



Threatened Species and Communities Risk Assessment

Victoria's Regional Forest Agreements

October 2020



Environment,
Land, Water
and Planning

OFFICIAL

Acknowledgment

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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.



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1. Introduction

1.1 Context for the assessment

The purpose of this document is to summarise information about the targeted threatened species and communities, highlight the hazards that pose a significant or high risk of harm and describe what is currently being done to manage them. The pathways towards implementation of further risk mitigation measures are also mapped out, with greater clarity around specific measures to be provided by April 2021.

The Commonwealth and Victorian Governments renewed Victoria's five Regional Forest Agreements (RFAs) on 30 March 2020 ([further information available here](#)). RFAs seek to balance the full range of environmental, social, economic and heritage values that forests can provide for current and future generations. The amended RFAs have a duration of 10 years in line with the Victorian Government's commitment to the Victorian Forestry Plan which phases out commercial native forest harvest operations by 2030 (see section 1.2 below).

Victoria's five RFA regions are Central Highlands, Gippsland, East Gippsland, North East and West (see Figure 1). The Forest Management System they accredit (see [Overview of Victoria's Forest Management System report](#)) provides for the protection of listed species and communities via the provision of a comprehensive, adequate and representative reserve system and ecologically sustainable forest management on public and private land (e.g. through mechanisms such as the *Code of Practice for Timber Production 2014* or active management of pest animals).

The renewed RFAs strengthen environmental protections in a number of ways, with key improvements including new clauses relating to the provision of timely interventions to protect threatened species including plans for their care and protection. This risk assessment is a key component of fulfilling that requirement and is the first step in a two-year process to update statutory conservation planning documents for all listed species and communities by April 2022. This risk assessment will contribute to a number of broader forest reform deliverables, including:

- The Major Event Review which will assess the impacts of the 2019-20 Victorian bushfires and identify remedial actions (Panel findings due April 2021);
- the review of the CAR Reserve System to be undertaken by Victoria (due by December 2021);
- updated action statements and management plans under the *Flora and Fauna Guarantee Act 1988* (due by April 2022);
- the comprehensive review of the *Code of Practice for Timber Production 2014* (the Code) (due by December 2023); and
- updated forest management plans (due by December 2023).

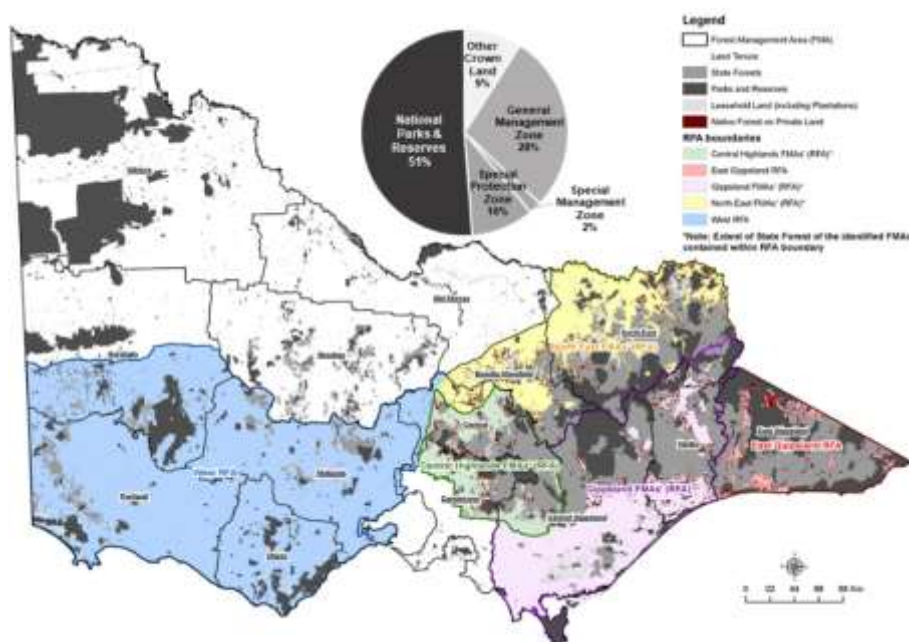


Figure 1. Victoria's five RFA regions - East Gippsland, Gippsland, Central Highlands, North East and West

1.2 Victorian Forestry Plan

The Victorian Government has developed the Victorian Forestry Plan to assist the timber harvesting industry as it manages its gradual transition away from native forest harvesting to a plantation-based timber supply.

Over the last ten years, the availability of native timber for harvesting has decreased by around half, due to bushfires and wildlife protection measures. At the same time, consumers and retailer demand has grown for plantation timber products.

In developing the Victorian Forestry Plan, the Victorian Government has aimed to strike the right balance between the environment and jobs. That includes the phasing out of all native forest harvesting by 2030, while at the same time supporting workers, businesses and communities. Under the plan, 90,000 hectares of Victoria's remaining old growth forest will be protected immediately. A further 96,000 hectares of forest across Victoria will be made exempt from timber harvesting to protect the Greater Glider and associated species. This habitat has been identified by experts as being critical to the survival of the Greater Glider and a range of other precious flora and fauna – many of which are not found anywhere else on earth.

Under the long-term plan, a \$120 million package will help make sure workers, businesses and communities have the support they need during the transition. By providing a long-term plan, timber industry workers and businesses have time to plan for their future and the industry as a whole time to transition to one based on a plantation-based timber supply.

1.3 RFA requirements

The risk assessment provided in this document is a new requirement of Victoria's five renewed RFAs. As prescribed in the RFAs, this risk assessment applies to those species or communities that are listed under Part 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) or Part 3 of the *Flora and Fauna Guarantee Act 1988* (Victoria), and are, or have the potential to be, impacted by forestry operations. A total of 79 species and communities were assessed, comprising 70 species and 9 communities¹. The relevant RFA clauses set out a timeline for conducting the risk assessment by 1 October 2020, with subsequent requirements to identify permanent protections and prepare or update statutory planning documents. Key points of the relevant clauses are as follows, noting that the Relevant Date in this case is 1 April 2020:

Victoria will, having regard to relevant Commonwealth Statutory Conservation Planning Documents:

(a) undertake a risk assessment within six months from each Relevant Date and determine whether additional interim or permanent protections and management actions are necessary;

(b) where necessary, use reasonable endeavours to implement interim enforceable protections and priority management actions for the Listed Species or Community within six months from each Relevant Date;

(c) where necessary, use reasonable endeavours to implement permanent protections and any other changes to the Forest Management System required for the Listed Species or Community within 24 months from each Relevant Date; and

(d) use reasonable endeavours to include any protections or management actions implemented pursuant to sub-paragraphs (b) or (c) in any new or updated Victorian Statutory Conservation Planning Documents.

DELWP will work with Victorian Government partners and stakeholders to prepare or update action statements and management plans under the *Flora and Fauna Guarantee Act 1988 (Vic)* for key species and communities included in this risk assessment by 1 April 2022. Section 4 of this report provides more information on the pathways towards the establishment of interim protections and other risk management actions, if required, by April 2021.

1.4 General approach

Overall risk can be thought of as the combination of **hazards** (what is the event or process that could occur) and **vulnerability** (what is the impact on the species or community of this hazard), resulting in a judgement on **consequence** (what is the impact if the hazard occurs, based on the vulnerability of the species or

¹ *Note: The FFG Listed "Alpine Bog" and "Fen (Bog Pool)" have been assessed as one community along with "Alpine Sphagnum Bogs and Associated Fens" (EPBC listing)

community); and subsequently a judgement on **likelihood** (how likely is the hazard to occur at the relevant scale to cause the consequence).

The combination of consequence and likelihood give an **overall risk rating** (what are potential impacts over time) for each hazard, for each species and community, within each RFA region (see Figure 1).

This listed species and communities risk assessment aims to identify, analyse and evaluate the **risks** to the conservation and recovery² of listed species and communities within each RFA region over a 20-year timeframe.

To achieve this aim, expert assessors are asked to list potential hazards to the conservation and recovery of individual species and communities within each RFA region, making an assessment of the vulnerability of those species to those hazards, the consequence if the hazard occurs and the likelihood of the hazard occurring within the species habitat.

Each hazard is then assigned an overall risk rating within each RFA region within the range of the species or community. Experts are asked to recommend potential mitigations for each hazard, subsequent steps in the process involve moderation of expert assessments and formulation of feasible and effective mitigations as required, including consideration of social and economic factors. This can be thought of as a 'risk-based' as opposed to 'scenario-based' risk assessment process³.

1.5 Definition of key terms and scope

Conservation and recovery of species for the purpose of the risk assessment is the maintenance of viable populations throughout their range (within an RFA region), subject to limits imposed by climate change. A viable population is considered to be sufficiently large, healthy and genetically diverse, with a robust capacity to recolonise areas of habitat following disturbance.

For communities, **conservation and recovery** for the purpose of this risk assessment is when the community can be maintained in terms of its extent, character (structure, condition and overall species richness) and key ecological functions/processes.

Species Range and Community extent within an RFA region is informed by current habitat distribution models or the mapped extent of listed communities within an RFA region, noting that the entire range of species and communities was considered, including areas securely protected in parks and reserves. Where a species or community assessor provides information that suggests the habitat distribution model does not reflect the current distribution, the assessor's best judgement of extent is used to guide the assessment.

Risk: This assessment considers risks that may result in not achieving the conservation and recovery of listed species and communities (as defined above) within each RFA region within a 20-year time scale. The components of the risk assessment (see Figure 1) in this context are defined as:

Hazard: a hazard is something that can potentially cause damage. In this context a hazard can be understood as a threatening process that impacts on a listed species or community and has the potential to limit their conservation and recovery. Clause 25D of the RFAs acknowledge that there are a range of threatening processes including habitat loss and fragmentation (such as timber harvesting and loss of hollow bearing trees), weed invasion, predation and competition, disease, inappropriate fire regimes and Climate Change. A list of hazards and vulnerability descriptors is at Appendix 2.

Vulnerability: how does the hazard impact that particular species or community if it occurs. This is defined as the direct mechanism of impact of the hazard.

Consequence: Consequence is an assessment of the outcome or impact if the hazard occurs on the species or community. Consequence assessments are rated on the level of impact to a species framed around severity, extent and duration of the hazard.

Likelihood: what is the likelihood that the hazard will occur in the 20-year time frame and what is the frequency at which the event will occur within the habitat for the species or extent of the community.

² The objective of the RFA as it relates to listed species and communities is that "Victoria will ensure that the components of its Forest Management System that relate to Listed Species and Communities will: (a) provide for the conservation and recovery of Listed Species and Communities" (Clause 25G, Central Highlands Regional Forest Agreement)

³ Compass Resource Management Ltd., Ebbwater Consulting (2015) City of Vancouver Coast Flood Risk Assessment Phase II final report, Prepared for City of Vancouver page.13

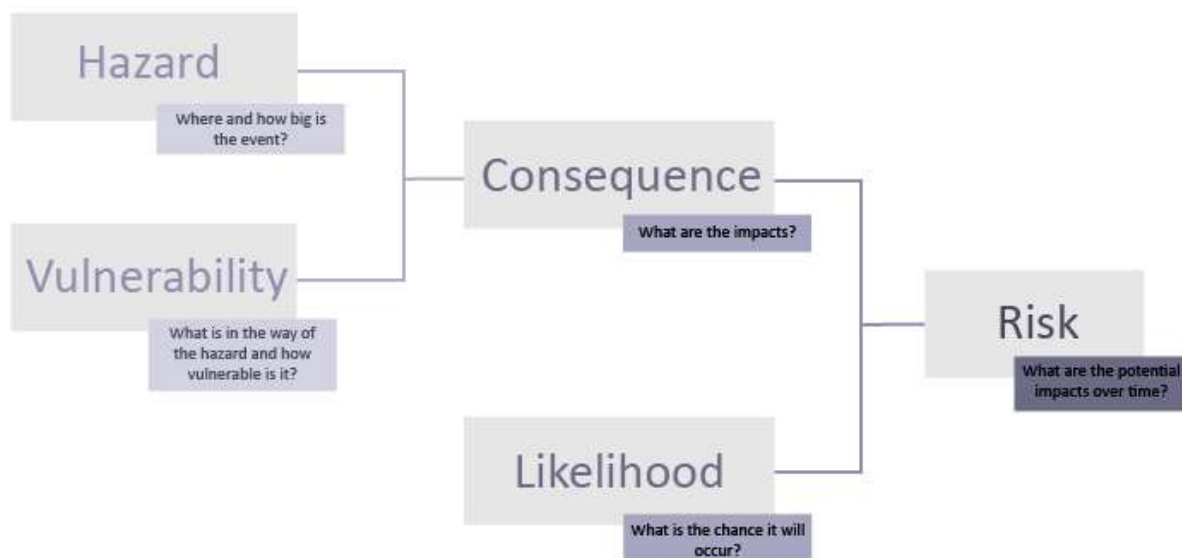


Figure 2. Factors considered in a risk assessment (Source: EBBWater 2016)

1.5.1 Geographical Scale

Hazard, Vulnerability, Consequence and Likelihood should be considered at an RFA region scale. This is in line with assessment of the JANIS criteria at an RFA scale and requirements to conduct risk assessments in each RFA region. An overall risk category for each for each species, taxon or community within each RFA region, will not be assigned. However, each risk by species and RFA region will have a rating. Risks are considered separately to ensure that controls can be appropriately designed for individual risks, however it is noted that ecological risks interact and this information is also captured through this process.

Species individual overall risk has recently been assessed as part of DELWPs Common Status Assessment project therefore this project will not duplicate the outcomes of that assessment⁴.

Experts are asked to constrain their consequence assessment for each hazard to the extent of that species or community in that RFA region. For example, if Leadbeater's Possum only occur in a small part of Gippsland RFA region, threats to its conservation and recovery should be considered in a local context – are the hazards going to cause local-extinction rather than the impact of hazards on the overall state-wide population.

1.5.2 Temporal Scale

Hazard, Vulnerability, Consequence and Likelihood have been considered across a 20-year time horizon, in line with the period of the previous RFA agreement.

1.5.3 Listed Species and Communities

The RFA defines listed species and communities as those that occur within an RFA region where those species, taxa or communities are listed under Part 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) or Part 3 of the *Flora and Fauna Guarantee Act 1988* (Victoria), and are, or have the potential to be, impacted by forestry operations. Occurrence within an RFA region is assessed using DELWP's Habitat Distribution Models. It should be noted that species included on DELWP's advisory lists but not formally listed as described above were not assessed.

There is no definitive list of species or communities that are, or have the potential to be, impacted by forestry operations. For the purpose of this risk assessment the following sources have been used to determine the list of relevant species:

- VEAC (2017) Conservation Values of State Forests 'focus' species⁵;
- Integrated Biodiversity Values Model species (DELWP Unpublished 2019);

4. Draft assessments are available online <https://www.environment.vic.gov.au/conserving-threatened-species/conservation-status-assessment-project>

5. Victorian Environmental Assessment Council (VEAC) 2017 <http://veac.vic.gov.au/investigation/assessment-of-conservation-values-of-state-forests/reports>

- Review of threats identified in species assessments for the Common Status Assessment project for forest dependent species⁶;
- Forest-dwelling threatened species and threatened forest ecological communities threat categories reported in Australia's *State of the Forests Report 2018* (Australian Bureau of Agricultural and Resource Economics and Sciences, 2020)⁷; and
- Additional expert opinion received for the purpose of the risk assessment in July 2020⁸.

A total of 70 species and nine ecological communities were assessed. The list of the species, communities and assessors is presented in **Appendix 1**.

1.6 Sources of information

The risk assessment has been informed by a number of key documents together with recent or current projects, including:

- Commonwealth conservation advices and recovery plans;
- Flora and Fauna Guarantee action statements;
- Conservation Status Assessment project species assessments;
- Biodiversity Bushfire Early Response and Recovery Program; and
- RFA Assess Program, including:
 - Landscape-scale survey program and climate change vulnerability assessment;
 - habitat distribution modelling; and
 - rainforest modelling.

1.7 Limitations and caveats

This risk assessment has been conducted as a desk-based exercise – no additional field information has been gathered specifically to inform the assessment. Limited information on bushfire impacts and post-bushfire recovery was available due to limits on access to fire-affected areas resulting from safety issues, seasonal factors and Covid-19 restrictions on movement. Typically, no more than two assessors were involved in each risk assessment, although where possible a combination of science and field staff were used. The vast majority of assessors were DELWP staff (see list at Appendix 1).

6. Draft assessments are available online <https://www.environment.vic.gov.au/conserving-threatened-species/conservation-status-assessment-project>

7. ABARES (2020) <https://www.agriculture.gov.au/abares/forestsaustralia/forest-data-maps-and-tools/data-workbooks#lists-of-forest-species-and-ecological-communities-from-australias-state-of-the-forests-report-2018>

⁸ Feedback from DELWP Regional Natural Environment Programs staff and Arthur Rylah Institute staff

1.8 Methods

The risk assessment process followed DELWP's *Risk Management Guidelines (2019)* and includes steps to identify, analyse and evaluate the risks to listed species and communities within each RFA region. Experts were also asked to identify potential mitigations, but not assess the residual risk if these mitigations are implemented.



Figure 3. Risk assessment process outline

Experts were stepped through a series of questions for each species and required to make judgements based on their knowledge and experience as well as some supporting information on **hazard extent** and existing **controls** where available. For example, the extent of timber harvesting across a species' modelled range within each RFA region was quantified to provide context for the expert. The existing controls for hazards were also outlined where relevant, such as species prescriptions contained in the Code of Practice for Timber Production (2014).

A subsequent moderation process was conducted to review all risk assessments to ensure consistency in application of the ratings system. The moderation process involved representatives from the assessors with key policy and planning experts to ensure ratings for control effectiveness, consequence and likelihood had been consistently applied. A more detailed description of the risk assessment methods is presented in **Appendix 2**.

