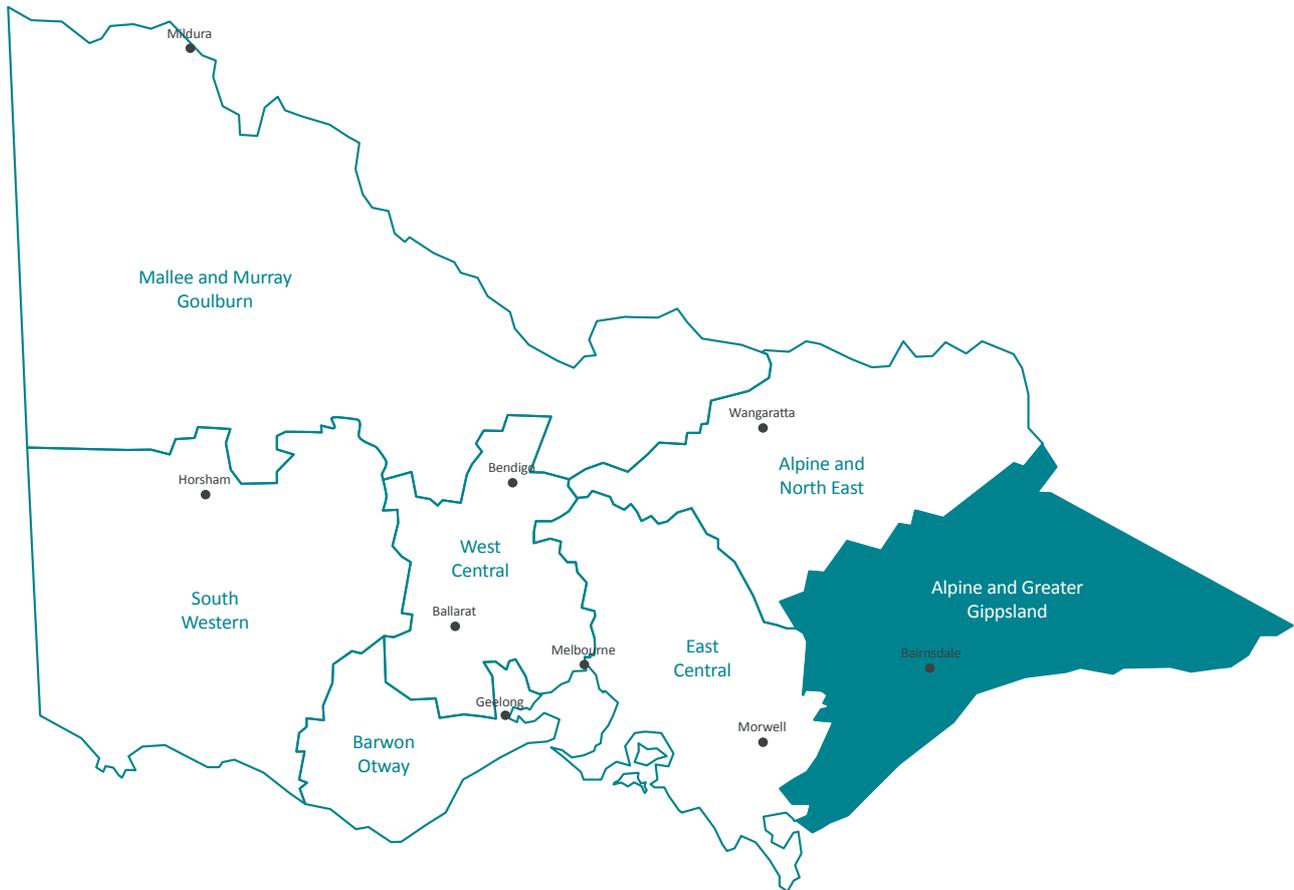


Strategic bushfire management plan

Alpine and Greater Gippsland





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2002–03 Alpine fire in the Deddick area © Michael Beckers DELWP

Introduction

Victoria is one of the most fire-prone areas in the world. In past decades, we have seen the disastrous effects that bushfires can have on communities — on people, properties, our economy and the environment.

Under the *Forests Act 1958*, and in line with the *Code of Practice for Bushfire Management on Public Land 2012*, the Department of Environment, Land, Water and Planning (DELWP) is responsible for managing bushfire risk on public land. The code of practice's two objectives are 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
- maintain or improve the resilience of natural ecosystems and their ability to deliver services such as biodiversity, water, carbon storage and forest products.

The code of practice requires DELWP to undertake strategic bushfire management planning. This is the first strategic bushfire management plan for the Alpine and Greater Gippsland bushfire risk landscape, one of Victoria's seven bushfire risk landscapes. The strategic planning approach we used to develop this plan replaces our previous fire protection planning approach.

We developed this plan in the context of Victoria's new emergency management arrangements. The Victorian Government's *Emergency Management Reform White Paper* and subsequent legislation aim to build community resilience through increased participation and shared responsibility.

This plan explains the fuel management strategy that we—DELWP and Parks Victoria (PV)—will undertake to minimise the impact of major bushfires on people, property, infrastructure, economic activity and the environment, to achieve the two code of practice objectives. It explains how we will do this by placing fire management zones—asset protection zones, bushfire moderation zones, landscape management zones and planned burning exclusion zones—on public land, and by doing other fuel management activities.

History tells us a small number of major bushfires have caused the greatest losses of human life, although any bushfire has the potential to result in loss of life and property. In some cases, major bushfires have also damaged fire-sensitive ecosystems and species.

As well as fuel management, the code of practice emphasises reducing bushfire risk through other strategies and actions for:

- prevention, to minimise the occurrence of bushfires, particularly those started by people
- preparation, so we are adequately prepared for bushfires and can better respond to them when they occur
- response, to ensure a timely and adequately resourced initial attack on all detected bushfires on public land
- recovery, to ensure we identify risks and damage resulting from bushfires.

Over the next few years, with community and stakeholder engagement, we will refine and document risk-based strategies for bushfire prevention, preparedness, response and recovery.



Planned burning ignition © DELWP

We use a risk-based approach to planning for bushfire management, based on the International Standard for Risk Management ISO 31000. Our approach:

- pairs local knowledge with world-leading bushfire simulation software, historical data and the best-available science to understand how bushfires behave
- incorporates multiple weather patterns and ignition likelihood weightings
- incorporates the views of communities, industries and other stakeholders about what they value and want to protect from bushfires
- proposes ongoing monitoring, evaluation and reporting about how implementation of our planning approach is reducing bushfire risk.

The international standard for risk management, with which our strategic planning approach complies, reflects the fact that risk can never be completely eliminated. Bushfires will still occur, and everyone needs to be prepared and ready to respond. But bushfire risk can be reduced with a high-quality risk management approach.

Our planning is based on partnerships. DELWP and PV have partnered with communities and other fire and emergency services agencies to develop this plan. It relies on action by governments, businesses and households, on public and private land, to make communities and the things we value safer. We will continue to work in partnership with communities, stakeholders and other agencies to implement this plan.

We thank everyone who is contributing to our planning approach, particularly the members of the Alpine and Greater Gippsland bushfire risk landscape's Internal Working Group and Landscape Reference Group. We also acknowledge the contributions of staff and representatives of DELWP, PV, VicForests, Country Fire Authority (CFA), the East Gippsland and Wellington shires, private land managers and communities in our landscape. We will continue to work in partnership with the agencies and organisations above, and with all other interested parties, to reduce bushfire risk on public and private land. We will also encourage residents and land owners to find out about bushfire risk on their property and have up-to-date bushfire plans.

We welcome this strategic, risk-based approach. As the officers responsible for ensuring DELWP's compliance with the code of practice, and for effective strategic planning and implementation at the regional level, we consider it will result in better bushfire risk management, safer communities and property, stronger local economies and more resilient ecosystems.

This document is a summary of our planning approach, and there is much information that sits behind it. To find out more, including how you can be involved in reviews and updates of the plan, visit www.delwp.vic.gov.au.

Alan Goodwin
DELWP Chief Fire Officer

Michael Timpano
DELWP Regional Director
Gippsland



Planned burning with an aerial driptorch © DELWP

About bushfire in our landscape

For strategic bushfire management planning purposes, DELWP and PV divide Victoria into seven bushfire risk landscapes. These are areas where bushfire behaviour—including the types of places that bushfires start, the terrain and vegetation through which they spread, and the types of impact they have—is sufficiently common to plan for the area as a whole.

Map 1 shows the Alpine and Greater Gippsland bushfire risk landscape. It is 3 290 000 ha, or 14% of the state's area. Of the landscape, 70% is public land and 30% is private land.

Managing bushfire risk is essential. In our landscape, the 1926 Black Sunday bushfires killed 61 people and destroyed farms, homes and forests. Since 2000, over 1.4 million ha of the landscape has been burned by bushfires. In the last 10 bushfire seasons, DELWP responded to an average 136 bushfires a year in our landscape. We suppressed about 75% of these bushfires before they grew to 5 ha. Rapidly detecting and suppressing bushfires before they grow to a size and intensity that makes them difficult to control is a core part of our approach to managing bushfire risk.

In the decade to 2015, 59% of all bushfires in our landscape to which DELWP responded were caused by lightning. Accidental ignitions (mainly by machinery, escapes from campfires and private burn offs) caused 16% of bushfires, deliberate action by people 11%, and the remaining 14% had other or unknown causes.

On Severe, Extreme and Code Red fire danger days, bushfires can start and spread quickly to become major bushfires. Typically on such days, a strong north-westerly wind blows hot, dry air from central Australia across Victoria. If a bushfire ignites, or is already burning, this wind can push it rapidly

south-east, creating a relatively narrow fire front and long fire flanks on its western and eastern sides. Then, an approaching cold front with a strong south-westerly wind can expand the bushfire's eastern flank into a wide fire front, and intensify the fire. These weather conditions can create fast-moving bushfires and powerful convection columns, which in turn cause ember storms, wind-blown debris, downbursts, fire tornadoes and explosive balls of igniting eucalyptus vapour. In our landscape, these types of conditions resulted in the Mt Ray–Boundary Track and Goongerah–Deddick Trail (February 2014), Tostaree–Princes Highway (February 2011) and Churchill–Jeeralang (February 2009) bushfires.

