian Coastal Plains	W, G	Critically Endangered	20/02/2015	CA approved
Natural Grasslands of the Murray Valley Plains	W	Critically Endangered	8/09/2012	CA approved
Natural Temperate Grassland of the South Eastern Highlands	EG, NE	Critically Endangered	6/04/2016	CA approved
Natural Temperate Grassland of the Victorian Volcanic Plain	CH, W	Critically Endangered	21/06/2008	CA approved
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	W, G	Critically Endangered	27/03/2012	CA approved

Community name	RFA region[1]	EPBC Act listing[2]	EPBC Act listing date effective	Status of conservation advice and recovery plans[3]
Silurian Limestone Pomaderris Shrubland of the South East Corner and Australian Alps Bioregions	G	Endangered	16/07/2000	RP approved
Subtropical and Temperate Coastal Saltmarsh	W, EG, G	Vulnerable	10/08/2013	CA approved
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	W, CH, G, NE	Critically Endangered	17/05/2006	RP approved

Notes:

(1) RFA regions: EG – East Gippsland, G – Gippsland, CH – Central Highlands, NE – North East, W - West
(2) EPBC Act listing as at 15 March 2019
(3) CA – Conservation Advice; RP – Recovery Plan
Source: Department of the Environment and Energy, Environmental Resources Information Network Species Profile and Threats Database

4. Extent of EPBC Act listed forest-dependent species suitable habitat within the CAR reserve system (forest-dependent species as identified in the VEAC 2017 Conservation Values of State Forests Report)

RFA Region	EPBC Act Listed Forest-Dependent Species (VEAC 2017)		Area of modelled habitat within protected areas as at June 2019 (ha)	Proportion of total modelled habitat within protected area (per cent by RFA)	Area of modelled habitat outside of protected areas as at June 2019 (ha)	Proportion of total modelled habitat outside of protected area (per cent by RFA)	Area of modelled habitat on private land as at June 2019 (ha)	Proportion of total modelled habitat on private land (per cent by RFA)	Total modelled habitat within each RFA (ha)
CENTRAL HIGHLANDS	Australian Grayling	*Prototroctes maraena*	3245	21 per cent	2,725	18 per cent	9,264	61 per cent	15,234
	Barred Galaxias	*Galaxias fuscus*	884	43 per cent	1,122	55 per cent	28	1 per cent	2,033
	Baw Baw Frog	*Philoria frosti*	7267	83 per cent	1,473	17 per cent	0	0 per cent	8,740
	Broad-toothed Rat	*Mastacomys fuscus*	14867	88 per cent	2,066	12 per cent	6	0 per cent	16,939
	Dwarf Galaxias	*Galaxiella pusilla*	49	29 per cent	24	15 per cent	93	56 per cent	167
	Flat-headed Galaxias	*Galaxias rostratus*	50	2 per cent	859	31 per cent	1,877	67 per cent	2,786
	Greater Glider	*Petauroides volans*	212154	39 per cent	269,985	49 per cent	66,021	12 per cent	548,161
	Grey-headed Flying-fox	*Pteropus poliocephalus*	1164	25 per cent	693	15 per cent	2,845	60 per cent	4,702
	Helmeted Honeyeater	*Lichenostomus melanops cassidix*	47	85 per cent	0	0 per cent	8	15 per cent	56
	Leadbeater's Possum	*Gymnobelideus leadbeateri*	81528	41 per cent	111,911	57 per cent	4,592	2 per cent	198,031

RFA Region	EPBC Act Listed Forest-Dependent Species (VEAC 2017)		Area of modelled habitat within protected areas as at June 2019 (ha)	Proportion of total modelled habitat within protected area (per cent by RFA)	Area of modelled habitat outside of protected areas as at June 2019 (ha)	Proportion of total modelled habitat outside of protected area (per cent by RFA)	Area of modelled habitat on private land as at June 2019 (ha)	Proportion of total modelled habitat on private land (per cent by RFA)	Total modelled habitat within each RFA (ha)
	Macquarie Perch	*Macquaria australasica*	32	9 per cent	109	32 per cent	203	59 per cent	343
	Murray Cod	*Maccullochella peelii*	407	8 per cent	1,873	37 per cent	2,800	55 per cent	5,079
	Regent Honeyeater	*Anthochaera phrygia*	1682	8 per cent	1,637	8 per cent	16,624	83 per cent	19,943
	Smoky Mouse	*Pseudomys fumeus*	56685	55 per cent	44,864	43 per cent	2,384	2 per cent	103,934
	Spot-tailed Quoll	*Dasyurus maculatus*	74924	47 per cent	61,314	39 per cent	22,923	14 per cent	159,161
	Spotted Tree Frog	*Litoria spenceri*	7	100 per cent	0	0 per cent	0	0 per cent	7
	Swift Parrot	*Lathamus discolor*	442	12 per cent	240	7 per cent	2,931	81 per cent	3,613
	Tall Astelia	*Astelia australiana*	33185	37 per cent	45,762	52 per cent	9,636	11 per cent	88,583
EAST GIPPSLAND	Australian Grayling	*Prototroctes maraena*	14880	61 per cent	5,759	24 per cent	3,651	15 per cent	24,290
	Booroolong Tree Frog	*Litoria booroolongensis*	50	14 per cent	116	32 per cent	197	54 per cent	362
	Broad-toothed Rat	*Mastacomys fuscus*	26997	80 per cent	6,663	20 per cent	0	0 per cent	33,659
	Brush-tailed Rock Wallaby	*Petrogale penicillata*	21205	96 per cent	242	1 per cent	563	3 per cent	22,009
	Greater Glider	*Petauroides volans*	318041	42 per cent	415,225	55 per cent	27,753	4 per cent	761,019
	Green and Golden Bell Frog	*Litoria aurea*	81066	56 per cent	49,841	34 per cent	14,429	10 per cent	145,336
	Grey-headed Flying-fox	*Pteropus poliocephalus*	25249	61 per cent	9,175	22 per cent	7,274	17 per cent	41,698

RFA Region	EPBC Act Listed Forest-Dependent Species (VEAC 2017)		Area of modelled habitat within protected areas as at June 2019 (ha)	Proportion of total modelled habitat within protected area (per cent by RFA)	Area of modelled habitat outside of protected areas as at June 2019 (ha)	Proportion of total modelled habitat outside of protected area (per cent by RFA)	Area of modelled habitat on private land as at June 2019 (ha)	Proportion of total modelled habitat on private land (per cent by RFA)	Total modelled habitat within each RFA (ha)
	Large Brown Tree Frog	*Litoria littlejohni*	44223	47 per cent	50,037	53 per cent	579	1 per cent	94,839
	Long-footed Potoroo	*Potorous longipes*	124367	40 per cent	183,344	59 per cent	4,348	1 per cent	312,058
	Smoky Mouse	*Pseudomys fumeus*	1450	20 per cent	5,842	79 per cent	98	1 per cent	7,390
	Spot-tailed Quoll	*Dasyurus maculatus*	350300	54 per cent	267,135	41 per cent	37,280	6 per cent	654,715
	Swift Parrot	*Lathamus discolor*	2411	87 per cent	174	6 per cent	200	7 per cent	2,785
GIPPSLAND	Australian Grayling	*Prototroctes maraena*	8368	19 per cent	10,389	24 per cent	24,891	57 per cent	43,648
	Barred Galaxias	*Galaxias fuscus*	11	5 per cent	220	95 per cent	0	0 per cent	231
	Booroolong Tree Frog	*Litoria booroolongensis*	150	18 per cent	306	37 per cent	367	45 per cent	823
	Broad-toothed Rat	*Mastacomys fuscus*	41027	61 per cent	24,346	36 per cent	1,706	3 per cent	67,078
	Dwarf Galaxias	*Galaxiella pusilla*	159	16 per cent	300	30 per cent	534	54 per cent	994
	Greater Glider	*Petauroides volans*	238877	40 per cent	321,510	53 per cent	44,282	7 per cent	604,670
	Green and Golden Bell Frog	*Litoria aurea*	16465	69 per cent	1,868	8 per cent	5,664	24 per cent	23,997
	Grey-headed Flying-fox	*Pteropus poliocephalus*	4614	38 per cent	2,553	21 per cent	5,051	41 per cent	12,218
	Leadbeater's Possum	*Gymnobelideus leadbeateri*	252	54 per cent	182	39 per cent	30	7 per cent	465
	Long-footed Potoroo	*Potorous longipes*	907	87 per cent	132	13 per cent	0	0 per cent	1,039

RFA Region	EPBC Act Listed Forest-Dependent Species (VEAC 2017)		Area of modelled habitat within protected areas as at June 2019 (ha)	Proportion of total modelled habitat within protected area (per cent by RFA)	Area of modelled habitat outside of protected areas as at June 2019 (ha)	Proportion of total modelled habitat outside of protected area (per cent by RFA)	Area of modelled habitat on private land as at June 2019 (ha)	Proportion of total modelled habitat on private land (per cent by RFA)	Total modelled habitat within each RFA (ha)
	Macquarie Perch	*Macquaria australasica*	307	70 per cent	97	22 per cent	36	8 per cent	440
	Smoky Mouse	*Pseudomys fumeus*	2129	29 per cent	5,290	71 per cent	0	0 per cent	7,419
	Spot-tailed Quoll	*Dasyurus maculatus*	86029	53 per cent	69,156	43 per cent	5,675	4 per cent	160,860
	Spotted Tree Frog	*Litoria spenceri*	9	100 per cent	0	0 per cent	0	0 per cent	9
	Swift Parrot	*Lathamus discolor*	258	57 per cent	20	4 per cent	174	39 per cent	451
NORTH EAST	Australian Grayling	*Prototroctes maraena*	80	84 per cent	15	16 per cent	0	0 per cent	96
	Barred Galaxias	*Galaxias fuscus*	406	33 per cent	811	67 per cent	0	0 per cent	1,217
	Booroolong Tree Frog	*Litoria booroolongensis*	17235	40 per cent	6,955	16 per cent	18,857	44 per cent	43,046
	Broad-toothed Rat	*Mastacomys fuscus*	43188	83 per cent	8,760	17 per cent	61	0 per cent	52,009
	Flat-headed Galaxias	*Galaxias rostratus*	1410	7 per cent	5,644	29 per cent	12,131	63 per cent	19,186
	Greater Glider	*Petauroides volans*	218562	40 per cent	284,438	52 per cent	41,519	8 per cent	544,518
	Grey-headed Flying-fox	*Pteropus poliocephalus*	686	41 per cent	376	22 per cent	611	37 per cent	1,674
	Long-footed Potoroo	*Potorous longipes*	10115	59 per cent	7,010	41 per cent	13	0 per cent	17,138
	Macquarie Perch	*Macquaria australasica*	935	30 per cent	1,040	34 per cent	1,108	36 per cent	3,083
	Murray Cod	*Maccullochella peelii*	4069	14 per cent	9,149	31 per cent	16,164	55 per cent	29,382

RFA Region	EPBC Act Listed Forest-Dependent Species (VEAC 2017)		Area of modelled habitat within protected areas as at June 2019 (ha)	Proportion of total modelled habitat within protected area (per cent by RFA)	Area of modelled habitat outside of protected areas as at June 2019 (ha)	Proportion of total modelled habitat outside of protected area (per cent by RFA)	Area of modelled habitat on private land as at June 2019 (ha)	Proportion of total modelled habitat on private land (per cent by RFA)	Total modelled habitat within each RFA (ha)
	Regent Honeyeater	*Anthochaera phrygia*	33804	21 per cent	18,960	12 per cent	110,802	68 per cent	163,567
	Smoky Mouse	*Pseudomys fumeus*	20117	47 per cent	22,484	52 per cent	337	1 per cent	42,938
	Spot-tailed Quoll	*Dasyurus maculatus*	47885	50 per cent	33,309	35 per cent	14,200	15 per cent	95,394
	Spotted Tree Frog	*Litoria spenceri*	60	98 per cent	1	2 per cent		0 per cent	61
	Swift Parrot	*Lathamus discolor*	16559	38 per cent	2,975	7 per cent	24,607	56 per cent	44,141
	Trout Cod	*Maccullochella macquariensis*	19	38 per cent	12	23 per cent	20	39 per cent	51
WEST	Australian Grayling	*Prototroctes maraena*	4627	29 per cent	2,810	18 per cent	8,486	53 per cent	15,923
	Brush-tailed Rock Wallaby	*Petrogale penicillata*	568	100 per cent	1	0 per cent	1	0 per cent	570
	Flat-headed Galaxias	*Galaxias rostratus*	0	0 per cent	308	26 per cent	898	74 per cent	1,205
	Greater Glider	*Petauroides volans*	23799	32 per cent	28,970	39 per cent	20,598	28 per cent	73,367
	Grey-headed Flying-fox	*Pteropus poliocephalus*	1072	31 per cent	814	24 per cent	1,553	45 per cent	3,438
	Macquarie Perch	*Macquaria australasica*	0	0 per cent	6	10 per cent	50	90 per cent	55
	Murray Cod	*Maccullochella peelii*	27	2 per cent	394	25 per cent	1,181	74 per cent	1,603
	Regent Honeyeater	*Anthochaera phrygia*	4787	21 per cent	2,271	10 per cent	15,962	69 per cent	23,020
	Smoky Mouse	*Pseudomys fumeus*	7991	96 per cent	125	2 per cent	179	2 per cent	8,295

RFA Region	EPBC Act Listed Forest-Dependent Species (VEAC 2017)		Area of modelled habitat within protected areas as at June 2019 (ha)	Proportion of total modelled habitat within protected area (per cent by RFA)	Area of modelled habitat outside of protected areas as at June 2019 (ha)	Proportion of total modelled habitat outside of protected area (per cent by RFA)	Area of modelled habitat on private land as at June 2019 (ha)	Proportion of total modelled habitat on private land (per cent by RFA)	Total modelled habitat within each RFA (ha)
	Spot-tailed Quoll	*Dasyurus maculatus*	66089	82 per cent	5,154	6 per cent	9,540	12 per cent	80,782
	Swift Parrot	*Lathamus discolor*	10711	25 per cent	5,117	12 per cent	26,547	63 per cent	42,374
	Tall Astelia	*Astelia australiana*	43413	65 per cent	5,359	8 per cent	18,343	27 per cent	67,114

Source: Unpublished analysis March 2019 - data derived from DELWP Habitat Distribution Models (Strategic Management Prospects versions) and corporate spatial layers PLM25 and FMZ100.
Notes:
- # EPBC Act listed forest-dependent species as identified in the VEAC 2017 Conservation Values of State Forests Report
~ Protected areas for the purpose of this analysis included dedicated reserves and SPZ's. This data set is identified in the aggregation of the PLM25 dataset and the Forest Management Zone dataset (FMZ100).
Species with modelled habitat less than 5 ha in total within an RFA have not been reported in this analysis.

5. EVC extent and conservation status of EVCs by RFA across the CAR reserve system

Central Highlands

Table 5.1a Representative conservation (percentage reservation status) of Forest EVCs[a] in the CAR Reserve System in the Central Highlands RFA Region as at 2019.