2. Key hazards identified in this risk assessment

The sections below describe the nature of the dominant hazards identified in this risk assessment, the nature of each hazard and the mechanisms by which the hazard might impact on vulnerable threatened species and communities. A total of 79 species and communities were assessed, comprising 70 species and nine communities⁹.

2.1 Inappropriate fire regimes

Single bushfire events can have a major impact on the environment. They can also have devastating impacts on human life, communities, property and the economy. Events such as the Alpine Fires of 2003, the Great Divide Fires of 2006, the Black Saturday Fires of 2009 and the 2019-20 bushfires in eastern Victoria have the capacity to substantially modify the environment in affected areas for decades, even centuries. Impacts of single bushfires can include:

- Direct mortality;
- Reduction in food supply;
- Loss of habitat structure and key features;
- Reduced water quality;
- Sedimentation of waterways;
- Reduced flows during subsequent regrowth phase;
- Elevated predation pressure; and
- Elimination of fire-sensitive vegetation communities.

Examples of threatened species and communities that might be significantly affected by a single bushfire include rainforest communities and the species that occur exclusively in rainforests.

While an individual bushfire might have a massive impact, it is the frequency of extensive, high severity fire that is likely to drive permanent changes in the distribution and abundance of threatened species and in the extent and condition of threatened communities. Bushfire regime is a term that refers to the patterns of bushfire through time, including the extent, severity, season and frequency. Different species and communities will be sensitive to different parts of the regime or different combinations. For example, some species will be more sensitive to season or severity rather than frequency.

There is now evidence that climate change is driving changes in each of the components of the bushfire regime: extent (bushfires are more extensive), severity (bushfires are more intense), season (bushfires are occurring outside the “normal” season) and frequency (major bushfires are more frequent). When combined with planned burning (see below), each site or landscape has a total fire regime. The impacts of changes in the total fire regimes on species and communities can include:

- Population declines where animal species lack the reproductive or dispersal capacity to recolonise habitat between fire events;
- Long-term changes to habitat structure, including the loss of mature and senescent growth stages;
- Decline or local loss of plant species where fires are occurring more frequently than their minimum tolerable fire interval;
- Competition from species (both native and introduced) better adapted to the altered regime;
- Physical environmental changes, including more frequent soil erosion and stream sedimentation events; and
- Longer-term changes to less well-studied organisms such as invertebrates and soil fungi, and implications for ecological processes such as nutrient cycling, seed dispersal and seedling establishment.

Examples of threatened species and communities that might be significantly affected by shifts in total fire regime include:

- species that are killed by fire and rely on seedling recruitment for persistence (e.g. Alpine Ash)
- species that depend on particular habitat features such as tree hollows or large logs

⁹ *Note: The FFG Listed “Alpine Bog” and “Fen (Bog Pool)” have been assessed as one community along with “Alpine Sphagnum Bogs and Associated Fens” (EPBC listing)

- fire-sensitive communities such as rainforests which are unable to recover sufficiently between fire events

The risk assessment has identified 55 threatened species and communities that are at high or significant risk as a result of inappropriate fire regimes. Examples include Giant Burrowing Frog, Barred Galaxias, Glossy Black-Cockatoo, Southern Greater Glider, Long-footed Potoroo, Tall Astelia, Diamond Python and Cool Temperate Rainforest.

2.2 Bushfire management

Given the threat posed by bushfires to life, property and the environment, bushfire management is an essential and ongoing part of forest management in Victoria. Bushfire management is the primary method for reducing the risk of major bushfires to life, property and the environment.

Bushfire management can be divided into phases of planning, prevention, preparedness, fuel management, response, recovery and monitoring. Fuel management and response are the key phases that generate risks to threatened species and communities, while noting the risks associated with bushfires as described above.

Fuel management most commonly involves planned burning, although other techniques such as mulching have been introduced. Whilst planned burning mitigates against bushfire risk for a range of values including some species and ecological communities, it contributes to the total fire regime mentioned above and may in some circumstances and for some species and communities generate undesirable ecological changes.

Planned burning also carries a level of risk to human life and property, most directly to the crews conducting the burns. Safety measures implemented to protect fire crews typically involve track maintenance/widening to ensure safe access and the removal of hazardous trees. Machines may be used to create firebreaks around the planned burn perimeter, leading to temporary vegetation loss and soil disturbance. The burn perimeter might also intersect with streams or drainage lines, increasing the risk of soil erosion and sedimentation. The use of machinery may also facilitate the spread of weeds and pathogens.

Bushfire response typically involves the following operations:

- Establishment of control lines using machinery;
- Backburning in more favourable conditions to retard the advance of the bushfire;
- Air attack using water or fire retardants;
- Use of crews with hand tools (rake hoes) to manage ground-level fuel;
- Blacking-out of hot spots or unburnt patches following the passage of the fire front; and
- Hazard tree removal for safety purposes.

The impacts of these activities on threatened species and communities may include:

- Direct mortality;
- Soil disturbance;
- Altered hydrology (e.g. alpine bogs);
- Spread of weeds and pathogens;
- Sedimentation of streams;
- Impacts on vegetation and streams of fire retardants;
- Loss of unburnt refuges that might support the surviving remnants of impacted populations; and
- Loss of hollow bearing trees.

The risk assessment has identified 10 threatened species and communities that are at high or significant risk as a result of bushfire management. Examples include the Glossy Black Cockatoo, Brush-tailed Phascogale, New Holland Mouse, Grampians Bitter-pea and Diamond Python.

2.3 Forestry operations

Timber harvesting can occur at different scales and intensities and use different harvesting methods. While the history of native forest timber harvesting in Victoria is complex and variable across different forest types and regions, there has been a general shift towards more intensive harvesting systems since the mid-20th century, driven by a combination of silvicultural and commercial factors. More recently, there has been a greater emphasis on the retention of mature trees within a general “clear-fell” harvesting approach, to provide seed for regeneration and habitat for fauna. Retention of understorey patches is also now common with typical coupes ranging between 20-40 hectares in size.

The site-level impacts of timber harvesting based on the standard “clear-fell” or “seed-tree” system include:

- Direct mortality, especially of arboreal species;
- Removal/modification and fragmentation of the forest structure;
- Soil disturbance and compaction due to machinery use, potentially also leading to soil erosion and sedimentation of waterways; and
- Edge creation, leading to changes in micro-climate characteristics such as light intensity, temperature, humidity and wind strength in the adjoining forests.

Following harvesting, hot regeneration burns are typically applied, to remove “slash” and create conditions suitable for germination and seedling establishment, noting that VicForests has incorporated lower impact regeneration options into their 2019 update of [harvesting and regeneration systems and high conservation management systems](#).

The use of heavy machinery during and after the harvesting operation can have a localised and detrimental impact on understorey species that rely on a vegetative response to disturbance, including tree-ferns and some long-lived shrubs and trees. Edge effects can impact especially on adjoining rainforest stands and aquatic species may be affected by sedimentation and poor water quality.

At the landscape-level, timber harvesting when conducted over a typical rotation period of 80 years will inevitably reduce the proportion of the forest in older age classes, including mature and senescent growth stages, depending on bushfire history. This effect will vary from area to area, depending on the extent of older age classes and their protection in the reserve system. However, where this effect is substantial, it would make the forest at a landscape-scale less suitable for hollow-dependent species such as possums, gliders and large forest owls.

As noted in the following chapter, the *Code of Practice for Timber Production* includes standards and prescriptions to address many of the impacts of timber harvesting. However, the measures are not necessarily sufficiently comprehensive or effective to manage all risks.

In particular, species and communities affected by the 2019-20 bushfires may have a higher risk rating than would otherwise be the case due to the elevated uncertainty as to the impacts of the bushfires and the implications for the additional impacts that forestry operations might have on those species and communities as they recover.

The risk assessment has identified 23 threatened species and communities that are at high or significant risk as a result of forestry operations, mainly associated with loss of hollow-bearing trees, habitat loss and fragmentation, direct mortality, loss of feed source or sedimentation effects. Examples include Giant Burrowing Frog, East Gippsland Galaxias, Glossy Black-Cockatoo, Leadbeater’s Possum and Diamond Python.

2.4 Pest plants and animals

Victorian public land native forests have been progressively invaded by pest plants and animals since European settlement. Predators such as foxes, dogs and cats, omnivores such as pigs and herbivores including deer, rabbits, goats and horses occur over wide areas, although not uniformly. Introduced trout are widespread in inland and coastal river systems, including some of the smallest headwater tributaries. Weeds are ubiquitous and include a wide range of life-forms from small forbs (herbs) to large, long-lived trees.

The impact of introduced predators clearly results in elevated levels of direct mortality, noting that native predators such as the dingo, spot-tailed quoll, large forest owls and other raptors also impact on populations of threatened species.

Introduced herbivores similarly impact on population of threatened plant species as browsing reduces growth and may impact on reproduction. Larger herbivores such as deer, horses and pigs also cause environmental impacts through trampling, pugging, soil erosion, weed and spreading disease.

Weeds simply out-compete native species in certain situations, especially following disturbance, through vigorous growth and often rapid reproduction.

While not strictly considered pest plants and animals, over-abundant or invasive native species may also pose a risk to threatened species and communities via similar mechanisms of impact, usually over-browsing of plants and competition. Examples include mammals such as kangaroos and wallabies, birds such as noisy miners and plants such as Forest Burgan and Sallow Wattle. These are included in a separate hazard, native species impacts, which is part of the “Other hazards” grouping below.

The risk assessment has identified 60 threatened species and communities that are at high or significant risk as a result of pest plants and animals. Examples include Baw Baw Frog, Dargo Galaxias, Broad-toothed Rat, Candy Spider-orchid, Alpine Bog Skink and Strzelecki Warm Temperate Rainforest.

2.5 Roding and strategic fuelbreaks

The permanent road network in Victorian public land forests is vital to bushfire management, timber production, recreation and public safety. Road construction, upgrading and maintenance are routinely carried out across the public land forest estate, including in parks and reserves, although construction of new permanent roads is relatively rare. Construction of temporary roads for access to timber harvesting coupes is common. The construction of strategic fuelbreaks is similar in terms of its impacts on threatened species and communities as permanent roads, and so is dealt with here rather than as part of bushfire management. Roding and fuelbreaks also encompass the installation and maintenance of bridges, culverts and drains. It should be noted that, for some species, opening up the forest canopy, disturbing the soil and creating artificial waterbodies due to drainage from roads may trigger germination or provide habitat, although it is unclear if this contributes significantly to the overall viability of the local populations.

The main impacts of roding and strategic fuelbreaks include:

- Vegetation and habitat loss and fragmentation;
- Edge effects on adjoining vegetation;
- Soil disturbance;
- Sediment input to streams; and
- Spread of weeds and pathogens.

The risk assessment has identified 10 threatened species and communities that are at high or significant risk as a result of roding and strategic fuelbreaks. Examples include Large Brown Tree Frog, East Gippsland Galaxias, Gorae Leek-orchid and Whitfield Spider-orchid.

2.6 Climate change

The CSIRO State of the Climate Report 2018 states:

- Australia's climate has warmed by just over 1 °C since 1910, leading to an increase in the frequency of extreme heat events;
- Oceans around Australia have warmed by around 1 °C since 1910, contributing to longer and more frequent marine heatwaves;
- Sea levels are rising around Australia, increasing the risk of inundation;
- The oceans around Australia are acidifying (the pH is decreasing);
- April to October rainfall has decreased in the southwest of Australia. Across the same region May–July rainfall has seen the largest decrease, by around 20 per cent since 1970;
- There has been a decline of around 11 per cent in April–October rainfall in the southeast of Australia since the late 1990s;
- Rainfall has increased across parts of northern Australia since the 1970s;
- Streamflow has decreased across southern Australia. Streamflow has increased in northern Australia where rainfall has increased; and
- There has been a long-term increase in extreme fire weather, and in the length of the fire season, across large parts of Australia.

For threatened species and communities in Victoria's forests, the most immediate impact of climate change comes in the form of droughts, reduced stream flows and bushfires. Some species may also be affected by temperature changes, either directly in terms of their physiological tolerances or indirectly in terms of impacts on food resources. The impact of extreme heat events on species such as the Grey-headed Flying-fox is well known, with significant levels of mortality in some populations on a single day. Temperature and humidity changes have also been implicated in the decline of Greater Glider populations in some areas.

The risk assessment has identified 48 threatened species and communities that are at high or significant risk as a result of climate change. Examples include Booroolong Tree Frog, McDowall's Galaxias, Red-tailed Black-Cockatoo (south-eastern), Grey-headed Flying-fox, Ben Major Grevillea, Swamp Skink and Strzelecki Warm Temperate Rainforest.

2.7 Other hazards

A range of other hazards were assessed as high-significant risk by the experts including:

- Adjacent land use;
- Dams;
- Diseases and pathogens;
- Drought;
- Firewood collection (incl. illegal felling);
- Pollution;
- Human disturbance;
- Land clearing;
- Mining;
- Recreation activities (hiking, camping, biking and horse-riding); and
- Infrastructure development and maintenance.

The risk assessment has identified 40 threatened species and communities that are at high or significant risk as a result of other hazards. Examples include Glenelg Freshwater Mussel, Regent Honeyeater, White-footed Dunnart, Dwarf Kerrawang, Alpine Bog Skink and Warm Temperate Rainforest (Far East Gippsland). Further detail of the species, communities and the relevant hazards in each RFA region is provided in Appendix 3.

2.8 Interaction of hazards

The hazards described above interact to varying extents. There is evidence that climate change is increasing the frequency and severity of droughts in south-eastern Australia, which in turn increases the frequency, extent and severity of bushfires. Bushfires and forestry operations may combine to accelerate the loss of mature and senescent forest growth stages. Protracted severe droughts will affect stream flows with corresponding impacts on water quality, as will extensive areas of regrowth forest arising from bushfires and forestry operations. While the impact of regrowth forest on water yield is similar whether resulting from bushfires or forestry operations, the contribution of bushfires is likely to be greater given the area typically affected. The permanent road system is thought to facilitate the movement of predators, and the movement of soils and gravel associated with roading may introduce weeds and pathogens.

2.9 Summary of risks.

Table 1: Summary of hazards causing significant or high risks to species and communities.

Note: The number of species and communities at significant or high risk from each hazard is shown, plus the total number of species and communities assessed as part of this risk assessment.

Hazards	Amphibians	Aquatics	Birds	Mammals	Plants	Reptiles	Communities	Total
Pest plants and animals	5	13	2	9	18	4	9	60
Inappropriate fire regimes	5	12	5	11	13	3	6	55
Climate change (including extreme weather and drought)	3	16	5	8	12	3	1	48
Forestry operations	2	10	4	5	1	1	0	23
Bushfire management	0	0	3	2	4	1	0	10
Roading and strategic fuelbreaks	1	7	0	0	2	0	0	10
Other	4	4	4	4	16	3	5	40
Number of species and communities assessed (total = 79)	6	16	7	12	25	4	9	

3. Current controls and response to risks

3.1 Measures implemented since April 2020

In the period since the 2019/20 bushfires and the renewal of Regional Forest Agreements on 31 March 2020, the Victorian Government has proactively responded to biodiversity risks, including a range of programs and measures that either directly or indirectly respond to many of the risks identified in this risk assessment.

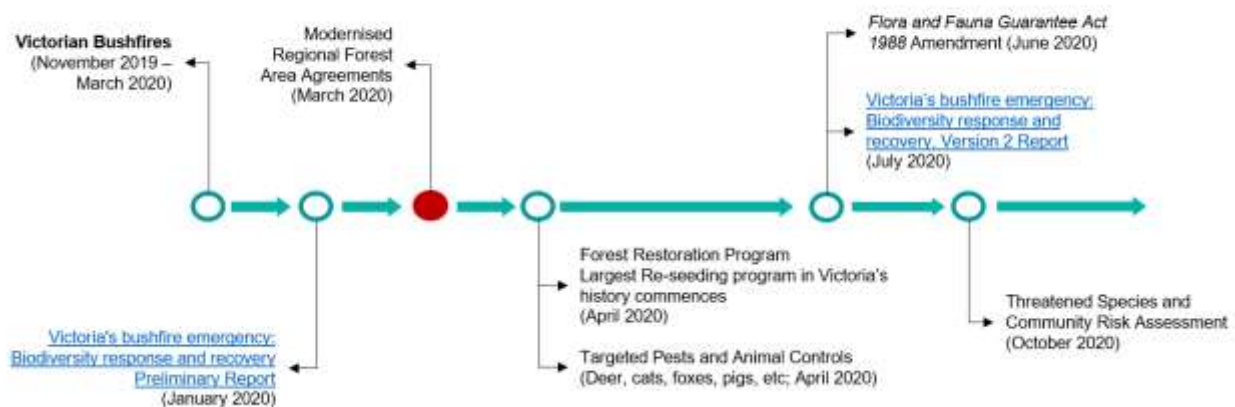


Figure 4. Action response timeline

3.1.1 Bushfire response and recovery program

The 2019/20 fires were exceptional in size and impact. The Department of Environment, Land, Water and Planning is continuing to coordinate and deliver actions to support and protect Victoria's plants and animals following the fires. The report, *Victoria's bushfire emergency: Biodiversity response and recovery*, assessed the fire extent as of 20 April 2020.

The 2019/20 Victorian bushfires burnt approximately 1,500,000 hectares across Victoria. The bushfires have impacted threatened species and their unique habitats, including approximately 78% of the remaining Warm Temperate Rainforest in Victoria.

The report assessed the impact of the Victorian bushfires on over 4400 species. It found that 244 species of plants and animals had at least 50% of their likely statewide habitat burnt, 215 of which are rare or threatened species.

Guided by the impact assessment described in the report, DELWP has worked alongside species experts, academics, and land managers to prioritise actions for fire-affected threatened species and habitats. This forms an overarching, multi-year program of initiatives across four phases:

- Emergency response actions (while the fire was active);
- Phase 1: Immediate and short-term actions (up to 1 year);
- Phase 2: Medium-term action (1-3 years); and
- Phase 3: Longer-term actions (beyond 3 years).