Climate change is increasing bushfire risk in Victoria and lengthening the average fire season. Climate change projections indicate that Victoria is likely to have up to 70% more Severe, Extreme and Code Red days by 2050. We will also likely have:

- reduced average rainfall and streamflows
- fewer rainfall days (with heavier rainfall), and more consecutive dry days
- more frequent and widespread droughts
- more days over 35°C, and a higher annual mean temperature.

Climate change is also likely to alter the attributes and availability of habitat for the landscape's plants and animals. This will magnify existing threats such as fragmentation (which isolates some species in particular areas) and loss of habitat (such as hollow-bearing trees). It may also increase the spread of some invasive species.



Grass trees in a fuel-reduced area © DELWP

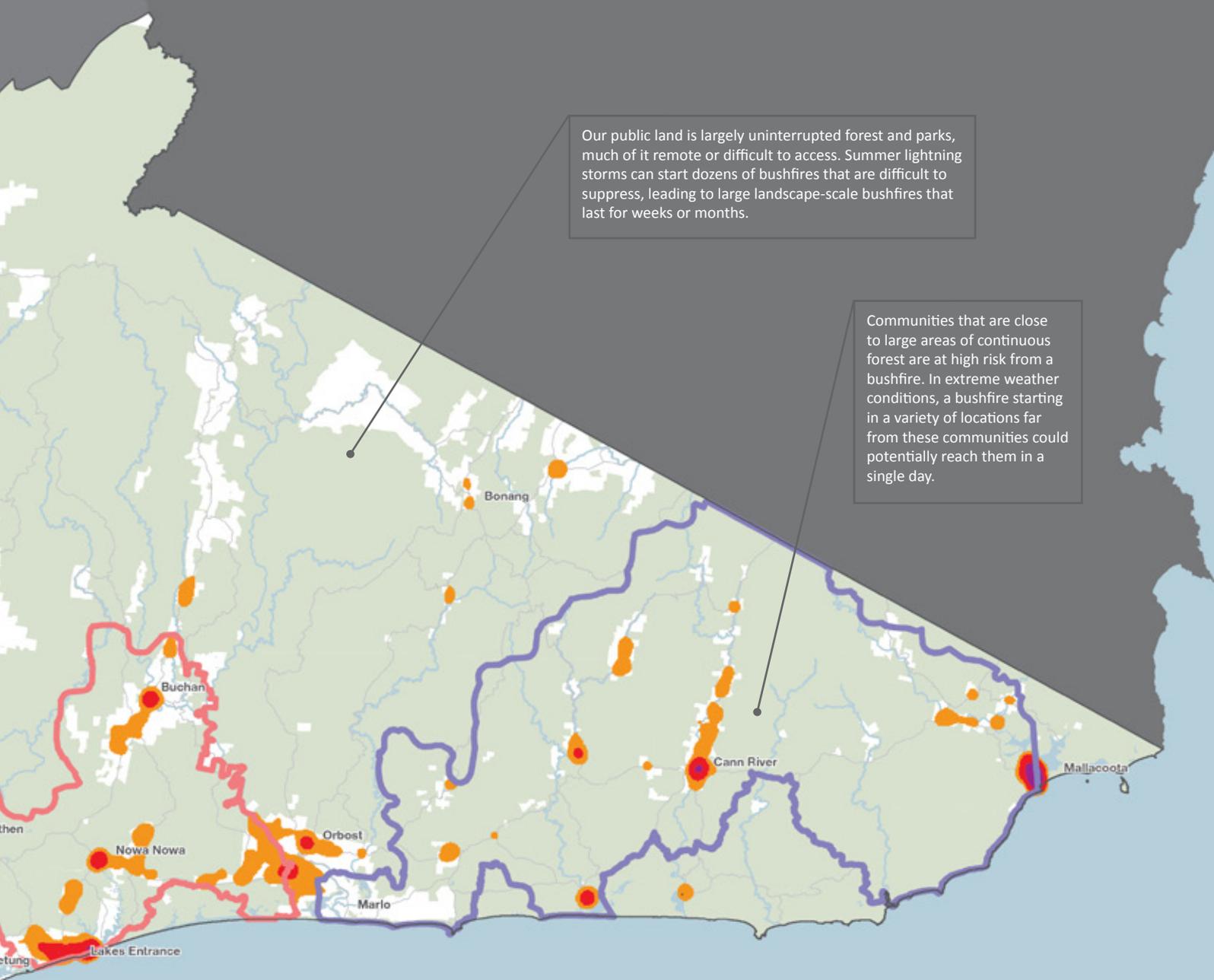
Map 1 shows the landscape's bushfire catchments. These are areas where the worst bushfires could start, spread and impact on priority communities and assets in a single day. These are important things to know because:

- at likely ignition points, we may conduct patrols on Severe, Extreme and Code Red fire danger days, and manage fuels (particularly if the spread or impact areas of these bushfires are difficult to treat)
- along spread paths, fuel management is the key to reducing the impact of major bushfires by reducing their spread and intensity
- managing fuel around and next to priority assets helps to minimise flame contact, radiant heat, ember generation and short-distance spotting potential. This fuel management can be difficult as it generally requires more resources and skills, and it may also rely on landowners making their properties as bushfire-safe as possible
- when a bushfire starts, we can use our knowledge of its likely spread paths and impacts to most effectively fight the fire, and provide information to communities that may be in its path.

Map 1 shows where bushfire simulations predict bushfires that would cause maximum damage to property. These locations have relatively high numbers of properties, and are in the path of many simulated bushfires. The map shows the consequences of major bushfires are greatest when ignitions occur to the north-west of Bruthen, Nowa Nowa, Cann River and Mallacoota.

Our public land is largely uninterrupted forest and parks, much of it remote or difficult to access. Summer lightning storms can start dozens of bushfires that are difficult to suppress, leading to large landscape-scale bushfires that last for weeks or months.

Communities that are close to large areas of continuous forest are at high risk from a bushfire. In extreme weather conditions, a bushfire starting in a variety of locations far from these communities could potentially reach them in a single day.



Simulated property risk:

- Low
- Moderate
- High
- Very high
- Extreme

Bushfire catchment:

- Glenmaggie
- Golden Beach
- Dargo
- Bruthen
- Banksia Peninsula
- Tongio
- Cann River
- Benambra

Public land

Private land

Main roads

0km 10km 20km

N

What this plan prioritises for protection

How do we decide what to prioritise for protection?

Our planning method is based on the International Standard for Risk Management ISO 31000. The risk assessment process identifies categories of assets and values we consider important in our landscape—communities and properties, infrastructure, public administration, economic and environmental assets—and assesses the likelihood of impact by major bushfires, for a range of consequence levels. An asset category is at high risk from bushfires if:

- it is vulnerable to fire (that is, if fire will damage and/or disrupt it)
- it is likely to experience frequent bushfire impact with relatively minor consequences, or infrequent bushfire impact with relatively major consequences.

We prioritise an asset category for protection if it is at high risk from bushfires, and we can meaningfully mitigate bushfire risk to it through our fuel management strategy. We consider all assets within each priority asset category as priority assets, regardless of where they are in the landscape. We use the PIPESS categories identified in the code of practice: People, Infrastructure, Public Administration, Environment, Economy and Social Settings.

We identified priorities for protection and developed our fuel management strategy in partnership with emergency service agencies and stakeholders from across our community (including the Internal Working Group and Landscape Reference Group), which determined the priority areas for bushfire management, using a risk mitigation framework.

Our planning method draws on the best available information from data and community consultation. We use the *Victorian Fire Risk Register* and information from Office of the Emergency Management Commissioner, DELWP, VicForests, PV and Aboriginal Affairs Victoria.

We use PHOENIX RapidFire bushfire simulation software, which is world-leading technology developed by The University of Melbourne and the Bushfire and Natural Hazards Co-operative Research Centre, in conjunction with DELWP. PHOENIX RapidFire simulates how bushfires spread from a grid of ignition points across the landscape, given:

- terrain and fuel (being a result of any location's fire history, type of vegetation and modelled fuel accumulation) at the starting point and along spread paths
- weather conditions.

Victorian Bushfire Risk Profiles provides more information about how DELWP uses PHOENIX RapidFire to quantify risk.