Ecosystem type	EVC number	Pre-1750 extent (ha)	Current extent (ha)	Percent remaining	% of current extent on private land	Status[b]	% of pre-1750 extent in the CAR Reserve System	% of current extent in the CAR Reserve System				
								Dedicated	Informal[c]	Prescription[d]	Private land covena-nts[e]	Total
Box Ironbark Forest*	61	2,609	1,684	65%	78%	V	1%	1%	0%	0%	0%	1%
Cool Temperate Rainforest*	31	22,932	4,668	20%	0%	V	19%	43%	40%	12%	0%	95%
Creekline Grassy Woodland*	68	705	193	27%	92%	E	1%	4%	0%	0%	0%	4%
Creekline Herb-rich Woodland*	164	5,809	2,746	47%	92%	V	1%	2%	0%	0%	0%	2%
Damp Forest*	29	198,927	170,255	86%	15%	V	38%	20%	10%	14%	0%	44.2 %
Damp Heathy Woodland*	793	14,187	7,120	50%	47%	V	22%	43%	0%	0%	0%	43%
Floodplain Riparian Woodland*	56	18,565	7,510	40%	70%	V	0%	1%	0%	0%	0%	1%
Floodplain Riparian Woodland/Plains Grassy Woodland Mosaic	250	8	5	66%	100%	N/A	0%	0%	0%	0%	0%	0%
Granitic Hills Woodland*	72	1,258	976	78%	100%	V	0%	0%	0%	0%	0%	0%
Grassy Dry Forest	22	63,618	47,288	74%	67%	-	19%	19%	6%	1%	0%	25%
Grassy Forest*	128	10,132	4,356	43%	87%	R	5%	12%	0%	0%	0%	12%
Grassy Riverine Forest*	106	210	73	35%	71%	V	0%	0%	0%	0%	0%	0%
Grassy Woodland*	175	24,695	8,428	34%	96%	V	0%	1%	0%	0%	0%	1%
Gully Woodland*	902	420	360	86%	65%	E	29%	34%	0%	0%	0%	34%
Heathy Dry Forest	20	15,162	14,725	97%	7%	V	75%	28%	38%	11%	0%	77%
Heathy Woodland*	48	3,713	2,168	58%	15%	V	33%	39%	14%	3%	0%	56.2 %

Herb-rich Foothill Forest*	23	168,294	137,336	82%	29%	V	32%	15%	13%	12%	0%	39.7%
Lowland Forest*	16	76,481	47,939	63%	47%	V	17%	22%	3%	2%	0%	27%
Montane Damp Forest*	38	20,433	20,392	100%	1%	V	51%	8%	18%	25%	0%	51.3%
Montane Dry Woodland	36	7,077	7,077	100%	0%	V	71%	3%	48%	21%	0%	71%
Montane Grassy Woodland*	37	22	22	100%	11%	R	88%	0%	88%	0%	0%	88%
Montane Wet Forest	39	46,528	46,516	100%	0%	V	61%	34%	18%	9%	0%	60.6%
Plains Grassland/Plains Grassy Woodland Mosaic	897	136	28	20%	100%	N/A	0%	0%	0%	0%	0%	0%
Plains Grassy Woodland*	55	44,316	12,121	27%	89%	V	0%	1%	0%	0%	0%	1%
Riparian Forest*	18	42,212	34,844	83%	24%	V	44%	20%	22%	10%	0%	53.2%
Riparian Scrub/Swampy Riparian Forest Mosaic	17	10,202	5,320	52%	85%	N/A	5%	10%	0%	0%	0%	10%
Shrubby Dry Forest	21	14,823	14,342	97%	1%	V	69%	54%	8%	9%	0%	71%
Shrubby Foothill Forest*	45	47,853	36,558	76%	28%	V	26%	27%	3%	3%	0%	33.7%
Sub-alpine Woodland	43	7,744	7,742	100%	0%	V	90%	78%	10%	2%	0%	90%
Swampy Riparian Woodland*	83	2,886	1,634	57%	54%	V	18%	33%	0%	0%	0%	33%
Swampy Woodland*	937	4,638	993	21%	93%	V	1%	3%	0%	0%	0%	3%
Valley Grassy Forest*	47	64,689	24,372	38%	92%	V	2%	6%	0%	0%	0%	6%
Valley Heathy Forest*	127	4,061	1,044	26%	99%	R	0%	0%	0%	0%	0%	0%
Warm Temperate Rainforest*	32	360	100	28%	2%	E	26%	15%	65%	14%	0%	94%
Wet Forest*	30	119,043	116,803	98%	6%	V	56%	30%	12%	15%	0%	56.6%
Cool Temperate Rainforest niche	31	#N/A	18,252	#N/A	1%	N/A	#N/A	39%	34%	12%	0%	85%
Warm Temperate Rainforest niche	32	#N/A	259	#N/A	6%	N/A	#N/A	13%	58%	16%	0%	87%

Table 5.1b Representative conservation (percentage reservation status) of non-Forest EVCs[a] in the CAR Reserve System in the Central Highlands RFA Region as at 2019.

Ecosystem type	EVC number	Pre-1750 extent (ha)	Current extent (ha)	Percent remaining	% of current extent on private land	Status[b]	% of pre-1750 extent in the CAR Reserve System	% of current extent in the CAR Reserve System				
								Dedicated	Informal[c]	Prescription[d]	Private land covenants[e]	Total
Alpine Crag Complex	1,000	15	15	100%	0%	N/A	100%	93%	7%	0%	0%	100%
Alpine Fen	171	4	4	100%	0%	V	100%	100%	0%	0%	0%	100%
Alpine Grassy Heathland	1,004	266	266	100%	0%	V	98%	97%	1%	0%	0%	98%
Bare Rock/Ground	993	23	23	98%	72%	N/A	25%	25%	0%	0%	0%	25%
Blackthorn Scrub*	27	330	317	96%	38%	E	59%	62%	0%	0%	0%	62%
Clay Heathland*	7	42	39	93%	48%	E	48%	38%	14%	0%	0%	52%
Escarpment Shrubland*	895	625	443	71%	43%	V	6%	9%	0%	0%	0%	9%
Grey Clay Drainage-line Aggregate	124	501	212	42%	74%	N/A	11%	26%	0%	0%	0%	26%
Montane Riparian Thicket*	41	2,561	2,520	98%	0%	R	72%	36%	25%	12%	0%	73%
Plains Grassland*	132	8,260	1,866	23%	83%	V	3%	13%	0%	0%	0%	13%
Plains Grassy Wetland*	125	186	56	30%	91%	V	1%	2%	0%	0%	0%	2%
Riparian Scrub*	191	190	63	33%	90%	R	2%	0%	0%	0%	6%	6%
Riparian Thicket	59	1,626	1,249	77%	53%	-	31%	9%	32%	0%	0%	40%
Riverine Escarpment Scrub*	82	42	32	77%	27%	R	56%	73%	0%	0%	0%	73%
Sub-alpine Riparian Shrubland	208	7	7	100%	0%	V	100%	100%	0%	0%	0%	100%
Sub-alpine Shrubland	42	174	174	100%	0%	V	100%	97%	3%	0%	0%	100%

Sub-alpine Treeless Vegetation	44	247	247	100%	1%	V	67%	3%	51%	12%	0%	67%
Sub-alpine Wet Heathland	210	214	214	100%	0%	V	96%	94%	2%	0%	0%	96%
Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic	211	363	363	100%	0%	N/A	97%	94%	3%	0%	0%	97%
Swamp Scrub*	53	5,527	855	15%	91%	V	0%	2%	0%	0%	0%	2%
Swampy Riparian Complex	126	39,779	11,664	29%	94%	N/A	1%	3%	0%	0%	0%	3%
Wet heathland/Riparian scrub mosaic	768	5,750	4,024	70%	29%	N/A	47%	67%	0%	0%	0%	67%
Wet Verge Sedgeland*	932	130	17	13%	95%	E	0%	0%	0%	0%	0%	0%
Wetland Formation*	74	12	6	50%	100%	R	0%	0%	0%	0%	0%	0%

East Gippsland

Table 5.2a Representative conservation (percentage reservation status) of Forest EVCsa in the CAR Reserve System in the East Gippsland RFA Region as at 2019.

Ecosystem type	EVC number	Pre-1750 extent (ha)	Current extent (ha)	Percent remaining	Status[b]	% of pre-1750 extent in the CAR Reserve System	% of current extent in the CAR Reserve System					% of current extent on private land
							Dedicated	Informal[c]	Prescription[d]	Private land covenants[e]	Total	
Banksia Woodland	14	40,838	39,395	96%	V	70%	59%	10%	3%	0%	73%	6%
Coast Banksia Woodland	2	3,440	3,410	99%	V	94%	94%	0%	0%	0%	94%	5%
Cool Temperate Rainforest*	31	9,728	4,241	44%	V	43%	64%	13%	22%	0%	99%	0%
Cut-tail Forest*	1506	46,015	46,015	100%	V	53%	31%	11%	11%	0%	52.9%	1%
Damp Forest*	29	232,132	230,636	99%	V	56%	34%	10%	12%	0%	56%	3%
Damp Sands Herb-rich Woodland*	3	772	484	63%	V	33%	52%	0%	0%	0%	52%	47%
Dry Rainforest*	34	92	26	29%	V	26%	85%	0%	5%	0%	90%	4%
Dry Valley Forest*	169	11	11	100%	R	80%	0%	80%	0%	0%	80%	2%
Foothill Box Ironbark Forest*	24	584	584	100%	E	99%	87%	10%	1%	0%	98.5%	0%

Gallery Rainforest*	135	848	306	36%	V	33%	23%	59%	9%	0%	90%	6%
Grassy Dry Forest	22	31,469	27,896	89%	-	39%	33%	5%	5%	0%	44%	34%
Grassy Woodland	175	37,963	34,079	90%	V	58%	64%	0%	0%	0%	64%	34%
Heathy Dry Forest	20	2,135	1,925	90%	V	56%	50%	4%	8%	0%	61.6%	12%
Herb-rich Foothill Forest	23	13	13	100%	V	98%	0%	98%	0%	0%	98%	0%
Limestone Box Forest	15	8,215	6,413	78%	V	47%	41%	17%	2%	0%	60.2%	25%
Littoral Rainforest*	4	440	49	11%	V	9%	79%	0%	0%	0%	79%	13%
Lowland Forest*	16	274,549	261,564	95%	V	41%	25%	12%	7%	0%	42.8%	7%
Montane Damp Forest	38	13,203	13,200	100%	V	78%	70%	5%	3%	0%	78%	0%
Montane Dry Woodland	36	65,543	59,322	91%	-	55%	53%	4%	3%	0%	60%	18%
Montane Grassy Woodland*	37	17,434	10,705	61%	V	25%	32%	3%	5%	0%	40%	42%
Montane Riparian Woodland*	40	4,939	3,027	61%	V	12%	13%	5%	1%	0%	20%	59%
Montane Wet Forest	39	13,068	13,068	100%	V	78%	75%	1%	3%	0%	78%	0%
Riparian Forest*	18	27,446	17,668	64%	V	37%	23%	32%	2%	0%	56.8%	28%
Riparian Scrub/Swampy Riparian Forest Mosaic	17	21,411	19,195	90%	N/A	57%	37%	17%	10%	0%	63%	11%
Shrubby Dry Forest	21	224,888	220,970	98%	-	61%	49%	6%	8%	0%	62%	6%
Shrubby Foothill Forest	45	2	2	100%	V	100%	0%	100%	0%	0%	100%	0%
Sub-alpine Woodland	43	8,739	8,672	99%	V	93%	91%	3%	0%	0%	94%	2%
Tableland Damp Forest*	35	5,083	5,026	99%	V	50%	34%	13%	3%	0%	50.7%	2%
Valley Grassy Forest*	47	21,754	17,634	81%	V	29%	16%	13%	6%	0%	35.7%	39%
Warm Temperate Rainforest*	32	33,167	13,686	41%	V	37%	34%	28%	28%	0%	90%	2%
Wet Forest	30	31,558	31,558	100%	V	64%	52%	6%	6%	0%	64%	1%
Cool Temperate Rainforest niche	31	N/A	5,486	N/A	N/A	N/A	60%	12%	22%	0%	95%	0%
Dry Rainforest niche	34	N/A	65	N/A	N/A	N/A	85%	0%	5%	0%	90%	5%
Gallery Rainforest niche	135	N/A	540	N/A	N/A	N/A	26%	55%	9%	0%	90%	6%
Littoral Rainforest niche	4	N/A	385	N/A	N/A	N/A	84%	1%	0%	0%	85%	8%
Warm Temperate Rainforest niche	32	N/A	19,432	N/A	N/A	N/A	35%	24%	27%	0%	86%	2%

Table 5.2b Representative conservation (percentage reservation status) of non-Forest EVCs[a] in the CAR Reserve System in the East Gippsland RFA Region as at 2019.

Ecosystem type	EVC number	Pre-1750 extent (ha)	Current extent (ha)	Percent remaining	Status[b]	% of pre-1750 extent in the CAR Reserve System	% of current extent in the CAR Reserve System					% of current extent on private land
							Dedicated	Informal[c]	Prescription[d]	Private land covenants[e]	Total	
Alpine Coniferous Shrubland	156	3	3	100%	E	100%	100%	0%	0%	0%	100%	0%
Alpine Damp Grassland	1002	62	62	100%	E	100%	100%	0%	0%	0%	100%	0%
Alpine Grassland	1001	113	113	100%	E	100%	100%	0%	0%	0%	100%	0%
Alpine Grassy Heathland	1004	87	87	100%	E	100%	100%	0%	0%	0%	100%	0%
Blackthorn Scrub	27	5,078	5,068	100%	V	86%	60%	21%	5%	0%	86%	1%
Brackish Sedgeland	13	192	192	100%	R	100%	100%	0%	0%	0%	100%	0%
Clay Heathland	7	2,882	2,431	84%	-	45%	47%	4%	2%	0%	53%	22%
Coastal Dune Scrub/Coastal Dune Grassland Mosaic	1	3,305	3,264	99%	N/A	93%	94%	0%	0%	0%	94%	1%
Coastal Lagoon Wetland*	11	854	843	99%	R	79%	79%	1%	0%	0%	80%	18%
Coastal Saltmarsh	9	1,263	1,214	96%	V	60%	62%	1%	0%	0%	62%	30%
Coastal Sand Heathland*	5	673	656	97%	R	90%	93%	0%	0%	0%	93%	7%
Dunes	994	1,920	1,896	99%	N/A	98%	99%	0%	0%	0%	99%	0%
Estuarine Wetland*	10	856	844	99%	V	48%	27%	21%	0%	1%	49%	7%
Montane Riparian Thicket*	41	29	29	100%	R	10%	1%	0%	9%	0%	10%	2%
Riparian Shrubland*	19	648	647	100%	R	83%	71%	12%	0%	0%	83%	9%
Riverine Escarpment Scrub	82	5	5	100%	R	100%	37%	63%	0%	0%	100%	0%
Rocky Outcrop Shrubland	28	1,602	1,602	100%	-	98%	97%	1%	0%	0%	98%	0%
Sand Heathland*	6	98	98	100%	R	7%	7%	0%	0%	0%	7%	92%
Sub-alpine Treeless Vegetation	44	1,842	1,814	98%	V	86%	84%	1%	1%	0%	87%	5%
Sub-alpine Wet Heathland*	210	149	149	100%	E	99%	99%	0%	0%	0%	99.4%	0%

Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic	211	11	11	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Water Body - estuary	1107	6,177	6,175	100%	N/A	40%	39%	0%	0%	0%	40%	1%
Water Body - Fresh	992	889	884	100%	N/A	54%	51%	2%	1%	0%	54%	4%
Wet Heathland	8	31,558	9,778	31%	-	24%	52%	21%	3%	0%	77%	4%
Wet Swale Herbland*	12	782	781	100%	R	98%	99%	0%	0%	0%	99%	1%

North East

Table 5.3a Representative conservation (percentage reservation status) of Forest EVCs[a] in the CAR Reserve System in the North East RFA Region as at 2019.