This Bushfire Biodiversity Response and Recovery program includes actions funded by the Victorian Government, Australian Government and other sources including public donations. DELWP is working closely with partner agencies, Traditional Owners, and non-government organisations to coordinate and support all actions to help the protection and recovery of Victoria's flora, fauna and habitats impacted by the 2019/20 fires.

Alongside the release of the preliminary report in January 2020, the Victorian Government took immediate action to support Victoria's bushfire impacted wildlife and biodiversity with a \$17.5 million funding package to assist Phase 1 of the Bushfire Biodiversity Response and Recovery program. Phase 1 of the Bushfire

Biodiversity Response and Recovery program delivers actions across seven key themes (hyperlinks connect to the DELWP website):

- [Immediate reconnaissance and assessment of critical species and habitats;](#)
- [Wildlife welfare;](#)
- [Emergency extraction to prevent extinction and limit species decline;](#)
- [Intensified and sustained management of threats;](#)
- [Maximising resilience across the landscape Reading and Healing Country;](#)
- [Knowledge, data and preparedness; and](#)
- [Nature-led community recovery.](#)

Many actions are already underway as we continue to assess fire-affected areas and respond directly to impacted plants and animals. More detail on species-specific actions can be found in Appendix 4.

3.1.2 Other key initiatives

Improved management of listed species and communities in emergencies

Following the recent bushfires 2019/20, DELWP identified that responding to threatened or endangered ecosystems or species during emergency events could be improved by greater integration with the Victorian emergency response arrangements. Working with Emergency Management Victoria, this change has been enacted. As a result, effective 1 December 2020, under the State Emergency Management Plan (SEMP), the Department of Environment Land Water and Planning will support an emergency response as a Lead Support Agency for Threatened ecosystems and species. This responsibility may apply to any emergency event type as defined in the State Emergency Management Plan. In undertaking this role, DELWP will undertake response activities to protect threatened ecosystems and species that have been impacted or have the real potential to be impacted by an emergency event. This also includes consideration of mitigation activities (mechanical, retardant, fire and smoke) for the emergency event and their potential to impact threatened species or ecosystems.

Forest Restoration and Reseeding

The 2019/20 fires impacted a substantial area of immature ash forest across state forest and reserves which was too young to naturally regenerate. An extensive forest restoration program was initiated following the fires to undertake emergency recovery works, resulting in the aerial sowing of 4.5 tonnes of ash seed across 11,500 hectares of forest – one of the largest single forest reseeded programs undertaken in Victoria, relying predominantly on existing seed stocks maintained by VicForests. Monitoring of the restoration work and evaluation of the approaches is ongoing while seed stocks are rebuilt.

Precautionary principle

Following the 2019/20 Victorian Bushfires, the Conservation Regulator has written to VicForests making clear their obligations under the precautionary principle within the *Code of Practice for Timber Production 2014* following the 2019-20 bushfires and reminding them of these obligations.

Ongoing delivery of Weeds and Pests on Public Land program

This program delivers landscape-scale weed and pest projects, focusing on protecting Victoria's biodiversity. The program invests \$3.1 million each year across approximately 10 per cent of the state throughout Victoria's highest biodiversity assets. A further \$1 million is contributed each year by delivery partner, Parks Victoria. Across Victoria's five RFA regions, 7 long-term, landscape scale pest (Arks) and weeds (Edens) programs operate – Glenelg Ark and Eden, Otways Eden, Grampians Ark, Southern Ark and Barry Mountains. These programs have continued to deliver vital pest and weed management in 2020 and protect Listed Species and Communities including Long-Footed Potoroo, Long-Nosed Potoroo and Southern Brown Bandicoot. In areas impacted by bushfires, these ongoing programs have been expanded or additional pest control programs added (e.g. the addition of Deer control).

Flora and Fauna Guarantee reform

On June 1, 2020, amendments to the *Flora and Fauna Guarantee Act 1988* came into effect to provide a modern and strengthened framework for the protection of Victoria's biodiversity. Important changes include:

- a new duty on public authorities to consider biodiversity;
- a cooperative approach to identifying and managing critical habitat determinations;
- the introduction of habitat conservation orders to protect critical habitat; and

- stronger enforcement powers and increased penalties.

The Conservation Status Assessment project

This project has re-assessed the conservation status of all plant, animal and fungi species that are currently considered to be rare or threatened in Victoria (i.e. included in the Advisory Lists or currently FFG-listed, over 2000 species.) Some species have been excluded from the assessments if they have unconfirmed taxonomy or have already been assessed under the Common Assessment Method at the national level. Species assessed as threatened at the state level, and any Victorian species listed under the EPBC Act, will be considered by the Minister for inclusion in the new FFG Threatened List.

Refining decision support tools

DELWP has delivered 11 taxon workshops in 2020 to identify at risk species and key threats, actions and locations to support upcoming Strategic Management Prospects tool expert elicitation and identify target species for specific needs assessments. More than 70 species were assessed, representing many species also included in this risk assessment.

Curiosity® feral cat bait

The feral cat bait, Curiosity® was registered as an agricultural chemical product for vertebrate pest control in February 2020. The Curiosity® bait for feral cats uses a new humane toxin which is considered best-practice world-wide. The RSPCA (Australia) has indicated that PAPP is a clear improvement in humaneness over previous toxins (e.g. 1080). The Curiosity® bait is designed for broad-scale, aerial and surface delivery in areas of southern and central Australia where native species are likely to be more susceptible to poisoning from conventional-style baits (e.g. 1080). Curiosity® is classified as a Schedule 7 Dangerous Poison and its sale and use are restricted. This means that Curiosity® baits can only be supplied to, and used by, appropriately trained and authorised persons. The label specifies conditions under which baits may be laid. Feral cat control will only be implemented by department and agency staff, and their agents. Victorian Crown land managers are keen to use the Curiosity® bait to control feral cats and have clearly indicated an aspiration for aerial deployment to complement on-ground measures such as trapping and shooting. The Department of Jobs, Precincts and Regions (DJPR) has introduced a permit system under the *Agricultural and Veterinary Chemicals (Control of Use) Act 1992* to limit the supply and use of Curiosity® to Crown land managers and their agents covered by the feral cat declaration in accordance with the product label and any further conditions considered necessary.

3.2 Existing frameworks for land management and biodiversity conservation

Risks to threatened species and communities are managed through a combination of general and targeted measures undertaken by the Victorian Government through DELWP and its portfolio partners such as Parks Victoria as part of implementation of the forest management system and public land management responsibilities. The following sections provide a high-level description of the measures in progress with particular focus on those established through Victoria's Regional Forest Agreements, including additional measures included through 2020 amendments to modernise Victoria's RFAs.

Victoria's Forest Management System Overview (December 2019) provides a summary of components of this system directed at protection and management of species and communities listed under the EPBC Act. The following section provides explanation of these frameworks as applicable to this risk assessment.

3.2.1 Forest management

There are ten existing Forest Management Plans (FMPs). These were written over a period of two decades, and the format and focus are variable between the different plans. These plans manage a range of forest values and threats with timber harvesting being a significant focus. Those written prior to 2007 predominantly have a site-based focus, while more recent plans adopt a high-level approach to planning and are more strategic. The following plans were predominantly used to develop the *Code of Practice for Timber Production 2014*: Forest Management Plan for the East Gippsland Forest Management Area 1995; East Gippsland Forest Management Plan Amendment 1997; Forest Management Plan for the Central Highlands 1998; Forest Management Plan for the North East 2001

The ten FMPs (with some minor exceptions) cover the entire landscape of Victoria, unlike the five RFAs, which apply to regions in which commercial wood production on public and private land is a major forest use.

The management and conservation strategies outlined in existing FMPs are expressed through the Forest Management Zoning Scheme, which classifies areas of State Forest for conservation, production, or multiple

use. The arrangement of these zones in the landscape, and the actions they give rise to, is the primary mechanism through which forest management objectives contained in these plans are met. The Forest Management Zoning Scheme comprises:

- Special Protection Zone (SPZ), managed for conservation values;
- Special Management Zone (SMZ), managed to conserve specific features while catering for timber production; and
- General Management Zone (GMZ) where multiple use management and timber production is generally permitted.

At the landscape scale and considering the conservation and protection of threatened species and communities, SPZs – which represent 10% of all State Forests – may be established to protect core habitat or to protect the occurrence of listed species or known locations of ecological communities. SPZs complement and form a component of the broader Comprehensive, Adequate and Representative (CAR) reserve system, which includes National Parks and other conservation reserves. CAR reserves cover 3.7 million hectares (51 per cent of Crown land) and play an important role in protecting threatened species and habitat.

The plans show priorities and permitted uses in a given area, and a series of aims, management guidelines, prescriptions and actions for each theme of management. Annual District Action Plans (DAPs) are then used to implement FMPs at a District scale, overseen by the region, and Operational work plans are then developed to direct specific actions (see below).

The current Forest Management Plans are up to 20 years old and require revision. The recently renewed RFAs require Victoria to “produce, publish and maintain in force at any given time one or more Forest Management Plans that apply to the land within the RFA Region; and (b) review and update any Forest Management Plan that applies, either in part or wholly, to land within the RFA Region by December 2023 and at least every ten years thereafter for so long as this Agreement remains in effect”. In addition, the RFAs state:

“in reviewing the Forest Management Plans Victoria will have regard to all relevant matters, including (but not limited to):

- *the needs of the Forest in order to maintain ecosystem health and vitality;*
- *Traditional Owner Country Plans or equivalent, associated strategies and agreements or relevant documents;*
- *the objectives, targets and metrics in Victoria’s current biodiversity strategy;*
- *the broad range of values and uses of the Forest;*
- *the impacts of Climate Change;*
- *community aspirations and objectives;*
- *the need for active management to reduce bushfire risk and support the recovery of forests and communities that depend on them after bushfire;*
- *threat management; and*
- *actions for surface and groundwater catchment management and soils.”*

Revised FMPs will respond to a broader range of forest values and threats (including Climate Change and Traditional Owner Country planning objectives) than previous plans. New FMPs will include, regional landscape level objectives for forest management across a broad range of forest values (including natural values, cultural values, recreation and experience values) and include a range of spatial strategies for meeting those objectives including, where appropriate, revised FMZ arrangements that reflect the location of forest values and uses in the landscape.

Operational forest management planning and delivery

The District Action Plan (DAP) provides an operational planning tool to support staff to address many of the complexities regarding the planning of forest operations on public land managed by DELWP. It brings together a number of existing planning processes into a single system and streamlines and consolidates the planning and approval process for forest/land use activities.

The DAP is designed to address legislative and policy requirements, as well as environmental and reputational risks associated with routine forest management activities. The guidelines assign approval responsibilities commensurate with risk, according to legal delegations where they apply.

Forest activity within the DAP Guideline refers to all activities conducted on public land managed by DELWP, and activities conducted by DELWP on public land managed by other bodies (e.g. Parks Victoria, Melbourne Water).

The DAP process is 'risk based'. The DAP requires activities that have a high reputational or environmental risk to be included in the DAP but allows for lower risk activities to be incorporated in order to assist districts to streamline and consolidate planning checks. The DAP is an internal document designed to assist district planning.

Whether an activity needs to be included on the DAP will be determined by the level of environmental or reputational risk the activity poses and whether the activity is part of another planning process. The level of risk posed by different activities has been broken into three categories; Level 1 being highest risk, Level 2 being moderate risk and the lowest risk being managed in the Low Risk Low Impact (LRLI) process (as described in Table 1). Note that the Low Risk Low Impact process is still under development, and planning can still be undertaken using the Work Order process in the interim. Level 1 and Level 2 forest activities must be included in the DAP.

The DAP establishes a one to three-year schedule of planned forest operations for all DELWP managed land within each Fire and Land District. Operations scheduled in the second and third year are optional for inclusion in the DAP. The DAP creates a consistent, uniform planning process for forest operations across the State providing:

- an annual tactical plan;
- a mechanism to undertake values checks; and
- a streamlined endorsement and approval process.

3.2.2 Forestry Operations

Forestry operations in native forests on public land occur exclusively within Victoria's State forests. State forests extend over approximately 3.2 million ha (approximately 49 per cent) of Crown land and are managed for multiple uses in addition to timber harvesting. Of this 3.2 million approximately 1.8 million hectares is allocated for purposes of timber harvesting in eastern Victoria under the Allocation Order and approximately 3,000 hectares is harvested annually.

Protection and control measures in respect to forestry operations are in place to protect the multiple values present in these landscapes. One of the high-level, key mechanisms to achieve this in State forests is the Forest Management Zoning system which determines the types of activities that can occur in certain areas of forest.

In the areas of State forest where timber production is broadly permitted, additional policy and regulatory controls are in place to conserve and protect threatened species through a variety of mechanisms. For example, the November 2019 policy decision to immediately end the harvesting of any old growth forest will benefit a range of species which rely on forests dominated by older growth stage trees. Additionally, the immediate protection of approximately 96,000 hectares of State forest areas available for timber production will further the protection and persistence of forest-dependant species such as the greater gilder and Leadbeater's possum.

In terms of regulatory controls, the maintenance of biological diversity and the ecological characteristics of flora and fauna is one of the key principles on which the *Code of Practice for Timber Production 2014* (the Code) is based. The Code and the incorporated *Management Standards and Procedures for Timber Harvesting Operations in Victoria's State Forests 2014* (MSPs) provide for the protection of biodiversity and mitigation of risks through mandatory actions, such as field-based prescriptions for species and their habitat, soil and water quality risk management and post-fire salvage risk management.

Detection-based prescriptions for threatened species and communities include the establishment of buffers to protect populations, modified silvicultural systems (e.g. retention harvesting), scheduling of timber harvesting and regeneration burning activities to minimise disturbance to colonies, protection of habitat features (e.g. nesting or feeding trees) and minimising impact from roading or stream crossing construction. DELWPs Forest Protection Survey Program aims to survey 80 per cent of coupes planned for harvest, providing information on where and when prescriptions should be applied, thus ensuring the protection of

high-conservation-value flora and fauna species and other forest values that may occur in coupes being planned for harvest.

Supporting these measures, there are more general, overarching operating instructions or prescriptions contained in the Code which act to minimise the impact on biodiversity values. These form a baseline for which biodiversity is protected or managed, including:

- retention and protection of habitat patches and specific vegetation types (e.g. rainforest), including wildlife corridors to facilitate animal movement and contribute to a linked system of reserves;
- targets for the retention of habitat trees and large trees to provide for the continuation and recruitment of hollow-bearing trees;
- protection of streamside vegetation through buffers and filter strips;
- slope restrictions and buffers to manage environmental impacts on water values and sedimentation risk;
- implementing appropriate control actions to prevent or manage pest plant or pathogen infestations;
- protecting other forest values such as soils, cultural heritage and amenity;
- specific prescriptions developed for salvage harvesting to reduce the impact on fire impacted forest; and
- application of the precautionary principle to biodiversity values (see below).

The precautionary principle is a free-standing and overarching obligation within the Code, which must be considered when there is a threat of serious or irreversible environmental damage and substantial scientific uncertainty as to the environmental damage. In this sense, the Precautionary Principle serves as an additional, overarching protection which may, in some cases, require undertaking management actions that are additional to those prescribed in the Code.

Following the 2019/20 Victorian Bushfires, the Conservation Regulator has written to VicForests making clear their obligations under the precautionary principle within the Code following the 2019-20 bushfires and reminding them of these obligations.

3.2.3 Bushfire and Planned Burning

Objectives and authorising environment

Risk controls exist across the bushfire management phases of planning, prevention, preparedness, fuel management, response, recovery and monitoring. DELWP's approach to bushfire management is guided by the *Code of Practice for Bushfire Management on Public Land 2012*, and in particular the two objectives:

- To minimise the impact of major bushfires on human life, communities, essential and community infrastructure, industries, the economy and the environment: human life will be afforded priority over all other considerations; and
- To maintain or improve the resilience of natural ecosystems and their ability to deliver services such as biodiversity, water, carbon storage and forest products.

DELWP is an integral part of Victoria's emergency management sector whose collective preparedness is guided by the Victorian Emergency Management Strategic Action Plan and the Emergency Management Manual Victoria. The State Emergency Management Priorities described in the State Emergency Response Plan under the *Emergency Management Act 2013* (Vic) underpin the planning and operational decisions made when managing the response to emergencies. "Protection of environmental and conservation assets that considers the cultural, biodiversity and social values of the environment" is one of the state control priorities.

Under the *Forests Act 1958* (Vic) the Secretary DELWP is responsible for planned prevention and immediate prevention and suppression of fire on lands managed by DELWP and Parks Victoria. Bushfire management is fully integrated across all land managed by DELWP and Parks Victoria. DELWP has a range of hazard specific assessment processes including strategic bushfire management planning, and the Emergency Management Framework for Threatened Species (many of these are inherently non-land tenure oriented due to the nature of the risks).

In addition to the priorities described in the State Emergency Management actions described by the Code of Practice for Bushfire Management on Public Land (manage the response efficiently and effectively, seeking to minimise environmental damage) additional actions are undertaken to manage the risk of response operations to threatened species and communities. These include:

- Natural Values and Wildlife Officer roles in most Level 3 Incident Management Teams;
- Biodiversity risk assessment role deployed in every Rapid Risk Assessment Team; and
- Environmental considerations in Readiness and Response Plans.

As described in the Victorian response to the Royal Commission into National Natural Disaster Arrangements: While the mechanisms above are a strong foundation, there is scope for improvement and consolidation. A key challenge for hazard managers is delivering effective mitigations to risks which:

- respond proportionately to risks to environmental values, including threatened species and communities, taking into account the forecast effects of climate change; and
- adequately manage collateral risks, including localised harms arising from mitigatory works. For example, fuel management, where planned burning may have broader benefits to the resilience of a landscape or the protection of communities and assets but cause localised impacts to species habitat.