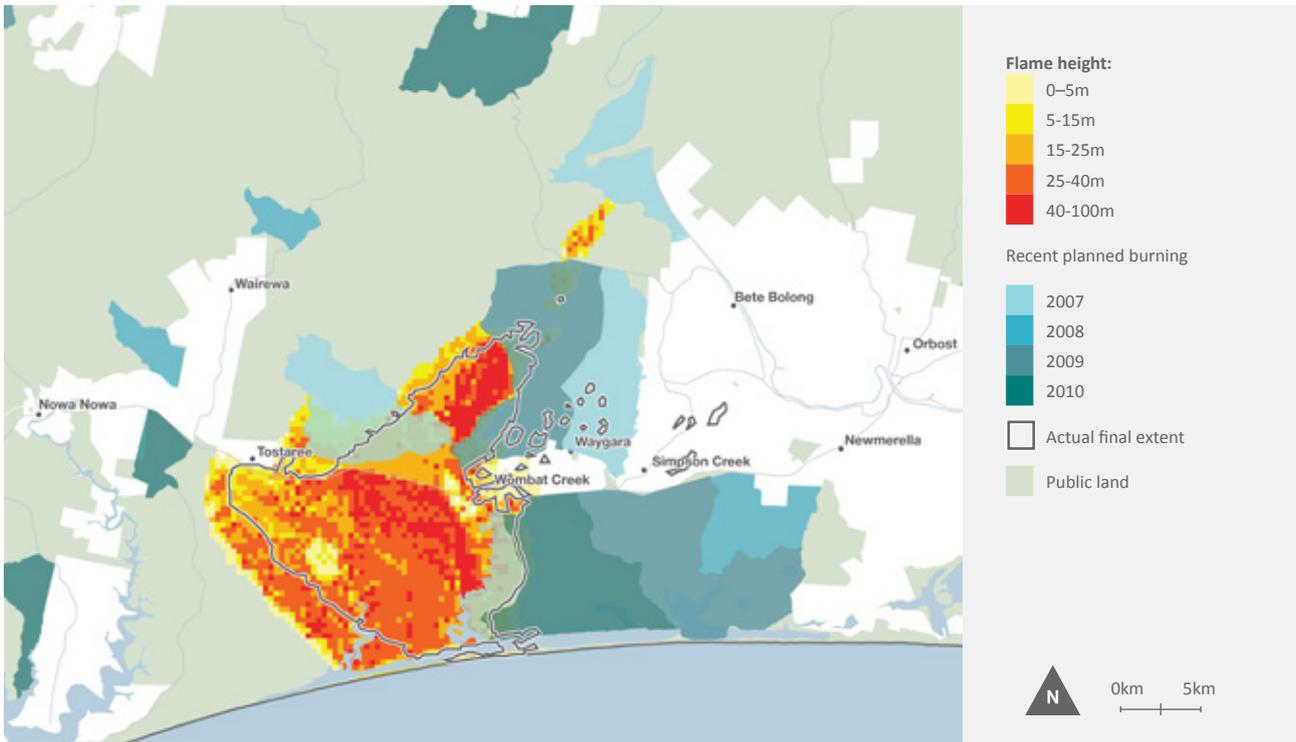
Map 2 compares PHOENIX RapidFire's bushfire simulation to the actual extent of the 2011 Tostaree bushfire. It shows that firefighters kept the final fire to very close to the simulated extent after 24 hours, particularly in the north-east sector, where the fire was substantially slowed by recent planned burning, and posed the greatest threat to communities. The differences between the simulated and actual extents were mostly due to local fire dynamics (fuel, weather and topographical variations) for which the simulation could not fully account. The map shows simulated flame heights (indicating fire intensity) which closely matched post-fire severity mapping. The map also shows recent nearby planned burning, which substantially slowed both the simulated and actual fires. This helped us stop the fire from spreading further east, south of the Princes Highway, and slowed its spread to suppressible levels north of the highway.

Map 3 compares the extent of the 2011 Tostaree bushfire with the extent simulation without planned burning since 2006. It shows that if no planned burning had been undertaken, the simulated bushfire could have grown to three times its size, increasing the likelihood and consequence of the bushfire impacting communities to the west and north of Orbost.

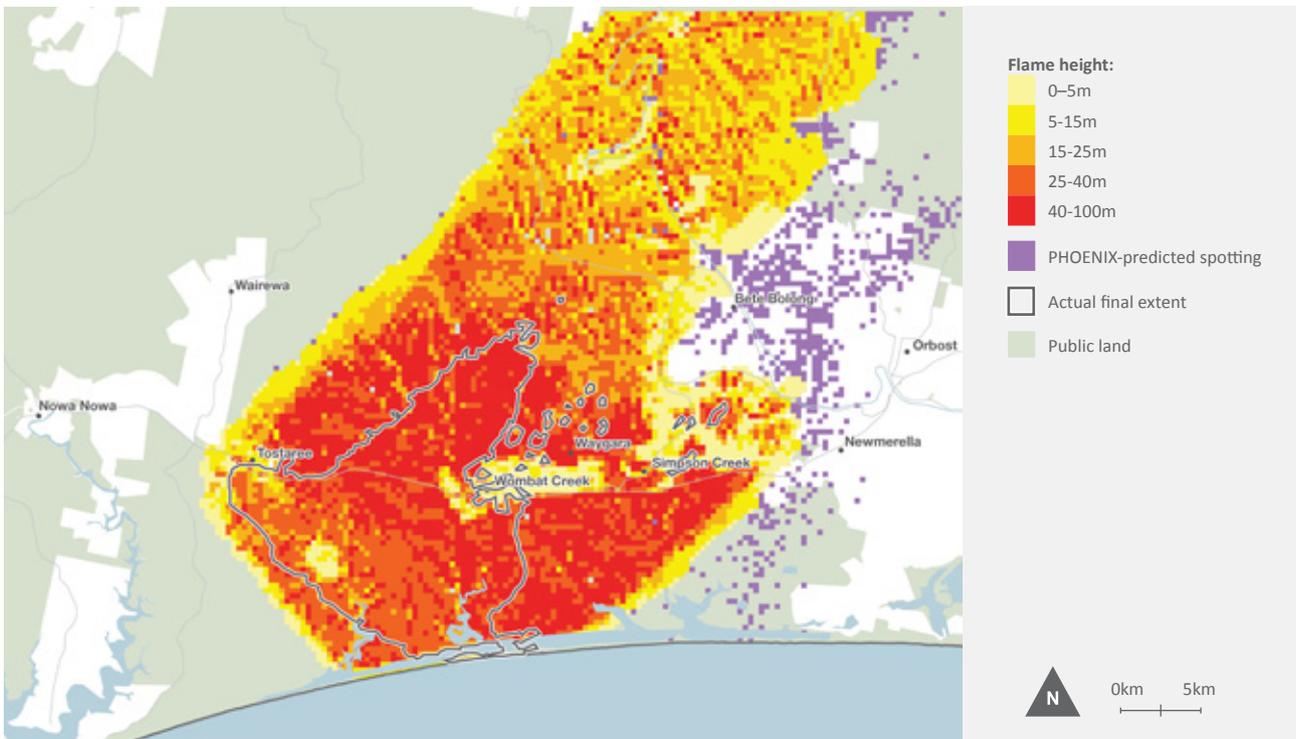


A community field day © DELWP

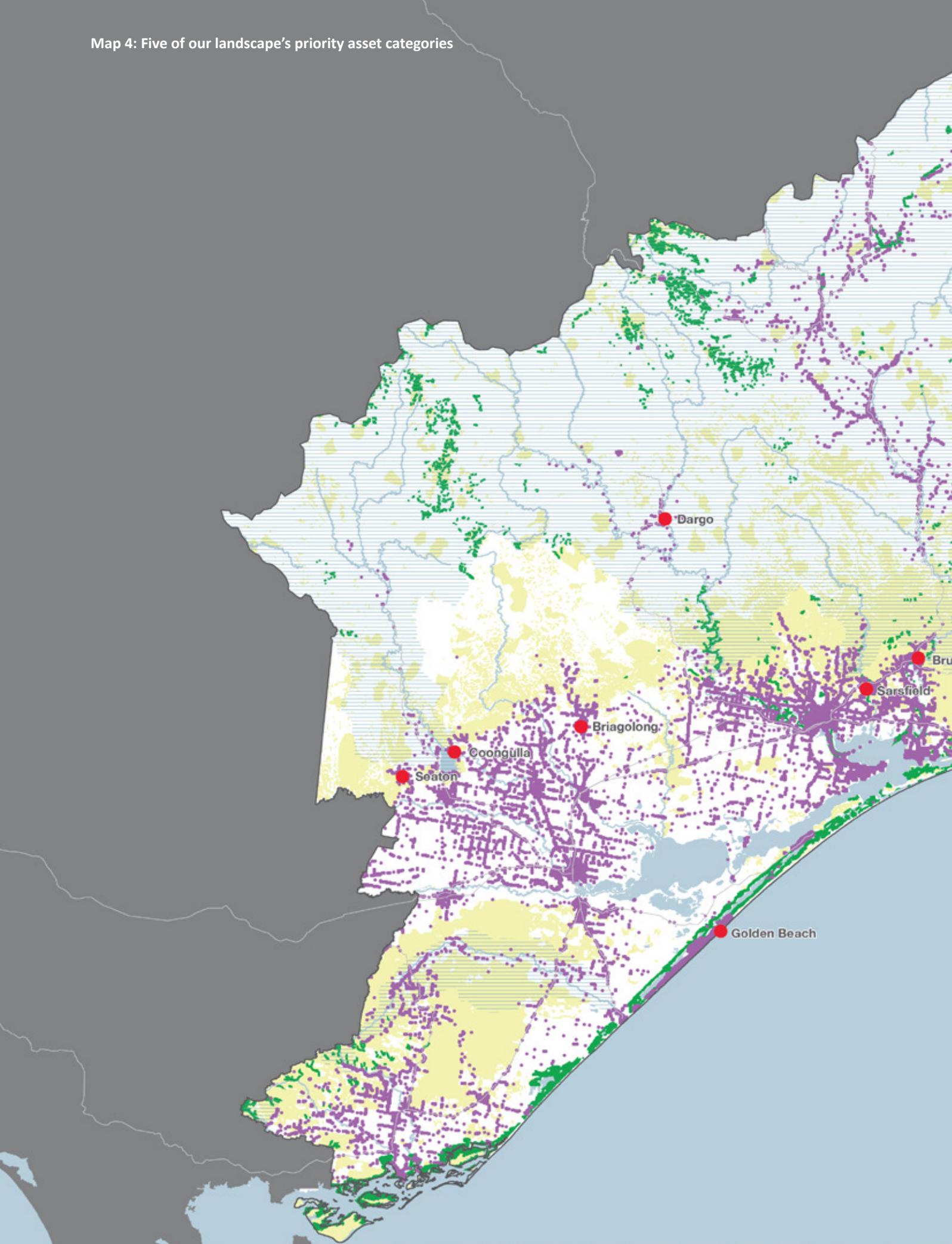
Map 2: Actual and simulated extent of 2011 Tostaree bushfire

