

Strategic bushfire management plan

Alpine and North East





© The State of Victoria Department of Environment, Land, Water and Planning 2015



This work is licensed under a Creative Commons Attribution 4.0 International licence. You are free to re-use the work under that licence, on the condition that you credit the State of Victoria as author. The licence does not apply to any images, photographs or branding, including the Victorian Coat of Arms, the Victorian Government logo and the Department of Environment, Land, Water and Planning (DELWP) logo. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>

Printed by Impact Digital, Brunswick.

ISBN 978-1-74146-702-4 (print)

ISBN 978-1-74146-703-1 (pdf)

Disclaimer

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

Accessibility

If you would like to receive this publication in an alternative format, please telephone the DELWP Customer Service Centre on 136186, email customer.service@delwp.vic.gov.au, or via the National Relay Service on 133 677 www.relayservice.com.au. This document is also available on the internet at www.delwp.vic.gov.au.

Contents

Introduction	2
About bushfire in our landscape	4
What this plan prioritises for protection	8
How do we decide what to prioritise for protection?	8
Communities	12
Infrastructure and environmental services	12
Economy	13
Environment	14
Cultural heritage and community assets	14
How we will protect our landscape	15
Our fuel management strategy	15
About our fuel management strategy	15
Reducing bushfire residual risk	15
Fire management zones	19
Fire operations planning	21
Balancing our fuel management approach	22
Other bushfire management strategies	23
Preventing bushfires	23
Being prepared for bushfires	23
Responding to bushfires	23
Recovering after bushfires	23
How we will continuously improve the planning process	24
Glossary	25



Helicopters are used to suppress fires in remote locations © 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 North East 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.



Craig's Hut, atop Clear Hills in Mansfield State Park was burnt down in the 2007 bushfires and subsequently rebuilt by popular demand © Paul O'Connor

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.

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 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.

We thank everyone who is contributing to our planning approach. This includes staff and representatives of DELWP, PV, VicForests, Country Fire Authority, Victoria Police, State Emergency Service, Emergency Management Commissioner and Emergency Management Victoria, Department of

Health and Human Services, local governments, catchment management authorities, water corporations, utility services, private land managers, regional industry advisors, cultural heritage experts and communities in the landscape. DELWP and PV 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

Christine Ferguson
DELWP Regional Director
Hume



Mitta Mitta River © 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 North East bushfire risk landscape. It is about 2 600 000 ha, or 11% of the state's area. Of the landscape, 52% is public land, including extensive areas of tall eucalypt forest rising up to the Great Dividing Range and the Victorian high country; 48% is private land, including the alpine valleys and the floodplains and grasslands of the Goulburn and Murray rivers. This variation in topography and land use influences how bushfires behave, the properties at risk, the type of assets and how we respond to fire.

Managing bushfire risk is essential. In the last 43 bushfire seasons, DELWP responded to an average 110 bushfires a year in our landscape. We suppressed 82% 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.

Since 1940, bushfires have resulted in 32 lives lost in our landscape: 24 to grassfires west of the Hume Freeway and eight to bushfires in the more-forested, elevated areas in the east. Most lives lost were those of firefighters. About twice the number of houses have been lost east of the freeway than west of it. In the last 15 years, bushfires have increased in size and intensity, burning millions of hectares of public and private land. These have resulted in lives lost, property

destroyed, major economic disruption, infrastructure damage and environmental assets harmed. Major bushfires in our landscape include the 1939 Black Friday fires (which burnt 940 312 ha), the 1952 Benalla-Moyhu fire (100 000 ha), the 1972 Mt Buffalo fire (12 140 ha), the 1985 Mt Buffalo fire (51 400 ha) the 2003 Alpine fire (over 1 million ha), the 2006-07 Great Divide fires (441 517 ha), the 2009 Beechworth Library Road fire (33 577 ha) and the 2013 Harrietville fire (36 000 ha).

In the last decade, 51% of all bushfires in our landscape to which DELWP responded (and which were mostly on public land) were due to lightning. Other bushfires were started by machinery, trains, escapes from campfires and burn offs, and other causes. Deliberate action by people accounted for 4% of bushfires, accidental ignitions 22% and the remaining 23% 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. This was what we saw in Victoria on 16 February 1983 (Ash Wednesday) and 7 February 2009 (Black Saturday).



The Bluff, Alpine National Park © Rowhan Marshall

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°, 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.