Ecosystem type	EVC number	Pre-1750 extent (ha)	Current extent (ha)	Percent remaining	Status[b]	% of pre-1750 extent in the CAR Reserve	% of current extent in the CAR Reserve System					% of current extent on private land
							Dedicated	Informal[c]	Prescription[d]	Private land covenants[e]	Total	
Alluvial Terraces Herb-rich Woodland*	67	209	70	33%	E	4%	12%	0%	0%	0%	12%	86%
Alluvial Terraces Herb-rich Woodland/Creekline Grassy Woodland Mosaic	81	338	225	67%	N/A	0%	0%	0%	0%	0%	0%	67%
Alluvial Terraces Herb-rich Woodland/Heathy Dry Forest Mosaic	79	757	624	82%	N/A	67%	81%	0%	0%	0%	81%	18%
Alluvial Terraces Herb-rich Woodland/Plains Grassy Woodland Mosaic	77	1,092	311	28%	N/A	2%	7%	0%	0%	0%	7%	89%
Alluvial Terraces Herb-rich Woodland/Valley Grassy Forest Mosaic	153	916	586	64%	N/A	1%	1%	0%	0%	0%	1%	91%
Box Ironbark Forest*	61	20,257	10,187	50%	V	17%	33%	0%	0%	0%	33%	66%
Box Ironbark Forest/Grassy Woodland Mosaic	247	212	127	60%	N/A	0%	0%	0%	0%	0%	0%	100%
Creekline Grassy Woodland*	68	10,650	5,604	53%	V	3%	6%	0%	0%	0%	6%	67%
Damp Forest	29	48,289	48,109	100%	V	78%	27%	21%	30%	0%	78%	1%
Dry Valley Forest	169	2	2	100%	R	100%	100%	0%	0%	0%	100%	0%
Floodplain Riparian Woodland*	56	40,391	15,916	39%	V	4%	10%	0%	0%	0%	10%	63%
Floodplain Riparian Woodland/Plains Grassy Woodland Mosaic	250	3,068	1,029	34%	N/A	6%	18%	0%	0%	0%	18%	80%

Floodplain Riparian Woodland/Riverine Grassy Woodland Mosaic	1032	120	66	55%	N/A	0%	0%	0%	0%	0%	0%	85%
Floodplain Riparian Woodland/Riverine Swamp Forest Mosaic	1034	4	4	98%	N/A	90%	93%	0%	0%	0%	93%	7%
Floodplain Riparian Woodland/Sedgy Riverine Forest Mosaic	1035	54	51	94%	N/A	11%	12%	0%	0%	0%	12%	87%
Granitic Hills Woodland	72	31,108	26,251	84%	V	54%	64%	0%	0%	0%	65%	35%
Granitic Hills Woodland/Heathy Dry Forest Mosaic	245	12	2	17%	N/A	0%	0%	0%	0%	0%	0%	100%
Granitic Hills Woodland/Rocky Outcrop Shrubland Mosaic	244	3,986	3,678	92%	N/A	63%	68%	0%	0%	0%	68%	29%
Grassy Dry Forest*	22	296,218	201,285	68%	V	22%	15%	10%	6%	0%	32%	52%
Grassy Dry Forest/Granitic Hills Woodland Mosaic	248	392	170	43%	N/A	0%	0%	0%	0%	0%	0%	100%
Grassy Dry Forest/Rocky Outcrop Shrubland Mosaic	599	955	538	56%	N/A	7%	12%	0%	0%	0%	12%	87%
Grassy Woodland*	175	85,868	29,334	34%	V	2%	4%	1%	0%	0%	5%	90%
Grassy Woodland/Heathy Dry Forest Mosaic	896	187	24	13%	N/A	0%	0%	0%	0%	0%	0%	100%
Grassy Woodland/Plains Grassy Woodland Mosaic	274	902	178	20%	N/A	0%	0%	0%	0%	0%	0%	90%
Grassy Woodland/Valley Grassy Forest Mosaic	251	1,486	408	27%	N/A	0%	1%	0%	0%	0%	1%	98%
Heathy Dry Forest	20	99,330	89,042	90%	V	56%	36%	13%	14%	0%	62.5%	17%
Heathy Woodland	48	37	37	100%	E	100%	0%	100%	0%	0%	100%	0%
Herb-rich Foothill Forest	23	555,400	450,347	81%	-	44%	23%	13%	19%	0%	55%	19%
Montane Damp Forest	38	39,923	39,922	100%	-	73%	36%	9%	28%	0%	73%	0%
Montane Dry Woodland	36	136,277	136,250	100%	-	72%	43%	7%	21%	0%	72%	0%
Montane Riparian Woodland	40	4	4	100%	V	100%	100%	0%	0%	0%	100%	0%
Montane Wet Forest*	39	20	20	100%	E	57%	0%	16%	41%	0%	57%	0%
Mountain Valley Riparian Woodland*	1085	1,341	996	74%	V	1%	1%	0%	0%	0%	1%	38%
Plains Grassy Woodland	55	143,263	27,831	19%	V	0%	1%	0%	0%	0%	1%	93%
Plains Grassy Woodland/Box Ironbark Forest Mosaic	287	58	41	71%	N/A	24%	34%	0%	0%	0%	34%	53%
Plains Grassy Woodland/Creekline Grassy Woodland Mosaic	261	7,618	1,625	21%	N/A	1%	3%	0%	0%	0%	3%	91%
Plains Grassy Woodland/Floodplain Riparian Woodland Mosaic	186	7,885	3,032	38%	N/A	0%	1%	0%	0%	0%	1%	59%
Plains Grassy Woodland/Grassy Woodland Mosaic	234	2,708	400	15%	N/A	0%	0%	0%	0%	0%	0%	95%
Plains Grassy Woodland/Valley Grassy Forest Mosaic	188	5,070	1,144	23%	N/A	0%	2%	0%	0%	0%	2%	91%
Plains Woodland*	803	60,780	10,953	18%	V	0%	2%	0%	0%	0%	2%	93%
Plains Woodland/Herb-rich Gilgai Wetland Mosaic	235	9,860	3,005	30%	N/A	3%	10%	0%	0%	0%	10%	87%

Riparian Forest	18	16,426	15,019	91%	V	68%	23%	48%	3%	0%	74%	11%
Riparian Forest/Creekline Grassy Woodland Mosaic	293	4	4	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Riparian Forest/Swampy Riparian Woodland Mosaic	237	11,178	7,144	64%	N/A	31%	13%	31%	4%	0%	48%	19%
Riverine Grassy Woodland*	295	5,929	2,329	39%	V	9%	22%	0%	0%	0%	22%	68%
Riverine Grassy Woodland/Riverine Swampy Woodland Mosaic	1040	11,823	3,663	31%	N/A	3%	9%	0%	0%	0%	9%	83%
Riverine Grassy Woodland/Sedgy Riverine Forest Mosaic	1041	5,129	22	0%	N/A	0%	21%	0%	0%	0%	21%	78%
Riverine Swamp Forest	814	406	355	87%	V	52%	60%	0%	0%	0%	60%	37%
Riverine Swampy Woodland*	815	1,508	884	59%	V	13%	22%	0%	0%	0%	22%	72%
Sand Ridge Woodland*	264	19	6	31%	E	10%	33%	0%	0%	0%	33%	67%
Sedgy Riverine Forest	816	921	840	91%	V	57%	62%	0%	0%	0%	62%	35%
Shallow Sands Woodland*	882	3,216	838	26%	V	0%	0%	0%	0%	0%	0%	100%
Shrubby Dry Forest	21	291,260	281,811	97%	V	68%	31%	15%	24%	0%	70.0%	4%
Spring Soak Woodland*	80	74	43	59%	E	1%	2%	0%	0%	0%	2%	97%
Sub-alpine Woodland	43	45,346	45,280	100%	V	86%	82%	1%	3%	0%	86%	0%
Swampy Riparian Woodland*	83	5,202	3,702	71%	V	35%	19%	28%	1%	0%	49%	34%
Swampy Riparian Woodland/Perched Boggy Shrubland Mosaic	212	1,354	649	48%	N/A	3%	7%	0%	0%	0%	7%	88%
Swampy Woodland*	937	11,071	3,052	28%	V	0%	0%	0%	0%	0%	0%	79%
Valley Grassy Forest*	47	250,296	80,332	32%	V	3%	6%	3%	0%	0%	9%	86%
Valley Grassy Forest/Box Ironbark Forest Mosaic	213	1,639	438	27%	N/A	0%	0%	0%	0%	0%	0%	100%
Valley Grassy Forest/Grassy Dry Forest Mosaic	265	247	172	69%	N/A	0%	0%	0%	0%	0%	0%	100%
Valley Heathy Forest*	127	1,748	596	34%	R	1%	2%	0%	0%	0%	2%	98%
Wet Forest	30	6,678	6,677	100%	V	87%	43%	24%	20%	0%	87%	0%

Table 5.3b Representative conservation (percentage reservation status) of non-Forest EVCs[a] in the CAR Reserve System in the North East RFA Region as at 2019.

Ecosystem type	EVC number	Pre-1750 extent (ha)	Current extent (ha)	Percent remaining	Status[b]	% of pre-1750 extent in the CAR Reserve System	% of current extent in the CAR Reserve System					% of current extent on private land
							Dedicated	Informal[c]	Prescription[d]	Private land covenants[e]	Total	
Alpine Coniferous Shrubland*	156	57	57	100%	E	94%	94%	0%	0%	0%	94%	0%
Alpine Crag Complex	1000	522	522	100%	N/A	99%	99%	0%	0%	0%	99%	0%
Alpine Damp Grassland	1002	1,047	1,046	100%	V	97%	97%	0%	0%	0%	97%	0%
Alpine Fen	171	6	6	100%	E	100%	100%	0%	0%	0%	100%	0%
Alpine Grassland	1001	1,524	1,522	100%	V	96%	96%	0%	0%	0%	96%	0%
Alpine Grassy Heathland	1004	3,635	3,633	100%	V	95%	95%	0%	0%	0%	95%	0%
Alpine Rocky Outcrop Heathland/Alpine Dwarf Heathland Mosaic	1105	554	553	100%	N/A	99%	98%	0%	0%	0%	99%	0%
Alpine Valley Peatland	288	182	181	100%	V	100%	100%	0%	0%	0%	100%	0%
Aquatic Herbland/Tall Marsh Mosaic	1047	7	7	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Billabong Wetland Aggregate	334	338	320	95%	N/A	20%	21%	0%	0%	0%	21%	66%
Clay Heathland*	7	45	41	89%	R	44%	40%	8%	1%	0%	49%	48%
Drainage-line Aggregate	168	401	355	89%	N/A	13%	15%	0%	0%	0%	15%	76%
Floodplain Wetland Aggregate	172	782	632	81%	N/A	12%	14%	0%	0%	0%	14%	76%
Late-lying Snowpatch Herbland*	1014	94	94	100%	E	98%	98%	0%	0%	0%	98%	0%
Montane Riparian Thicket	41	1,272	1,249	98%	V	92%	29%	64%	1%	0%	94%	0%
Perched Boggy Shrubland*	185	548	220	40%	E	0%	1%	0%	0%	0%	1%	96%
Riparian Shrubland	19	1,425	1,271	89%	-	56%	63%	0%	0%	0%	63%	20%
Riparian Thicket*	59	336	164	49%	R	0%	0%	0%	0%	0%	0%	98%
Riverine Escarpment Scrub*	82	2,403	1,083	45%	R	18%	15%	25%	1%	0%	41%	46%
Rocky Outcrop Shrubland/Rocky Outcrop Herbland Mosaic	73	3,367	3,252	97%	N/A	88%	75%	16%	0%	0%	92%	8%

Snowpatch Grassland*	1012	107	107	100%	E	77%	77%	0%	0%	0%	77%	0%
Sub-alpine Dry Shrubland	1003	283	283	100%	V	100%	100%	0%	0%	0%	100%	0%
Sub-alpine Riparian Shrubland	208	6	6	100%	V	100%	100%	0%	0%	0%	100%	0%
Sub-alpine Shrubland	42	2,194	2,189	100%	V	82%	82%	0%	0%	0%	82%	0%
Sub-alpine Treeless Vegetation	44	2,092	2,061	98%	V	78%	77%	1%	1%	0%	79%	0%
Sub-alpine Wet Heathland	210	4	4	100%	V	100%	100%	0%	0%	0%	100%	0%
Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic	211	1,080	1,078	100%	N/A	95%	95%	0%	0%	0%	95%	0%
Tall Marsh*	821	2	2	98%	R	0%	0%	0%	0%	0%	0%	100%
Water Body - Fresh	992	1,217	947	78%	N/A	13%	17%	0%	0%	0%	17%	28%
Wetland Formation*	74	3,637	2,506	69%	R	3%	4%	0%	0%	0%	4%	95%

Gippsland

Table 5.4a Representative conservation (percentage reservation status) of Forest EVCs[a] in the CAR Reserve System in the Gippsland RFA Region as at 2019.

Ecosystem type	EVC number	Pre-1750 extent (ha)	Current extent (ha)	Percent remaining	Status[b]	% of pre-1750 extent in the CAR Reserve System	% of current extent in the CAR Reserve System					% of current extent on private land
							Dedicated	Informal[c]	Prescription[d]	Private land covenants[e]	Total	
Box Ironbark Forest*	61	7,509	3,998	53%	V	20%	37%	0%	0%	1%	38%	59%
Coast Banksia Woodland*	2	3,438	2,192	64%	V	29%	45%	0%	1%	0%	46%	53%
Cool Temperate Rainforest*	31	11,314	3,658	32%	V	26%	15%	12%	4%	50%	80%	14%
Creekline Herb-rich Woodland	164	1,010	935	93%	V	77%	20%	58%	6%	0%	83%	4%
Damp Forest*	29	226,048	124,927	55%	V	32%	12%	19%	25%	2%	57.5%	20%
Damp Heathy Woodland*	793	243	122	50%	R	6%	3%	0%	0%	9%	13%	86%
Damp Heathy Woodland/Lowland Forest Mosaic	1106	54,199	9,627	18%	N/A	2%	11%	0%	0%	0%	12%	86%
Damp Sands Herb-rich Woodland*	3	43,726	17,985	41%	V	16%	39%	0%	0%	0%	40%	53%