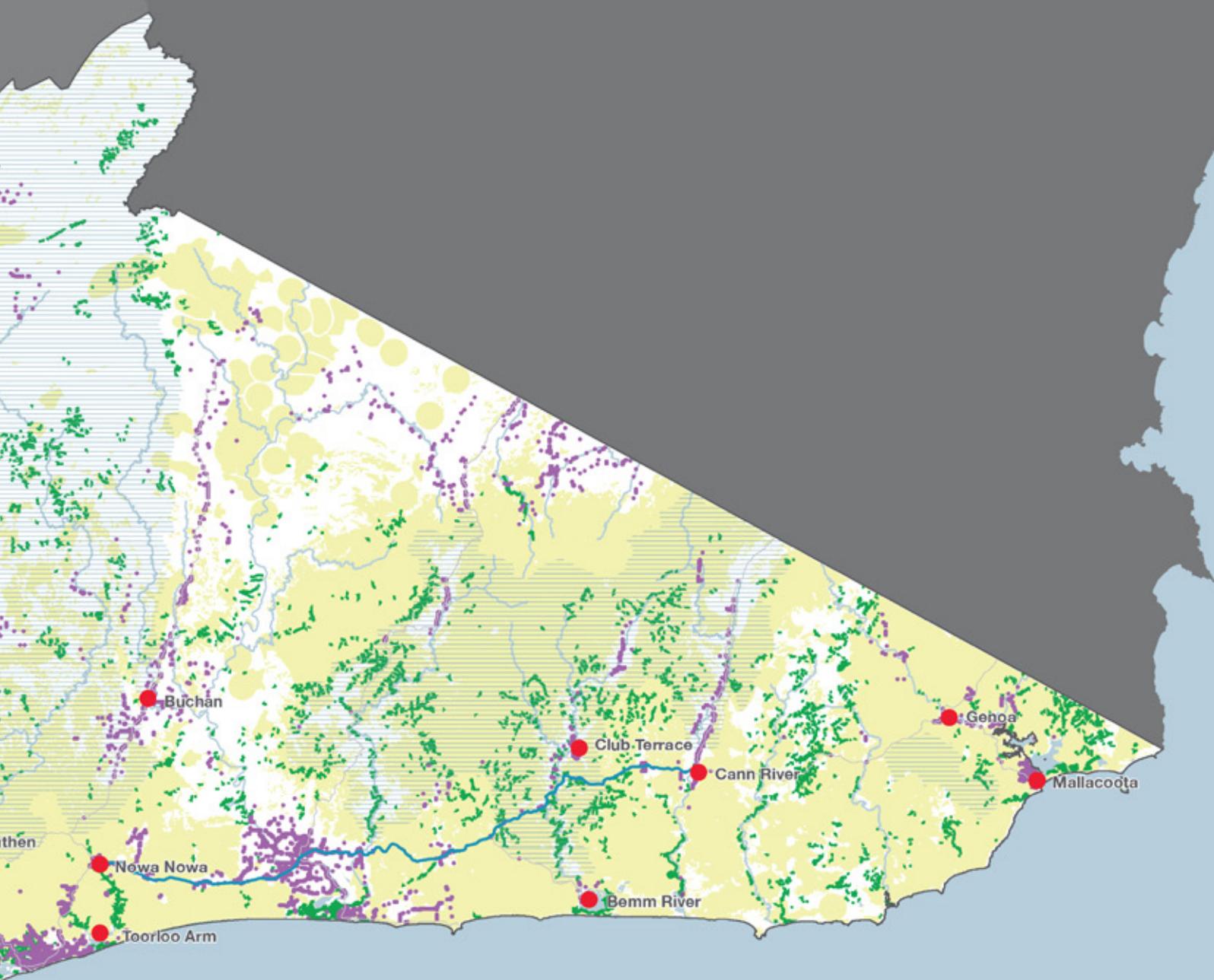


Map 3: Actual and simulated (without planned burning) extent of 2011 Tostaree bushfire



Map 4: Five of our landscape's priority asset categories





- Higher-risk communities
- Dwelling assets
- Nationally important transport link
- Water supply catchments
- Fire-sensitive listed vegetation communities
- Priority plant and animal habitat

0km 10km 20km

N



Water authorities' field day © DELWP

Communities

Map 4 shows 15 of our landscape's higher-risk communities. The code of practice prioritises minimising the impact of bushfires on human life over all other considerations. We assessed the 15 communities shown on the map as at higher risk of more-frequent or more-damaging fires.

The location of many communities in the landscape exposes them to bushfire risk. In 2011, about 84 000 people, or 2% of Victoria's population, lived in our landscape. Of this population, 38% lived in small towns and settlements with less than 500 people in rural and coastal settings. Many of the small settlements are at increased bushfire risk from nearby forested land.

Some communities and groups of people are more vulnerable to bushfires than others, including those who lack experience of bushfire, summer visitors, people with disabilities or illness, the elderly and people from non-English-speaking backgrounds. These people and communities in particular tend to be less-aware of bushfire risks, less prepared for bushfire, and less able to quickly respond to it. These factors can also compromise evacuation and firefighting efforts. Small town populations in this landscape are declining, and their average ages (and thus the number of people needing help during bushfires) are increasing. An ageing and declining population also means there are fewer and less-able-bodied volunteers to fight fires on private land.

We measure risk to life and property by modelling dwelling loss, one component of how we prioritise zone placement, according to the relative risk that properties face from bushfire.

To protect our priority communities, we:

- place asset protection zones close to communities so we intensively manage fuel
- place asset protection zones or bushfire moderation zones close to communities, to slow the spread of bushfires before they reach communities, and to reduce ember attack on properties
- place bushfire moderation zones where bushfires that might threaten communities are most likely to originate and intensify.

Infrastructure

Map 4 shows two of the landscape's priority infrastructure assets: a section of the Princes Highway and the water supply catchments. Other priority infrastructure asset categories include communications and utility infrastructure.

The Princes Highway is the main freight route for produce into and out of Gippsland, and there are few alternative routes for heavy vehicles (which comprise 20% of all traffic along this highway). There is a 50% increase in traffic volumes along the highway in busy holiday periods, with peak traffic over the summer holiday.

The water supply catchments are vulnerable to bushfires. They can damage water supply infrastructure and contaminate the water with ash and other debris. In some areas in the catchments, post-bushfire landslides of water and debris can do further damage, and degrade water quality.

Electricity and telecommunications infrastructure is essential for bushfire response, including to disseminate emergency information to communities. Electricity is essential for pumping water, for air conditioning and for other basic services, especially for vulnerable people and even more so if they are in remote locations.



Greencomb spider-orchid © Faye Bedford DELWP



Eastern bristlebird © DELWP

We prioritise this infrastructure for protection to ensure, in the event of a bushfire, there is minimal disruption to essential services, and that post-bushfire recovery works are not impeded. Identifying priority infrastructure also helps us keep in touch with owners during a bushfire.

To protect our priority infrastructure, we:

- place fire management zones that indirectly protect communities by protecting priority infrastructure
- work with the infrastructure owners and managers to help them implement their fire protection plans
- ensure planned burning does not disrupt or damage high-voltage transmission lines (the dense particles in smoke can arc electricity between the lines, potentially shorting them).

Public administration facilities

We prioritise public administration facilities to minimise disruptions to emergency management services in the event of a bushfire, and to minimise impediments to recovery works after a bushfire.

We prioritise administration facilities (such as government and shire offices), emergency facilities (such as incident control centres, fire stations and police stations) and emergency infrastructure (such as firefighting airbases, communications / radio towers and fire-spotting towers).

Environment

Map 4 shows the landscape's fire-sensitive listed vegetation communities, and priority plant and animal habitat.

We prioritise these environmental assets if they have conservation importance for Victoria or Australia, if fire is likely to change them, and if they can be managed at a landscape level.

We prioritise fire-sensitive listed vegetation communities because an intense bushfire can have severe and long-term ecological effects on them: it can alter the composition and structure of their vegetation, fragment them and make them susceptible to invasion by exotic species. Across the landscape, there are 29 100 ha of these communities, which are listed as important under state or federal legislation. These communities are often in small isolated patches and include Alpine sphagnum bogs and associated fens, littoral rainforest and coastal vine thickets, warm temperate rainforest and Alpine snowpatch.

We also prioritise the habitat of 17 plant and 26 animal species that are vulnerable to fire and of conservation or social concern within the landscape. Bushfires can affect these species in many ways including by reducing the availability of these species' food, causing their populations to decline and destroying components of critical habitat. Species that occur in small, isolated populations are particularly vulnerable to bushfires and include the Brush-tailed rock wallaby, Eastern bristlebird, Wellington mint-bush and Colquhoun grevillea.

To protect our priority environmental assets, we:

- through fire management zoning, minimise the impacts of planned burning on them, while protecting other priority assets
- identify and retain environmental values (such as some areas of long-undisturbed vegetation) important for ecosystem resilience
- incorporate the requirements of environmental values when doing planned burning or other fuel management activities
- identify potential conflicts between our intended planned burning and environmental values.



Tawny frogmouth © Faye Bedford DELWP

Economy

We prioritise the landscape's tourism industry because it contributes over \$450 million annually, and accounts for more than 2400 jobs in the Wellington and East Gippsland shires. Bushfires put the industry at risk: they damage or destroy the natural environments and infrastructure on which the industry relies, and most tourists visit from December to April.

Bushfires can harm the timber, agriculture, apiary, horticulture and viticulture industries: they destroy and damage buildings, fencing, machinery and equipment, and kill and injure livestock. Bushfires impact the apiary industry and threaten food security, by damaging native and productive plants such as fruit trees and grape vines. The viticulture industry is particularly vulnerable to smoke taint during the summer bushfire season.

To protect our priority economic assets, we:

- place zones to help reduce risk to them, while protecting other priority assets
- work in partnership with owners of plantations and private land managers as they implement their own fuel management strategies.

Cultural heritage and social assets

The public land within our landscape has a long and complex Aboriginal and non-Aboriginal history.