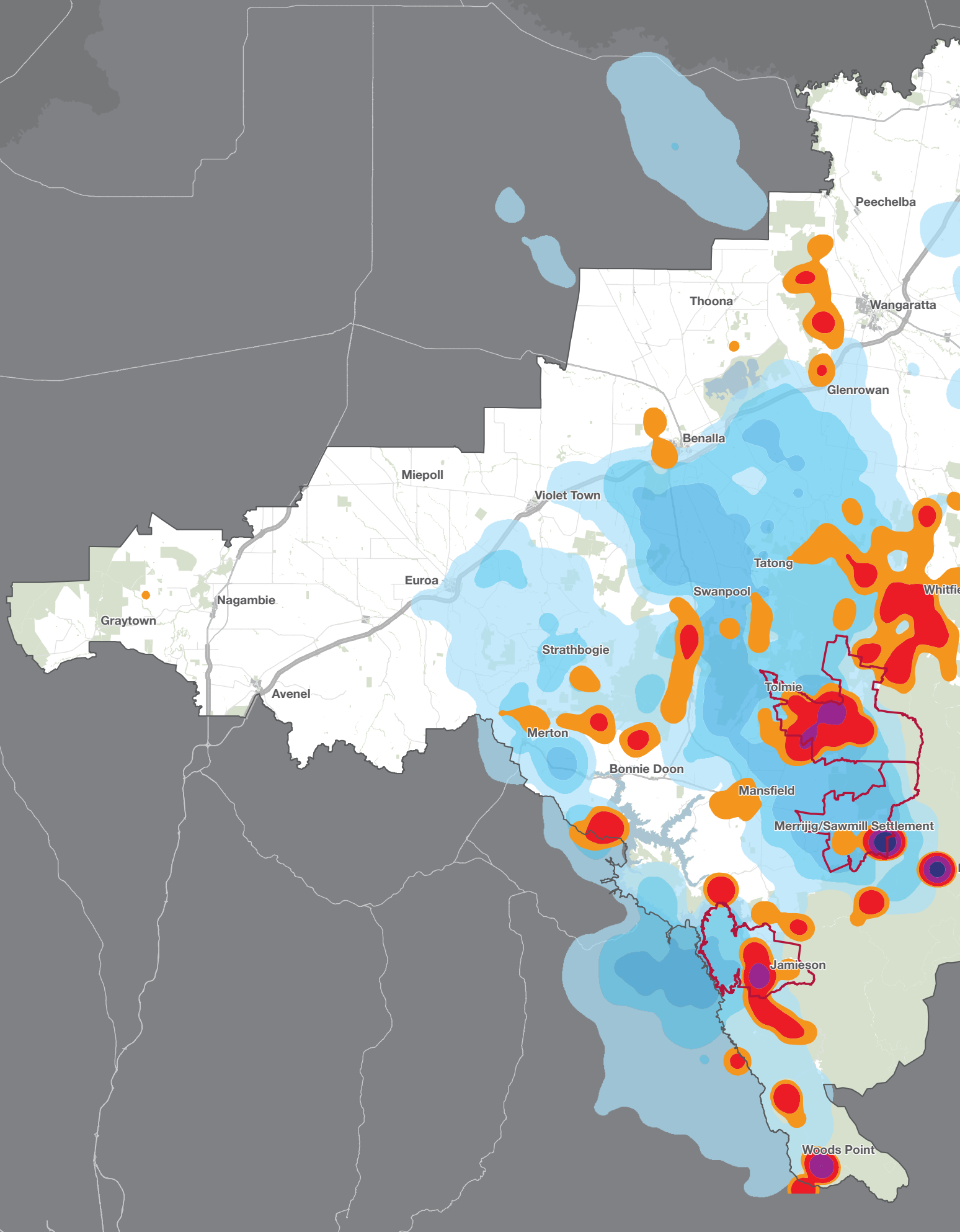
Map 1 shows the landscape's bushfire catchments. These are areas where the worst bushfires could start, spread and impact on priority communities and assets in a single day. These are important things to know because:

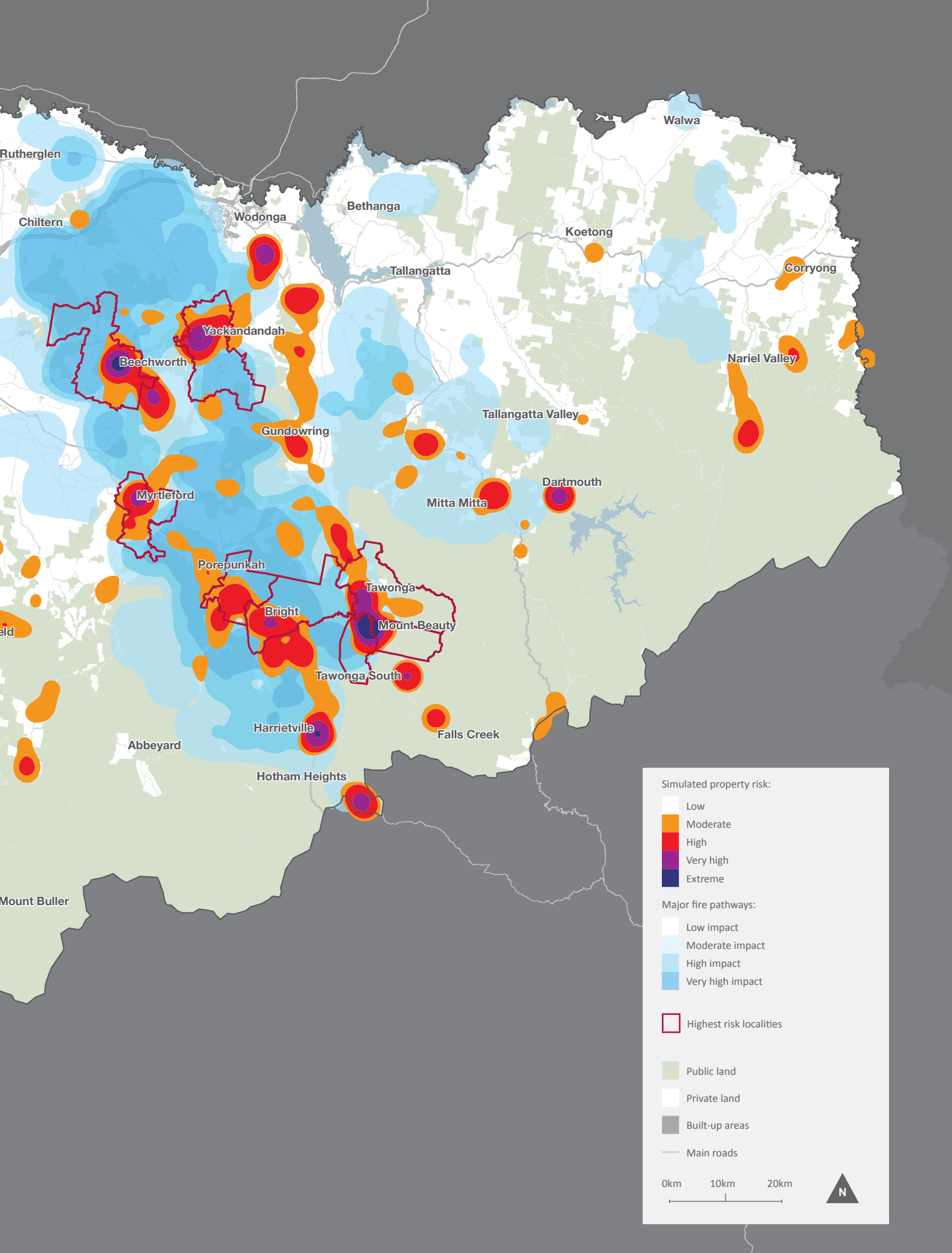
- at likely ignition points, we may conduct patrols on Severe, Extreme and Code Red fire danger days, and manage fuels (particularly if the spread or impact areas of these bushfires are difficult to treat)
- along spread paths, fuel management is the key to reducing the impact of major bushfires by reducing 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 also shows where bushfire simulations predict bushfires 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 simulated property risk is highest around the communities in the valleys and the surrounding hilly terrain in the Alpine, Indigo and Mansfield shires, particularly in the localities of Beechworth, Bright, Jamieson, Mt Beauty, Myrtleford, Porepunkah, Sawmill Settlement/Merrijig, Tawonga, Tawonga South, Tolmie and Yackandandah. The communities in these localities are in the paths of simulated bushfires with the greatest level of potential impact. They are vulnerable to bushfires starting at a variety of locations, and bushfires under worst-case weather conditions would result in the most properties lost.

Map 1: Bushfire catchments and simulated property risk







High fuel loads in the mountainous terrain in the east of the landscape can result in intense fires that are hard to suppress © DELWP

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 the assets we consider important in our landscape, consistent with state fire control priorities: communities and properties, infrastructure and economic and environmental assets. We then assess the asset's risk, based on its likely exposure and vulnerability to a major bushfire, and how consequential a major bushfire would be. That is, something has a high risk rating if:

- it is very likely to be exposed to a major bushfire
- it is vulnerable to fire: that is, if fire would damage and/or disrupt it
- there would be consequences ranging from important to catastrophic if bushfire damaged or disrupted it.

Once we have identified the assets at highest risk from bushfire, we design a fuel management strategy which prioritises those assets for protection.

Our planning method draws on the best available information from data and community consultation. We use the Office of Emergency Services Commissioner's *Wildfire Project*, regional bushfire planning assessments, the *Victorian Fire Risk Register* and state government data about environmental assets and cultural heritage.

We consult with communities, stakeholders and experts. This includes representatives of industry, land managers, emergency services and local governments, and with a wide range of experts including ecologists and cultural heritage experts. We consult about our modelling tools, bushfire behaviour, our risk assessment methods, the landscape's assets and the vulnerability of those assets. By drawing on the knowledge and experience of local communities, we can better understand what they value and how they see bushfire risk, and engage with them in planning the best course of action.

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 (we use worst-case weather conditions similar to those in Victoria on Ash Wednesday 1983 and Black Saturday 2009).

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

Map 2 compares PHOENIX Rapidfire's simulation of the initial extent of the 2009 Beechworth–Library Road bushfire, and the actual extent, about 12 hours after ignition. It shows that the fire, moving south-east, almost immediately encountered forest which was fuel-reduced by bushfire in 2003 and planned burning in 2005 and 2008. The simulation shows that without fuel reduction, the fire would have travelled 12 km further, potentially threatening the entire Ovens Valley between Myrtleford and Bright. Fuel-reduced areas also provided safer anchor points for crews suppressing the fire and helped protect the Mt Big Ben telecommunications tower.