The Inspector General Emergency Management in its inquiry into the 2019-20 Victorian fire season found (finding 3.3) that:

Considerable work has been conducted to increase preparedness for the impacts of bushfire in wildlife welfare through reform of key conservation legislation, regulation, strategies and policies. While work for ecological biodiversity is less mature, the foundations for greater preparedness and protection of Victoria's wildlife and biodiversity have been established.

DELWP's bushfire management program considers how best to meet both these objectives and recognises the need to manage these objectives over different temporal and geographic scales. This is achieved through managing fuels and conducting burns to protect, maintain and or improve ecosystem values and build ecosystem resilience. Fire is a natural and vital process for many of Victoria's ecosystems, and ecosystem resilience reflects this natural relationship between fire, regeneration and ecosystem health.

Larger and more intense fires, such as the 2019-20 bushfires pose the greatest threat to ecological values. Our approach needs to fully incorporate ecological burning for healthy ecosystems, and a risk-based approach to protect fire sensitive ecosystems and habitats from the impacts of high severity bushfires. Planned burns are typically cooler, patchier and allow for more localised regeneration.

As described in the *Code of Practice for Bushfire Management on Public Land 2012*, the planning hierarchy is:

- Legislation (*Forests Act 1958* (Vic), *Flora and Fauna Guarantee Act 1988* (Vic), *Environment Protection and Biodiversity Conservation Act 1999* (Cth) etc);
- Code of Practice for Bushfire Management on Public Land;
- Manual/Guidelines/Prescriptions/Standard Operating Procedures;
- Strategic Bushfire Management Plans;
- Joint Fuel Management Program; and
- Burn Plans.

Threatened species and communities are considered at all stages in the management planning hierarchy.

Strategic, operational and tactical planning for fuel management

Strategic planning is conducted at a regional scale and is used to inform place-based decisions about where and when fuel management is delivered. The strategic planning process identifies where the values defined in the Code are located across the landscape, it accounts for the current and future extent and quality of these values. Strategic planning also, where possible, considers trends, including population, industry and environmental change. These decisions are further informed by the current context such as recent fire history and local considerations such as a values assessment of fuel reduction impacts in that place. Strategic planning provides the rationale behind the fuel management action and aids alignment of fuel reduction to meet objectives in the Code.

One of the high-level, key mechanisms to achieve this is on public land is the Fire Management Zoning system. Fire Management Zones are areas of public land where fire is applied for specific asset, fuel and overall forest and park management objectives.

- Asset Protection Zone (APZ) aims to provide the highest level of localised protection to human life and property and key community assets. This zone aims to reduce the speed and intensity of bushfires;
- Bushfire Moderation Zone (BMZ). BMZ complements the APZ in that the use of planned burning in the BMZ is designed to protect nearby assets;

- Landscape Management Zone (LMZ). Within this zone, planned burning will be used for bushfire protection outcomes by reducing the overall fuel and bushfire hazard in the landscape, ecological resilience through appropriate fire regimes, management of the land for particular values including forest regeneration and protection of water catchments at a landscape level; and
- Planned Burning Exclusion Zone (PBEZ). This zone excludes the use of planned burning primarily in areas intolerant to fire.

The strategic planning process results in a Fire Management Zone configuration which is optimised across space and time, to deliver bushfire risk reduction to the identified values across the landscape for the life of the strategy (30-40 years).

The arrangement of Fire Management Zones in the landscape, translates into actions such as the treatment of fuels by planned burning or mechanical means, the maintenance of roads, tracks and breaks. These operational activities are set out in the three-year rolling Joint Fuel Management Program (JFMP).

Without mitigation measures, fuel treatments (planned burning and non-burn treatments) could result in localised impacts to environmental and cultural values (such as damage to habitat trees or cultural heritage values). Each activity on the JFMP is assessed to determine if and how it may impact threatened species and communities. This process is built into the Standard Operating Procedures for Fuel Treatment Activities (SOP 3.4.1) and associated work instruction (3.4.1.3). This work instruction provides the guidance on the process to follow when identifying values, threats and the application of standard mitigation measures.

An annual program of works is developed from the JFMP. Mitigation measures identified through the JFMP process are implemented to mitigate localised threats to threatened species and communities.

Strategic fuelbreaks and roading

Strategic fuelbreaks and roads both require degrees of vegetation modification and ongoing maintenance, involving varying degrees of mechanical treatment depending on the objective and the site. Roads have a multiple use value providing access for recreation, fuel management or forestry purposes. Where the road is used or maintained for forestry purposes then vegetation clearing is also subject to the risk controls described under the Forestry subheading.

The key Victorian legislative frameworks that provide risk controls for threatened species and communities in respect of bushfire and fuel management, including for roading and fuelbreaks established or maintained for those purposes, are:

- *Flora and Fauna Guarantee Act 1988*, which provides a structure to enable and promote the conservation of Victoria's native flora and fauna and manage potentially threatening processes. It provides for the creation of a threatened species list. Sustainable forest management includes the maintenance and conservation of biodiversity, which is incorporated into the sustainable forest management system. Through the Common Assessment Method, the FFG Act controls match requirements under the *Environment and Biodiversity Conservation Act 1999*;
- *Planning and Environment Act 1987*, within which regulations known as the native vegetation removal regulations are established. A permit is usually required to remove, destroy or lop native vegetation, with some exemptions that apply. The regulations are primarily implemented through local council planning schemes. Guidelines for the Removal, Destruction or Lopping of Native Vegetation, that outline how native vegetation removal is assessed and offset, is an incorporated document in all Victorian planning schemes; and
- *Forests Act 1958, Conservation, Forests and Lands Act 1987, and Sustainable Forests (Timber) Act 2002* within which the *Code of Practice for Timber Production* operates and gives rise to the *Management Standards and Procedures*. These instruments provide an enforceable regulatory framework to protect environmental values. The Code applies to the planning and conducting of all commercial timber production and timber harvesting operations on both public and private land in Victoria. Any roading, tending, regeneration or rehabilitation activities conducted in association with a timber harvesting operation are by definition, also a timber harvesting operation.

Recovery

In the recovery phase of a bushfire DELWP undertakes a number of impact and risk assessments that inform the need and priority for protection and control measures.

An Incident Controller, particularly during a fire with high severity of impact, may deploy a Rapid Risk Assessment Team (RRAT) to provide the land manager with a snapshot of the priority risks identified

following a bushfire event and provide practical treatment solutions and approximate costs for risk mitigation. Scoping the scale and nature of short (emergency stabilisation and initial recover) and longer-term recovery works as soon as possible after a bushfire event better supports the land manager to manage immediate risks. The RRAT report will inform a recovery plan. It also assists government to determine likely cost implications. During the bushfires of 2019/20, nine such deployments were made to individual fires or parts of larger fires.

3.2.4 Biodiversity policy and programs

Flora and Fauna Guarantee Act

The *Flora and Fauna Guarantee Act 1988* includes a range of provisions relevant to the conservation and recovery of threatened species and communities. In summary, these include:

- The objectives (section 4);
- Duties of public authorities (section 4C);
- Secretary's functions (section 7);
- Listing process (sections 10-16);
- Flora and Fauna Guarantee strategy (sections 17-18);
- Action statements (section 19);
- Critical habitat (section 20);
- Management plans (sections 21-24);
- Public authority management agreements (section 25);
- Habitat conservation orders (sections 26-42);
- Protected flora controls (sections 45-51); and
- Listed fish controls (sections 52-53).

Reform of the Flora and Fauna Guarantee Act

The *Flora and Fauna Guarantee Act 1988* has been amended to provide a modern and strengthened framework for the protection of Victoria's biodiversity. The changes came into effect in mid-2020. The amended Act:

- introduces principles to guide the implementation of the FFG Act, including consideration of the rights and interests of Traditional Owners and the impacts of climate change;
- requires consideration of biodiversity across government to ensure decisions and policies are made with proper consideration of the potential impacts on biodiversity;
- clarifies existing powers to determine critical habitat and improves their protection by encouraging cooperative management;
- gives effect to a consistent national approach to assessing and listing threatened species using the [Common Assessment Method \(CAM\)](#), which will reduce duplication of effort between jurisdictions and facilitate the monitoring and reporting of species' conservation status; and
- modernises the FFG Act's enforcement framework including stronger penalties.

Common Assessment Method

The Commonwealth and most State and Territory Governments have signed an intergovernmental agreement to implement a Common Assessment Method (CAM) for assessing the conservation status of all Australian threatened species. Assessments are based on International Union for Conservation of Nature (IUCN) Red List categories and criteria, and conform to additional standards developed by a national working group representing all jurisdictions. Under the CAM, each state or territory will have a single list of threatened species. In Victoria, this will consolidate three lists, the *Environment Protection and Biodiversity Conservation Act 1999* List, the *Flora and Fauna Guarantee Act 1988* Threatened List and the non-statutory Victorian advisory lists.

The Conservation Status Assessment Project has re-assessed the conservation status of all plant, animal and fungi species that are currently considered to be rare or threatened in Victoria (i.e. included in the Advisory Lists or currently FFG-listed, over 2000 species.) Some species have been excluded from the assessments if they have unconfirmed taxonomy or have already been assessed under the CAM at the national level. Species assessed as threatened at the state level, and any Victorian species listed under the EPBC Act, will be considered by the Minister for inclusion in the new FFG Threatened List.

Conservation planning for threatened species and communities

DELWP is reviewing its approach to conservation planning for threatened species and communities, with a proposal to streamline and accelerate action statement preparation while maintaining detailed information, including specific management actions, for high profile and more complex species and communities in management plans prepared under the Act.

Biodiversity 2037

Protecting Victoria's Environment - Biodiversity 2037 is the Victorian Government's ambitious plan to stop the decline of our biodiversity and achieve overall biodiversity improvement over the next 20 years. It makes the case for increased effort and defines a modern approach to managing our biodiversity. It is underpinned by ground-breaking science that for the first time allows us to get upstream of the problem of Victoria's biodiversity decline. The Victorian Government is leading this process, but ultimately, we need the people of Victoria to commit to helping us protect the future health and conservation of our biodiversity. The Plan establishes a long-term vision and goals. Specific targets have been developed to deliver on these goals. Of most relevance to forest dependent threatened species and communities is the goal "Victoria's natural environment is healthy" and the associated target:

A net improvement in the outlook across all species by 2037, so that:

- 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.
- We achieve a net gain of the overall extent and condition of habitats across terrestrial, waterway and marine environments.

The Biodiversity 2037 plan also identified a set of 20 priorities, including:

- Deliver excellence in management of all land and waters; and
- Maintain and enhance a world-class system of protected areas.

Coupled with Biodiversity 2037 plan's release, the Victorian Government committed \$86.3 million over four years and a further \$20 million per year ongoing to implement the plan. This represented the greatest ever single investment in biodiversity conservation by a Victorian government.

Strategic Management Prospects

The aim of the Victorian Government's Biodiversity Plan *Biodiversity 2037 – Protecting Victoria's Environment* is to "see an overall improvement, where the majority of habitats and threatened species will be improved, and habitat gains will outweigh losses". The Strategic Management Prospects (SMP) approach is being implemented to give Victoria a long-term, strategic approach to identifying cost-effective management actions that deliver an improved outlook for as many species as possible. The initial focus is on terrestrial species and common landscape-scale issues that affect many species (e.g. predation and herbivory by invasive species, competition from weeds, harvesting and/or fire regimes). This is being progressively supplemented by similar assessments for individual species which have Specific Needs (e.g. direct interventions such as translocation or genetic manipulation, or highly localised habitat management).

SMP integrates and simultaneously compares information on biodiversity values, threats, expected benefits of management actions and indicative costs of management actions across Victoria. Location-specific actions are ranked across Victoria based on their relative contributions to net conservation outcomes across all species.

SMP can be used by land managers and biodiversity professionals in a variety of ways, including to:

- inform the design of on-ground projects so that these can maximise biodiversity outcomes;
- provide scope and focus for partnership discussions;
- inform and improve the Biodiversity Plan Targets and report on progress towards them; and
- SMP Version 2.0 has just been released with a range of improved inputs, including consideration of the major 2019/20 fires. The [DELWP NatureKit portal](#) allows users to view the large set of maps and access a range of reports.

Strategic Management Prospects provides valuable information to support decision-makers, who combine it with other practicalities, including capability and capacity of managers, feasibility of the action, and level of community support.

Biodiversity Response Planning

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 organisations and the community.

Eighty-five new projects for on-ground biodiversity action worth \$33.67 million were announced for funding through Biodiversity Response Planning. Funded projects commenced in 2018-2019 through to 2021.

Weeds and pests on public land program

The Weeds and Pests on Public Land (WPPL) program funds landscape-scale weed and pest projects, focusing on protecting Victoria's biodiversity. The program is working to achieve the vision of Biodiversity 2037, Victoria's plan to stop the decline of our native plants and animals and ensure our natural environment is healthy and resilient.

The program invests \$3.1 million each year across approximately 10 per cent of the state throughout Victoria's highest biodiversity assets. A further \$1 million is contributed each year by delivery partner, Parks Victoria.

There are four streams of projects as outlined below, currently the program funds ten flagship projects across Victoria including the Ark, Eden, Bounceback and Weeds at the Early Stage of Invasion (WESI) projects:

- Predator control: Ark projects target foxes and benefit a wide range of native mammals, birds and reptiles;
- Weed control: Eden projects detect and control high risk weed species that threaten biodiversity values;
- Herbivore control: The Mallee Bounceback Rabbit Control project aims to protect and restore the biodiversity of semi-arid woodlands; and
- Capability building: The WESI project builds the capability of land managers to respond to early invader weeds.

Climate change

There are several strategies being developed to respond to the challenges presented by climate change. Victoria's *Climate Change Adaptation Action Plan for the Natural Environment System* (CCAAPNES), is one of the seven system-level adaptation action plans being developed during 2020 and 2021 under the *Climate Change Act 2017* (Vic). These system-level adaptation action plans will respond to the priorities for adaptation outlined in the Climate Change Act, including an assessment of the extent to which existing policy addresses these priorities, and identifying actions to address key gaps. These plans will be complemented by six regional climate change adaptation strategies that provide place-based, stakeholder-led analysis of climate change adaptation issues. Victoria's 10 Catchment Management Authorities (CMAs) have each developed regional Natural Resource Management Plans for Climate Change Adaptation and are incorporating resilience planning into the renewal of their Regional Catchment Strategies.

Victorian Deer Control Strategy

A Victorian Deer Control Strategy has been prepared by DELWP and the Department of Jobs, Precincts and Regions to address the widespread and rapid increase in wild deer across Victoria. The Strategy outlines a process for a strategic and coordinated approach to deer control. It is Victoria's plan to reduce the impact that increasing deer numbers are having on the environment, agriculture, Aboriginal cultural heritage, and public safety.

Native vegetation removal and counterbalancing

The removal of native vegetation is regulated under the Victoria Planning Provisions. There is an exemption for removal of native vegetation on Crown land. The Crown land exemption provides for native vegetation removal to the minimum extent necessary to manage Crown land by or on behalf of the Secretary to DELWP or Parks Victoria. Removal must be in accordance with the Procedure for the removal, destruction or lopping

of native vegetation on Crown land (Crown land procedure). The Crown land procedure classifies native vegetation removal as either a maintenance activity or as new removal of native vegetation.

Works associated with bushfire management including planned burn areas, hazardous tree removal, fire control lines and infrastructure associated with a planned burn or bushfire response are maintenance works and not included in this report. Fuel breaks that are not associated with bushfire management and planned burns are recorded under new removal of native vegetation.

The Crown land procedure requires that:

- native vegetation removal must be to the minimum extent necessary;
- new removal of native vegetation be recorded and reported in habitat hectares annually; and
- counterbalancing activities be recorded and reported in habitat hectares annually.

The Crown land procedure also provides for a five yearly detailed assessment to determine if DELWP and PV operations on Crown land achieve, as a minimum, no net loss to biodiversity as required by the regulations.

Caring for our environment – faunal emblems program

The Caring for Our Environment - Faunal Emblems Program is helping to improve the long-term sustainability of the Leadbeater's Possum and the Helmeted Honeyeater. The Victorian Government is providing funding for targeted actions that will assist populations directly, as well as protecting and restoring crucial habitat. Activities focusing on the highland populations of Leadbeater's Possum include:

- Artificial hollows monitoring - of the 132 hollows established, 510 checks over the two years showed 58% have now been occupied by Leadbeater's Possums;
- Patterns of recolonisation post bushfire - The results of the surveys confirmed that, in the 11 years since Black Saturday, Leadbeater's possum has successfully recolonised much of its potential habitat in the burnt area, and now occurs again throughout the fire footprint;
- Lake Mountain and Mt Bullfight post fire habitat assessments - the first quantitative vegetation data describing sub-alpine habitat occupied by Leadbeater's Possum;
- Successful supplementary feeding trial;
- Priority research projects investigating genetics, health status and fertility;
- Nest box installation – 189 nest boxes installed at various locations, including 20 installed in the Wallaby Creek section of the Yarra Ranges National Park for translocation trials; and
- Research into cat predation – no evidence of fur content in any the samples analysed to date.

3.2.5 Private land conservation

Protected areas on private land are considered to form part of the CAR reserve system, one of the foundations of ecologically sustainable forest management. Trust for Nature, through its statutory powers, plays a unique role in protecting the diverse range of native plants, animals and habitats on private land in perpetuity, a key role in biodiversity conservation in Victoria.

This role is particularly important in Victoria as 62% of the land area is privately owned, of which over 10 million hectares has been cleared. As ongoing loss of habitat on private land continues, long-term protection of what remains is critical to the future persistence of many ecosystems and species, particularly those whose are reliant on private land areas to avoid extinction. To achieve this goal, Trust for Nature works closely with private landowners, government agencies, other conservation organisations, traditional owners and businesses to help protect and manage Victoria's special habitats, plants and wildlife found on private land.