Damp Sands Herb-rich Woodland/Lowland Forest Mosaic	770	24,972	8,336	33%	N/A	6%	19%	0%	0%	1%	19%	79%
Damp Sands Herb-rich Woodland/Swamp Scrub Mosaic	925	5,113	795	16%	N/A	6%	42%	0%	0%	0%	42%	58%
Dry Rainforest*	34	111	27	25%	V	24%	76%	11%	13%	0%	100%	0%
Dry Valley Forest*	169	24,988	21,329	85%	R	50%	15%	26%	17%	0%	58%	15%
Floodplain Riparian Woodland*	56	19,642	7,318	37%	V	1%	2%	0%	0%	0%	3%	72%
Floodplain Riparian Woodland/Billabong Wetland Mosaic	690	3,058	195	6%	N/A	0%	0%	0%	0%	0%	0%	95%
Gallery Rainforest*	135	401	42	10%	E	10%	62%	28%	2%	2%	94%	2%
Granitic Hills Woodland	72	3,975	3,973	100%	V	100%	100%	0%	0%	0%	100%	0%
Grassy Dry Forest	22	39,804	36,822	93%	-	53%	26%	20%	11%	0%	57%	28%
Grassy Dry Forest/Heathy Woodland Mosaic	783	530	530	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Grassy Forest*	128	1,801	249	14%	V	0%	0%	0%	0%	0%	0%	99%
Grassy Woodland*	175	48,547	25,826	53%	V	15%	22%	5%	0%	1%	29%	68%
Heathy Dry Forest	20	88,250	86,653	98%	V	75%	48%	14%	14%	0%	77%	7%
Heathy Woodland*	48	43,834	34,276	78%	V	46%	48%	10%	0%	2%	59.4%	23%
Herb-rich Foothill Forest	23	133,168	120,565	91%	V	71%	49%	11%	18%	0%	79%	10%
Limestone Box Forest*	15	1,383	891	64%	V	20%	13%	18%	0%	0%	31%	49%
Littoral Rainforest*	4	90	22	24%	E	13%	54%	0%	0%	0%	54%	37%
Lowland Forest*	16	204,233	122,033	60%	V	20%	13%	17%	3%	0%	34%	36%
Lowland Forest/Heathy Woodland Mosaic	698	9,647	698	7%	N/A	1%	8%	0%	0%	0%	8%	92%
Lowland Herb-rich Forest*	877	36,002	24,565	68%	V	21%	7%	16%	8%	0%	31%	45%
Montane Damp Forest	38	105,437	105,192	100%	V	63%	41%	5%	17%	0%	63.0%	1%
Montane Dry Woodland	36	138,819	130,837	94%	V	58%	45%	7%	10%	0%	61.9%	6%
Montane Grassy Woodland*	37	58,180	37,918	65%	V	24%	10%	23%	4%	0%	37.4%	35%
Montane Grassy Woodland/Montane Grassland Mosaic	703	1,868	112	6%	N/A	0%	0%	2%	0%	0%	2%	69%
Montane Herb-rich Woodland	319	24,756	24,277	98%	V	67%	37%	19%	13%	0%	69%	7%
Montane Riparian Woodland*	40	7,470	4,135	55%	V	21%	25%	13%	0%	1%	39%	42%
Montane Wet Forest	39	11,692	11,691	100%	V	67%	38%	6%	24%	0%	67.5%	1%
Plains Grassy Forest*	151	89,149	33,133	37%	V	12%	6%	26%	0%	1%	33%	49%
Plains Grassy Woodland*	55	135,717	19,035	14%	V	1%	7%	0%	0%	0%	7%	89%

Plains Grassy Woodland/Gilgai Wetland Mosaic	259	31,041	3,522	11%	N/A	0%	0%	3%	0%	0%	4%	92%
Riparian Forest	18	11,641	9,837	85%	V	63%	37%	25%	11%	0%	74%	10%
Riparian Forest/Swampy Riparian Woodland Mosaic	237	164	144	88%	N/A	37%	42%	0%	0%	0%	42%	5%
Seasonally Inundated Shrubby Woodland*	195	131	50	38%	R	0%	1%	0%	0%	0%	1%	66%
Shrubby Damp Forest	316	68,565	68,292	100%	V	72%	16%	30%	27%	0%	72.6%	2%
Shrubby Dry Forest	21	272,352	267,828	98%	V	67%	27%	22%	19%	0%	67.9%	5%
Shrubby Foothill Forest*	45	50,378	37,750	75%	V	43%	19%	23%	15%	0%	56.9%	10%
Shrubby Foothill Forest/Damp Forest Mosaic	315	7,989	7,894	99%	N/A	63%	2%	23%	40%	0%	64%	3%
Shrubby Wet Forest*	201	2,235	2,233	100%	V	42%	5%	17%	20%	0%	42.5%	1%
Sub-alpine Woodland	43	53,482	53,446	100%	V	79%	74%	2%	2%	0%	79%	2%
Swamp Scrub/Plains Grassy Forest Mosaic	639	2,937	209	7%	N/A	0%	0%	0%	0%	0%	0%	99%
Swampy Riparian Woodland*	83	15,659	4,171	27%	V	1%	2%	0%	0%	0%	3%	54%
Swampy Riparian Woodland/Swamp Scrub Mosaic	688	4,117	724	18%	N/A	1%	1%	2%	0%	1%	4%	83%
Swampy Woodland*	937	1,540	302	20%	V	1%	3%	0%	0%	0%	3%	90%
Tableland Damp Forest*	35	10,927	10,913	100%	V	40%	13%	11%	16%	0%	40%	1%
Valley Grassy Forest*	47	11,706	6,493	55%	V	12%	12%	6%	1%	2%	22%	74%
Valley Grassy Forest/Grassy Dry Forest Mosaic	265	7	2	31%	N/A	0%	0%	0%	0%	0%	0%	29%
Valley Grassy Forest/Swamp Scrub Mosaic	699	222	29	13%	N/A	1%	8%	0%	0%	0%	8%	90%
Valley Heathy Forest	127	1,246	1,228	99%	-	90%	6%	86%	0%	0%	92%	7%
Valley Slopes Dry Forest	177	1,996	1,933	97%	V	74%	9%	63%	3%	0%	76%	14%
Warm Temperate Rainforest*	32	11,434	2,861	25%	V	21%	36%	23%	14%	13%	85%	10%
Wet Forest*	30	136,276	75,929	56%	V	25%	10%	7%	12%	16%	45.5%	30%
Cool Temperate Rainforest niche	31	#N/A	6,791	#N/A	N/A	#N/A	16%	13%	3%	45%	76%	13%
Dry Rainforest niche	34	#N/A	79	#N/A	N/A	#N/A	63%	13%	15%	0%	91%	8%
Gallery Rainforest niche	135	#N/A	169	#N/A	N/A	#N/A	37%	16%	2%	1%	56%	25%
Littoral Rainforest niche	4	#N/A	65	#N/A	N/A	#N/A	53%	0%	0%	0%	53%	42%
Warm Temperate Rainforest niche	32	#N/A	6,372	#N/A	N/A	#N/A	20%	21%	11%	12%	64%	27%

Table 5.4b Representative conservation (percentage reservation status) of non-Forest EVCs[a] in the CAR Reserve System in the Gippsland RFA Region as at 2019.

Ecosystem type	EVC number	Pre-1750 extent (ha)	Current extent (ha)	Percent remaining	Status[b]	% of pre-1750 extent in the CAR Reserve System	% of current extent in the CAR Reserve System					% of current extent on private land
							Dedicated	Informal[c]	Prescription[d]	Private land covenants[e]	Total	
Alpine Coniferous Shrubland*	156	6	6	100%	E	38%	38%	0%	0%	0%	38%	7%
Alpine Damp Grassland*	1002	599	598	100%	E	80%	74%	6%	1%	0%	80%	14%
Alpine Fen	171	19	19	100%	V	95%	71%	7%	16%	0%	95%	0%
Alpine Grassland	1001	713	708	99%	V	71%	64%	5%	1%	0%	71%	16%
Alpine Grassy Heathland	1004	1,177	1,175	100%	V	85%	84%	1%	0%	0%	85%	6%
Alpine Grassy Heathland/Alpine Grassland Mosaic	1005	656	654	100%	N/A	91%	91%	0%	0%	0%	91%	9%
Alpine Rocky Outcrop Heathland/Alpine Dwarf Heathland Mosaic	1105	24	23	100%	N/A	35%	35%	0%	0%	0%	35%	4%
Aquatic Herbland/Plains Sedgy Wetland Mosaic	691	1,155	921	80%	N/A	17%	21%	0%	0%	0%	21%	78%
Bare Rock/Ground	993	72	66	91%	N/A	91%	100%	0%	0%	0%	100%	0%
Billabong Wetland Aggregate	334	862	534	62%	N/A	3%	4%	0%	0%	0%	4%	74%
Bird Colony Shrubland	154	49	48	98%	N/A	98%	100%	0%	0%	0%	100%	0%
Blackthorn Scrub	27	7,364	7,359	100%	V	84%	20%	53%	12%	0%	85%	2%
Blocked Coastal Stream Swamp	875	29	29	100%	V	100%	100%	0%	0%	0%	100%	0%
Calcareous Swale Grassland	309	559	559	100%	E	100%	100%	0%	0%	0%	100%	0%
Clay Heathland*	7	683	679	99%	R	86%	47%	40%	0%	0%	87%	12%
Coastal Alkaline Scrub	858	3,563	3,563	100%	V	100%	100%	0%	0%	0%	100%	0%
Coastal Dune Grassland	879	34	34	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Coastal Dune Scrub	160	31	31	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Coastal Dune Scrub/Coastal Dune Grassland Mosaic	1	11,130	9,326	84%	N/A	62%	74%	0%	0%	0%	74%	22%
Coastal Headland Scrub*	161	1,099	923	84%	R	64%	76%	0%	0%	0%	76%	24%

Coastal Lagoon Wetland	11	59	59	100%	R	100%	100%	0%	0%	0%	100%	0%
Coastal Saltmarsh	9	7,195	6,744	94%	V	63%	67%	0%	0%	0%	68%	31%
Coastal Sand Heathland	5	23	23	100%	R	100%	100%	0%	0%	0%	100%	0%
Coastal Tussock Grassland	163	1,159	996	86%	V	78%	90%	0%	0%	0%	90%	9%
Damp Heathland/Wet Heathland Mosaic	625	7,093	637	9%	N/A	2%	17%	10%	0%	0%	27%	72%
Deep Freshwater Marsh	681	8,184	7,509	92%	-	35%	39%	0%	0%	0%	39%	44%
Estuarine Wetland*	10	8,046	6,687	83%	V	44%	53%	0%	0%	0%	53%	42%
Estuarine Wetland/Estuarine Swamp Scrub Mosaic	935	298	223	75%	N/A	18%	22%	0%	0%	2%	24%	65%
Floodplain Reedbed*	863	1,624	806	50%	R	3%	5%	0%	0%	0%	5%	89%
Lake Bed Herbland*	107	605	605	100%	R	0%	0%	0%	0%	0%	0%	0%
Limestone Pomaderris Shrubland*	133	174	102	58%	E	34%	46%	12%	0%	0%	58%	26%
Mangrove Shrubland	140	1,125	970	86%	V	67%	78%	0%	0%	0%	78%	21%
Montane Grassland*	702	2,014	359	18%	V	0%	2%	0%	0%	0%	2%	70%
Montane Grassy Shrubland*	207	88	85	96%	V	0%	0%	0%	0%	0%	0%	52%
Montane Riparian Thicket	41	2,533	2,531	100%	V	95%	16%	77%	2%	0%	95%	1%
Montane Rocky Shrubland	192	3,168	3,168	100%	V	98%	92%	5%	1%	0%	98%	0%
Montane Swamp*	318	702	326	46%	R	4%	7%	0%	0%	1%	8%	60%
Plains Grassland*	132	35,617	2,628	7%	E	1%	14%	0%	0%	0%	14%	79%
Plains Grassy Wetland*	125	1,094	312	29%	V	0%	0%	0%	0%	0%	0%	94%
Riparian Scrub	191	14,900	10,014	67%	-	46%	40%	24%	5%	0%	69%	19%
Riparian Shrubland	19	4,358	2,914	67%	-	20%	18%	11%	1%	0%	30%	27%
Riverine Escarpment Scrub	82	9,033	8,911	99%	-	80%	29%	38%	14%	0%	81%	7%
Rocky Outcrop Shrubland	28	1,813	1,808	100%	-	96%	37%	60%	0%	0%	96%	3%
Rocky Outcrop Shrubland/Rocky Outcrop Herbland Mosaic	73	9,438	9,434	100%	N/A	97%	77%	5%	16%	0%	97%	1%
Rocky Shore	986	315	251	80%	N/A	79%	100%	0%	0%	0%	100%	0%
Sand Heathland	6	8,305	7,993	96%	-	85%	89%	0%	0%	0%	89%	6%
Sand Heathland/Wet Heathland Mosaic	307	3,434	3,433	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Sandy Beach	985	1,303	1,262	97%	N/A	91%	94%	0%	0%	0%	94%	1%
Sandy Flood Scrub	141	2,457	1,425	58%	-	14%	24%	0%	0%	0%	24%	54%

Sedge Wetland*	136	2,221	1,713	77%	R	28%	31%	4%	0%	1%	36%	52%
Snowpatch Grassland*	1012	13	13	100%	E	0%	0%	0%	0%	0%	0%	0%
Spray-zone Coastal Shrubland	876	48	46	96%	R	96%	100%	0%	0%	0%	100%	0%
Sub-alpine Dry Shrubland	1003	277	277	100%	V	99%	99%	0%	0%	0%	99%	1%
Sub-alpine Grassland*	206	116	116	100%	E	95%	84%	3%	8%	0%	94.7%	0%
Sub-alpine Shrubland*	42	42	41	99%	V	10%	11%	0%	0%	0%	11%	3%
Sub-alpine Treeless Vegetation	44	3,106	3,028	98%	V	70%	50%	16%	6%	0%	71%	16%
Sub-alpine Wet Heathland	210	1,284	1,151	90%	V	69%	61%	14%	1%	0%	77%	15%
Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic	211	72	72	100%	N/A	83%	82%	0%	1%	0%	83%	10%
Sub-alpine Wet Heathland/Sub-alpine Grassland Mosaic	317	166	158	95%	N/A	48%	47%	3%	1%	0%	51%	41%
Swamp Scrub*	53	81,326	24,410	30%	V	9%	31%	0%	0%	0%	31%	56%
Swamp Scrub/Plains Grassland Mosaic	687	22,260	1,999	9%	N/A	1%	2%	11%	0%	0%	12%	82%
Swamp Scrub/Plains Sedgy Wetland Mosaic	733	26	10	40%	N/A	0%	0%	0%	0%	0%	0%	69%
Swamp Scrub/Wet Heathland Mosaic	638	1,129	234	21%	N/A	4%	21%	0%	0%	0%	21%	79%
Swampy Riparian Complex	126	6,752	1,730	26%	N/A	0%	1%	0%	0%	0%	1%	93%
Water Body - Fresh	992	47,339	47,027	99%	N/A	23%	24%	0%	0%	0%	24%	4%
Wet Heathland	8	14,398	8,339	58%	-	48%	80%	4%	0%	0%	84%	15%
Wet heathland/Riparian scrub mosaic	768	54	14	27%	N/A	0%	0%	0%	0%	0%	0%	100%
Wet Rocky Outcrop Scrub	310	511	511	100%	R	100%	100%	0%	0%	0%	100%	0%
Wet Sands Thicket*	233	65	56	86%	E	18%	0%	0%	21%	0%	21%	22%
Wet Swale Herbland	12	175	175	100%	E	100%	100%	0%	0%	0%	100%	0%
Wetland Formation*	74	583	582	100%	R	78%	77%	0%	0%	1%	78%	22%

West

Table 5.5a Representative conservation (percentage reservation status) of Forest EVCs[a] in the CAR Reserve System in the West RFA Region as at 2019.