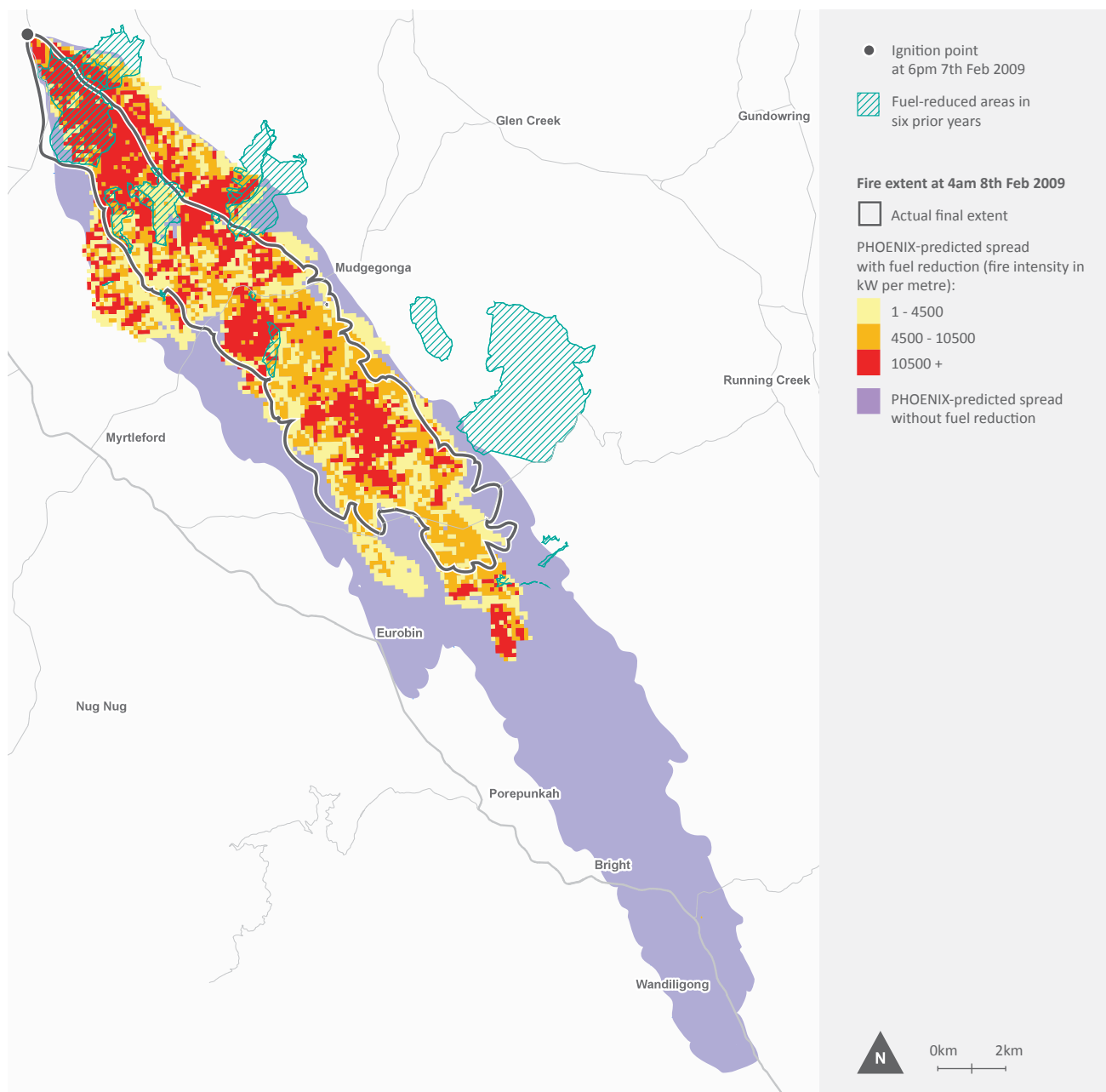


Many areas of private land in the landscape are surrounded by public land © Caitlin Cruikshank