Trust for Nature uses a variety of methods to achieve conservation goals across Victoria. These include:

- 'on title agreements' known as conservation covenants to protect private land in perpetuity;
- land purchase;
- partnering with organisations and communities to strategically assess and plan conservation outcomes; and
- on-ground works such as planting, species monitoring, weed control and fencing.

3.2.6 Research and monitoring

The Integrated Forest Ecosystem Research (IFER) Agreement with Melbourne University delivers a range of data sets for improved land management decision-making. This includes specific projects which explore the

population viability of priority, forest-dependent threatened fauna species across their range. This project is integrating state-of-the-art landscape simulation modelling (LANDIS) with species distribution and population modelling to assess the combined effects of timber harvesting, bushfire, planned burning and climate change on the species. The flagship Decision Support System (DSS) uses field-based inputs and recognises and emulates the drivers of change in a Victorian forested landscape - bringing world-class science into a scenario modelling framework that enables better understanding of the impacts of various interventions in the landscape.

The Forest Biodiversity and Community Dynamics program explores the impacts of environmental variation and fire management on diversity, and more recently have integrated growth stage optimisation and landscape simulation models to explore the impact of alternative scenarios of planned burning, in interaction with bushfire, on plant diversity.

The Victorian Forest Monitoring Program provides baseline data for long term trend detection and prediction of changes in vegetation diversity, composition and structure so that management options can respond to emerging changes in forest dynamics.

DELWP's Statewide ecosystem resilience monitoring program is delivered in partnership with the Bushfire Natural Hazards CRC and several other research organisations to assess the effectiveness of bushfire management at maintaining or improving the natural environment. The monitoring program involves surveys of vegetation structure, birds and ground-dwelling mammals at sites selected to encompass gradients of time since fire and inter-fire interval.

The Australian National University is assisting DELWP with research examining conservation of Greater Glider populations across Victorian. In a separate project, they are examining the impact of timber harvesting in the Central Highlands RFA region, with a particular focus on long-term responses to fire by arboreal marsupials, forest birds, vegetation and other elements of biodiversity.

DELWP has partnered with the University of Melbourne to investigate population viability of forest dependent threatened species. Specific research questions include:

- What are the independent and interactive effects of timber harvesting, bushfire, planned burning, habitat fragmentation and climate change on the population viability of forest-dependent threatened species?
- How do these effects vary through space and time?
- What is the relative importance of each of these landscape disturbance processes with respect to the long-term persistence of forest-dependent threatened species?

For each of the seven 'focus' forest-dependent threatened species:

- What is the minimum viable population size?
- What is the population trajectory under each simulated scenario, including the expected minimum population size?
- Where do the strongholds of the species currently exist and where are they likely to exist in the future?
- Given the projected increase in stochastic disturbances due to climate change, how much habitat is required to support ongoing population viability?

For each the other high priority forest-dependent threatened species:

- What is the metapopulation capacity threshold above which the species is expected to persist?
- What is the capacity of the landscape to support the species under each simulated scenario?
- What are the relative costs and benefits of species models of greater or lesser complexity for the purposes of analysing forest management scenarios?

4. Pathways towards implementing interim protection and risk mitigation actions

The following section outlines the Departments' approach to where necessary, using reasonable endeavours to implement any enforceable interim protections and management actions to address identified risks to threatened species and communities. These steps will ensure that DELWP and its partners are best placed, where necessary to implement permanent protections and any other changes to Victoria's forest management system by April 2022.

The risk assessment undertaken for this report illustrates that while DELWP has implemented many control measures since 1 April 2020 in addition to the range of existing control measures that mitigate and manage risks to threatened species and communities, further improvements and additional measures may be required. DELWP's focus over the next 6 months will be identifying which of the significant-high risk rated species and communities are at the greatest risk of serious and irreversible environmental damage in the short-term, such as those with narrow distribution and at elevated risk due to the 2019/20 bushfire impacts. This will be followed by the exploration of appropriate risk mitigation measures for this sub-set of species or communities, and any identified actions prioritised for implementation by April 2021.

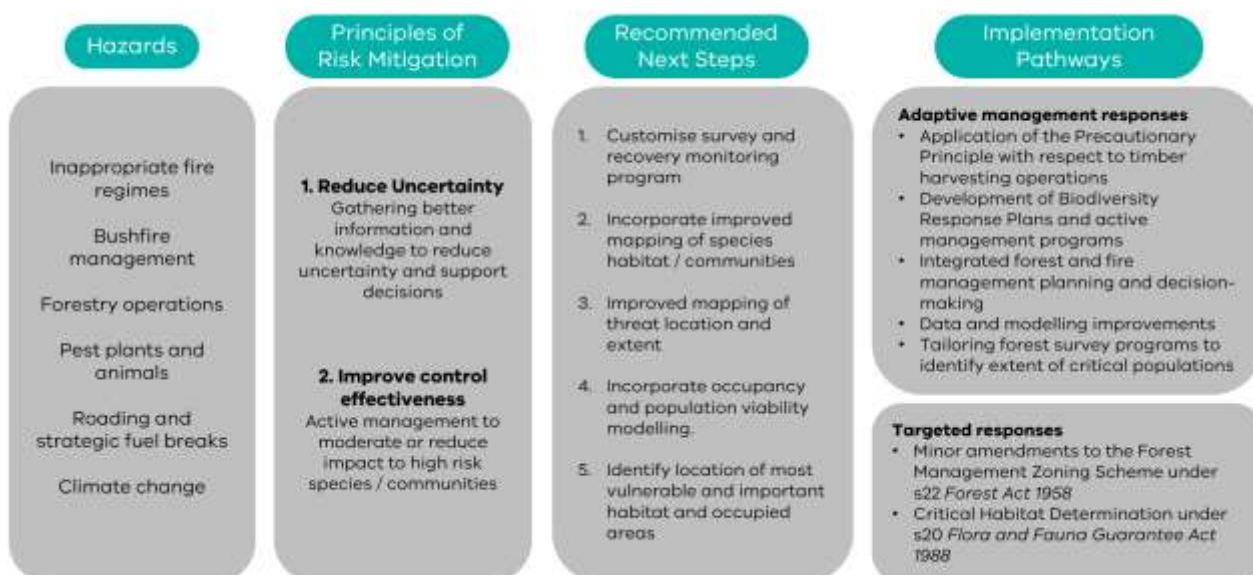


Figure 5: Mitigating Risk – Interim Protection Implementation Pathway

4.1 Principles for risk mitigation

When considering the identified hazards and the associated risk assessment for threatened species and communities, there are two key over-arching principles for the mitigation of these risks.

1. Reduction of uncertainty to support decision-making

For many of the species and communities identified as high risk, uncertainty regarding likelihood and consequence often influenced the overall risk assessment. For example, some species had very broad distributions of habitat, or had little information on where exactly key habitat is located, and therefore estimating the vulnerability to identified hazards was less clear. In such circumstances, it is difficult to understand the extent of habitat in existing reserves, or the likelihood of the habitat or its species being directly impacted by the identified hazards.

Recommendation: Gathering better information and knowledge to reduce uncertainty and support decision-making and prioritisation of effort.

2. Improve the effectiveness of control

Controls seek to minimise the overall risk of the hazard to threatened species and communities. Where the controls may be ineffective, improving them by actively managing risks can mitigate or moderate the overall

threat to species or communities. For example, identifying and retaining important habitat during timber harvesting operations is one approach to actively manage the threats to species and communities.

Recommendation: Undertake and investigate active management options to moderate or reduce impact to species or communities at highest risk.

These two principles of risk mitigation frame the next intermediate steps for interim protections and to inform implementation pathways.

4.2 Recommended next steps

Several key steps have been identified as necessary precursors to inform decisions about the appropriate risk response and implementation pathway.

Next steps <i>(focus on species and communities at greatest risk of serious or irreversible damage in the short-term)</i>	How this can inform risk mitigation
1. Customise survey and recovery monitoring program	Surveying allows more confidence in the location of threatened species and improves the effectiveness of controls to protect threatened species. Surveying also allows for validation of existing models and improved understanding of occupancy and persistence of species in known protected habitats
2. Incorporate improved mapping of species habitat and communities' extent	Better understanding the distribution of species and extent of communities allows for better understanding of performance of current reserve system
3. Improved mapping of threat location and extent	Spatial information representing the location of threats across the landscape can then interact with improved mapping of important species habitat and community extent to reduce uncertainty surrounding extent of vulnerability to the threat and support more targeted risk mitigation response.
4. Incorporate occupancy and population viability modelling	Improve confidence and reduce uncertainty in models that give understanding of how occupancy might change through time in response to disturbance; population viability modelling provides insight in to the extent of habitat required for given species. This can then guide planning and implementation of controls.
5. Identify location of most vulnerable and important habitat and occupied areas	Understanding the location of the most vulnerable and important habitat areas can reduce uncertainty and improve the effectiveness of any proposed controls by ensuring they are targeted to the areas that matter most for threatened species or community.

By undertaking these steps concurrently with other work underway better information will enable determination of the most appropriate risk response to support recovery and maintenance of viable populations throughout their range until more substantive and permanent measures can be put in place.

4.3 Implementation pathways

Following completion of the recommended next steps outlined above, DELWP will be able to identify the most suitable pathways for implementing interim protection and priority actions for threatened species and communities. Two implementation pathways will be explored:

- a. adaptive management responses; and
- b. targeted responses.

4.3.1 Adaptive Management Responses

Adaptive management responses can be applied directly or more generally to improve control effectiveness, reduce or moderate expected harm or decrease the likelihood of harm. Necessarily, they remain adaptive and flexible in the way they can be deployed and responsive to changing information. Examples include:

- application of the Precautionary Principle with respect to timber harvesting operations;
- development of Biodiversity Response Plans and active management programs;
- integrated forest and fire management planning and decision-making;
- data and modelling improvements; and
- tailoring forest survey programs to identify extent of critical populations.

The Precautionary Principle and risks of Significant Impact

The application of the 'Precautionary Principle' is a mandatory and enforceable action of the *Code of Practice for Timber Production 2014* and must be complied with when planning and conducting timber harvesting operations. The application of the precautionary principle does not prescribe any one specific management action nor does it require the avoidance of all risk, and as such, it is an adaptive management approach which allows for a range of flexible alternative measures that respond proportionately to risk. While it is also a key principle under ecologically sustainable forest management, where a lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation, it does not have the same enforceable application to DELWP's conduct of fuel reduction burning or other forest management activities. DELWP will implement practices for the physical activities conducted under the bushfire management programs that avoid, mitigate and manage potential impacts on matters of national environmental significance (MNES) under the *Environmental Protections and Biodiversity Conservation Act 1999* (Cth) (the EPBC Act).

Biodiversity response planning and active management

Biodiversity Response Planning is a regional based planning approach to biodiversity conservation in Victoria; the State has been divided into 11 geographical areas with associated working groups for each of these areas that include a range of stakeholders who have experience and knowledge of the regional biodiversity across their area. Working groups use the latest science and assessments, including that embedded in the Strategic Management Prospects tool and their own local knowledge, to identify priority landscapes or themes. Projects can then be developed by interested stakeholders and community members within these priority landscapes or themes to actively manage threats and support resourcing allocations.

Integrated Forest and Fire Management Planning

DELWP will continue to improve planning guidance in the areas of forest and fire planning paying particular attention to the use of decision support tools such as Strategic Management Prospects and Fire Analysis Modelling of Ecosystem values (FAME) to inform priority forest management actions (such as pest and weed control) and the arrangement of fire management zones. This is further supported by DELWP's use of Structured decision-making (SDM) when making strategic and operational forest and fire planning decisions.

SDM is an approach that helps people unpack complex decisions, navigate trade-offs and make logical and transparent choices. It provides a means of bringing together both scientific information and human values to make decisions, through analysis and inclusive deliberation. The approach is particularly useful in decision-making contexts characterised by uncertainty, multiple stakeholders and competing objectives. Broadly, the SDM steps involved included understanding the decision context, setting objectives, identifying possible management strategies, and estimating and analysing the consequences and inherent trade-offs of these strategy options. The strategy that gives the greatest benefit to the chosen values, while balancing the impacts of management actions on those same values is then chosen.

Improved Impact and Values Modelling

DELWP will also undertake work to improve modelling of the impact of fuel management on environmental values, including threatened species. These modelling enhancements will drive improvements in evaluation and reporting, and strategic bushfire management planning.

DELWP and the Country Fire Authority (CFA) are undertaking work to improve bushfire risk data and modelling and there are multiple research projects planned and underway that will improve our understanding of bushfire behaviour and fuel dynamics. These improvements will result in a better

understanding of fire behaviour at specific points in the landscape, fire regimes and climate change drivers on fire regimes.

DELWP implements the *Monitoring, Evaluation and Reporting (MER) Framework for Bushfire Management on Public Land* to measure the effectiveness of bushfire management on public land. DELWP has invested in developing fire and biodiversity monitoring protocols and collecting monitoring data and has committed to review the fuel management MER Framework by July 2021.

Forest Survey Programs

Survey programs provide useful on-ground information which can help with management decisions and targeted approaches relating to threatened species and key habitat. For example, the Forest Protection Survey Program currently surveys at least 80 per cent of coupes in State forests that are scheduled to be harvested each year, to protect plants, animals and their habitats that are either threatened or of high conservation value. A prioritisation process identifies the highest-priority species and coupes to survey, with surveys adopting specific techniques to identify and detect the target species or their habitats. Utilising other existing landscape-scale survey programs to survey in a more targeted way to proactively verify occupancy for narrowly distributed species and identify important habitat locations for a range of threatened species and communities will provide important adaptive management information for threatened species management and protection.

4.3.2 Targeted Responses

Targeted responses are characterised by having a more definitive action, such as the protection of identified habitat areas or specific features through regulatory prohibitions, rather than guiding management approaches. For the purpose of introducing enforceable interim protections, there are two main options under consideration:

- **Minor Amendments to the Forest Management Zoning Scheme** under s22 *Forests Act 1958*; and
- **Critical Habitat Determination** under s20 *Flora and Fauna Guarantee Act 1988*.

Both options can be implemented in shorter timeframes than other enforceable protection options however require more definitive information regarding location and extent of communities, critical habitat or occupancy, and require careful evaluation of social and economic impacts. Both options can also provide legally enforceable restrictions to a range of activities under Victorian law.

Minor Amendments to the Forest Management Zoning Scheme

The Forest Management Zoning scheme is described in Part 3 of this report. The Forest Management Zoning scheme can be amended by the Secretary under Section 22 of the *Forests Act 1958*, whereby existing General Management Zone, Special Management Zone or Special Protection Zone areas could be amended to create new Special Management Zone or Special Protection Zones to manage and protect specific forest values or localities in State Forests. Decisions to undertake minor zoning amendments must generally consider a range of guidelines and standards¹⁰, including:

- Ensuring that the principles and operational goals of the *Code of Practice for Timber Production 2014* can still be met;
- Ensuring that the Comprehensive, Adequate and Representative reserve system continues to comply with JANIS criteria; and
- Ensuring minimisation of practical access problems for forestry operations and forest management, such as avoiding competition with strategic burning zones.

Where a change to zoning is proved to be warranted, any significant proposed changes will be made available for public viewing and comment.

Minor zoning amendments can establish Special Protection Zones that are site-specific and targeted to protect well-defined habitat or a known population of a high-risk species or community. Where less certainty regarding specific locations or extent of exists, Special Management Zones could be applied with associated conditions aimed at mitigating environmental harm or the likelihood of the harm arising from the hazard.

The Secretary would be required to consult with affected land or forest managers to ensure their rights and interests are appropriately considered. Compliance with the FMZ Scheme is a condition of the Allocation

¹⁰ See *Process for amending Forest Management Zoning Scheme: Standard Operating Procedure*, Version 3 2019; Policy and Planning Division, Forest Fire and Regions Group, DELWP

Order 2019, which permits and authorises the conduct of timber harvesting operations and associated management activities in State forests.

Critical Habitat Determination

A Critical Habitat Determination (CHD) can be made by the Secretary to DELWP under section 20 of the *Flora and Fauna Guarantee Act 1988*. This can be in respect to any area that significantly contributes to the conservation in Victoria of a listed taxon or community of flora or fauna. A CHD is subject to notification, consultation and public comment requirements, plus a requirement to consult with the Scientific Advisory Committee (SAC). Any declaration must also be published in the government gazette. Note that areas identified for forest management zoning amendments may provide precursor information for where a CHD may be suitable, though this is not a required part of implementing a CHD.

The determination does not carry regulatory power, is subject to public consultation, and the Secretary must take reasonable steps to enter into agreements with managers for the area covered by the determination. However, a determination still signals the importance of the area or habitat and may lead to additional considerations and processes. For example, a CHD overrides any existing order of the Governor in Council published in the Government Gazette which authorises the taking of protected flora that may occur during timber harvesting operations; in such instances the Secretary of DELWP may have to authorise any such operation in CHD areas where protected flora may be affected. The Secretary may also make guidelines for areas eligible for CHDs to inform their management.

4.4 Risk mitigations that are ongoing

In addition to the above steps, there are ongoing actions that will continue to be implemented in the short-to-medium term which will serve to mitigate some of the risks and threats identified to threatened species and communities that have been identified. Many of these ongoing initiatives have been highlighted in Part 3 of this report, and further detail can be obtained from that section. Funding and resources to support these activities have been provided by the Commonwealth and Victorian Governments.

Pest plants and animals

- Intensified and sustained management of pest plant and animal threats following the 2019/20 fires
- Trials of targeted predator control programs (e.g. baits for cats)
- Landscape scale, targeted pest and weed management (the 'Ark' and 'Eden') programs, including:
 - Central Highlands Eden;
 - Glenelg Ark and Eden;
 - Otways Eden;
 - Grampians Ark;
 - Southern Ark and
 - Barry Mountains.