The landscape's Aboriginal cultural heritage stretches back thousands of generations and includes the use of fire by Aboriginal people for environmental, economic and social purposes. The landscape today has over 9500 registered Aboriginal cultural heritage sites including ceremonial gathering places, shell middens, burial sites, scar trees and artefact scatters. It is likely there are many more undiscovered sites.

There is one registered Aboriginal party in the landscape: the Gunaikurnai Land and Waters Aboriginal Corporation. A large part of the landscape is formally recognised as the traditional land of the Gunaikurnai people, and DELWP and PV jointly manage 10 parks and reserves with the Traditional Owner Land Management Board. We will continue to work with these groups to ensure the best possible protection of our cultural heritage.

The landscape's non-Aboriginal cultural heritage includes over 170 years of mining, water and timber harvesting, grazing and recreation.

We prioritised community meeting places as they are important for community connectivity. Some are places of last resort in a bushfire emergency.

To protect our priority cultural heritage and social assets, we:

- protect known cultural heritage sites from disturbance when we manage fuel, and when we suppress bushfires
- protect unknown cultural heritage sites during all our activities, by watching for unidentified sites; only a very small percentage of Victoria's area has been formally assessed for Aboriginal cultural heritage.

How we will protect our landscape

Our fuel management strategy

About our fuel management strategy

Map 5 shows the landscape's fuel management strategy. The strategy comprises:

- fire management zones, which establish our long-term balanced fire regime on public land by defining objectives for fuel management across the landscape
- major fuel breaks, which are permanent, slashed fuel breaks of between 20–40 m and include or adjoin a mineral earth vehicle track.

The main fuel management action is planned burning, which is deliberate burning to reduce the quantity of leaf litter, twigs, bark and undergrowth. It is the most effective method of managing fuel on large areas of public land, and the main way we reduce bushfire risk. Fuel management also serves ecosystem resilience purposes, such as regeneration of plant species and habitat. Where appropriate, we may also manage fuel by slashing, mowing, mulching and applying herbicide. We will work with industry groups and communities to investigate other fuel management techniques.

To develop our fuel management strategy, we combined our knowledge of bushfire behaviour and PHOENIX RapidFire simulations with our prioritisation of human life communities, infrastructure and public administration facilities, and of economic, environmental and cultural heritage and social assets.

Reducing bushfire residual risk

Residual risk is the risk, on average and across the whole landscape—including public and private land—that bushfires will impact on life, property or other assets. It is expressed as the percentage of the risk that remains after bushfire history and fuel management (mainly planned burning) activities are taken into account. For example, 80% residual risk means that the risk of property and infrastructure being impacted by a bushfire—on average, throughout the landscape—is 20% less than it would have been had we never had bushfires and fuel management to reduce the fuel hazard. The complex mosaic of fuel-reduced and bushfire-burnt patches across the landscape—with different times since the last fire—is mainly what determines residual risk at any point in time. Residual risk changes constantly as bushfires burn new areas, as we manage fuel, and as fuel accumulates.

One way DELWP measures the effectiveness of the fuel management strategy is by how well it reduces residual risk. PHOENIX RapidFire allows us to simulate the reduction in residual risk at any particular location, at a particular point of time, if we reduce fuel hazard at the ignition points and along the spread paths of bushfires that could impact on it. Then we prioritise planned burning in areas which result in the greatest risk reduction.

Annual fuel management activities will be guided by a long-term residual risk target.

The fuel management strategy aims to ensure that:

- through to 2050, as fuel re-accumulates in forests burnt in 2002–03 and 2006–07, residual risk to life and property does not return to pre-2006 levels, but is kept below 65%
- through to 2050, residual risk to life and property continues to decline.



Planned burning in the Tambo district © Greg McCarthy DELWP

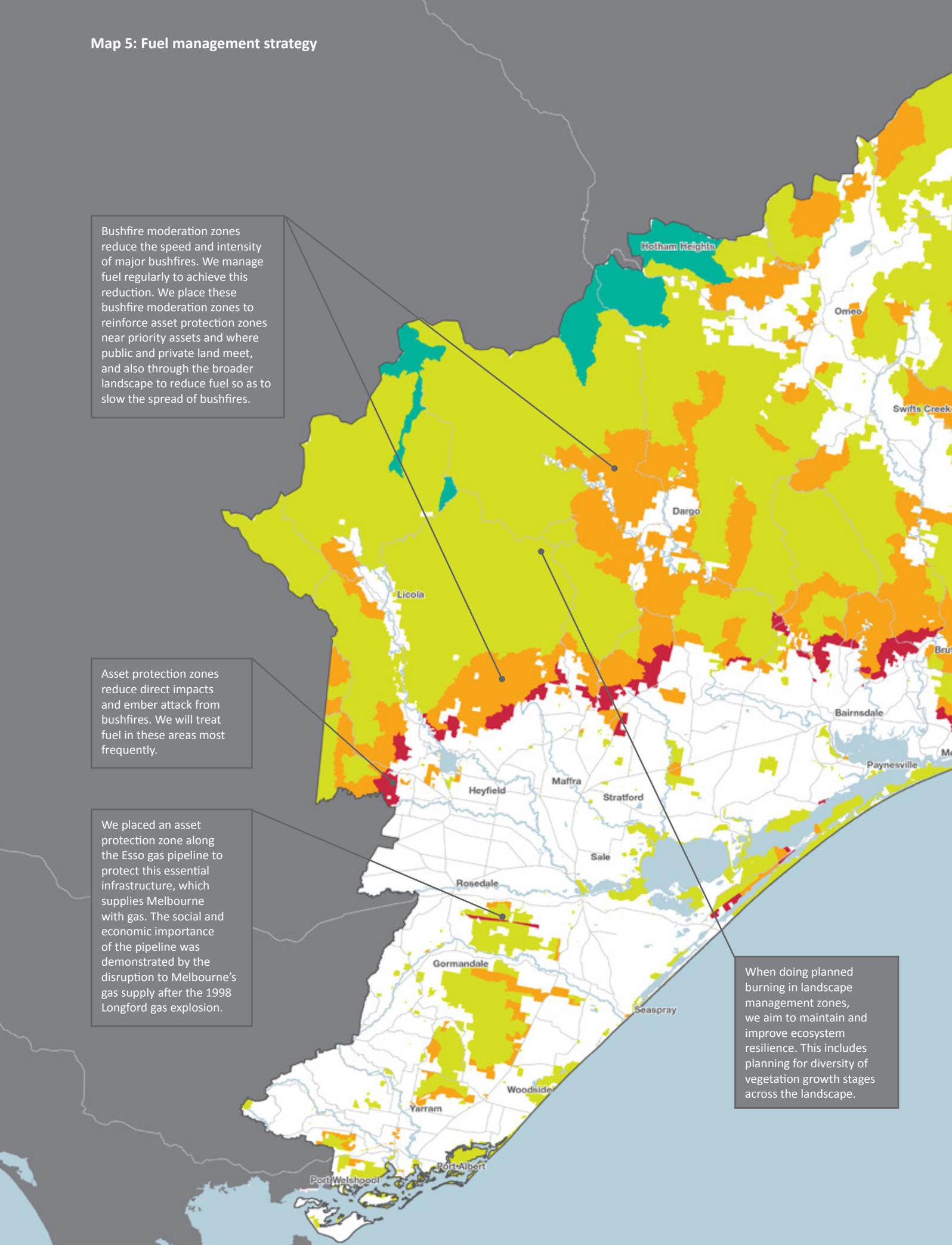
Map 5: Fuel management strategy

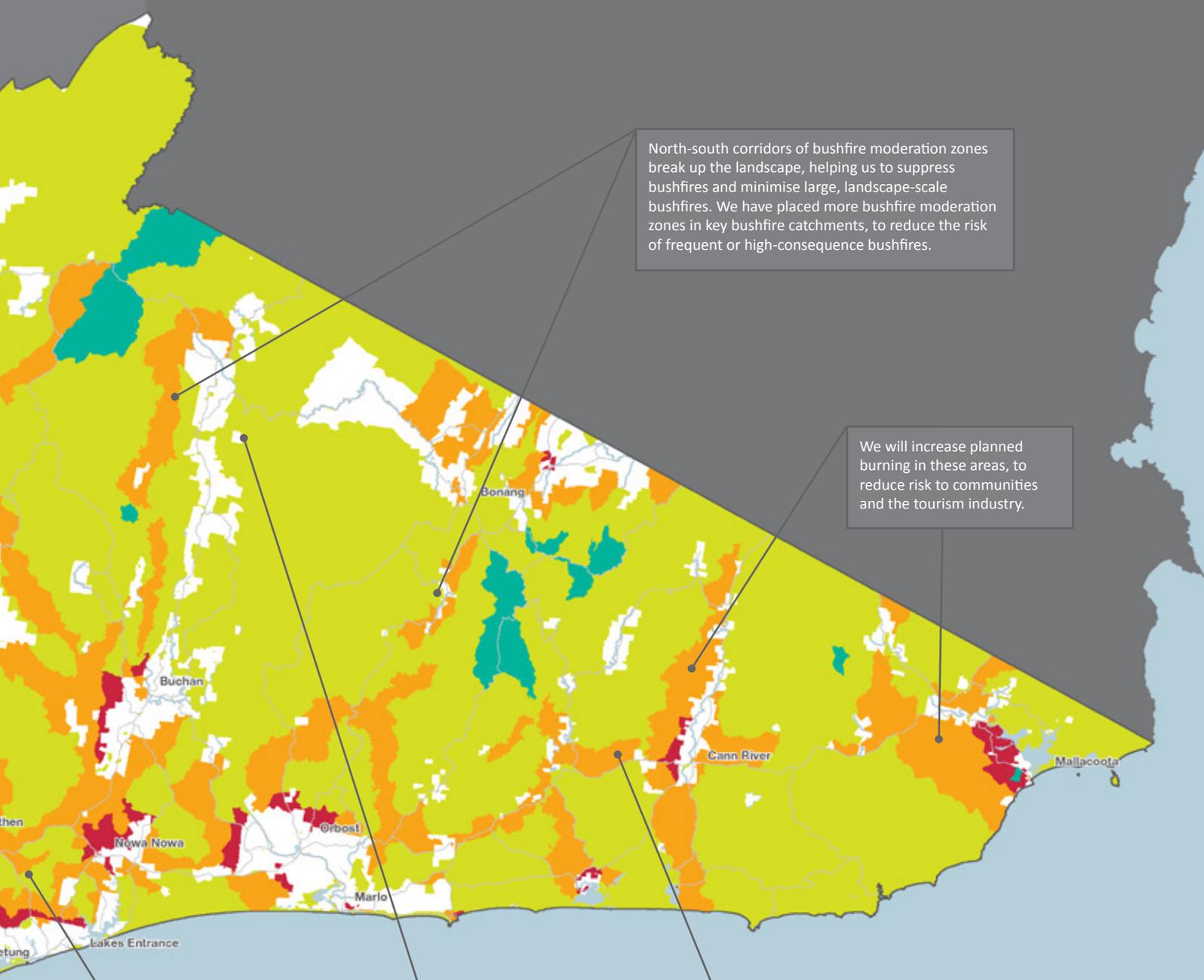
Bushfire moderation zones reduce the speed and intensity of major bushfires. We manage fuel regularly to achieve this reduction. We place these bushfire moderation zones to reinforce asset protection zones near priority assets and where public and private land meet, and also through the broader landscape to reduce fuel so as to slow the spread of bushfires.