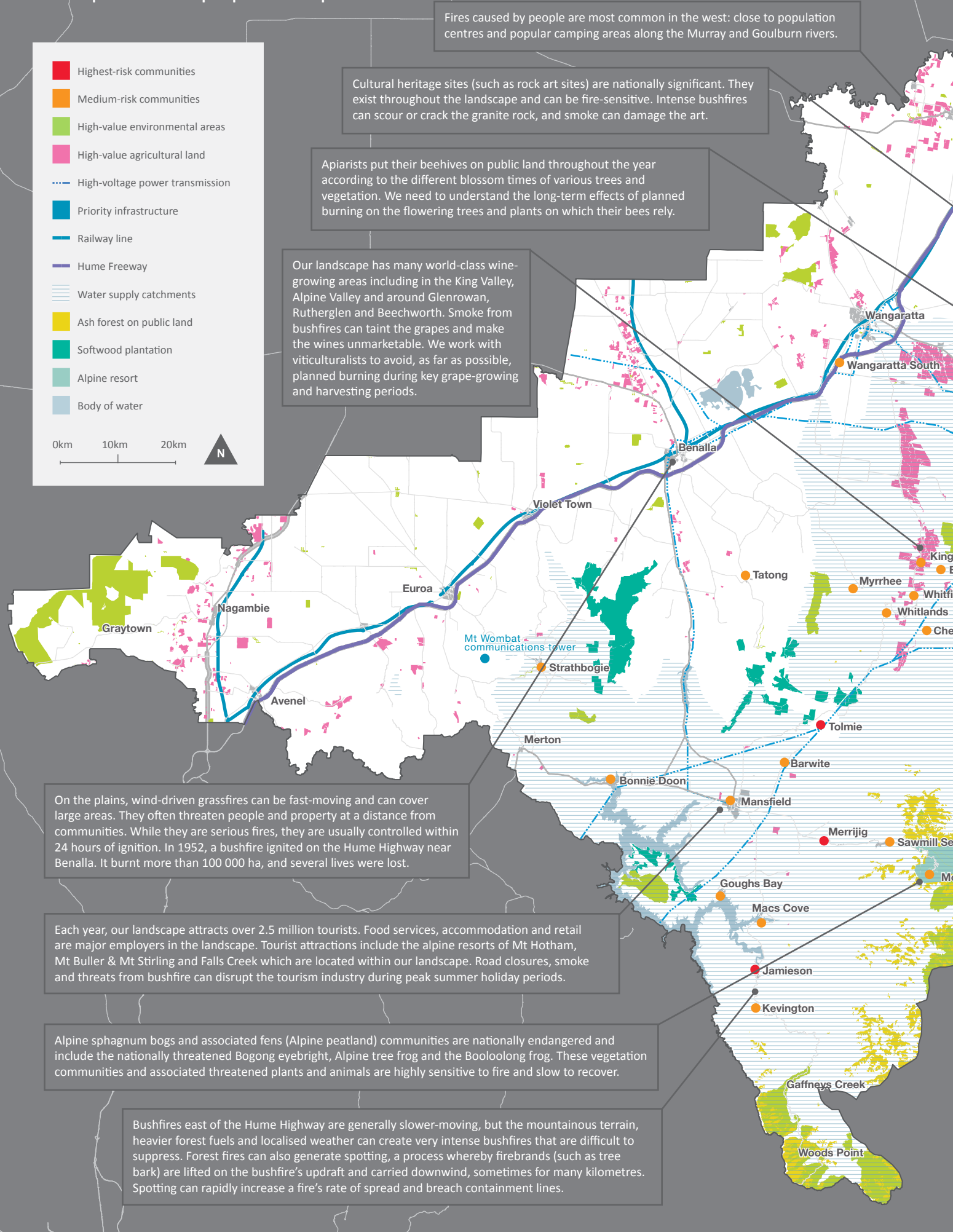


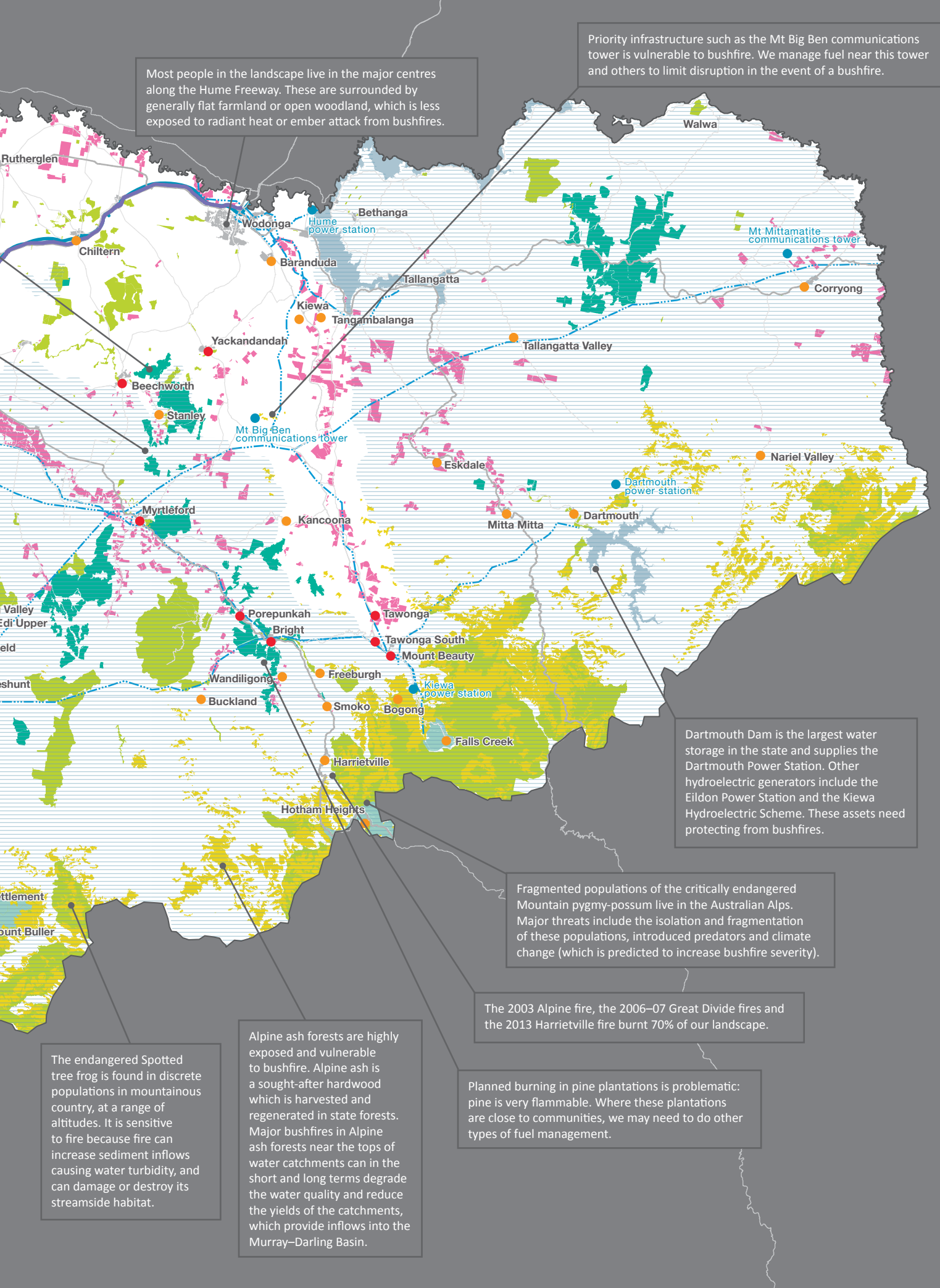
An historical site in Warby-Ovens National Park © DELWP