Science

- Reconnaissance and assessment of critical habitat and recovery following the 2019/20 fires;
- Expert elicitation to refine decision support tools;
- Specific needs assessments to inform investment in future recovery actions, and actions to maximise resilience across Victoria;
- Genetic risk assessment for key threatened species;
- Genetic rescue projects for species known to be at risk; and
- Feasibility assessments of safer haven establishment and wild to wild translocations to reduce risks of catastrophic loss in future bushfire events.

Other active management

- Nest box and tree hollow installation in bushfire-affected areas;
- Restoration of forests impacted by multiple short-interval bushfires;
- Work on improving the management of listed species and communities in future emergencies;
- Nature-led community recovery programs;
- Major upgrade to seed collections to insure against potential future loss;
- Potential to fence key sites to exclude herbivores; and
- Revegetation projects on private land in bushfire-affected areas.

Appendix 1: Assessed items and assessors

Table 1: List of Species and associated listing status

Common Name	Scientific Name	EPBC status	FFG status
Alpine Bog Skink	<i>Pseudemoia cryodroma</i>		Threatened
Alpine Spiny Crayfish	<i>Euastacus crassus</i>	Endangered	Threatened
Aniseed Boronia	<i>Boronia galbraithiae</i>	Vulnerable	Threatened
Barred Galaxias	<i>Galaxias fuscus</i>	Endangered	Threatened
Baw Frog	<i>Philoria frosti</i>	Endangered	Threatened
Betka Bottlebrush	<i>Callistemon kenmorrisonii</i>	Vulnerable	Threatened
Blue-tongue Greenhood	<i>Pterostylis oreophila</i>	Critically Endangered	
Booroolong Tree Frog	<i>Litoria booroolongensis</i>	Endangered	Threatened
Brilliant Sun-orchid	<i>Thelymitra mackibbinii</i>	Vulnerable	Threatened
Broad-toothed Rat	<i>Mastacomys fuscus mordicus</i>	Vulnerable	Threatened
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>		Threatened
Candy Spider-orchid	<i>Caladenia versicolor</i>	Vulnerable	Threatened
Colquhoun Grevillea	<i>Grevillea celata</i>	Vulnerable	Threatened
Concave Pomaderris	<i>Pomaderris subplicata</i>	Vulnerable	Threatened
Crimson Spider-orchid	<i>Caladenia concolor</i>	Vulnerable	Threatened
Curve Tail Burrowing Crayfish	<i>Engaeus curvisuturus</i>		Threatened
Dargo Galaxias	<i>Galaxias mungadhan</i>		Threatened
Diamond Python	<i>Morelia spilota spilota</i>		Threatened
Don's Spider Orchid	<i>Caladenia cremna</i>	Critically Endangered	
Drooping Grevillea, Ben Major Grevillea	<i>Grevillea floripendula</i>	Vulnerable	Threatened
Dwarf Kerrawang	<i>Rulingia prostrata</i>	Endangered	Threatened
East Gippsland Galaxias	<i>Galaxias aequipinnis</i>		Threatened
Eastern She-oak Skink	<i>Cyclodomorphus michaeli</i>		Threatened
Elegant Spider-orchid, Blood-red Spider-orchid	<i>Caladenia formosa (Arachnorchis formosa)</i>	Vulnerable	
Giant Burrowing Frog	<i>Heleioporus australiacus</i>	Vulnerable	Threatened
Glenelg Freshwater Mussel	<i>Hyridella glenelgensis</i>	Critically Endangered	Threatened
Glenelg Spiny Freshwater Crayfish, Pricklyback	<i>Euastacus bispinosus</i>	Endangered	Threatened
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>		Threatened
Gorae Leek-orchid	<i>Prasophyllum diversiflorum</i>	Endangered	Threatened
Grampians Bitter-pea	<i>Daviesia laevis</i>	Vulnerable	Threatened
Greater Glider	<i>Petauroides volans</i>	Vulnerable	Threatened
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Vulnerable	Threatened
Gully Grevillea	<i>Grevillea barklyana</i>		Threatened
Large Brown Tree Frog	<i>Litoria littlejohni</i>	Vulnerable	Threatened
Leadbeater's Possum	<i>Gymnobelideus leadbeateri</i>	Critically Endangered	Threatened
Leafy Nematolepis	<i>Nematolepis frondosa</i>	Vulnerable	Threatened
Long-footed Potoroo	<i>Potorous longipes</i>	Endangered	Threatened
Long-nosed Potoroo	<i>Potorous tridactylus Potorous tridactylus trisulcatus</i>	Vulnerable	Threatened
Maidenhair Spleenwort	<i>Asplenium hookerianum</i>	Vulnerable	Threatened
Mallacoota Burrowing Crayfish	<i>Engaeus mallacoota</i>		Threatened

Common Name	Scientific Name	EPBC status	FFG status
Martin's Toadlet	<i>Uperoleia martini</i>		Threatened
Masked Owl	<i>Tyto novaehollandiae</i>		Threatened
McDowalls Galaxias	<i>Galaxias mcdowalli</i>		Threatened
Mount Cole Grevillea	<i>Grevillea montis-cole</i> <i>subsp. montis-cole</i>		Threatened
Narracan Burrowing Crayfish	<i>Engaeus phyllocercus</i>		Threatened
New Holland Mouse	<i>Pseudomys novaehollandiae</i>	Vulnerable	Threatened
Orbost Spiny Crayfish	<i>Euastacus diversus</i>		Threatened
Powerful Owl	<i>Ninox strenua</i>		Threatened
Red-tailed Black-Cockatoo (south-eastern)	<i>Calyptorhynchus banksii graptogyne</i>	Endangered	Threatened
Regent Honeyeater	<i>Anthochaera phrygia</i>	Critically Endangered	Threatened
Rough Eyebright	<i>Euphrasia scabra</i>		Threatened
Round-leaf Pomaderris	<i>Pomaderris vacciniifolia</i>	Critically Endangered	Threatened
Roundsnout Galaxias	<i>Galaxias terenasus</i>		Threatened
Rufous Pomaderris	<i>Pomaderris brunnea</i>	Vulnerable	
Slender Tree-fern	<i>Cyathea cunninghamii</i>		Threatened
Smoky Mouse	<i>Pseudomys fumeus</i>	Endangered	Threatened
Sooty Owl	<i>Tyto tenebricosa</i>		Threatened
South Gippsland Spiny Crayfish	<i>Euastacus neodiversus</i>		Threatened
Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	Endangered	Threatened
Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i>	Endangered	Threatened
Spotted Tree Frog	<i>Litoria spenceri</i>	Endangered	Threatened
Strzelecki Burrowing Crayfish	<i>Engaeus rostrigaleatus</i>		Threatened
Strzelecki Gum	<i>Eucalyptus strzeleckii</i>	Vulnerable	Threatened
Swamp Skink	<i>Lissolepis coventryi</i>		Threatened
Swift Parrot	<i>Lathamus discolor</i>	Critically Endangered	Threatened
Tall Astelia	<i>Astelia australiana</i>	Vulnerable	Threatened
Tapered Galaxias	<i>Galaxias lanceolatus</i>		Threatened
Wellington Mintbush	<i>Prostanthera galbraithiae</i>	Vulnerable	Threatened
West Gippsland Galaxias	<i>Galaxias longifundus</i>		Threatened
White-footed Dunnart	<i>Sminthopsis leucopus</i>		Threatened

Table 2: List of Communities and associated listing status

Community name	EPBC status	FFG status
Alpine Bog*		Threatened
Alpine Sphagnum Bogs and Associated Fens*	Endangered	
Cool Temperate Mixed Forest		Threatened
Cool Temperate Rainforest		Threatened
Fen (Bog Pool)*		Threatened
Gippsland Red Gum (<i>Eucalyptus tereticornis</i> subsp. <i>mediana</i>) Grassy Woodland and Associated Native Grassland	Critically Endangered	
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	
Strzeleckis Warm Temperate Rainforest		Threatened
Warm Temperate Rainforest (East Gippsland Alluvial Terraces)		Threatened
Warm Temperate Rainforest (Far East Gippsland)		Threatened
Western Basalt Plains (River Red Gum) Grassy Woodland (55-04)		Threatened

* Note: The FFG Listed "Alpine Bog" and "Fen (Bog Pool)" have been assessed as one community along with "Alpine Sphagnum Bogs and Associated Fens" (EPBC listing)

Table 3: List of assessors for the risk assessment

DELWP – Arthur Rylah Institute	DELWP – Forest Fire and Regions Group	Additional assessors
Arn Tolsma	Andrew Pritchard	Kevin Rowe (Museums Victoria)
Dianne Crowther	Belinda Rossack	Neville Walsh (Royal Botanical Gardens)
Geoff Brown	Dan Pendavingh	
Geoff Sutter	Donna McMaster	
Jemma Cripps	Glen Johnson	
Jenny Nelson	Jerry Alexander	
Judy Downe	Kerry Seaton	
Lindy Lumsden	Kylie Singleton	
Louise Durkin	Lucas Bluff	
Nick Clemann	Marc Perri	
Peter Menkhorst	Mick Bramwell	
Phoebe Macak	Pauline Rudolph	
Steve Sinclair	Richard Hill	
Tarmo Raadik	Stephen Henry	
	Tony Mitchell	

Appendix 2: Additional details of methods

The risk assessment process

The risk assessment process follows DELWPs Risk Management Guidelines (2019) and includes steps to identify, analyse and evaluate the risks to listed species and communities within each RFA region. Experts are also asked to identify potential mitigations, but not assess the residual risk if these mitigations are implemented.

Experts will be stepped through a series of questions for each species and required to make judgements based on their knowledge and experience as well as some supporting quantitative information on **hazard extent** and existing **controls** where available. For example, the extent of timber harvesting across a species modelled range within each RFA region has been quantified to provide context for the expert. The existing controls for hazards are also outlined where relevant, such as species prescriptions contained in the Code of Practice for Timber Production (2014).

A subsequent moderation process will review all risk assessments and ensure consistency in application of the ratings system.

Step 1: Establish the Context (species or community)

The policy context for this risk assessment is described in this document including scope and the key policy objective that risk is being assessed against.

For each species some key information is provided (prefilled) to set the context for the species or community. This information includes:

- Taxon ID
- Species Common and Scientific Name OR Community name
- Taxon Type OR written description of community
- Listing status DELWP Advisory, EPBC and FFG
- Extent of species modelled habitat state-wide OR mapped extent of community where available
- Proportion of species modelled habitat within each RFA region OR area of mapped community within RFA region
- Proportion of habitat potentially available to forestry operations
- Proportion of habitat impacted by 2019/20 bushfires
- Proportion of habitat within the CAR Reserve System
- Proportion of habitat subject to different fire management zones (i.e. to indicated areas likely to be treated with planned burning)

Step 2: Identify Hazards and Vulnerability

In this step experts are asked to describe the major hazards operating on the species or community within each RFA region that it occurs. Experts will be provided with background information from the relevant statutory conservation planning document (e.g. conservation advice, action statement, CAM assessment) where available. Experts will be asked to describe the hazard and provide information on the vulnerability of the species to that hazard - how does the hazard impact that particular species or community if it occurs. This is defined as the direct mechanism of impact of the hazard.

The objective guiding the identification of hazards is those threatening processes that may limit the conservation and recovery of listed species and communities within each RFA region over a 20-year time period.

An initial list of hazards and vulnerability (direct mechanism of impact) is available for experts to choose from. This is to allow for consistent definition of hazards and ultimately consistent overall risk assessments. Experts are able to describe their own hazards if those in the list are not applicable.

Experts will be asked to provide the following information per hazard:

- Hazard (select from a drop-down list of options OR add additional)

- Vulnerability – how does the hazard directly impact populations or its habitat (select from a drop-down list of options OR add additional) – *add multiple columns to describe all relevant mechanisms of impact.*
- Any additional information on the hazard, if required – *e.g. outline any specific details relevant to the hazard such as ‘only impacts near the Snowy River’*
- Relevant RFA region (CH, NE, G, EG, W or All) – *where a hazard is different in different RFA regions please add additional rows for each RFA region*

Step 3: Identify Current Controls and Effectiveness

A risk assessment should be performed to establish a realistic view of risks requiring consideration and/or treatment within the context of the risk assessment. Therefore, when performing a risk assessment and discussing hazards, the current controls or policy settings should be considered.

Experts will be asked to provide the following information per hazard:

- Current control measures – expert to describe, if there are a number of mechanisms of impact outlined in the previous step then experts are asked to provide as many controls that are currently occurring to manage those impacts
- Effectiveness of current controls (see table below) – rate the combination of the controls in managing the overall hazard
- Effectiveness of controls rationale – any additional information not covered in the two points above

Step 4: Provide a statement on the interaction of hazards and direct mechanism of impact

Once all threats to a species or community have been listed, experts are asked to comment on the interaction of listed hazards. This can be individually or as whole. This statement will be a qualitative assessment of the ways in which the threats may interact to increase the level of risk of any one threat.

Step 5: Conduct current risk assessment

Current risk assessment is an assessment of the risk rating as it stands today, with consideration of all existing controls currently in place. It includes identifying existing controls (included in step 3) and an assessment of the effectiveness of identified controls. The risk analysis step is conducted when all hazards and controls have been listed. Experts are asked to assess the consequence of the hazard occurring, given the species or community vulnerability, based on the effectiveness of the current controls.

Experts are then asked to make a judgement on the likelihood of the hazard and consequence occurring and determine the overall risk level according to the likelihood and consequence scales.

In this step experts are asked to provide the following for each risk listed for each RFA region per species or community:

- Consequence (using predefined definitions)
- Likelihood (using predefined definitions)
- Overall risk level (using risk matrix)
- Confidence in assessment (using predefined definitions)

Consequence is the impact if the hazard occurs, based on the vulnerability of the species or community. For some hazards, such as timber harvesting, certain assumptions may need to be made – for example, timber harvesting will only occur in areas currently available to timber harvesting, the current timber demand, and considering the current applicable prescriptions. Similarly, for wildfire, an assumption might be made that the future fire regimes will reflect those of the past 20 years as opposed to any scenarios about varying fire frequency.

Likelihood is the probability that the hazard will occur and impact on the species (i.e. occurs in the species habitat) and cause the listed consequence over a 20-year timeframe.

Step 6: Propose possible mitigations

Risk management is fundamentally about identifying risks and then treating the risks to ensure that the risk profile is kept within a tolerable level. While it is unlikely that the risks will be eliminated entirely, the purpose of treating risks is to achieve an acceptable risk exposure in the most effective and efficient manner.

This step requires experts to identify possible mitigations for the hazards identified in step 2 where those hazards have been assessed as **high** to **significant** overall. Experts are asked to provide general mitigations which will be considered in subsequently defining any interim protections or management actions when all risk assessments for all species and communities are complete.

We acknowledge that some risks/threats are more manageable than others – if, in the opinion of the assessor, there is no feasible and effective mitigation, this should be stated.

Step 7: Expert reviewer information and important resources

Experts details are recorded, and any important resources relied upon in the assessments are documented for further information if required.

Step 8: Moderation of assessments

A subsequent moderation process was conducted to review all risk assessments to ensure consistency in application of the ratings system. The moderation process involved representatives from the assessor group (i.e. taxon experts) with key policy and planning experts to ensure ratings for control effectiveness, consequence and likelihood had been consistently applied. The moderation group met over two workshops to identify any issues. Following this, assessors were re interviewed to clarify judgements made (i.e. provide a rationale or further information) or to change ratings assigned to species or regions. This resulted in some changes to the species and community assessments.

Step 9: Finalise and Report

Following the moderation process the finding from individual species and communities’ assessments were compiled into one summary spreadsheet to allow for interpretation of the data and analysis. The outcomes of the risk assessment were documented in this report, with a focus on the high-significant rated risks.