Asset protection zones reduce direct impacts and ember attack from bushfires. We will treat fuel in these areas most frequently.

We placed an asset protection zone along the Esso gas pipeline to protect this essential infrastructure, which supplies Melbourne with gas. The social and economic importance of the pipeline was demonstrated by the disruption to Melbourne's gas supply after the 1998 Longford gas explosion.

When doing planned burning in landscape management zones, we aim to maintain and improve ecosystem resilience. This includes planning for diversity of vegetation growth stages across the landscape.





North-south corridors of bushfire moderation zones break up the landscape, helping us to suppress bushfires and minimise large, landscape-scale bushfires. We have placed more bushfire moderation zones in key bushfire catchments, to reduce the risk of frequent or high-consequence bushfires.

We will increase planned burning in these areas, to reduce risk to communities and the tourism industry.

We have extended the planned burning frequency in bushfire moderation zones in this area from eight to 10 years, to protect a priority plant species. Our simulations show this change has not significantly increased residual risk in the landscape.

Our planned burning in landscape management zones will help protect the habitat of priority animal species that live in small, isolated populations.

The bushfire moderation zone adjacent to the Princes Highway will reduce the risk of disruption to this important transport link.

	Area (hectares)
■ Asset protection zone (APZ) <i>Aim to reduce fuel through planned burning or other methods approximately every 5 years.</i>	47,000
■ Bushfire moderation zone (BMZ) <i>Aim to reduce fuel through planned burning or other methods approximately every 8 years. Some burn units in this zone have an altered fuel management regime in response to specific ecological considerations.</i>	486,600
■ Landscape management zone (LMZ) <i>Planned burning will focus on maintaining and improving ecosystem resilience, and fuel management will also be undertaken for risk reduction.</i>	1,679,700
■ Planned burning exclusion zone (PBEZ) <i>Exclude planned burning.</i>	93,100

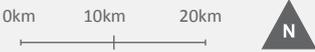


Figure 1 shows measured and expected residual risk in our landscape from 1980 through to 2050. It shows residual risk (the blue line and shaded darker blue area):

- fell sharply in response to major bushfires in the early 1980s
- increased in the following years as vegetation slowly grew back, from around 44% in 1984 to almost 78% in 2002
- decreased to 42% in 2010 – a historic low – as a result of major bushfires in 2003 and 2006 and planned burning
- increased as fuel re-accumulated in the bushfire-affected areas
- will be maintained below levels that existed before the 2003 and 2006 bushfires, by managing fuel on public land.

The figure shows (the darker blue shaded area) that implementing our fuel management strategy on public land will reduce residual risk to between 33% and 69%. Implementing our strategy should see risk decline well below current levels, towards the lower end of the indicated range.

The exact residual risk in future will depend on where we schedule our planned burns each year within the zones; the size, intensity and location of bushfires when they occur; and how quickly fuel re-accumulates in burnt areas. We have

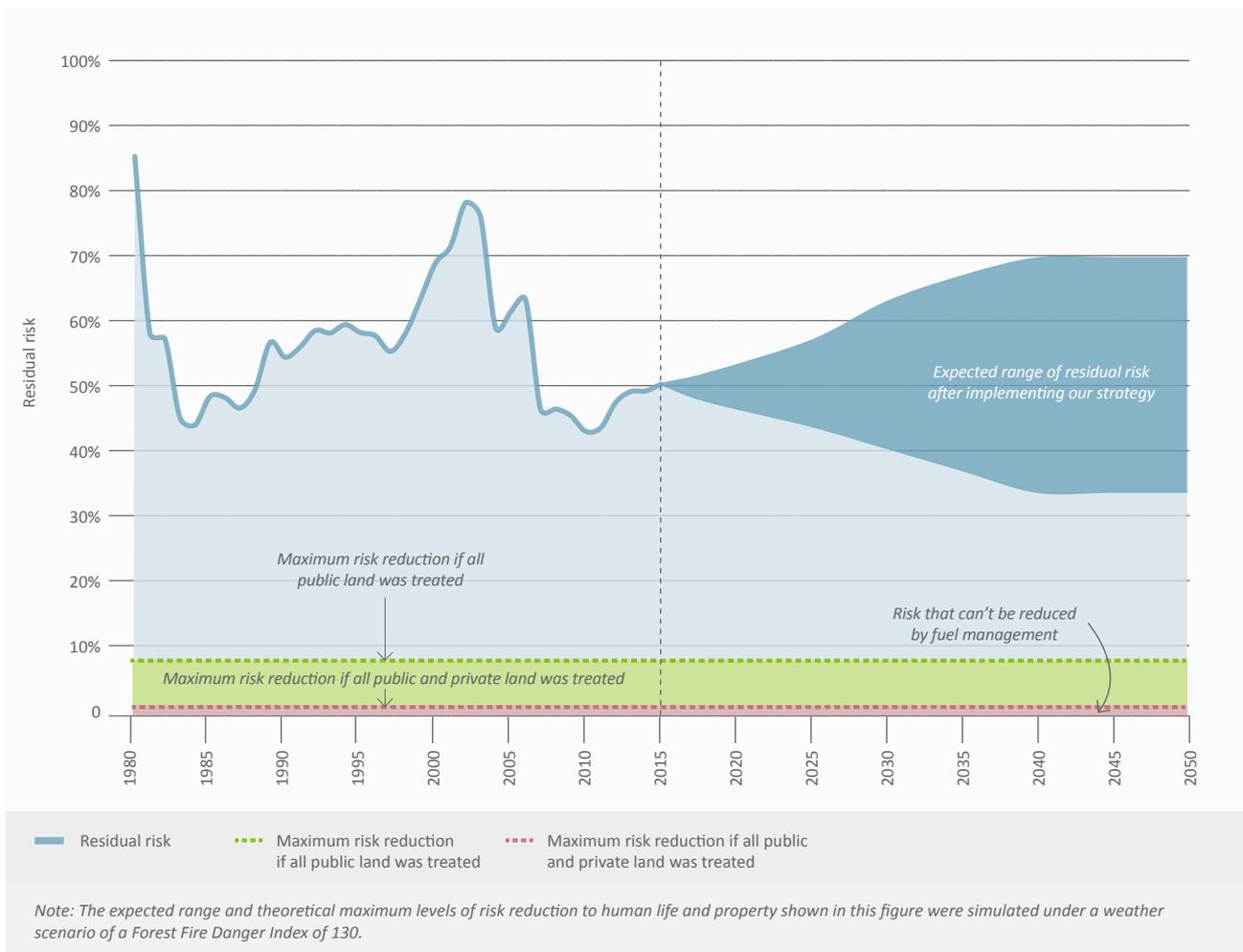
forecast the future residual risk using PHOENIX RapidFire bushfire simulation software and multiple planned burning scenarios. The uncertainty of all the factors that influence residual risk reduces our ability to pinpoint exactly what residual risk will be in the future.

Figure 1 also shows (the green dotted line) that fuel management on private land could theoretically reduce residual risk by up to an additional 7%, which highlights the importance of complementary bushfire preparation, preparedness, response and recovery actions. DELWP will support other agencies (mainly CFA and local governments) and landowners to prioritise and focus their fuel management activities on the highest-priority areas of private land. Local governments can also use our information and products when developing their own strategies for managing risk on private land.

Fire management zones

Fire management zones (FMZs) define objectives for fuel management across the landscape. FMZs were first established in Victoria in 1995 and outline how frequently to treat areas. We will review and adjust FMZs occasionally, as new technology, science and information become available. This plan incorporates the outcomes of a review of our landscape's FMZs.

Figure 1: Residual risk 1980–2050





Planned burning in the Snowy district © Michael Beckers DELWP

There are four types of FMZs. They are:

- **Asset Protection Zone:** an area around properties and infrastructure where we do intensive fuel management to provide localised protection, to reduce radiant heat and ember attack on life and property in the event of a bushfire
- **Bushfire Moderation Zone:** an area where we manage fuel hazard to reduce the speed and intensity of bushfires, and to protect nearby assets, particularly from ember attack in the event of a bushfire
- **Landscape Management Zone:** an area where we manage fuel to reduce residual risk, improve ecosystem resilience, and for other purposes (such as to regenerate forests and protect water catchments)
- **Planned Burning Exclusion Zone:** an area where we try to avoid planned burning, mainly because the vegetation cannot tolerate fire.