Ecosystem type	EVC number	Pre-1750 extent (ha)	Current extent (ha)	Percent remaining	Status[b]	% of pre-1750 extent in the CAR Reserve	% of current extent in the CAR Reserve System					% of current extent on private land
							Dedicated	Informal[c]	Prescription[d]	Private land covenants[e]	Total	
Alluvial Terraces Herb-rich Woodland*	67	22,585	12,179	54%	V	12%	19%	4%	0%	0%	23%	70%
Alluvial Terraces Herb-rich Woodland/Claypan Ephemeral Wetland Mosaic	455	36	36	100%	N/A	98%	98%	0%	0%	0%	98%	1%
Alluvial Terraces Herb-rich Woodland/Creekline Grassy Woodland Mosaic	81	293	250	85%	N/A	2%	2%	0%	0%	0%	2%	97%
Alluvial Terraces Herb-rich Woodland/Hills Herb-rich Woodland Mosaic	452	36	36	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Alluvial Terraces Herb-rich Woodland/Plains Grassy Woodland Mosaic	77	9,835	2,413	25%	N/A	1%	2%	1%	0%	0%	3%	91%
Alluvial Terraces Herb-rich Woodland/Sedge Wetland Mosaic	457	30	30	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Basalt Creekline Shrubby Woodland*	705	3,877	230	6%	E	0%	0%	0%	0%	0%	0%	100%
Basalt Shrubby Woodland*	642	64,570	3,382	5%	E	0%	0%	0%	0%	0%	1%	97%
Basalt Shrubby Woodland/Herb-rich Foothill Forest Mosaic	742	1,238	30	2%	N/A	0%	0%	0%	0%	0%	0%	100%
Black Box Lignum Woodland*	663	256	178	70%	V	6%	9%	0%	0%	0%	9%	26%
Box Ironbark Forest*	61	27,021	20,710	77%	R	19%	24%	0%	0%	0%	25%	68%
Box Ironbark Forest/Grassy Woodland Mosaic	247	9	9	100%	N/A	27%	28%	0%	0%	0%	28%	7%
Cinder Cone Woodland	644	488	341	70%	V	68%	97%	0%	0%	0%	97%	3%
Cool Temperate Rainforest*	31	15,639	3,978	25%	V	24%	92%	0%	5%	0%	96%	4%
Creekline Grassy Woodland*	68	65,938	23,391	35%	E	1%	1%	1%	0%	1%	2%	86%
Creekline Herb-rich Woodland*	164	9,043	5,050	56%	V	12%	12%	9%	0%	0%	21%	69%
Creekline Sedgy Woodland*	640	2,893	1,649	57%	V	1%	1%	1%	0%	0%	2%	63%
Damp Forest*	29	2,595	2,434	94%	R	64%	48%	18%	2%	0%	68%	20%
Damp Forest/Herb-rich Foothill Forest Mosaic	597	171	171	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Damp Forest/Lowland Forest Mosaic	372	31	31	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Damp Forest/Riparian Scrub Mosaic	373	11	11	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Damp Heath Scrub/Heathy Woodland Complex	836	16	16	98%	N/A	90%	92%	0%	0%	0%	92%	8%

Damp Heathland/Damp Heathy Woodland Mosaic	746	116,630	15,515	13%	N/A	3%	6%	19%	0%	0%	25%	65%
Damp Heathland/Seasonally Inundated Shrubby Woodland Mosaic	754	63	63	100%	N/A	99%	0%	99%	0%	0%	99%	1%
Damp Heathy Woodland*	793	2,610	1,178	45%	R	25%	13%	42%	0%	0%	55%	39%
Damp Sands Herb-rich Woodland*	3	181,466	70,250	39%	V	11%	22%	6%	0%	0%	28%	63%
Damp Sands Herb-rich Woodland/Alluvial Terraces Herb-rich Woodland Mosaic	417	7	7	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Damp Sands Herb-rich Woodland/Dry Creekline Woodland mosaic	423	8	8	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Damp Sands Herb-rich Woodland/Heathy Woodland Mosaic	881	7,131	6,200	87%	N/A	66%	75%	1%	0%	0%	76%	13%
Damp Sands Herb-rich Woodland/Herb-rich Foothill Forest Mosaic	781	3,181	641	20%	N/A	8%	9%	31%	0%	0%	40%	58%
Damp Sands Herb-rich Woodland/Lowland Forest Mosaic	770	1,843	1,062	58%	N/A	32%	16%	40%	0%	0%	56%	25%
Damp Sands Herb-rich Woodland/Plains Grassy Woodland Mosaic	885	126,786	20,346	16%	N/A	0%	0%	2%	0%	0%	2%	95%
Damp Sands Herb-rich Woodland/Plains Swampy Woodland Mosaic	732	9,406	1,500	16%	N/A	0%	1%	1%	0%	0%	2%	95%
Damp Sands Herb-rich Woodland/Riparian Woodland Mosaic	725	417	416	100%	N/A	91%	91%	0%	0%	0%	91%	3%
Damp Sands Herb-rich Woodland/Seasonally Inundated Shrubby Woodland Mosaic	757	697	495	71%	N/A	33%	47%	0%	0%	0%	47%	53%
Damp Sands Herb-rich Woodland/Sedgy Riparian Woodland Mosaic	422	176	176	100%	N/A	92%	92%	0%	0%	0%	92%	8%
Damp Sands Herb-rich Woodland/Shallow Sands Woodland Mosaic	779	2,203	1,044	47%	N/A	11%	17%	5%	0%	0%	22%	77%
Damp Sands Herb-rich Woodland/Shrubby Woodland Mosaic	672	1,685	1,542	92%	N/A	36%	37%	3%	0%	0%	40%	38%
Drainage-line Woodland*	679	3,805	1,866	49%	V	4%	5%	3%	0%	0%	8%	67%
Dry Creekline Woodland*	285	660	522	79%	E	29%	26%	9%	1%	0%	37%	56%
Dune Soak Woodland*	673	121	88	73%	R	28%	17%	21%	0%	0%	38%	62%
Escarpment Shrubland/Damp Sands Herb-rich Woodland Mosaic	675	431	431	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Escarpment Shrubland/Grassy Woodland Mosaic	662	65	31	47%	N/A	0%	0%	0%	0%	0%	0%	68%
Floodplain Riparian Woodland*	56	42,632	15,499	36%	V	1%	3%	0%	0%	0%	3%	67%
Floodplain Riparian Woodland/Billabong Wetland Mosaic	690	2,300	808	35%	N/A	0%	0%	0%	0%	0%	0%	99%
Floodplain Riparian Woodland/Plains Grassy Woodland Mosaic	250	2,894	771	27%	N/A	0%	0%	0%	0%	0%	0%	81%
Floodplain Thicket/Seasonally Inundated Shrubby Woodland Mosaic	553	25	25	100%	N/A	100%	0%	100%	0%	0%	100%	0%
Floodplain Thicket/Sedgy Riparian Woodland Mosaic	431	5	5	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Granitic Hills Woodland*	72	6,700	2,558	38%	V	9%	24%	0%	0%	0%	24%	75%
Grassy Dry Forest*	22	130,645	83,263	64%	V	18%	16%	11%	1%	0%	28%	59%
Grassy Dry Forest/Heathy Woodland Mosaic	783	4,175	2,800	67%	N/A	41%	4%	57%	0%	0%	61%	38%
Grassy Dry Forest/Rocky Outcrop Shrubland Mosaic	599	204	140	68%	N/A	21%	31%	0%	0%	0%	31%	69%

Grassy Forest*	128	11,757	5,693	48%	R	1%	1%	0%	0%	0%	2%	95%
Grassy Woodland*	175	259,257	66,061	25%	V	1%	2%	0%	0%	0%	3%	92%
Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic	697	19,520	6,799	35%	N/A	2%	4%	1%	0%	0%	4%	90%
Grassy Woodland/Box Ironbark Forest Mosaic	262	1,703	1,268	74%	N/A	0%	0%	0%	0%	0%	0%	100%
Grassy Woodland/Damp Sands Herb-rich Woodland Mosaic	719	43,897	8,131	19%	N/A	0%	0%	2%	0%	0%	2%	96%
Grassy Woodland/Heathy Dry Forest Mosaic	896	31,961	10,110	32%	N/A	0%	1%	0%	0%	0%	1%	95%
Grassy Woodland/Heathy Woodland Mosaic	802	2,825	1,946	69%	N/A	4%	5%	0%	0%	1%	5%	92%
Grassy Woodland/Hills Herb-rich Woodland Mosaic	752	20,091	5,902	29%	N/A	0%	1%	0%	0%	0%	1%	97%
Grassy Woodland/Valley Grassy Forest Mosaic	251	204	84	41%	N/A	0%	0%	0%	0%	0%	0%	98%
Heathland Thicket/Seasonally Inundated Shrubby Woodland Mosaic	565	11	11	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Heathland Thicket/Sedgy Riparian Woodland Mosaic	601	11	11	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Heathy Dry Forest*	20	150,989	119,194	79%	V	40%	44%	6%	1%	0%	51.1%	36%
Heathy Dry Forest/Damp Sands Herb-rich Woodland Complex	391	22	22	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Heathy Dry Forest/Heathy Woodland Mosaic	393	469	469	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Heathy Dry Forest/Hills Herb-rich Woodland Mosaic	389	12	12	100%	N/A	96%	96%	0%	0%	0%	96%	4%
Heathy Dry Forest/Plains Grassy Woodland Mosaic	765	40	40	99%	N/A	0%	0%	0%	0%	0%	0%	100%
Heathy Dry Forest/Riparian Scrub Mosaic	634	29	29	100%	N/A	92%	92%	0%	0%	0%	92%	0%
Heathy Dry Forest/Sand Heathland Mosaic	771	5	4	82%	N/A	2%	2%	0%	0%	0%	2%	98%
Heathy Dry Forest/Shrubby Woodland Mosaic	392	61	60	99%	N/A	96%	97%	0%	0%	0%	97%	0%
Heathy Dry Forest/Valley Grassy Forest Mosaic	390	434	434	100%	N/A	98%	98%	0%	0%	0%	98%	2%
Heathy Herb-rich Woodland*	179	41,477	26,230	63%	V	25%	24%	16%	0%	0%	40%	41%
Heathy Herb-rich Woodland/Damp Sands Herb-rich Woodland Mosaic	785	5,332	1,074	20%	N/A	9%	41%	4%	0%	0%	45%	55%
Heathy Woodland	48	223,685	194,502	87%	-	56%	46%	19%	0%	0%	64%	21%
Heathy Woodland/Damp Heathland Mosaic	478	25,838	15,597	60%	N/A	43%	18%	54%	0%	0%	72%	26%
Heathy Woodland/Grassy Dry Forest Mosaic	481	1,377	1,377	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Heathy Woodland/Heathy Herb-rich Woodland Mosaic	790	3,800	2,885	76%	N/A	68%	4%	86%	0%	0%	89%	6%
Heathy Woodland/Limestone Woodland Mosaic	737	3,583	3,415	95%	N/A	85%	89%	0%	0%	0%	89%	6%
Heathy Woodland/Plains Grassy Woodland Mosaic	493	1,808	1,377	76%	N/A	36%	21%	26%	0%	0%	47%	45%
Heathy Woodland/Riparian Scrub Mosaic	467	11	11	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Heathy Woodland/Sand Heathland Mosaic	892	8,613	5,774	67%	N/A	42%	50%	13%	0%	0%	63%	37%

Heathy Woodland/Seasonally Inundated Shrubby Woodland Mosaic	756	458	215	47%	N/A	19%	0%	40%	0%	0%	40%	16%
Heathy Woodland/Sedgy Riparian Woodland Mosaic	475	26	22	85%	N/A	43%	51%	0%	0%	0%	51%	36%
Heathy Woodland/Shrubby Woodland Mosaic	471	360	354	98%	N/A	86%	87%	0%	0%	0%	87%	11%
Heathy Woodland/Valley Grassy Forest Mosaic	464	202	199	98%	N/A	95%	97%	0%	0%	0%	97%	1%
Herb-rich Foothill Forest*	23	231,180	95,173	41%	V	9%	11%	9%	1%	0%	21%	57%
Herb-rich Foothill Forest/Grassy Dry Forest Mosaic	381	7	7	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Herb-rich Foothill Forest/Lowland Forest Mosaic	378	14	14	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Herb-rich Foothill Forest/Sedgy Riparian Woodland Mosaic	380	13	13	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Herb-rich Foothill Forest/Shrubby Foothill Forest Mosaic	178	12,963	9,243	71%	N/A	16%	16%	6%	1%	0%	23%	20%
Herb-rich Heathy Forest	278	431	431	100%	V	100%	100%	0%	0%	0%	100%	0%
Hillcrest Herb-rich Woodland*	70	821	728	89%	V	47%	33%	20%	0%	0%	53%	47%
Hills Herb-rich Woodland*	71	36,441	25,867	71%	V	31%	41%	2%	0%	1%	44%	54%
Hills Herb-rich Woodland/Grassy Dry Forest Mosaic	789	55	55	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Hills Herb-rich Woodland/Heathy Woodland Mosaic	727	765	765	100%	N/A	98%	98%	0%	0%	0%	98%	2%
Hills Herb-rich Woodland/Lateritic Woodland Mosaic	761	151	131	87%	N/A	0%	0%	0%	0%	0%	0%	100%
Hills Herb-rich Woodland/Plains Grassy Woodland Mosaic	745	5,878	2,993	51%	N/A	5%	0%	10%	0%	0%	10%	79%
Hills Herb-rich Woodland/Shrubby Woodland Mosaic	773	106	106	100%	N/A	97%	97%	0%	0%	0%	97%	3%
Hills Herb-rich Woodland/Valley Grassy Forest Mosaic	759	150	150	100%	N/A	52%	52%	0%	0%	0%	52%	48%
Lateritic Woodland	704	7,252	6,533	90%	V	62%	28%	41%	0%	0%	69%	24%
Lateritic Woodland/Heathy Dry Forest Mosaic	760	116	107	93%	N/A	1%	1%	0%	0%	0%	1%	99%
Lateritic Woodland/Heathy Woodland Mosaic	764	83	77	93%	N/A	32%	1%	34%	0%	0%	35%	65%
Lignum Swampy Woodland*	823	222	221	99%	V	38%	0%	38%	0%	0%	38%	40%
Limestone Ridge Woodland	664	29	28	98%	V	76%	78%	0%	0%	0%	78%	22%
Limestone Rise Grassland/Limestone Rise Woodland Mosaic	736	98	97	99%	N/A	76%	0%	77%	0%	0%	77%	6%
Limestone Woodland	670	72	72	100%	E	100%	100%	0%	0%	0%	100%	0%
Low Rises Woodland*	66	5,259	2,540	48%	V	16%	32%	0%	0%	0%	32%	52%
Lowland Forest*	16	172,485	98,691	57%	V	27%	45%	1%	0%	0%	46.8%	25%
Lowland Forest/Grassy Dry Forest Mosaic	388	60	60	100%	N/A	97%	97%	0%	0%	0%	97%	3%
Lowland Forest/Heathy Dry Forest Mosaic	382	743	743	100%	N/A	99%	99%	0%	0%	0%	99%	1%
Lowland Forest/Heathy Woodland Mosaic	698	66	66	100%	N/A	100%	100%	0%	0%	0%	100%	0%