Ratings tables and descriptions

Table 1: Control effectiveness rating

Control Rating	Description
Good	Controls are well designed, address the risk, and are effective and reliable at all times in eliminating the direct mechanism of impact. Further controls to reduce risk may still be considered
Satisfactory	Most controls are designed correctly and are in place and effective. Controls address risk at least partially however may require further improvement. Some work needs to be done to improve operating effectiveness or managers have doubts about operational effectiveness and reliability of some controls. Consideration be given to implementing further controls
Poor	There are some controls, but they do not address the risk effectively and require significant improvement. Most of the controls do not seem correctly designed, in that they do not operate effectively. Significant control gaps. Additional controls must be developed for all risks
Uncontrolled	There is virtually no credible control or controls that exist do not address the risk. Managers have no confidence that any degree of control is being achieved due to poor control design and/or very limited operational effectiveness. Further controls must be implemented to address risks

Table 2: Consequence descriptors

Category	Descriptors
Extreme	<p>Extent: Impacts on almost all (> 80%) of the extent of the species/community range OR a majority of particularly high value sites</p> <p>Severity: Very serious effect on the species persistence, significant reduction in population size and/or associated habitat: species/community likely to go extinct across the range in the <u>RFA region</u> or any of the discrete sub populations within a region within the timeframe due to the hazard</p> <p>Duration: Impacts expected to endure over a long time period (e.g. 20 + years) or populations are not expected to recover</p>
Major	<p>Extent: Impacts on a large proportion (60-80%) of the extent of the species /community range or a major amount of high value sites</p> <p>Severity: major effect on the species or community persistence, major reduction in population size and/or associated habitat, species/community may be threatened with extinction across the range in the RFA region or any of the discrete sub populations within the region.</p> <p>Duration: Impacts expected to endure over a major time period 10-20 years</p>
Moderate	<p>Extent: Impacts on moderate proportion (30-60%) of the extent of the species /community range or a moderate amount of high value sites</p> <p>Severity: Moderate effect on the species or community persistence, may be a reduction in population size, unlikely to be threatened with extinction from this hazard</p> <p>Duration: Impacts expected to endure over a moderate time period 5-10 years</p>
Minor	<p>Extent: Limited impacted on the extent of the species/community range (10-30%) or high value sites</p> <p>Severity: minor effect on the specie or community persistence, unlikely to lead to population reduction</p> <p>Duration: Impacts expected to endure over a short time period 1-4-years</p>
Negligible	<p>Extent: Negligible effect on the extent of the species/community range, Contained locally within a single site/area</p> <p>Severity: Negligible effect on the species or community persistence:</p> <p>Duration: Impacts expected to ensure for a negligible time period and/or under 1 year</p>

Table 3: Likelihood descriptors

Rating	Description
Almost Certain	<p>The hazard is expected to occur at all times within a species habitat or community extent over 20 years, at a scale that will cause the expected consequence</p> <p>There is great opportunity, reason or means for it to occur</p>
Likely	<p>The hazard is likely to occur in most circumstances. within a species habitat or community extent over 20 years, at a scale that will cause the expected consequence</p> <p>There is considerable opportunity, reason or means for the consequence to occur</p>
Possible	<p>The hazard might occur within a species habitat or community extent over 20 years, at a scale that will cause the expected consequence</p> <p>There is some opportunity, reason or means to occur</p>
Unlikely	<p>The hazard is unlikely to occur within a species habitat or community extent over 20 years, at a scale that will cause the expected consequence</p> <p>there is little opportunity, reasons or means to occur</p>
Rare	<p>The hazard may only occur in exceptional circumstances</p>

Table 4: Risk matrix

Likelihood	Consequence				
	Negligible	Minor	Moderate	Major	Extreme
Almost Certain	Medium	Significant	High	High	High
Likely	Medium	Medium	Significant	High	High
Possible	Low	Medium	Medium	Significant	High
Unlikely	Low	Low	Medium	Medium	Significant
Rare	Low	Low	Low	Medium	Significant

Table 5: Confidence in assessment¹¹

Confidence level	Descriptor	Supporting evidence
Highest	Assessed likelihood, consequence or risk is easily assessed to one level, with almost no uncertainty	Recent historical event of similar magnitude to that being assessed in the community of interest or Quantitative modelling and analysis of highest quality and length of data relating directly to the affected community, used to derive results of direct relevance to the scenario being assessed
High	Assessed likelihood, consequence or risk has only one level, but with some uncertainty in the assessment	Recent historical event of similar magnitude to that being assessed in a directly comparable community of interest or Quantitative modelling and analysis use sufficient quality and length of data to derive results of direct relevance to the event being assessed
Moderate	Assessed likelihood, consequence or risk could be one of two levels, with significant uncertainty	Historical event of similar magnitude to that being assessed in a comparable community of interest or Quantitative modelling and analysis with reasonable extrapolation of data required to derive results of direct relevance to the event being assessed
Low	Assessed likelihood, consequence or risk could be one of three or more levels, with major uncertainty	Some comparable historical events through anecdotal information or Quantitative modelling and analysis with extensive extrapolation of data required to derive results of relevance to the event being assessed
Lowest	Assessed likelihood, consequence or risk could be one of four or more levels, with fundamental uncertainty	No historical events or quantitative modelled results to support the levels

11. National Emergency Risk Assessment Guidelines Handbook “: Confidence level descriptions” (page 42), Australian Institute for Disaster Resilience

Table 6: Hazards

Hazards	Description of the hazard and assumptions
Climate Change	Describe direct mechanism of impact if not covered by a hazard listed below. Where a hazard that is likely to be exacerbated by climate change is include below, please include in hazard description in assessment matrix.
Disease and pathogens	All diseases and pathogen that a species/community may be susceptible.
Drought	Significant reduction in average rainfall, resulting in (but not limited to) below average soil moisture, and water retainment. Please indicate if climate change induced. Does NOT include wildfire as a result of drought
Environmental weeds	Invasive flora, inclusive of exotic and native invasive species. These compete directly and indirectly with threatened species. May impact (but is not restricted to) recruitment of species, habitat and food availability.
Firewood collection (incl. illegal felling)	The legal and non-legal removal of trees (besides VicForests forestry operations – harvesting, see definition)
Flood	Sudden and/or prolonged overabundance of water in a given location
Food availability	Reduction in the availability of direct food source. Includes reduction in food availability due to climate change, or geographical range of a species. This does NOT include food availability as a result of timber harvesting, fire or any other listed threats.
Pollution	Including (but not limited to) fire retardant, chemicals used for agricultural purposes, and polluted waterways.
Forestry Operations – harvesting	Including managing of trees (before harvest), and the harvesting of forest produce. It includes the direct impact that forestry operations have with the landscape and regeneration burns. It does NOT include road construction
Fuel Management - Mulching	All mulching activities that are included within direct and indirect firefighting activities, mulching relating to track and road shoulder maintenance, and recreation site maintenance.
Hazardous tree removal	The removal of hazardous trees for the purpose of pre or post burn preparation, human safety, ensuring road access etc.
Human Disturbance	Direct human disturbance to the species. Including (but not limited to roadkill, take from the wild etc.)
Inappropriate fire regime (prescribed burns)	The presence of prescribed burning, and the direct impacts of the prescribed burn. NOT inclusive of containment activities (such as containment lines, retardant, etc).
Inappropriate fire regime (wildfire)	The presence of wildfire or bushfire, and the direct impacts of the wildfire. NOT inclusive of containment activities (such as containment lines, retardant, etc). Assume past 20 years of fire history occurs in the next 20 years.
Introduced herbivores	Exotic herbivores that are introduced to a given environment. These may include (but is not restricted to), deer, horses, goats and pigs. This does NOT include native herbivores/grazier to a given environment (such as macropods).
Introduced predators	Exotic predators that are introduced to a given environment. These may include (but is not restricted to), foxes, cats and dogs. These do NOT include predator's native to a given environment (such as birds of prey). Does not include bait that may be used to control species.
Introduced aquatics	All aquatic animals that are either exotic or not historically native to a given location.
Introduced species (specify)	All species that are either introduced or overabundant/opportunistic native species. These may include (but is not restricted to), invasive birds

Hazards	Description of the hazard and assumptions
	(Australian Raven), introduced birds (noisy miner, noisy friarbird and the red wattlebird), honeybees etc.
Land clearing (e.g. Agricultural, new infrastructure)	The act of removing native land. Including, build, updating and maintaining infrastructure, agriculture (plantations, crops, stock grazing etc) etc.
Mining	Any activities that specifically relate to mining, including (but not limited to) the construction and recovery, extraction and transport of products, from a mine.
Native species impacts	All native wildlife that threaten species. Including over abundant native grazing species (such as Macropods), and native predators (such as birds of prey, quolls, native fish etc).
Recreation activities (hiking, camping, biking and horse-riding, motorbike/trail bike riding, 4WD)	Recreational activities, on all land tenures. Including (but not restricted to) hiking, biking, camping, boating, 4-wheel driving. Including the authorised and non-authorised installation of tracks predominately used for these activities. As well as continuous maintenance (legal and illegal) of this infrastructure. Please specific in further detail which recreational activity is relevant.
Development projects	All activities related to development projects on public and private land, may include renewable energy wind turbines etc.
In-stream barrier e.g. dams	Human constructed barriers that alter the hydrology or flow of a river or limit movement
Hydro-power generation	The damming and release of water to generate electricity which changes hydrology
Roading and fuelbreaks (construction and maintenance)	The construction, maintenance and upkeep of all roads and development of strategic fuelbreaks. This includes for the purpose of fire response, fire management and recreation.
Genetic diversity (specify)	The genetic makeup of a species. Including the overall genetic diversity across local and broad populations.
Extreme Weather events	Severe, sudden changes in weather. Such as extreme hail, catastrophic wind. Excluding fire, drought or flood (see other specific categories)

Appendix 3: Lists of species and communities with significant or high risks by RFA region

Table 1: Central Highlands

Species or Community	Hazards rated as significant or high						
	Bushfire management	Inappropriate fire regimes	Climate change (including extreme weather and drought)	Forestry operations	Pest plants and animals	Roading and strategic fuelbreaks	Other
Amphibians	0	1	0	0	2	0	2
Baw Baw Frog					✓		✓
Spotted Tree Frog		✓			✓		✓
Aquatics	0	1	1	1	1	1	0
Barred Galaxias		✓	✓	✓	✓	✓	
Birds	2	3	4	2	2	0	2
Masked Owl	✓	✓	✓		✓		✓
Powerful Owl	✓	✓	✓	✓			
Sooty Owl		✓	✓	✓	✓		
Swift Parrot			✓				✓
Mammals	1	8	5	3	5	0	3
Broad-toothed Rat		✓	✓		✓		
Brush-tailed Phascogale	✓	✓	✓		✓		✓
Grey-headed Flying-fox		✓	✓				✓
Leadbeater's Possum		✓		✓			✓
Smoky Mouse		✓		✓	✓		
Southern Brown Bandicoot		✓	✓		✓		
Southern Greater Glider		✓	✓	✓			
White-footed Dunnart		✓			✓		
Plants	1	3	0	0	3	0	1
Gully Grevillea		✓					
Round-leaf Pomaderris	✓	✓			✓		
Strzelecki Gum					✓		✓
Tall Astelia		✓			✓		
Reptiles	0	1	2	0	2	0	1
Alpine Bog Skink		✓	✓		✓		
Swamp Skink			✓		✓		✓
Communities	0	3	0	0	3	0	0
Alpine Sphagnum Bogs and Associated Fens		✓			✓		
Cool Temperate Mixed Forest		✓			✓		
Cool Temperate Rainforest		✓			✓		

Table 2: East Gippsland

Species or Community	Hazards rated as significant or high						
	Bushfire management	Inappropriate fire regimes	Climate change (including extreme weather and drought)	Forestry operations	Pest plants and animals	Roading and strategic fuelbreaks	Other
Amphibians	0	3	2	2	2	1	1
Giant Burrowing Frog		✓		✓	✓		
Large Brown Tree Frog		✓	✓	✓		✓	
Martin's Toadlet		✓	✓		✓		✓
Aquatics	0	7	7	7	5	4	0
Alpine Spiny Crayfish		✓	✓	✓	✓		
Curve Tail Burrowing Crayfish		✓	✓	✓		✓	
East Gippsland Galaxias		✓	✓	✓	✓	✓	
Mallacoota Burrowing Crayfish		✓	✓	✓			
McDowall's Galaxias		✓	✓	✓	✓		
Orbost Spiny Crayfish		✓	✓	✓	✓	✓	
Roundsnout Galaxias		✓	✓	✓	✓	✓	
Birds	3	4	3	4	2	0	1
Glossy Black-Cockatoo	✓	✓		✓			
Masked Owl	✓	✓	✓	✓	✓		✓
Powerful Owl	✓	✓	✓	✓			
Sooty Owl		✓	✓	✓	✓		
Mammals	0	8	6	2	7	0	2
Broad-toothed Rat		✓	✓		✓		
Grey-headed Flying-fox		✓	✓				✓
Long-footed Potoroo		✓		✓	✓		
Long-nosed Potoroo		✓	✓		✓		
Smoky Mouse		✓			✓		
Southern Brown Bandicoot		✓	✓		✓		
Southern Greater Glider		✓	✓	✓			
Spot-tailed Quoll			✓		✓		
White-footed Dunnart		✓			✓		✓
Plants	1	4	4	1	5	0	2
Betka Bottlebrush					✓		✓
Blue-tongue Greenhood					✓		
Colquhoun Grevillea	✓	✓	✓	✓			
Leafy Nematolepis		✓	✓		✓		
Rough Eyebright					✓		✓
Rufous Pomaderris		✓	✓				
Slender Tree-fern		✓	✓		✓		
Reptiles	1	3	3	1	4	0	2
Alpine Bog Skink		✓	✓		✓		
Diamond Python	✓	✓		✓	✓		✓

Species or Community	Hazards rated as significant or high						
	Bushfire management	Inappropriate fire regimes	Climate change (including extreme weather and drought)	Forestry operations	Pest plants and animals	Roading and strategic fuelbreaks	Other
Eastern She-oak Skink		✓	✓		✓		
Swamp Skink			✓		✓		✓
Communities	0	4	0	0	4	0	2
Alpine Sphagnum Bogs and Associated Fens		✓			✓		
Cool Temperate Rainforest		✓			✓		
Warm Temperate Rainforest (East Gippsland Alluvial Terraces)		✓			✓		✓
Warm Temperate Rainforest (Far East Gippsland)		✓			✓		✓

Table 3: Gippsland

Species or Community	Hazards rated as significant or high						
	Bushfire management	inappropriate fire regimes	Climate change (including extreme weather and drought)	Forestry operations	Pest plants and animals	Roading and strategic fuelbreaks	Other
Amphibians	0	2	1	1	2	0	1
Giant Burrowing Frog		✓		✓	✓		
Martin's Toadlet		✓	✓		✓		✓
Aquatics	0	2	6	2	5	2	6
Dargo Galaxias			✓		✓		✓
Narracan Burrowing Crayfish			✓		✓		✓
South Gippsland Spiny Crayfish			✓				✓
Strzelecki Burrowing Crayfish			✓		✓		✓
Tapered Galaxias		✓	✓	✓	✓	✓	✓
West Gippsland Galaxias		✓	✓	✓	✓	✓	✓
Birds	3	4	3	4	2	0	1
Glossy Black-Cockatoo	✓	✓		✓			
Masked Owl	✓	✓	✓	✓	✓		✓
Powerful Owl	✓	✓	✓	✓			
Sooty Owl		✓	✓	✓	✓		
Mammals	1	8	6	3	7	0	2
Broad-toothed Rat		✓	✓	✓	✓		
Grey-headed Flying-fox		✓	✓				✓
Long-nosed Potoroo		✓	✓		✓		
New Holland Mouse	✓	✓	✓		✓		
Smoky Mouse		✓		✓	✓		
Southern Brown Bandicoot		✓	✓		✓		
Southern Greater Glider		✓	✓	✓			
Spot-Tailed Quoll					✓		
White-footed Dunnart		✓			✓		✓
Plants	2	6	5	0	8	0	5
Aniseed Boronia		✓					
Blue-tongue Greenhood					✓		
Colquhoun Grevillea	✓	✓	✓				
Dwarf Kerrawang		✓	✓		✓		✓
Leafy Nematolepis		✓	✓		✓		
Maidenhair Spleenwort			✓				
Rough Eyebright					✓		✓
Round-leaf Pomaderris	✓	✓			✓		✓
Slender Tree-fern		✓	✓		✓		
Strzelecki Gum					✓		✓
Wellington Mint-bush					✓		✓

Species or Community	Hazards rated as significant or high						
	Bushfire management	inappropriate fire regimes	Climate change (including extreme weather and drought)	Forestry operations	Pest plants and animals	Roading and strategic fuelbreaks	Other
Reptiles	0	1	2	0	2	0	2
Alpine Bog Skink		✓	✓		✓		✓
Swamp Skink			✓		✓		✓
Communities	0	3	1	0	4	0	1
Alpine Sphagnum Bogs and Associated Fens		✓			✓		
Cool Temperate Rainforest		✓			✓		
Gippsland Red Gum Grassy Woodland and Associated Native Grassland					✓		✓
Strzeleckis Warm Temperate Rainforest		✓	✓		✓		

Table 4: West

Species or Community	Hazards rated as significant or high						
	Bushfire Management	Inappropriate fire regimes	Climate Change (including extreme weather and drought)	Forestry operations	Pest Plants and Animals	Roading and strategic fuelbreaks	Other
Aquatics	0	2	2	0	2	0	1
Glenelg Freshwater Mussel		✓	✓		✓		✓
Glenelg Spiny Crayfish		✓	✓		✓		
Birds	2	3	4	0	1	0	4
Masked Owl	✓	✓	✓		✓		✓
Powerful Owl	✓	✓	✓				
Red-tailed Black-Cockatoo (south-eastern)		✓	✓				✓
Regent Honeyeater							✓
Swift Parrot			✓				✓
Mammals	1	7	5	0	5	0	3
Brush-tailed Phascogale	✓	✓	✓		✓		✓
Grey-headed Flying-fox		✓	✓				✓
Long-nosed Potoroo		✓	✓		✓		
Smoky Mouse		✓			✓		
Southern Brown Bandicoot		✓	✓		✓		
Southern Greater Glider		✓	✓				
White-footed Dunnart		✓			✓		✓
Plants	2	4	7	0	9	1	8
Ben Major Grevillea		✓	✓				✓
Brilliant Sun-orchid			✓		✓		✓
Candy Spider-orchid			✓		✓		✓
Elegant Spider-orchid			✓		✓		✓
Gorae Leek-orchid	✓				✓	✓	✓
Grampians Bitter-pea	✓	✓	✓		✓		✓
Mount Cole Grevillea			✓		✓		✓
Slender Tree-fern		✓	✓		✓		
Strzelecki Gum					✓		✓
Tall Astelia		✓			✓		
Reptiles	0	0	1	0	1	0	1
Swamp Skink			✓		✓		✓
Communities	0	1	0	0	2	0	1
Cool Temperate Rainforest		✓			✓		
Western Basalt Plains (River Red Gum) Grassy Woodland (55-04)					✓		✓

Table 5: North East

Species or Community	Hazards rated as significant or high						
	Bushfire Management	Inappropriate fire regimes	Climate Change (including extreme weather and drought)	Forestry operations	Pest Plants and Animals	Roading and strategic fuelbreaks	Other
Amphibians	0	2	1	0	2	0	2
Booroolong Tree Frog		✓	✓		✓		✓
Spotted Tree Frog		✓			✓		✓
Birds	2	3	4	0	2	0	3
Masked Owl	✓	✓	✓		✓		✓
Powerful Owl	✓	✓	✓				
Regent Honeyeater							✓
Sooty Owl		✓	✓		✓		
Swift Parrot			✓				✓
Mammals	1	7	4	2	5	0	2
Broad-toothed Rat		✓	✓		✓		
Brush-tailed Phascogale	✓	✓	✓		✓		✓
Grey-headed Flying-fox		✓	✓				✓
Long-footed Potoroo		✓			✓		
Smoky Mouse		✓		✓	✓		
Southern Greater Glider		✓	✓	✓			
White-footed Dunnart		✓			✓		
Plants	0	2	1	0	3	1	3
Blue-tongue Greenhood					✓		
Concave Pomaderris		✓			✓		✓
Crimson Spider-orchid					✓		✓
Maidenhair Spleenwort			✓				
Whitfield Spider-orchid		✓				✓	✓
Reptiles	0	1	1	0	1	0	1
Alpine Bog Skink		✓	✓		✓		✓
Communities	0	1	0	0	1	0	0
Alpine Sphagnum Bogs and Associated Fens		✓			✓		

Appendix 4: Species-specific bushfire response and recovery actions

Terrestrial vertebrates

Southern Greater Glider

Impact of fires: 32% of modelled habitat in Victoria is within the current fire extent; 21% of modelled habitat in Victoria has been impacted by high severity fire.