Map 2: Actual and simulated extent until 4am of 2009 Beechworth-Library Road fire



Map 3: Our landscape's priorities for protection







Our landscape's 65 000 ha of softwood and native hardwood plantations have local, state and national significance © DELWP



Smoke from fires can permeate the skin of grapes, and wine made from smoke-tainted grapes may be unmarketable © Caitlin Cruikshank

Communities

Map 3 shows our landscape's priority communities and their localities (including outlying properties). The code of practice prioritises minimising the impact of bushfires on human life over all other considerations. Communities at highest risk in our landscape are those located in the forested hills and valleys.

We prioritised these communities and their localities because modelling shows they would have the highest number of houses lost in a major bushfire. The location of many communities in our landscape increases their bushfire risk. Most cities and towns in the landscape have growing peri-urban areas, and the main towns to the east of the freeway are developing toward heavily forested areas. Bushfires in these more heavily forested areas are more likely than grassfires to generate the levels of intense heat or embers that destroy houses.

Some communities and groups of people are more vulnerable to bushfire 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.

To protect our priority communities, we:

- place asset protection zones and bushfire management zones in areas north and west of the communities in the likely spread paths of major bushfires
- place bushfire moderation zones to create strategic fuel-reduced corridors along spread paths, to reduce the intensity and rate of spread of major bushfires
- provide advice to other land managers and fire agencies about high-risk areas for other fire risk planning preparedness activities such as conducting private land fuel reduction
- increase patrols in high-fire-risk areas (including camping areas) on high-fire-danger days.

Infrastructure and environmental services

Map 3 shows our landscape's priority infrastructure: our water supply catchments and major storages, freeways and highways, high-voltage transmission lines and communications networks.

Our water catchments and storages are of national significance and include Lake Hume (the main operating storage of the Murray River system) and Dartmouth Dam (the largest water storage in the state). Our catchments provide almost 40% of the inflows into the Murray–Darling system and also supply water to major irrigation districts, Adelaide and numerous other cities and towns. Our landscape's catchments also provide water for hydroelectric generators, including the Eildon power station, Kiewa power station and Dartmouth power station.

Our water supply catchments are vulnerable to bushfires which can damage water supply infrastructure and contaminate the water with ash and debris. In some areas in the catchments, post-bushfire landslides of water and debris can do further damage, and degrade water quality, if the terrain is steep and the soil is erodible.

Maintaining water flows in the Murray, Goulburn and Broken river systems is important for water supply to major towns and cities, for ecosystem resilience and for irrigation. The irrigation infrastructure in the Goulburn and Broken river systems supplies water for one of Australia's major food-producing areas.

We prioritised our freeway and highway corridors including the Hume and Goulburn Valley freeways; the Midland, Murray Valley, Kiewa Valley and Omeo highways; and the Great Alpine and Bogong High Plains roads. We also prioritised the four rail corridors that connect Melbourne, Sydney and southern New South Wales.

We prioritised our landscape's high-voltage transmission lines. Direct flame contact, radiant heat and thick smoke can cause arcing which can shut down electricity supplies and disrupt communities.

We prioritised key communications infrastructure including Airservices Australia communications towers on Mt Big Ben, Mt Mittamatite and Mt Hickey. We also considered emergency communications and logistical networks, so that in the event of a bushfire there is minimal disruption to essential services and recovery works are not impeded afterwards.