Map 5 shows the location of FMZs in our landscape. In:

- asset protection zones, we aim to reduce fuel by planned burning or other methods about every five years, over a total 47 000 ha
- bushfire moderation zones, we aim to reduce fuel about every eight years, over a total 486 600 ha; we will alter the fuel management regime in some burn units in this zone to meet ecological objectives
- landscape management zones, we will do planned burning mainly to maintain and improve ecosystem resilience, but also to reduce fuel, over a total 1 679 700 ha.

Fire operations planning

Each year we produce an updated fire operations plan for each region in our landscape. These plans:

- are rolling schedules of fuel treatments specifying the total area where we aim to reduce fuel, and the location and sequencing of individual burns and other treatments
- are guided by priority fuel management areas, to ensure our fuel management program continues to drive down residual risk

- cover all fuel treatment on public land, including areas of lower risk
- address factors such as public safety and access.

The actual residual risk reduction we achieve across the landscape depends on the extent to which we can implement our fire operations plans: how much fuel management we are able to conduct (given the weather and other operational constraints), the amount of area where we can reduce fuel, the arrangement of the burns or other treatments in the landscape and other factors. Over time, the residual risk will also be influenced by bushfires.

To inform fire operations planning, each year we identify priority fuel management areas, areas of public and private land where it is most important to reduce the current fuel hazard and bushfire risk. When identifying these areas, we take account of recent bushfires and fuel management activities. We also produce information to indicate the current suitability of each public land burn unit for planned burning, considering among other things the time since last fire, the sensitivity of the vegetation to fire and the requirement to maintain or improve ecosystem resilience. We will work with other agencies (mainly CFA and local governments) and private landowners to help ensure they are aware of the priority areas on which to focus their fuel management activities.

We recognise that planned burning can affect communities, infrastructure and public administration facilities, and economic, environmental and cultural heritage and social assets. We will continue to identify measures to mitigate these impacts through fire operations planning and burn planning—without compromising our strategic fuel management objectives—and to implement our procedures to mitigate risks to priority environmental assets.

DELWP will ensure our fire operations planning process:

- is informed by the fuel management strategy and priority fuel management areas
- complies with the objectives of FMZs.

Balancing our fuel management approach

While the primary aim of our fuel management strategy is to reduce the risk of bushfire impacts on life and property, we also aim to maintain and improve ecosystem resilience.

An ecosystem's resilience is reflected in its capacity to withstand and recover from a range of disturbances, including fire. We measure ecosystem resilience by looking at the whole landscape and at multiple fires with various frequencies of burning.

We currently measure risk to ecosystem resilience across the landscape using tolerable fire intervals (TFIs). TFIs are the minimum and maximum recommended times between fire events for a particular group of vegetation communities with common ecological requirements for fire, and common fire behaviour characteristics. These groups of vegetation communities are known as ecological fire groups (EFGs). TFIs are an interim measure: we are working on other measures, including growth stages of vegetation.

Burning within these intervals can assist in maintaining healthy and resilient ecosystems. Burning repeatedly outside these intervals increases the risk that there will be fundamental changes in the abundance and composition of species and in the type of vegetation in the EFG. It may also increase the risk of weed invasion, erosion and the loss of nutrients in the soil. We are currently investigating ways to better understand the impacts of burning outside the minimum and maximum TFIs.

Multiple major bushfires can also result in EFGs being burnt under minimum TFI and can negatively affect fire-sensitive ecosystems and species. Elements of our fuel management strategy try to reduce the impact of these outcomes.

Initial work on the measure (growth stage of vegetation) is showing promising results in measuring ecosystem resilience. The growth stage of vegetation depends on when it was last burnt, or subject to other disturbance. Each vegetation type passes through distinct stages following disturbance, each stage differing in the quality of the habitat it provides for plants and animals. Lack of diversity of growth stages in a landscape may reduce the ecosystem's capacity to resist damage and maintain its basic structure and type after being disturbed by fire.

Figure 2 shows the area of the EFGs in our landscape we expect to repeatedly treat by planned burning below their minimum TFI under the fuel management strategy.

Under the strategy, we expect that the average fire return interval will be lower than minimum TFI for 383 000 ha, or about 14%, of vegetation in the landscape. The majority of this area will be in asset protection zones and bushfire moderation zones. We expect to burn repeatedly below minimum TFI in up to 27% of grassy / heathy dry forest and up to 22% of foothill forest.

We recognise there is a trade-off between reducing bushfire risk to life and property and maintaining ecosystem resilience across the landscape. We will continue to work to better balance the two code of practice objectives. In some areas we modified our strategy to accommodate the needs of some plant and animal species (for example, the Colquhoun grevillea species in the case study on page 21, the habitat of which needs a particular fire regime that minimises its risk from planned burning). Our risk analysis shows these adjustments do not significantly raise modelled residual risk in the landscape. Accommodating the needs of individual species is a good, initial step towards a more sophisticated approach to including environmental values in strategic fuel management.



A bushfire near Aberfeldy © Michael Beckers DELWP



Colquhoun grevillea

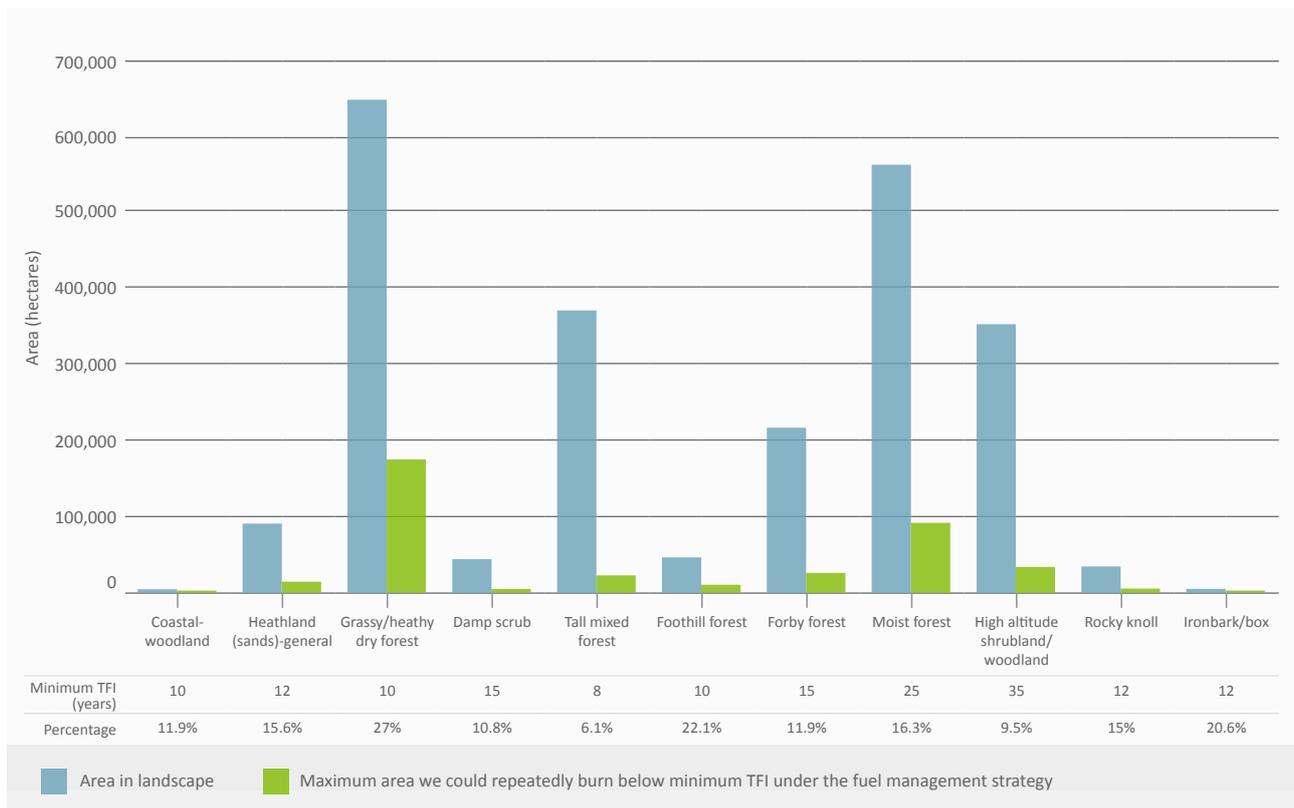
The Colquhoun grevillea (*Grevillea celata*) is a low shrub growing to 1.8 m tall. It is endemic to a small area of our landscape. It is listed as vulnerable under the federal *Environment Protection and Biodiversity Conservation Act 1999*, and as threatened under the state *Flora and Fauna Guarantee Act 1988*.

The *National recovery plan for the Colquhoun Grevillea* identifies inappropriate fire regimes as a threat to the species. It also suggests fire should be applied no more frequently than at 10 year intervals.

Under our fuel management strategy, some populations of Colquhoun grevillea are in bushfire moderation zones, where the frequency of planned burning is eight years. In these areas, we will extend this frequency to 10 years. These adjustments do not significantly raise modelled residual risk in the landscape, meaning in this instance we can both reduce residual risk and meet the needs of this threatened species.

Colquhoun grevillea © Kerry Seaton DELWP

Figure 2: EFGs proposed for repeated planned burning below minimum TFI





Brush-tailed rock-wallaby

The Brush-tailed rock-wallaby (*Petrogale penicillata*) is a small wallaby weighing up to 8 kg. It is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and as threatened under the state *Flora and Fauna Guarantee Act 1988*. It is considered critically endangered in Victoria. Within our landscape, a small colony of 20 to 30 animals lives in the Little River Gorge near Wulgulmerang. This is the largest remaining colony of the Brush-tailed rock-wallaby in Victoria.

Like many animals living in small and isolated populations, the rock-wallaby is particularly susceptible to a one-off event such as a bushfire, which can kill individuals or affect habitat by reducing their available food. It is very difficult to manage fire where the rock-wallaby lives, and the impact of planned burning on the habitat of the rock-wallaby is not well-understood.