Lowland Forest/Riparian Forest Mosaic	385	25	25	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Lowland Forest/Riparian Scrub Mosaic	386	10	10	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Lowland Forest/Shrubby Woodland Mosaic	590	26	26	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Lowland Forest/Valley Grassy Forest Mosaic	383	1,318	1,196	91%	N/A	76%	84%	0%	0%	0%	84%	16%
Lunette Woodland*	652	1,932	672	35%	E	3%	9%	0%	0%	0%	9%	80%
Metamorphic Slopes Shrubby Woodland*	69	79	45	57%	V	0%	0%	0%	0%	0%	0%	100%
Montane Grassy Woodland	37	14	14	100%	V	100%	100%	0%	0%	0%	100%	0%
Montane Grassy Woodland/Rocky Outcrop Shrubland Mosaic	859	9	9	100%	N/A	65%	65%	0%	0%	0%	65%	0%
Montane Rocky Shrubland/Shrubby Foothill Forest Mosaic	336	20	20	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Plains Grassland/Plains Grassy Woodland Mosaic	897	16,102	6,290	39%	N/A	1%	1%	0%	0%	0%	1%	96%
Plains Grassy Woodland*	55	1,124,207	230,188	20%	V	1%	4%	2%	0%	0%	6%	85%
Plains Grassy Woodland/Creekline Grassy Woodland Mosaic	261	489	354	72%	N/A	0%	0%	0%	0%	0%	0%	99%
Plains Grassy Woodland/Plains Swampy Woodland Mosaic	739	5,400	704	13%	N/A	1%	2%	2%	0%	0%	4%	93%
Plains Grassy Woodland/Sand Heathland Mosaic	498	7	7	100%	N/A	9%	0%	0%	9%	0%	9%	15%
Plains Grassy Woodland/Shrubby Woodland Mosaic	730	75	74	99%	N/A	65%	64%	1%	0%	0%	65%	35%
Plains Grassy Woodland/Stony Knoll Shrubland Mosaic	716	54,294	14,094	26%	N/A	1%	1%	0%	0%	2%	2%	98%
Plains Grassy Woodland/Valley Grassy Forest Mosaic	188	180	83	46%	N/A	0%	0%	0%	0%	0%	0%	98%
Plains Riparian Shrubby Woodland*	659	416	391	94%	E	7%	7%	0%	0%	0%	7%	13%
Plains Sedgy Woodland*	283	4,403	3,745	85%	V	37%	15%	28%	1%	0%	44%	43%
Plains Swampy Woodland*	651	17,263	1,267	7%	E	0%	4%	2%	0%	0%	6%	90%
Plains Swampy Woodland/Swamp Scrub Mosaic	776	2,666	285	11%	N/A	1%	2%	4%	0%	0%	6%	83%
Plains Woodland*	803	449,361	77,667	17%	V	1%	2%	1%	0%	0%	4%	93%
Plains Woodland/Damp Sands Herb-rich Woodland Mosaic	787	5,753	3,182	55%	N/A	6%	3%	7%	0%	0%	10%	76%
Plains Woodland/Herb-rich Gilgai Wetland Mosaic	235	453	397	88%	N/A	0%	0%	0%	0%	0%	0%	99%
Plains Woodland/Plains Grassy Wetland Mosaic	660	1,509	1,201	80%	N/A	53%	4%	38%	25%	0%	67%	32%
Riparian Forest*	18	10,282	7,516	73%	V	25%	28%	6%	0%	0%	34%	29%
Riparian Forest/Creekline Grassy Woodland Mosaic	293	157	118	75%	N/A	1%	1%	0%	0%	0%	1%	82%
Riparian Forest/Sedgy Riparian Woodland Mosaic	506	9	9	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Riparian Forest/Swampy Riparian Woodland Mosaic	237	376	221	59%	N/A	0%	0%	0%	0%	0%	0%	89%
Riparian Scrub/Seasonally Inundated Shrubby Woodland Mosaic	512	8	8	100%	N/A	100%	100%	0%	0%	0%	100%	0%

Riparian Scrub/Sedgy Riparian Woodland Mosaic	596	556	426	77%	N/A	67%	88%	0%	0%	0%	88%	0%
Riparian Scrub/Swampy Riparian Forest Mosaic	17	6,780	5,067	75%	N/A	39%	52%	0%	0%	0%	52%	27%
Riparian Shrubland/Grassy Woodland Mosaic	666	2,673	158	6%	N/A	0%	4%	0%	0%	0%	4%	84%
Riparian Shrubland/Swampy Riparian Woodland Mosaic	269	142	110	78%	N/A	0%	0%	0%	0%	0%	0%	67%
Riparian Woodland*	641	24,312	10,290	42%	V	2%	3%	2%	0%	0%	5%	62%
Riparian Woodland/Escarpment Shrubland Mosaic	668	560	231	41%	N/A	0%	1%	0%	0%	0%	1%	71%
Riverine Chenopod Woodland*	103	10,173	2,268	22%	V	1%	6%	0%	0%	0%	6%	70%
Riverine Grassy Woodland/Sedgy Riverine Forest Mosaic	1041	1,110	597	54%	N/A	0%	0%	0%	0%	0%	0%	55%
Rocky Chenopod Woodland*	64	1,751	1,159	66%	R	29%	43%	0%	0%	0%	43%	53%
Rocky Outcrop Shrubland/Heathy Dry Forest Mosaic	357	147	147	100%	N/A	99%	99%	0%	0%	0%	99%	1%
Rocky Outcrop Shrubland/Heathy Woodland Mosaic	358	6	6	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Rocky Outcrop Shrubland/Lowland Forest Mosaic	355	3	3	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Salt Paperbark Woodland*	676	188	181	96%	R	44%	37%	6%	0%	3%	46%	54%
Salt Paperbark Woodland/Samphire Shrubland Mosaic	741	328	316	96%	N/A	82%	84%	1%	0%	0%	85%	15%
Sand Forest*	134	1,553	1,111	72%	V	4%	3%	3%	0%	0%	6%	90%
Sand Heathland/Seasonally Inundated Shrubby Woodland Mosaic	502	34	34	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Sand Ridge Woodland*	264	996	516	52%	V	8%	13%	3%	0%	0%	16%	82%
Sand Ridge Woodland/Damp Sands Herb-rich Woodland Mosaic	729	428	287	67%	N/A	0%	0%	0%	0%	0%	0%	71%
Sandy Stream Woodland*	674	7,325	2,961	40%	V	0%	1%	0%	0%	0%	1%	92%
Scoria Cone Woodland*	894	15,507	2,500	16%	V	1%	6%	0%	0%	0%	6%	82%
Scree-slope Woodland	709	32	32	100%	V	100%	100%	0%	0%	0%	100%	0%
Seasonally Inundated Shrubby Woodland*	195	8,767	6,844	78%	R	35%	35%	10%	0%	0%	45%	51%
Seasonally Inundated Shrubby Woodland/Heathland Thicket Mosaic	529	32	32	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Seasonally Inundated Shrubby Woodland/Plains Sedgy Woodland Mosaic	751	3,485	2,016	58%	N/A	19%	10%	22%	1%	0%	33%	55%
Seasonally Inundated Shrubby Woodland/Sedge Wetland Mosaic	531	11	11	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Sedge-rich Woodland	65	179	179	100%	V	88%	86%	2%	0%	0%	88%	9%
Sedgy Riparian Woodland*	198	12,010	8,166	68%	R	35%	42%	7%	1%	0%	51%	30%
Sedgy Riparian Woodland/Dry Creekline Woodland Mosaic	516	31	31	100%	N/A	98%	98%	0%	0%	0%	98%	2%
Sedgy Riparian Woodland/Riparian Shrubland Mosaic	515	18	18	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Sedgy Swamp Woodland*	707	356	195	55%	V	3%	0%	6%	0%	0%	6%	92%

Semi-arid Woodland*	97	20	5	23%	E	0%	0%	0%	0%	0%	0%	50%
Shallow Freshwater Marsh/Seasonally Inundated Shrubby Woodland Mosaic	521	6	6	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Shallow Sands Woodland*	882	46,053	23,002	50%	V	12%	15%	8%	0%	0%	23%	66%
Shallow Sands Woodland/Heathy Herb-rich Woodland Mosaic	788	69	66	96%	N/A	0%	0%	0%	0%	0%	0%	100%
Shallow Sands Woodland/Heathy Woodland Mosaic	748	958	891	93%	N/A	78%	64%	19%	0%	0%	83%	16%
Shallow Sands Woodland/Plains Sedgy Woodland Mosaic	711	28,087	17,551	62%	N/A	19%	14%	15%	0%	0%	30%	56%
Shrubby Dry Forest	21	11,523	10,463	91%	V	58%	63%	1%	0%	0%	64%	24%
Shrubby Foothill Forest	45	80,939	71,647	89%	-	40%	36%	8%	2%	0%	45%	18%
Shrubby Foothill Forest/Heathy Dry Forest Mosaic	377	108	108	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Shrubby Foothill Forest/Lowland Forest Mosaic	376	416	416	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Shrubby Wet Forest*	201	37,246	32,482	87%	V	44%	50%	0%	0%	0%	50.4%	21%
Shrubby Woodland	282	11,130	9,696	87%	-	55%	62%	1%	0%	0%	63%	33%
Shrubby Woodland/Alluvial Terraces Herb-rich Woodland Mosaic	438	251	250	100%	N/A	87%	87%	0%	0%	0%	87%	12%
Shrubby Woodland/Lateritic Woodland Mosaic	766	15	14	92%	N/A	4%	4%	0%	0%	0%	4%	96%
Shrubby Woodland/Riparian Scrub Mosaic	799	121	98	80%	N/A	65%	81%	0%	0%	0%	81%	1%
Shrubby Woodland/Sand Heathland Mosaic	448	24	24	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Shrubby Woodland/Seasonally Inundated Shrubby Woodland Mosaic	443	33	33	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Shrubby Woodland/Sedgy Riparian Woodland Mosaic	450	104	103	99%	N/A	60%	60%	0%	0%	0%	60%	20%
Spring Soak Woodland*	80	4	2	49%	E	19%	39%	0%	0%	0%	39%	61%
Stony Knoll Shrubland/Basalt Shrubby Woodland Mosaic	744	223	16	7%	N/A	0%	0%	0%	0%	0%	0%	100%
Stony Rises Woodland*	203	76,072	43,713	57%	V	14%	23%	0%	0%	1%	24%	74%
Stony Rises Woodland/Stony Knoll Shrubland Mosaic	792	3,588	3,317	92%	N/A	48%	0%	38%	0%	14%	52%	47%
Swampy Riparian Woodland*	83	11,181	3,001	27%	V	0%	0%	0%	0%	0%	0%	84%
Swampy Riparian Woodland/Spring Soak Woodland Mosaic	272	54	35	65%	N/A	0%	0%	0%	0%	0%	0%	100%
Valley Grassy Forest*	47	66,800	36,652	55%	V	12%	17%	5%	0%	0%	22%	74%
Valley Grassy Forest/Creekline Grassy Woodland Mosaic	890	426	263	62%	N/A	0%	0%	0%	0%	0%	0%	92%
Valley Grassy Forest/Damp Sands Herb-rich Woodland Complex	411	53	53	100%	N/A	98%	98%	0%	0%	0%	98%	2%
Valley Grassy Forest/Grassy Dry Forest Mosaic	265	140	140	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Valley Grassy Forest/Herb-rich Foothill Forest Mosaic	408	9	9	100%	N/A	84%	84%	0%	0%	0%	84%	16%
Valley Grassy Forest/Lateritic Woodland Mosaic	796	38	30	78%	N/A	1%	1%	0%	0%	0%	1%	99%

Valley Grassy Forest/Sedgy Riparian Woodland Mosaic	410	37	37	100%	N/A	98%	98%	0%	0%	0%	98%	2%
Valley Grassy Forest/Shrubby Woodland Mosaic	413	23	23	100%	N/A	95%	95%	0%	0%	0%	95%	5%
Valley Heathy Forest*	127	1,473	1,060	72%	R	1%	1%	0%	0%	0%	1%	98%
Valley Slopes Dry Forest*	177	14	14	100%	R	84%	84%	0%	0%	0%	84%	16%
Warm Temperate Rainforest*	32	38	13	36%	E	36%	100%	0%	0%	0%	100%	0%
Wet Forest	30	47,470	40,329	85%	V	53%	62%	0%	0%	0%	62%	23%
Wet Forest/Damp Forest Mosaic	589	18	18	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Wet Heathland/Heathy Woodland Mosaic	645	6,356	4,665	73%	N/A	64%	86%	1%	0%	0%	87%	12%
Cool Temperate Rainforest niche	31	#N/A	10,827	#N/A	N/A	#N/A	72%	0%	3%	0%	75%	17%
Warm Temperate Rainforest niche	32	#N/A	24	#N/A	N/A	#N/A	100%	0%	0%	0%	100%	0%

Table 5.5b Representative conservation (percentage reservation status) of non-Forest EVCs[a] in the CAR Reserve System in the West RFA Region as at 2019.

Ecosystem type	EVC number	Pre-1750 extent (ha)	Current extent (ha)	Percent remaining	Status[b]	% of pre-1750 extent in the CAR Reserve System	% of current extent in the CAR Reserve System					% of current extent on private land
							Dedicated	Informal[c]	Prescription[d]	Private land covenants[e]	Total	
Aquatic Herbland*	653	2,513	1,889	75%	R	19%	18%	6%	1%	0%	25%	72%
Aquatic Herbland/Plains Sedgy Wetland Mosaic	691	30,169	16,725	55%	N/A	10%	16%	1%	0%	1%	18%	77%
Brackish Drainage-line Aggregate	643	1,521	683	45%	N/A	2%	3%	0%	0%	0%	3%	96%
Brackish Lake Aggregate	636	3,657	3,615	99%	N/A	6%	6%	0%	0%	0%	6%	8%
Brackish Sedgeland*	13	576	488	85%	R	34%	35%	4%	0%	0%	40%	60%
Brackish Wetland*	656	1,070	654	61%	R	19%	29%	2%	0%	0%	31%	66%
Cane Grass Wetland*	291	1,490	1,382	93%	V	45%	48%	1%	0%	0%	49%	46%
Cane Grass-Lignum Halophytic Herbland*	898	137	109	80%	R	56%	71%	0%	0%	0%	71%	29%
Clay Heathland	7	32	32	99%	V	98%	99%	0%	0%	0%	99%	1%
Claypan Ephemeral Wetland	284	3	3	100%	R	100%	100%	0%	0%	0%	100%	0%
Coast Gully Thicket	181	345	217	63%	V	46%	72%	0%	0%	0%	72%	23%
Coastal Alkaline Scrub	858	18,234	10,762	59%	V	40%	67%	2%	0%	0%	69%	29%
Coastal Dune Scrub	160	4,849	4,006	83%	V	52%	63%	0%	0%	0%	63%	28%
Coastal Dune Scrub/Coastal Dune Grassland Mosaic	1	2,705	2,001	74%	N/A	49%	67%	0%	0%	0%	67%	13%
Coastal Headland Scrub	161	5,457	4,154	76%	-	54%	70%	0%	0%	0%	71%	26%
Coastal Landfill/Sand Accretion	797	77	33	42%	R	33%	78%	0%	0%	0%	78%	16%
Coastal Mallee Scrub*	665	597	332	56%	R	36%	60%	0%	0%	5%	65%	35%
Coastal Saltmarsh*	9	1,519	488	32%	V	9%	27%	0%	0%	0%	27%	31%
Coastal Saltmarsh/Mangrove Shrubland Mosaic	302	5,064	3,948	78%	N/A	46%	59%	0%	0%	0%	59%	33%
Coastal Sand Heathland	5	33	32	97%	R	97%	100%	0%	0%	0%	100%	0%
Coastal Tussock Grassland	163	728	615	84%	V	65%	77%	0%	0%	0%	77%	14%
Coastal Tussock Grassland /Coastal Headland scrub mosaic	162	1,453	1,033	71%	N/A	46%	65%	0%	0%	0%	65%	35%