The critically endangered Mountain pygmy-possum is now only found in fragmented populations in the Victorian Alps © Glen Johnson



The landscape has many important Aboriginal heritage sites © DELWP

To protect our priority infrastructure and environmental services, we:

- manage fuel in and around the upper reaches of our main water catchments to reduce the size and intensity of bushfires in the fire-sensitive Alpine ash forests, and in and around areas which may generate mass debris flows after major bushfires
- provide information and advice to the owners and managers of prioritised infrastructure to inform their fuel and asset management activities.

Economy

Map 3 shows our landscape's priority economic assets, which are the tourism industry, plantation timber and native hardwood resources, and agriculture.

We prioritised plantation timber and native hardwood (Alpine ash) areas because they are highly exposed and vulnerable to bushfires. Our landscape has 65 000 ha of softwood plantations and native hardwood resources, both of which have local, state and national significance. They also provide the raw material for several wood processing plants in our landscape. Our plantations are located in clusters across our foothill country and are usually adjacent to native forest. Communities next to pine plantations are at increased bushfire risk because they are highly flammable and provide continuity of fuel for spreading bushfires. Also, plantations cannot be effectively planned burned.

Mature native hardwood forests to be harvested are at the most risk from bushfires because they are the highest-value timber asset in our landscape. Also, if a bushfire burns large areas of Alpine ash in the water catchments, the water yield will drop: areas of regenerating Alpine ash do not yield as much water, and the water may be poorer-quality.

We prioritised the tourism industry because bushfires damage the natural environments which attract tourists and the infrastructure they use. The threat of bushfires may also deter them from visiting forested areas. Each year, our landscape attracts over 2.5 million tourists. Food services, accommodation and retail are major employers and particularly in the Alpine and Mansfield shires, which are also at the highest risk from bushfires.

During the bushfire season, there are large influxes of people into our landscape for camping, water sports and other recreation activities. Bush camping is popular during the summer holidays in the landscape's valleys and beside its lakes and rivers, which are often in remote bush settings. Campers can be at particular bushfire risk.

We prioritised primary production because 20% of Victoria's agriculture, forestry and fishing exports come from our landscape. 50% of the state's fruit produce is grown in the Goulburn Valley and Shepparton area, which relies on water from our landscape's catchments. Bushfires destroy and damage buildings, fencing, machinery and equipment. They kill and injure livestock and damage productive plants, such as fruit trees and grape vines. Smoke from fires can permeate the skin of fruits. The viticulture industry is particularly vulnerable as wine made from smoke-tainted grapes may be unmarketable. Bushfires also damage the natural environments and infrastructure on which tourism industries rely.

To protect our priority economic assets, where practicable we:

- place bushfire management zones next to plantations, to reduce the likelihood of fire spreading into them, and conduct more frequent burning in them if required to maintain appropriate fuel hazard levels
- place asset protection zones to the north-west of plantations, in the spread paths of likely major bushfires
- place bushfire management zones to create a network of strategic fuel-reduced corridors, to reduce the spread of bushfires and reduce potential impacts on the primary production and tourism industries (including bushfire smoke and long periods of disruption)
- include high-value native hardwood areas in planned burning exclusion zones, or in landscape management zones with reduced planned burning frequency, if it is not conflicting with bushfire risk to communities
- place bushfire management zones north and west of large areas of private land, and more frequently burn these areas
- place bushfire management zones on the north-west slopes of mountain ranges, if there are assets to the south-east that would be at risk of ember showers from an uphill run of fire on the slopes
- include prioritised tourist assets in landscape management zones or planned burning exclusion zones.

Environment

Map 3 shows our landscape's high-value ecological areas (HVEAs). These are areas where the most fire-sensitive plants, animals and vegetation communities occur. These areas are sensitive to fire because it can cause direct loss of species and loss of habitat (such as hollow-bearing trees for large owls, and food sources for Mountain pygmy possums). Fire can also cause waterway and wetland turbidity affecting aquatic species such as Alpine tree frog and Barred galaxias. Also, too-frequent fire can disrupt the ability of many species to reach maturity and successfully reproduce.

HVEAs also include nationally listed threatened vegetation communities including Alpine bog and associated fens, and Box gum woodlands and grasslands.

We prioritised our landscape's sizeable areas of wet forest, including fire-sensitive Alpine ash. Alpine ash is important for healthy water catchments and is habitat for the threatened Leadbeater's possum, such as in a small section of wet forest near Woods Point. While fire is part of this natural system, planned burning is difficult in wet forests as they are usually too damp, and when they do dry out in summer the fuel loads are usually too extreme to safely control a planned burn. For this reason, we reduce fuel hazard in adjoining drier forests and aggressively attack any fire outbreaks in them.