Under our fuel management strategy, the Brush-tailed rock-wallaby colony at Little River Gorge and surrounding areas are in a landscape management zone. This zone provides us with the opportunity to do planned burning in areas surrounding the colony to reduce risk from large, intense bushfires. It also allows us to do burning trials or to not burn the actual habitat of the rock-wallaby until we better understand the implications of planned burning.

Brush-tailed rock-wallaby © Lucy Clausen DELWP



Wax-lip orchid © Faye Bedford DELWP



Smoky mouse © Linda Broome



Platypus at Valencia Creek © DELWP

Other bushfire management strategies

As well as implementing our fuel management strategy, we will also undertake prevention, preparedness, response and recovery actions on public land. We will also continue to share bushfire risk information and work in partnership with other agencies (including CFA, local government, Emergency Management Victoria and Victoria Police). These actions will strengthen bushfire management across our landscape.

Preventing bushfires

Preventative actions minimise the occurrence of bushfires, particularly those started by people when weather conditions are extreme. To improve bushfire prevention, DELWP and PV will:

- prioritise compliance activities (as part of the Gippsland Arson Prevention Program), including community education and enforcement patrols with Victoria Police and other land and resource managers, to reduce intentional ignitions
- close some state forests and national parks on days of extreme bushfire weather, to increase public safety and reduce the likelihood of fires starting in forested areas
- share bushfire risk analysis information with local governments, other emergency services agencies, land managers and community-based planning forums, to improve bushfire prevention activities on public and private land.

Being prepared for bushfires

We must be adequately prepared for bushfires, to improve our response to them when they occur.

Well-maintained roads and tracks are essential for quick response and for community and firefighter safety. DELWP manages 30 800 km of roads on public land in our landscape; they allow access for heavy firefighting machinery, safe access for bushfire response and a safe environment for planned burning.

DELWP will manage our strategic roads and bridges to the standard for bushfire management agreed with other agencies, and ensure road maintenance budgets are prioritised consistent with this.

Each year, before the bushfire season, DELWP and CFA will jointly assess the bushfire risk across the whole landscape to identify priority areas for response, fuel management and community engagement, and develop local mutual aid plans that cover our joint preparedness and response activities.

DELWP and PV will review and revise emergency management plans for closing, evacuating and protecting priority visitor sites (such as camping sites, walking tracks and day-use areas) when the fire danger rating is Severe or above, and where people may be at risk from bushfire.

DELWP will work with relevant agencies and infrastructure managers to develop and implement bushfire mitigation actions for infrastructure identified as having high-to-extreme risk of bushfire damage.

DELWP will develop and maintain its staff capability in bushfire management, including emergency response.

DELWP will work in partnership with other agencies (including Emergency Management Victoria, CFA, local governments and Victoria Police) to include strategic risk analysis and PHOENIX RapidFire simulation in municipal and regional fire and emergency management planning.

DELWP will provide bushfire risk information to Victoria Police, local governments and CFA to help them develop evacuation and traffic management plans for priority communities and locations.

Responding to bushfires

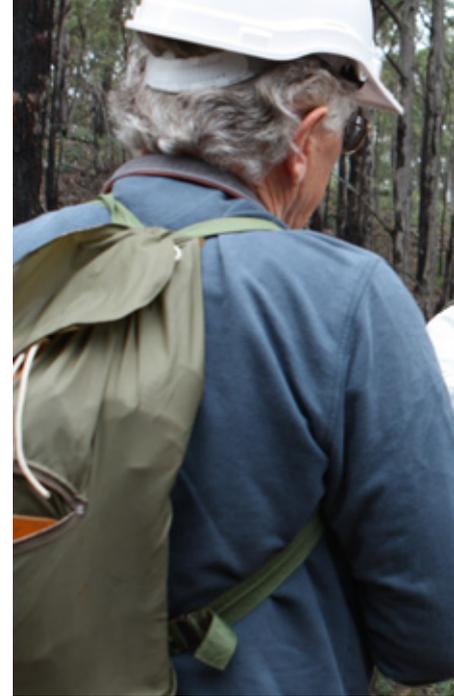
DELWP is responsible for suppressing fires in state forests and national parks, and on protected public land. To improve bushfire response, DELWP will:

- continue to provide an integrated response to bushfires with CFA and other emergency managers
- share bushfire risk assessment data and information with other fire agencies and land managers (such as PV, CFA, VicForests and private plantation owners) to support bushfire response
- continue to identify and validate our landscape's priority assets for protection.

Recovering after bushfires

DELWP and PV are responsible for the recovery of public land after a bushfire. To improve bushfire recovery, DELWP will:

- work with other agencies and communities to identify recovery priorities
- address recovery priorities to re-establish access to public land in a timely manner, and support bushfire-impacted communities to return to normal daily life.



Planned burning in the Tambo district © Greg McCarthy DELWP

How we will continuously improve the planning process

DELWP and PV will monitor, evaluate and report on implementation of our planning process. We will identify what, where and when monitoring activities need to be done to support evaluation of the effectiveness of our planning. This will enable us to make more informed decisions over time. We will continue to engage with the community and key stakeholders in our planning, monitoring and implementation. Bushfire management will continue to evolve with advances in science, technology and how we engage with communities. We intend to continually improve our bushfire management planning approach.

We will continue to engage with the regional Traditional Owners and work in partnership with those who have settlement agreements with the state on public land, to achieve a balanced fuel management strategy.

Monitoring activities will be guided by the statewide monitoring, evaluation and reporting framework. These activities will measure changes to:

- residual risk
- ecosystem resilience.

We will use the information we collect about fuels, habitat and ecosystem resilience to:

- evaluate the extent to which the fuel management strategy has reduced the impact of bushfires on life, property and the environment
- quantify the effect of the fuel management strategy on ecosystem resilience
- refine and improve the models that underlie our strategic planning.

We will assess how effectively our activities are achieving the two code of practice objectives. Through DELWP's annual fuel management reporting, we will report on how we are monitoring our activities and progressing towards the two code of practice objectives. We will use the *Monitoring, Evaluation and Reporting Framework for Bushfire Management on Public Land* to guide how we monitor and evaluate implementation of this strategic bushfire management plan, particularly:

- the extent to which the fuel management strategy has reduced the impact of bushfires on communities and the environment
- the effectiveness of the fuel management strategy at maintaining or improving ecosystem resilience across the landscape
- the risk to ecosystem resilience in areas that may be burnt below their TFI (such as Forby forest, Grassy/heathy dry forest, Moist forest, Tall mixed forest and Foothill forest).

We will report to the community regularly. We will report annually on fuel management activities; every five years on the effectiveness of the fuel management strategy and other actions in this plan; and at least every ten years on achievement of the code of practice objectives.

Through DELWP's *Bushfire Science Strategy 2013–17*, we will invest in research to improve the information available for future plans. We plan to improve our risk assessment method by better incorporating weather patterns, ignition likelihood weightings and convection strength and by developing better measures for ecosystem resilience. We also plan to improve how we identify and rate public administration assets and social (including cultural heritage) assets.



A community field day © DELWP

We will develop a long-term burn schedule. The schedule will take into account changes in vegetation structure and other aspects of habitat that are affected by bushfires or other fuel management activities. This will help us to better balance immediate asset protection needs with long-term vegetation and ecosystem resilience needs. It can also be adjusted to reflect the impacts of any bushfires that may occur.

We will further analyse particular areas to better understand the best places to manage fuel to maintain and improve ecosystem resilience. This will include areas with long-unburnt vegetation or with habitat for fire-sensitive species we want to protect from bushfires and planned burning.

Glossary

Asset Protection Zone – an area around properties and infrastructure where we do intensive fuel management to provide localised protection against radiant heat and ember attack in the event of a bushfire.

Bushfire Moderation Zone – an area where we manage fuel load to reduce the speed and intensity of bushfires, and to protect nearby assets, particularly from ember attack in the event of a bushfire.

CFA – Country Fire Authority.

Code of practice – *Code of Practice for Bushfire Management on Public Land 2012*.

DELWP – Department of Environment, Land, Water and Planning.

Ecological fire group (EFG) – a grouping of ecological vegetation classes with common ecological requirements for fire, and common fire behaviour characteristics.

Fire Management Zone (FMZ) – an area of public land where fire is used for specific asset, fuel and overall forest and park management objectives. There are four types of fire management zone: Asset Protection Zone, Bushfire Moderation Zone, Landscape Management Zone and Planned Burning Exclusion Zone.

ISO 31000 – a family of standards relating to risk management codified by the International Organization for Standardization.

Landscape Management Zone – an area where we manage fuel load to reduce fuel hazard, improve ecosystem resilience and for other purposes.

PHOENIX Rapidfire – software that simulates how bushfires spread given terrain, fuel and weather conditions.

PIPESS – a systematic way of categorising assets by People, Infrastructure, Public Administration, Environment, Economy and Social Setting.

Planned burning – deliberate burning to manage the quantity of leaf litter, twigs, bark and undergrowth in order to reduce bushfire risk.

Planned Burning Exclusion Zone – an area where we try to avoid planned burning, mainly because the vegetation cannot tolerate fire, or because we cannot burn it safely.

PV – Parks Victoria.

Residual risk – the risk, on average and across the whole landscape – including public and private land – that bushfires will impact on life, property or other assets. Residual risk is expressed as the percentage of risk that remains after bushfire history and fuel management (mainly planned burning) are taken into account.

Tolerable fire intervals (TFIs) – the minimum and maximum recommended times between fire events for a particular ecological fire group (EFG). Burning regularly outside these intervals increases the risk that there will be fundamental changes in species' abundance and composition, and the type of vegetation.

Victorian Fire Risk Register (VFRR) - The *Victorian Fire Risk Register* is a systematic process used to identify assets at risk from bushfires, assess the level of risk to assets and record a range of current treatments to mitigate the risk. The register includes human, economic, environmental and cultural assets. The Country Fire Authority (CFA) facilitates and manages the VFRR.

We – DELWP and PV, together.

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