Damp Heath Scrub	165	17,775	3,911	22%	V	14%	63%	0%	0%	0%	63%	36%
Damp Heathland*	710	7,646	5,794	76%	R	47%	35%	27%	1%	0%	63%	12%
Damp Heathland/Riparian Scrub Mosaic	595	28	28	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Damp Heathland/Sand Heathland Mosaic	762	937	897	96%	N/A	71%	43%	30%	1%	0%	74%	6%
Damp Heathland/Wet Heathland Mosaic	625	10	10	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Deep Freshwater Marsh	681	6,644	3,660	55%	-	24%	42%	1%	0%	0%	43%	43%
Escarpment Shrubland*	895	3,886	1,890	49%	V	1%	1%	0%	0%	1%	2%	90%
Estuarine Wetland*	10	1,334	1,082	81%	V	17%	21%	0%	0%	0%	21%	62%
Floodplain Reedbed*	863	112	112	100%	R	78%	78%	0%	0%	0%	78%	22%
Floodplain Thicket*	280	3,191	2,924	92%	R	81%	77%	11%	0%	0%	88%	1%
Floodplain Thicket/Damp Heathland mosaic	434	22	22	100%	N/A	80%	0%	80%	0%	0%	80%	0%
Floodplain Thicket/Riparian Scrub Complex	430	54	54	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Floodplain Thicket/Wet Heathland Mosaic	585	44	44	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Freshwater Lake Aggregate	718	375	343	92%	N/A	40%	44%	0%	0%	0%	44%	56%
Freshwater Lignum Shrubland*	657	830	793	95%	R	14%	12%	1%	3%	0%	15%	84%
Freshwater Meadow*	680	1,706	989	58%	R	5%	5%	4%	0%	0%	9%	87%
Heathland Thicket	279	667	667	100%	V	98%	92%	6%	0%	0%	98%	1%
Heathland Thicket/Sand Heathland Mosaic	426	14	14	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Heathland Thicket/Wet Heathland Mosaic	427	10	10	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Inland Saltmarsh*	677	352	320	91%	R	62%	68%	0%	0%	0%	68%	32%
Lignum Swamp*	104	399	210	53%	R	0%	0%	0%	0%	0%	0%	96%
Lignum-Cane Grass Swamp*	655	539	462	86%	R	23%	27%	0%	0%	0%	27%	73%
Limestone Pomaderris Shrubland	133	4	4	100%	V	100%	100%	0%	0%	0%	100%	0%
Mangrove Shrubland*	140	93	87	93%	V	51%	54%	0%	0%	0%	54%	42%
Mangrove Shrubland/Estuarine Flats Grassland Mosaic	903	61	46	76%	N/A	56%	73%	0%	0%	0%	73%	0%
Montane Rocky Shrubland	192	1,873	1,873	100%	V	100%	100%	0%	0%	0%	100%	0%
Montane Wet Heathland	184	54	54	100%	V	100%	100%	0%	0%	0%	100%	0%
Permanent Open Freshwater	682	671	655	98%	N/A	80%	82%	0%	0%	0%	82%	18%
Permanent Saline	684	979	965	99%	N/A	41%	42%	0%	0%	0%	42%	8%
Plains Brackish Sedge Wetland	891	29	29	99%	V	77%	78%	0%	0%	0%	78%	22%

Plains Freshwater Sedge Wetland	899	91	88	97%	V	93%	97%	0%	0%	0%	97%	3%
Plains Grassland*	132	861,000	114,021	13%	V	0%	2%	0%	0%	1%	4%	94%
Plains Grassland/Stony Knoll Shrubland Mosaic	715	6	3	41%	N/A	11%	28%	0%	0%	0%	28%	72%
Plains Grassy Wetland*	125	43,755	18,067	41%	V	0%	0%	0%	0%	1%	1%	98%
Plains Grassy Wetland/Red Gum Wetland Mosaic	832	102	98	95%	N/A	3%	3%	0%	0%	0%	3%	96%
Plains Savannah*	826	1,944	116	6%	E	0%	0%	0%	0%	0%	0%	88%
Plains Sedgy Wetland*	647	33,664	18,661	55%	V	1%	1%	0%	0%	0%	2%	93%
Red Gum Swamp*	292	32,755	22,706	69%	V	5%	5%	1%	1%	0%	7%	87%
Red Gum Wetland/Aquatic Herbland Mosaic	886	1,280	1,216	95%	N/A	27%	26%	2%	0%	0%	28%	68%
Red Gum Wetland/Shallow Freshwater Marsh Mosaic	458	30	28	94%	N/A	23%	25%	0%	0%	0%	25%	31%
Reed Swamp*	300	682	670	98%	R	83%	84%	0%	0%	0%	84%	7%
Riparian Scrub*	191	6,712	5,424	81%	R	57%	52%	18%	0%	0%	71%	26%
Riparian Scrub/Heathland Thicket Mosaic	509	85	85	100%	N/A	100%	100%	0%	0%	0%	100%	0%
Riparian Shrubland*	19	196	189	96%	R	45%	41%	6%	0%	0%	47%	32%
Rocky Outcrop Herbland	193	10,029	10,027	100%	V	99%	99%	0%	0%	0%	99%	0%
Rocky Outcrop Shrubland	28	14,155	14,109	100%	V	95%	90%	6%	0%	0%	96%	1%
Rocky Outcrop Shrubland/Rocky Outcrop Herbland Mosaic	73	10,038	9,474	94%	N/A	84%	82%	7%	0%	0%	89%	9%
Saline Lake Aggregate	717	2,691	2,562	95%	N/A	21%	22%	0%	0%	0%	22%	69%
Sand Heathland	6	15,453	15,043	97%	-	90%	83%	9%	0%	0%	92%	6%
Sandstone Ridge Shrubland*	93	1,442	651	45%	R	15%	34%	0%	0%	0%	34%	66%
Seasonally Inundated Sub-saline Herbland	196	58	58	100%	R	100%	100%	0%	0%	0%	100%	0%
Sedge Wetland*	136	4,471	3,424	77%	R	44%	23%	31%	3%	0%	57%	39%
Semi-Permanent Saline	683	1,147	1,113	97%	N/A	69%	68%	2%	0%	1%	71%	29%
Shallow Freshwater Marsh	200	5,139	3,317	65%	-	19%	22%	3%	0%	4%	30%	64%
Shallow Freshwater Marsh/Floodplain Thicket Mosaic	519	124	96	78%	N/A	35%	44%	0%	0%	0%	44%	0%
Spray-zone Coastal Shrubland	876	96	92	96%	R	96%	100%	0%	0%	0%	100%	0%
Stony Knoll Shrubland*	649	175	3	2%	E	0%	0%	0%	0%	0%	0%	100%
Stream Bank Shrubland	851	6,595	4,647	70%	-	14%	18%	2%	0%	0%	20%	60%
Swamp Scrub*	53	53,679	11,264	21%	V	4%	13%	3%	0%	0%	17%	71%
Swamp Scrub/Aquatic Herbland Mosaic	720	2,437	1,190	49%	N/A	15%	29%	0%	0%	2%	30%	66%

Swamp Scrub/Plains Sedgy Wetland Mosaic	733	8,985	1,276	14%	N/A	0%	2%	0%	0%	1%	3%	87%
Swampy Riparian Complex	126	518	54	10%	N/A	0%	0%	0%	0%	0%	0%	100%
Water Body - Fresh	992	14,189	12,908	91%	N/A	21%	23%	0%	0%	0%	24%	17%
Water body - salt	991	52,051	50,427	97%	N/A	15%	16%	0%	0%	0%	16%	13%
Water Body - to be determined	983	186	179	96%	N/A	4%	4%	0%	0%	0%	4%	41%
Wet Heathland*	8	11,725	8,192	70%	R	58%	75%	8%	0%	0%	83%	12%
Wet heathland/Riparian scrub mosaic	768	74	68	92%	N/A	78%	85%	0%	0%	0%	85%	15%
Wet Sands Thicket*	233	1,292	1,259	97%	R	71%	73%	0%	0%	0%	73%	6%
Wetland Formation*	74	870	524	60%	R	29%	48%	0%	0%	0%	48%	31%

NOTES ACCOMPANYING TABLES 1 – 5

a. The figures shown in this table are based on modelled information mapped at a scale of 1:100,000 derived during the pre-1750 analysis of vegetation types in the Central Highlands and are therefore only approximate. EVC mapping used in 1998 has been revised to ensure the state-wide EVC data set is based on the best available information and integrates new methods of mapping and modelling vegetation across Victoria. As a result, information relating to EVC extent or reservation levels between 1998 and 2019 is not directly comparable and may differ due to the different modelling and mapping approaches. Differences between the two data sets include: changes to how the pre-1750 EVC dataset was created, changes to how DEWP creates a view of EVC extent (using a new native vegetation extent model and the pre 1750 dataset), applying nomenclature standards to EVCs which may have resulted in the discontinuation of certain EVC names, the splitting of EVCs, reconciliation of mapping units (such as mosaics and complexes), the delineation of new EVC types and spatial adjustments.

b. E=endangered, V=vulnerable, R=rare in accordance with the JANIS Reserve Criteria. Complexes, Mosaics, Aggregates and Niches are mapping units and not assigned a conservation status.

c. Informal Reserve includes broad areas and linear elements of SPZ and other informal reserves,

d. This comprises areas protected by prescription, including stream buffers and rainforest outlined in the Code of Practice, where these values and prescriptions are identified spatially. Areas protected by prescription are modelled only and subject to field verification.

e. Private Land Covenants includes areas protected under conservation covenants under the *Victorian Conservation Trust Act 1972* and Land Management Cooperative Agreements under the *Conservation Forests and Lands Act 1987*.

f. IPAs: Immediate Protection Areas in the Central Highlands announced on 7 November 2019. Tenure arrangements for IPAs will be confirmed via a community engagement process in 2020-21.

g. MOG is modelled and actual areas protected from timber harvesting is determined through in-field detection. Areas of old growth greater than 3ha will be included Informal Areas, other areas will be protected by prescription.

Rainforest Niche: Mapping unit – indicates area of potential or unverified modelled rainforest as distinct from confirmed rainforest.

* Indicates priority EVCs for increased protection in the CAR Reserve System. Priorities for inclusion in the CAR Reserve System have been identified according to the remaining extent occurring on private or public land and the ability of publicly managed land to meet the conservation objectives for EV

6. Wetland type within the CAR reserve system 2018

RFA region and land type	Area ('000 hectares)							
	Dedicated Reserve	GMZ	Other Public Land	Private	SMZ	SPZ	Other State forest	Protected[53]
East Gippsland								
Coastal saltmarsh	290	0	410	50	0	0		290
Estuary	40	0	0	0	0	10		50
High country peatlands	30	10	0	0	0	40		30
Intertidal flats	0	0	0	0	0	0		0
Permanent freshwater lakes	0	0	0	0	0	0		0
Permanent freshwater marshes and meadows	30	0	0	0	0	0		30
Permanent freshwater swamps	0	0	10	0	0	0		0
Permanent freshwater swamps/marshes/meadows	0	0	0	0	0	0		0
Permanent saline lakes	0	0	0	0	0	0		0
Permanent saline marshes and meadows	0	0	0	0	0	0		0
Permanent saline swamps	0	0	0	0	0	0		0
Permanent saline swamps/marshes/meadows	0	0	0	0	0	0		0
Temporary freshwater lakes	0	0	0	0	0	0		0
Temporary freshwater marshes and meadows	150	0	0	0	0	0		150
Temporary freshwater swamps	0	20	20	40	0	0		0
Temporary freshwater swamps/marshes/meadows	0	0	0	0	0	0		0
Temporary saline lakes	0	0	0	0	0	0		0
Temporary saline marshes and meadows	0	0	0	0	0	0		0
Temporary saline swamps	0	0	0	0	0	0		0
Temporary saline swamps/marshes/meadows	0	0	0	0	0	0		0
Unknown	200	20	10	100	10	0		200
Gippsland								
Coastal saltmarsh	1270	0	1090	610		0		1270
Estuary	20	0	0	10		0		20
High country peatlands	100	10	0	20		30		130
Intertidal flats	540	0	10	130		0		540
Permanent freshwater lakes	20	10	170	170		0		20
Permanent freshwater marshes and meadows	60	0	20	40		0		60

[53] Protected = Dedicated Reserve + SPZ

Permanent freshwater swamps	0	0	10	40	0	0
Permanent freshwater swamps/marshes/meadows	0	0	0	0	0	0
Permanent saline lakes	100	0	2180	40	0	100
Permanent saline marshes and meadows	100	0	0	140	0	100
Permanent saline swamps	0	0	0	0	0	0
Permanent saline swamps/marshes/meadows	0	0	0	0	0	0
Temporary freshwater lakes	0	0	0	60	0	0
Temporary freshwater marshes and meadows	50	0	20	210	0	50
Temporary freshwater swamps	80	10	10	200	40	120
Temporary freshwater swamps/marshes/meadows	0	0	0	0	0	0
Temporary saline lakes	0	0	0	0	0	0
Temporary saline marshes and meadows	100	0	10	10	0	100
Temporary saline swamps	0	0	0	0	0	0
Temporary saline swamps/marshes/meadows	0	0	0	0	0	0
Unknown	760	0	320	680	0	760
Central Highlands						
Coastal saltmarsh	0	0	0	0	0	0
Estuary	0	0	0	0	0	0
High country peatlands	40	0	0	0	10	50
Intertidal flats	0	0	0	0	0	0
Permanent freshwater lakes	210	10	780	60	0	210
Permanent freshwater marshes and meadows	0	0	0	0	0	0
Permanent freshwater swamps	0	0	0	10	0	0
Permanent freshwater swamps/marshes/meadows	0	0	0	0	0	0
Permanent saline lakes	0	0	0	0	0	0
Permanent saline marshes and meadows	0	0	0	0	0	0
Permanent saline swamps	0	0	0	0	0	0
Permanent saline swamps/marshes/meadows	0	0	0	0	0	0
Temporary freshwater lakes	0	0	0	10	0	0
Temporary freshwater marshes and meadows	0	0	0	40	0	0
Temporary freshwater swamps	10	0	0	100	0	10
Temporary freshwater swamps/marshes/meadows	0	0	0	0	0	0

Temporary saline lakes	0	0	0	0	0	0
Temporary saline marshes and meadows	0	0	0	0	0	0
Temporary saline swamps	0	0	0	0	0	0
Temporary saline swamps/marshes/meadows	0	0	0	0	0	0
Unknown	20	0	0	90	0	20
North east						
Coastal saltmarsh	0	0	0	0		0
Estuary	0	0	0	0		0
High country peatlands	150	0	0	0		150
Intertidal flats	0	0	0	0		0
Permanent freshwater lakes	190	10	2540	150		190
Permanent freshwater marshes and meadows	0	0	0	0		0
Permanent freshwater swamps	0	0	0	0		0
Permanent freshwater swamps/marshes/meadows	0	0	0	0		0
Permanent saline lakes	0	0	0	0		0
Permanent saline marshes and meadows	0	0	0	0		0
Permanent saline swamps	0	0	0	0		0
Permanent saline swamps/marshes/meadows	0	0	0	0		0
Temporary freshwater lakes	0	0	0	20		0
Temporary freshwater marshes and meadows	10	0	10	340		10
Temporary freshwater swamps	10	0	0	190		10
Temporary freshwater swamps/marshes/meadows	0	0	0	0		0
Temporary saline lakes	0	0	0	0		0
Temporary saline marshes and meadows	0	0	0	0		0
Temporary saline swamps	0	0	0	0		0
Temporary saline swamps/marshes/meadows	0	0	0	0		0
Unknown	50	0	30	470		50
West						
Coastal saltmarsh	380	0	20	320	0	0	380
Estuary	20	0	0	10	0	0	20
High country peatlands	0	0	0	0	0	0	0
Intertidal flats	0	0	0	0	0	0	0
Permanent freshwater lakes	740	0	660	290	0	0	740
Permanent freshwater marshes and meadows	0	0	0	10	0	0	0

Permanent freshwater swamps	0	0	0	20	0	0	0
Permanent freshwater swamps/marshes/meadows	0	0	0	0	0	0	0
Permanent saline lakes	3620	0	60	440	0	0	3620
Permanent saline marshes and meadows	30	0	0	0	0	0	30
Permanent saline swamps	0	0	0	0	0	0	0
Permanent saline swamps/marshes/meadows	10	0	0	0	0	0	10
Temporary freshwater lakes	200	0	920	620	0	10	210
Temporary freshwater marshes and meadows	460	20	240	4900	0	120	580
Temporary freshwater swamps	840	20	70	950	70	50	890
Temporary freshwater swamps/marshes/meadows	30	0	0	40	0	0	30
Temporary saline lakes	560	0	40	610	0	0	560
Temporary saline marshes and meadows	240	0	0	360	0	0	240
Temporary saline swamps	50	0	0	20	0	10	60
Temporary saline swamps/marshes/meadows	110	0	0	10	0	0	110
Unknown	800	30	180	7290	10	90	890

Source: Waterway land type is from the WETLANDCURRENT spatial layer in the VSDL/CSDL.