What is being done?

- Arboreal mammal surveys - following desktop assessment of fire intensity at recent record locations, teams will be assessing the post-fire status of affected arboreal mammal populations using spotlighting and call playback.
- Artificial hollows - a project aimed at creating artificial habitat for hollow-using birds and mammals in East Gippsland is also being established, and will involve:
 - Installing nest boxes at priority locations for target species;
 - Holding training workshops for citizen scientists on nest box design, installation and monitoring; and
 - Collecting and reporting on deployment and occupancy of nest boxes.

This action is funded by the Victorian Government's Bushfire Biodiversity Early Relief and Recovery Program and philanthropic funding from Birdlife Australia, and is being delivered by Birdlife Australia with support from DELWP and Parks Victoria

Southern Brown Bandicoot

Impact of fires: 25% of modelled habitat in Victoria is within the current fire extent; 19% of modelled habitat in Victoria has been impacted by high severity fire. A very high proportion of the East Gippsland distribution has been burnt.

What is being done?

- Due to the high impacts of the fires on the Southern Brown Bandicoot's East Gippsland distribution, it has been identified that genetic management is required across its range. This will ensure that the risk is spread through genetic mixing, to improve the fitness of key populations and manage key threats. This action is funded by the Victorian Government's Bushfire Biodiversity Early Relief and Recovery Program. Delivery partners: Parks Victoria, Royal Botanical Gardens Cranbourne, Melbourne Strategic Assessment.

Spot-tailed Quoll

Impact of fires: 32% of modelled habitat in Victoria is within the current fire extent; 24% of modelled habitat in Victoria has been impacted by high severity fire. Initial reconnaissance suggests that most Upper Snowy sites (north of Gelantipy) were not in the current fire extent.

What is being done?

- Post fire assessments of Spot-tailed Quoll populations will include:
 - Assessment of extent of burnt habitat to determine urgency of additional surveys (these surveys will be designed to supplement existing camera trapping surveys such as for Southern Ark);
 - If applicable, targeted camera trapping surveys at known locations within fire boundary; and
 - Document current status, fire impact and risks.

This action is funded by the Victorian Government's Bushfire Biodiversity Early Relief and Recovery Program.

Long-footed Potoroo

Impact of fires: 79% of modelled habitat in Victoria is within the current fire extent; 51% of modelled habitat in Victoria has been impacted by high severity fire. A very high proportion of the Long-footed Potoroos East Gippsland distribution has been burnt, and populations may be impacted. However, there is evidence of

individuals in recently burnt areas, suggesting that the species may have been less impacted than initially indicated by desktop analysis.

What is being done?

- On-ground targeted assessments will be conducted for Long-footed Potoroos at 50 fire-affected sites. This includes:
 - Desktop assessment of fire intensity at contemporary record locations;
 - Assess post-fire status of populations using terrestrial camera trapping;
 - On-ground assessment of extent of fire impacts, and immediate resulting status for Long-footed Potoroo within Barry Mountains;
 - Assess extent and severity of habitat impacts for other non-target species opportunistically;
 - Identify and report on key threats to populations; and
 - Document current status, fire impacts and risks.

This action is funded by the Australian Government's Wildlife and Threatened Species Recovery Grants.

Long-nosed Potoroo

Impact of fires: 45% of modelled habitat in Victoria is within the current fire extent; 30% of modelled habitat in Victoria has been impacted by high severity fire. A very high proportion of this species' East Gippsland distribution has been burnt. Recent (pre-fire) detections of this species have been few, and it is therefore high priority to assess the post-fire status.

What is being done?

- On-ground targeted assessments will be conducted for Long-nosed Potoroos at 50 fire-affected sites. This includes:
 - Desktop assessment of fire intensity at contemporary record locations;
 - Assess post-fire status of populations using terrestrial camera trapping;
 - On-ground assessment of extent of fire impacts;
 - Assess extent and severity of habitat impacts for other non-target species opportunistically;
 - Identify and report on key threats to populations; and
 - Document current status, fire impacts and risks.

This action is funded by the Australian Government's Wildlife and Threatened Species Recovery Grants.

Smoky Mouse

Impact of fires: 20% of modelled habitat in Victoria is within the current fire extent; 13% of modelled habitat in Victoria has been impacted by high severity fire.

What is being done?

- Assessments will be conducted at 5 sites and will include:
 - Desktop assessment of fire intensity at contemporary record locations;
 - Targeted surveys at key locations due to limited distribution of these species. Methods will include camera trapping, scat sampling and runway search; and
 - Document current status, fire impact and risks.

This action is funded by the Australian Government's Wildlife and Threatened Species Recovery Grants.

Broad-toothed Rat

Impact of fires: 23% of modelled habitat in Victoria is within the current fire extent; 15% of modelled habitat in Victoria has been impacted by high severity fire. Reconnaissance activities suggest that populations in sub-alpine areas may be impacted.

What is being done?

- Assessments will be conducted at 5 sites and will include:
 - Desktop assessment of fire intensity at contemporary record locations;
 - Targeted surveys at key locations due to limited distribution of these species. Methods will include camera trapping, scat sampling and runway search; and
 - Document current status, fire impact and risks.

This action is funded by the Australian Government's Wildlife and Threatened Species Recovery Grants.

Glossy Black-Cockatoo

Impact of fires: 64% of modelled habitat in Victoria is within the current fire extent; 41% of modelled habitat in Victoria has been impacted by high severity fire. Most of the population in East Gippsland has been impacted. The impact of fire on this species' primary food source (Casuarina seeds) is likely to be severe.

What is being done?

- In order to best establish the way forward for recovery of this species, the following assessments are occurring:
 - Revisiting previously surveyed sites where Glossy Black-Cockatoo habitat was located and assessing for presence of the species as well as damage to its primary food tree cones (*Allocasuarina littoralis*);
 - Assessment of current status, fire impact and risks; and
 - As Glossy Black Cockatoos are a highly mobile species of concern, incidental records from opportunistic information collection will help to inform management actions such as opportunities for supplementary feeding.

This action is funded by the Victorian Government's Bushfire Biodiversity Early Relief and Recovery Program.

Large Brown Tree Frog

Impacts of fires: 87% of modelled habitat in Victoria is within the 2019-20 fire extent; 56% of modelled habitat in Victoria has been impacted by high severity fire. All known populations may be impacted.

What is being done?

- Planned recovery activities include:
 - Complete population status/threat assessments for Large Brown Tree Frog;
 - Assess the threat level to habitat (e.g. likely siltation) and whether there are potential locations for off-stream ponds;
 - Provide up to 30 off-stream artificial temporary ponds at highest priority locations; and
 - Complete assessments for other key known Large Brown Tree Frog locations.

This action is funded by the Victorian Government's Bushfire Biodiversity Early Relief and Recovery Program and will be delivered by DELWP in partnership with Moogjii Aboriginal Council East Gippsland Inc. Support from Zoos Victoria, Parks Victoria and the Arthur Rylah Institute.

Booroolong Frog

Impacts of fires: 38% of modelled habitat in Victoria is within the 2019-20 fire extent; 36% of modelled habitat in Victoria has been impacted by high severity fire. Two of three Victorian populations have been impacted.

What is being done?

- Surveys are being conducted in known population locations;
- A limited number of Booroolong frogs have been found at burnt sites; and
- None have been found at downstream unburnt site due to significance ash/sediment load.

This project is being coordinated by DELWP Hume and is funded by the Australian Government's Wildlife and Threatened Species Recovery Grants.

Spotted Tree Frog

Impact of fires: 50% of known habitat in Victoria is within the 2019-20 fire extent. Several locations have been subject to multiple fire events since 2003. Four of the eight fire affected populations have been impacted by high severity fire and significant post-rain ash and sediment events.

Whilst adult Spotted Tree Frogs may die during fire events, the juvenile life stages (tadpoles and metamorphosing frogs) are highly susceptible to being killed during post-rain ash and sediment events. Chytrid fungus (a pathogen causing disease in amphibians) is key threat for all remaining Spotted Tree Frog populations. Chytrid is known to reduce the survival of adult Spotted Tree Frogs and we anticipate that the combined impacts of fire, sedimentation and disease during the 2019-20 fire season could be particularly severe at some sites.

Non-native fish (trout, carp and redfin) eat Spotted Tree Frog tadpoles and are another recognized key threat to all remaining populations. Predation of tadpoles by non-native fish in subsequent seasons is expected to further exacerbate the 19-20 fire, post-flood and sedimentation and disease impacts and reduce the species capacity to recover.

What is being done?

- On-ground Spotted Tree Frog assessments comprising multiple day and night surveys per site commenced 28th February 2020 and have now been completed at seven sites;
- Post-fire population and chytrid status will be determined for each population and compared against pre-fire benchmarks; and
- The requirement for site specific management interventions including the potential future collection of frogs to enable captive breeding programs will be determined.

This action is funded by the Australian Government's Wildlife and Threatened Species Recovery Grants and is being delivered by the University of Melbourne and DELWP. Support from National Environmental Science Program (NESP) Threatened Species Recovery Hub, Zoos Victoria, Parks Victoria, Arthur Rylah Institute.

Diamond Python

Impacts of fires: 86% of modelled habitat in Victoria is within the 2019-20 fire extent; 61% of modelled habitat in Victoria has been impacted by high severity fire. Most of the populations may be impacted, however there are likely to be individuals on Howe Flat.

What is being done?

- Some species tend to be recorded incidentally more often than via targeted survey. For large reptile predators as the Diamond Python, opportunistic information will be collected during other fauna assessment and survey activities in East Gippsland and the North East; and
- Members of the public will also be encouraged to submit photographs and locality details of these large and easily identified species into the Victorian Biodiversity Atlas.

This action is funded by the Victorian Government's Bushfire Biodiversity Early Relief and Recovery Program

Freshwater fishes

Fire can fatally increase water temperature and increase the amount of ash and sediment flowing into rivers during post-fire storms, which clog up the streams and impact on breeding success, as well as instream food and habitat availability. Salvaging these species before fire impacts lead to extinction or further decline is a critical management strategy.

Endemic & threatened Galaxiid species

Within Victoria there are small, native fishes known as galaxiids. Eleven species are highly threatened, and are now only found in small, remote, mountain streams in the Gippsland region of Victoria. These species have declined dramatically in number and distribution, largely due to predation by introduced trout. Most species now exist as a single, small, isolated population - each galaxiid species persist in a small area (<0.5 ha total). As non-migratory freshwater species, they are highly susceptible to the localised impacts such as drought, and the post-fire impacts of sediment influx.

Impact of fires: Threatened freshwater fish with very small distributions and low ability to move are at most risk from the impacts of fire on fresh waterways. Extensive bushfires have burnt through the known habitat of many of these species, and heavy rains following the fires further threaten the species by washing ash, sediment and toxic chemicals into rivers and streams.

All eleven Galaxiid species have been identified as species of concern by the Victorian Bushfire Biodiversity Response and Recovery Report. Fire impacts for at-risk populations are outlined below:

- Dargo Galaxias (*Galaxias mungadhan*) - 16% of modelled habitat in Victoria is within the 2019-20 fire extent. All populations have been impacted;
- McDowall's Galaxias (*Galaxias mcdowalli*) - 77% of modelled habitat in Victoria is within the 2019-20 fire extent. All populations may be impacted; and
- East Gippsland Galaxias (*Galaxias aequipinnis*) - 100% of modelled habitat in Victoria is within the 2019-20 fire extent. It is likely that all populations have been impacted.

What is being done?

- Several species and populations of Galaxiids have been salvaged. They were brought into temporary housing at the Arthur Rylah Institute as an insurance population while the ash and debris from the fires moves through the streams;
- Dargo Galaxias: Approximately 200 critically endangered Dargo Galaxias were extracted from Dargo River near Mt Hotham in February 2020. This stream is the only known habitat of this species, which is listed as critically endangered by the IUCN;
- McDowall's Galaxias: 100 individuals were extracted post-fire and
- East Gippsland Galaxias: 100 individuals were extracted post-fire.

The extractions were led by expert teams including DELWP regional and Arthur Rylah Institute (ARI) staff and Parks Victoria. Extractions, temporary housing and return of species are funded by the Australian Government's Wildlife and Threatened Species Recovery Grants. Extractions were also supported by the Victorian Government's Bushfire Biodiversity Early Relief and Recovery Program, as part of Theme 3: Emergency extraction to prevent extinction and limit species decline.

What still needs to be done?

- Individuals will be returned to the stream once water quality conditions improve and riparian vegetation has recovered. It may also be necessary to establish captive breeding program as insurance population against future events. Further reconnaissance and research are needed to understand the impacts of the fires on these localised species.
- The restricted area in which the Galaxias species occur has been impacted by fire multiple time over the past 20 years. In addition to immediate recovery actions such as extraction, there is a broader and longer-term recovery objective of reducing the risk of extinction of Galaxiid populations. This can be done by undertaking additional surveys and locating potentially suitable translocation sites free of predatory species or other Galaxiids.

Aquatic invertebrates

Orbost Spiny Crayfish

Impact of fires: A majority of this species' known range is within the fire extent.

What is being done?

- 30 individuals were extracted. The extraction was led by expert teams including DELWP regional and Arthur Rylah Institute (ARI) staff and Parks Victoria. They are funded by the Victorian Government's Bushfire Biodiversity Early Relief and Recovery Program. Temporary housing and return are funded by the Australian Government's Wildlife and Threatened Species Recovery Grants.

Flora

Impacts of fires: 154 flora species have been identified as being of immediate concern.

Plant responses to fire are complex but can be broadly split into those species that regenerate from seed or those that can re-sprout. Seed-regeneration may occur from soil-stored seed while others rely on seed migration from unburnt populations. Regardless of which survival strategy is used, most plants are very susceptible to drought stress and browsing by animals in the post-fire environment and mortality may be high in populations that survive fire. Long-term survival also depends on fire regimes, since repeated fires may exhaust seedbanks and rootstocks.

What is being done?

- Immediate reconnaissance field surveys are underway to inform ongoing management for key threatened flora and critical vegetation communities. Most of these surveys are scheduled for spring.
- Surveys will include assessment of invasive weed status in unburnt areas such as Warm Temperate Rainforest and Wetlands.
- In addition, actions are underway for emergency seed collection:
 - Emergency collection of seed and plant material, ex situ seed banking and/or propagation for key rare or threatened species. Includes improvements to seedbank and related infrastructure if needed; and

- Prioritisation of critical flora species for seed collection and/or vegetative propagation material – includes extraction from non-burnt areas under imminent and potential threat and burnt vegetation requiring priority collection post-fire.

These actions are funded by the Victorian Government's Bushfire Biodiversity Early Relief and Recovery Program and will be led by the Royal Botanic Gardens Victoria in partnership with DELWP and Parks Victoria.

Ecological communities

Impacts of fires: There are two communities potentially impacted by forestry operations listed under the *Environment Protection and Biodiversity Conservation Act 1999* within the fire boundary. Currently there is limited direct impact on these communities by fire. However, these areas are at high risk of the future indirect bushfire impacts such as from soil erosion, increased exposure and elevated levels of feral herbivore browsing. These communities are:

- Alpine Sphagnum Bogs and Associated Fens ecological community (11% of community within current fire extent)
- Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (15% of community within current fire extent)

There are also seven communities listed under the *Flora and Fauna Guarantee Act 1988* impacted by the fires. Rainforest in Victoria develops in the long-term absence of severe disturbance such as fire, and there are significant areas of rainforest within the current fire extent. In addition to the bushfires, these sites are at high risk of the future indirect impacts of bushfire such as soil erosion, exposure, weed invasion, eucalypt invasion and encroachment and elevated levels of feral herbivore browsing. These communities are:

- Cool Temperate Mixed Forest (~40% of community within current fire extent);
- Dry Rainforest (Limestone) (44% of community within current fire extent);
- Warm Temperate Rainforest (Coastal East Gippsland) (>80% of community within current fire extent);
- Warm Temperate Rainforest (East Gippsland Alluvial Terraces) (~90% of community within current fire extent);
- Warm Temperate Rainforest (Far East Gippsland) (>70% of community within current fire extent);
- Warm Temperate Rainforest (Cool Temperate Overlap, Howe Range) Community (>90% of community within current fire extent); and
- Cool Temperate Rainforest (8% of community within current fire extent).

What is being done?

- Immediate reconnaissance field surveys are underway to inform ongoing management for key threatened flora and critical vegetation communities, including warm temperate rainforest, littoral rainforest, cool temperate rainforest, Alpine peatlands, and Alpine Ash. Most of these surveys are scheduled for spring; and
- Surveys will include assessment of invasive weed status in unburnt areas such as Warm Temperate Rainforest and Wetlands.

These actions are funded by the Victorian Government's Bushfire Biodiversity Early Relief and Recovery Program.