7. Special Water Supply Catchment Areas across the RFA regions (CRA)

RFA	Name of Catchment	Area (km^2)	For the protection of	Special Area	Slope (Degrees)	Seasonal Closure	Stream Buffer (m)	Filter strips (m)
East Gippsland	Betka River	117	Town Water					
	Cann River	642	Town Water					
	Brodribb River	935	Town Water, Stock and Domestic use					
	Rocky River	24	Town Water			BREAKDOWN NOT AVAILABLE		
	Buchan River	801	Town Water					
	Bemm River	904	Town Water, Stock and Domestic use					
	Tambo River	206	Town Water and Industrial Use					
	Boggy Creek	271	Town Water					
Gippsland	Agnes Creek	67	Town					
	Battery Creek (Fish Creek)	2	Town					
	Bellview and Ness Creeks (Korumburra)	6	Town					
	Billys Creek	21	Town	Yes	14		5 chain (b) 1,2,3 chain	
	Buchan River	801	Town					
	Deep Creek (Foster)	18	Town					
	Glenmaggie	1909	Irrigation			1 June - 31 Oct	40	
	Lake Hume	10062	Irrigation			1 July - 30 Sept		
	Lake Hume (northern)	6902	Town water, Irrigation	Yes	18			
	Little Bass River (Poowong-Loch)	7						
	Merrimans Creek (Seaspray)	423	Town					

	Mirboo North	8	Town				100, 20, 40	
	Mitchell River	3900	Irrigation, Town					
	Narracan Creek	82	Town					
	Nicholson River	451	Town	Yes	30		200,40	
	Rollo Creek	6	Town					
	Ruby Creek (Leongatha)	9	Town					
	Sunny Creek	5	Town					
	Tambo River	2650	Town, Industrial					
	Tanjil River	509	Town, Irrigation, Industrial	Yes		1 June - 31 Oct		
	Tarra River	28	Town	Yes		1 June - 31 Oct	200	
	Tarwin River	137	Town					
	Tyers River	317	Town	Yes		1 June - 31 Oct		
	Upper Goulburn	2836	Irrigation					
	Walkley Creek	8	Town					
Central Highlands	Upper Goulburn	3535	Irrigation	Yes	30		20	5
	Lake Eildon Environs	868	Irrigation	Yes	30		20	5
	Tyers River	317	Town water	Yes	30	1 June-31 oct	20	5
	Kilmore	5	Town water	Yes	25			
	Bunyip River	39	Town water	Yes	30	1 May - 30 Nov, 1 June-31 oct,	20	5
	Healesville	3	Town water	Special Area Plan no longer in effect				
	Mccraes Creek	5	Town water	Yes				
	Drouin	14	Town water		30	1 July - 30 Sept	20	5
	Tarago River	114	Town water	Yes	30	1 May - 31 Oct	20	5

	Micks Creek	5	Town water	Special Area Plan no longer in effect				
	Thomson River (Stages 1, 1A, 2)	332	Town water	Special Area Plan no longer in effect	30	1 May - 31 Oct	40	5
	Thomson River (Stage 3)	158	Town water		30	1 May - 31 Oct	40	5
	Running Creek (Hurstbridge).	20	Town water					
	Tanjil	509	Town water/Irrigation/Industrial	Yes	30	1 June-31 oct	20	5
	Britannia Creek	18	Town water	Yes	25	1 July- 30 Sept	20	5
	Tomahawk Creek (Gembrook)	3	Town water					
	Sunday Creek (Broadford-Kilmore)	20	Town water	Yes	30		20	5
North East	Bakers Gully (Bright)	7	Town Water					
	Barambogie Creek (Chiltern)	11	Town Water					
	Buckland River	322	Town Water					
	Buffalo River (Lake Buffalo)	1150	Irrigation					
	Diddah Diddah Creek (Springhurst)	11	Town Water					
	Fifteen Mile Creek (Glenrowan)	310	Town Water, Irrigation Stock, Domestic					
	Honeysuckle Creek (Violet Town)	25	Town Water					
	King River (Lake William Hovell)	332	Irrigation					

	Lake Hume (Northern Section)	6902	Town Water, Irrigation	Yes	18			
	Lake Hume	10062	Irrigation			1 July - 30 Sept.		
	Lake Nillahcootie	413	Irrigation, Stock, Domestic			1 June - 31 Oct.		
	Lake Eildon (environs)	868	Irrigation	Yes				
	Mitchell River (part)	3900	Town Water					
	Nine Mile Creek (Longwood)	4	Town Water					
	Nine Mile, Clear and Hurdle Creeks (Beechworth & Yackandandah)	63	Town Water					
	Ovens River (Bright)	350	Town Water					
	Ovens River (Wangaratta)	3070	Town Water					
	Ryans Creek	77	Town Water Industrial	Yes	12	1 Mar - 31 Oct 1 May - 31 Oct	100, 40, 20	
	Seven Creeks and Mountain Hut Creek (Euroa)	191	Town Water					
	Upper Goulburn	2836	Irrigation	Yes		1 June - 31 Oct		
	Upper Goulburn (Upper Delatite)	242	Town Water			1 June - 31 Oct.		
	Upper Kiewa	409	Hydroelectricity					
	Upper Kiewa (East Kiewa U2)	17	Hydroelectricity Town Water	Yes	30, 25		40, 20	

West	Avoca	10	Town	Yes			100, 40, 10 , 20	
	Ballarat	98	Town					
	Barwon Downs Intake Area (Geelong)	77	Town					
	Cairn Curran	1594	Irrigation					
	Creswick	33	Town					
	Djerriwarrh	26	Town	Yes			1 chain	
	Eppalock	2116	Irrigation					
	Eppalock (Kyneton)	12	Town	Yes			2 chain, ½ chain	
	Eppalock (Newham Parish)	14	Town	Yes				
	Fiery Creek and Tributaries (Beaufort)	8	Town					
	Forest Creek (Amphitheatre)	3 Town						
	Gellibrand River	507	Town	Yes	25	1 June – 31 October		
	Gellibrand River (South Otway)	183	Town	Yes	25	1 June – 31 October		
	Gisborne- Sunbury	6	Town	Yes			1 chain	
	Konong Wootong Reservoir (Coleraine)	11	Town					
	Lake Merrimu	85	Irrigation, Industry	Yes			5 chain (h), 1 chain (i)	
	Lake Merrimu (Goodmans Creek)	39	Irrigation, Industry, Town	Yes			5 chain (h), 1 chain (i)	
	Lake Merrimu (Lerderderg River)	218	Irrigation, Industry					
	Lal Lal Reservoir	219	Town					
	Lal Lal Reservoir (Res. Environs)	18		Yes				

	Lancefield	19	Town	Yes			1 chain	
	Langi Ghiran Reservoir (Ararat)	1	Town					
	Learmonth Borefield (Learmonth)	59	Town					
	Little Tea Tree Tributaries (Hamilton)	4	Town					
	Loddon River (Laanecoorie)	1830	Town					
	Lorne	28	Town					
	Macedon	3	Town	Yes				
	Mason Creek (Willaura)	16	Town					
	McCallum Creek	187	Town					
	Merino	51	Town					
	Mollison Creek (Pyalong)	166	Town					
	Monument Creek	9	Town					
	Moorabool River (She Oaks)	460	Town					
	Mortlake Springs (Mortlake)	14	Town					
	Mt Macedon	3	Town	Yes				
	Musical Gully and Troy Reservoirs (Beaufort)	1	Town					
	Painkalac Creek (Aireys Inlet)	34	Town			1 June – 30 September	200 (l), 40 (m)	
	Parwan	157	Irrigation					
	Pennyroyal, Matthews and Gosling Creeks	74	Town			1 June – 30 September		
	Picnic Road (Ararat)	1	Town					
	Pykes Creek Reservoir and Werribee River	237	Town					
	Riddell's Creek	5	Town	Yes			1 chain	
	Rocklands	1342	Irrigation					

Rocklands Reservoir Environs	160	Irrigation	Yes				
Romsey	9		Yes				
Rosslynne Reservoir (Jackson Creek)	85	Town	Yes				
Rosslynne Reservoir (Riddell Creek)	21	Town					
Serra Range Tributaries (Dunkeld)	48	Town					
Skenes Creek	8	Town	Yes	25	1 May – 30 November		
St Enochs Springs (Skipton)	79	Town					
Stony Creek (Geelong)	26	Town	Yes				
Sunbury	18	Town	Yes				
Trawalla Creek	108	Stock, Domestic					
Tullaroop Reservoir	722	Town					
Upper Barwon	145	Town	Ye	25	1 June – 31 October (n)	5 chain ½ chain (o)	
Wannon River Tributaries (Lake Bellfield)	2	Town					
West Barham River	12	Town		25	1 May – 30 November		
Wimmera Systems	4383	Stock, Domestic					
Malakoff Creek - Landsborough	29	Town	Yes				
Woodend	4	Town	Yes			1 chain	
Yuppeckiar Creek Reservoir (Glenthompson)	1	Town					

Data Source: Information derived from the Comprehensive Regional Assessments accessed via the ABARES website

1 chain = 20.12 metres

Note: in the Otway FMA a maximum 25o slope limitation will be applied in special water supply catchment areas; 20o and 15o slope limit will be applied in areas of Land Degradation Hazard Class 4 and 5 respectively (DCE 1992 p. 48). Seasonal closures are specified for designated catchments in the Midlands FMA (O'Shaughnessy and Associates 1995b, p53). (a) full supply level at Sugarloaf and Lead Reservoirs; (b) the upper side of water races; (c) the lower side of water races; (d) watercourses as shown on Plan No. S-221; (e) full supply level of reservoirs; (f) banks of streams, springs or watercourses; (g) off-take weir; (h) streams, springs and watercourses within catchment; (i) storages and off-take pipes; (j) banks of watercourses and springs specified on Plan No. 1297; (k) full supply

of reservoir; (l) streams shown by heavy line on Plan No. S 789 otherwise 20 m on streams shown; (m) full supply level of the West Barwon Reservoir and West Barwon River for 10 chains upstream from full supply level of reservoir; (n) seasonal closure on Upper Barwon (Dewing's Creek) from 1 June – 30 September inclusive; (o) streams, channels and off-takes as specified on Plan No. 1044

8. Harvest data per RFA and by species group

RFA	Species Group	Grade Group	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Central Highlands	Ash	D+ Sawlog	269,095	238,045	173,803	154,525	223,572	315,601	228,713	153,828	173,463	171,955	173,103	198,373	165,857	129,154	112,643
Central Highlands	Ash	E Grade & Pulplog	580,889	551,599	495,893	507,132	608,334	928,309	740,117	580,291	558,107	522,473	639,990	617,639	505,240	411,620	379,124
Central Highlands	Ash	Other	0	733	0	1,395	352	227	500	878	1,218	922	734	2,995	2,433	3,004	1,879
Central Highlands	Mixed Species	D+ Sawlog	23,309	20,395	18,173	12,941	19,279	55,607	34,681	46,596	39,571	36,901	33,628	45,049	42,999	58,488	44,727
Central Highlands	Mixed Species	E Grade & Pulplog	66,088	89,630	75,784	57,663	73,959	132,711	132,216	161,951	87,234	120,733	133,672	165,920	196,565	257,954	203,538
Central Highlands	Mixed Species	Other	0	498	0	0	81	75	0	0	1,999	1,142	2,435	2,211	3,069	7,267	3,086
East Gippsland	Ash	D+ Sawlog	9,645	5,340	5,695	2,708	3,348	204	3,316	2,630	6,767	5,795	2,916	3,211	1,417	0	0
East Gippsland	Ash	E Grade & Pulplog	31	0	20,037	18,716	19,516	7,608	6,266	6,043	10,968	8,419	4,000	2,857	797	0	0
East Gippsland	Ash	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East Gippsland	Mixed Species	D+ Sawlog	101,830	102,541	89,304	91,521	111,550	81,341	61,074	62,030	56,492	44,998	51,774	49,848	40,607	42,436	41,578
East Gippsland	Mixed Species	E Grade & Pulplog	366,600	386,460	361,626	296,630	378,608	301,354	325,611	257,989	182,228	158,077	104,840	31,121	61,170	86,305	88,007
East Gippsland	Mixed Species	Other	0	0	0	0	1,338	1,024	1,875	3,747	8,990	3,041	5,571	8,460	5,799	12,422	12,337
Gippsland	Ash	D+ Sawlog	59,210	53,815	75,706	75,671	46,244	1,780	39,946	26,463	18,844	18,406	23,658	31,693	31,524	19,174	15,035
Gippsland	Ash	E Grade & Pulplog	39,798	39,145	122,134	301,989	131,561	674	61,198	89,548	44,431	34,726	50,423	53,690	75,721	54,694	47,693
Gippsland	Ash	Other	0	0	0	0	0	0	0	0	0	114	404	538	460	1,751	731

RFA	Species Group	Grade Group	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gippsland	Mixed Species	D+ Sawlog	13,401	11,663	8,607	11,455	9,711	1,521	9,330	1,888	2,331	6,012	3,772	3,752	8,125	7,775	8,781
Gippsland	Mixed Species	E Grade & Pulplog	100,621	89,881	44,415	49,061	70,771	10,770	40,152	23,736	26,375	20,913	23,796	22,771	31,022	22,581	26,995
Gippsland	Mixed Species	Other	20	0	0	0	68	157	0	74	656	2,018	898	1,320	901	2,101	5,815
North East	Ash	D+ Sawlog	54,924	34,272	23,459	29,995	14,477	5,733	3,571	3,949	9,789	13,282	5,767	10,673	4,256	7,262	4,341
North East	Ash	E Grade & Pulplog	147,395	145,597	68,409	91,848	12,779	2,270	1,372	5,947	18,174	23,915	14,949	27,949	14,216	20,330	11,930
North East	Ash	Other	0	129	0	0	126	0	0	89	0	134	154	456	0	1,479	208
North East	Mixed Species	D+ Sawlog	930	5,160	3,944	6,382	3,656	12	34	0	1,334	2,479	0	426	2,349	1,035	3,728
North East	Mixed Species	E Grade & Pulplog	18	347	4,196	21,806	4,397	18	0	249	0	399	493	1,988	4,317	2,226	4,572
North East	Mixed Species	Other	0	0	0	0	0	0	0	0	5,323	7,393	680	969	1,323	781	3,335

RFA boundaries do not align with normal VicForests FMA boundaries, however data has been reprocessed to report via RFA region.
Harvest volumes in a year do not align with sales volumes and hence stumpage revenues in any year due to the influence of placing timber in storage for later sale
Salvage operations after 2006 and 2009 fires may distort some of the volumes/revenues
VicForests commenced operation on 1 August 2004 under a stumpage sale model transitioning to a mill door sale model in 2006/2007
Since 2004 VicForests has used three business systems, each with slight variations on how data is grouped and hence how it can be extracted
All due care has been taken in compiling this information, but it cannot be guaranteed to be without flaw