We prioritised some ecological fire groups (EFGs) that are most vulnerable to too-frequent or too-intense fires. EFGs are groupings of ecological vegetation classes that have common ecological requirements for fire, and common fire behaviour characteristics. Fire-sensitive EFGs are often where we find fire-sensitive plants and animals. For example, fire-sensitive High-altitude shrubland/woodland is where we most often find threatened species such as Bogong eyebright, Snow daphne and Alpine water skink. On the plains, the threatened Squirrel glider and Lace monitor occur in the fire-sensitive Riverine woodland/forest EFG.

We also prioritised long-undisturbed areas of native vegetation. Large bushfires in 2003 and 2006–07, logging and increased planned burning have greatly reduced these areas. The remaining areas help to maintain and enhance our landscape's ecosystem resilience. Old growth forests and woodlands provide a variety of habitats for species such as Leadbeater's possum, Squirrel glider and Powerful owl.

To protect our priority environmental assets, we:

- where possible, include HVEAs in a landscape management zone or planned burning exclusion zone. Landscape management zones are larger areas in which there may be widely dispersed ecological assets. We manage these zones for ecological and fuel reduction outcomes. Planned burning exclusion zones usually cover smaller areas where ecological assets are more concentrated, it is practical to place a boundary, and it doesn't conflict with bushfire risk to communities
- identify where HVEAs are on the likely spread paths of major bushfires towards other priority assets
- identify conflicts between planned burning to protect other assets and the fire-sensitivity of the species and communities in the HVEA

- exclude HVEAs and other important ecological assets in our landscape during planned burning or other fuel management activities
- provide other land managers with information about important ecological assets on their land.

Cultural heritage and community assets

Our landscape's history stretches back thousands of generations and includes the use of fire by Aboriginal people for environmental, economic and social purposes. Our landscape has thousands of Aboriginal cultural heritage sites including ceremonial gathering places, shell middens, burial sites, scar trees, artefact scatters, stone quarries, rock shelters and rock art sites. As only about 5% of Victoria has been formally assessed for cultural heritage evidence, the number of recognised sites will continue to grow, particularly in our landscape which has large tracts of forest.

Bushfire risk management must draw on the wisdom and experience of Aboriginal land management regimes and support Aboriginal people to rebuild and maintain connections to Country.

There are three registered Aboriginal parties in our landscape: Taungurung Clans Aboriginal Corporation, the Yorta Yorta Nation Aboriginal Corporation and the Gunaikurnai Land and Waters Aboriginal Corporation. We will continue to work with these parties to ensure the best possible protection of our cultural heritage.

The landscape's non-Aboriginal cultural heritage dates to the 1820s when the high country cattlemen started building their rough huts, some of which still stand. In the early 1850s, people flocked to the region from around the world looking for gold, particularly to the alpine valleys and high country, and to the Chiltern and Rutherglen areas. Many heritage sites remain from this period, including those of the Chinese.

Community assets such as recreation reserves and community halls are also part of our landscape's cultural heritage and have important social value.

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

- where possible, include them in a landscape management zone or planned burning exclusion zone
- do planned burning near to fire-sensitive sites, to reduce the impacts of bushfire
- protect known cultural heritage sites from disturbance when we manage the fuel load, and when we fight bushfires
- keep a watch out for, and record the details of, any new sites; only a very small percentage of Victoria's area has been formally assessed for evidence of Aboriginal cultural heritage.

How we will protect our landscape

Our fuel management strategy

About our fuel management strategy

In our landscape, the bushfire risk to life and property is 7% of Victoria's total risk. Our larger communities (Benalla, Wangaratta and Wodonga) are located along the Hume Freeway corridor and have lower bushfire risk than our smaller communities, particularly those in the forested hills and valleys.

The residual risk to life and property in our landscape has reduced in recent decades due to major bushfires and increased planned burning, but residual risk remains high in some areas. These are areas we cannot effectively planned burn (such as pine plantations and wet forest), or areas where the risk arises from fast-moving grassfires on private land—which we do not manage—although we do work closely with local governments, CFA and communities as they reduce risk on private land.

Where we can, we manage the fuel hazard on public land close to towns to reduce the intensity of, and ember attack from, major bushfires. Further away, we focus fuel management on the likely spread paths and the worst ignition areas for major bushfires.

We prioritise for protection those communities at the highest risk in the worst bushfire weather, but we also consider all our communities because we know that bushfires could ignite from, spread to and potentially impact most areas.

We prioritise all assets using objective risk assessment methods to inform our fuel management strategy.

Our landscape has some of the largest national parks and reserves in Victoria. They contain a high level of biodiversity, but some areas are also highly flammable. Inappropriate fire regimes can threaten fire-sensitive animal and plant species, as well as whole ecological communities. Our strategy aims to mitigate this threat.

Our fuel management 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
- a balanced fuel management approach across the landscape to ensure that planned burning to protect life and property does not unduly damage other priorities.

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, applying herbicide and grazing.

To develop our fuel management strategy, we combined our knowledge of bushfire behaviour and PHOENIX RapidFire simulations with our prioritisation of human life and communities, infrastructure and environmental services, economic assets, environmental assets and cultural heritage and community 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-managed and bushfire-burned patches—with different times since the last fire—across the landscape 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.

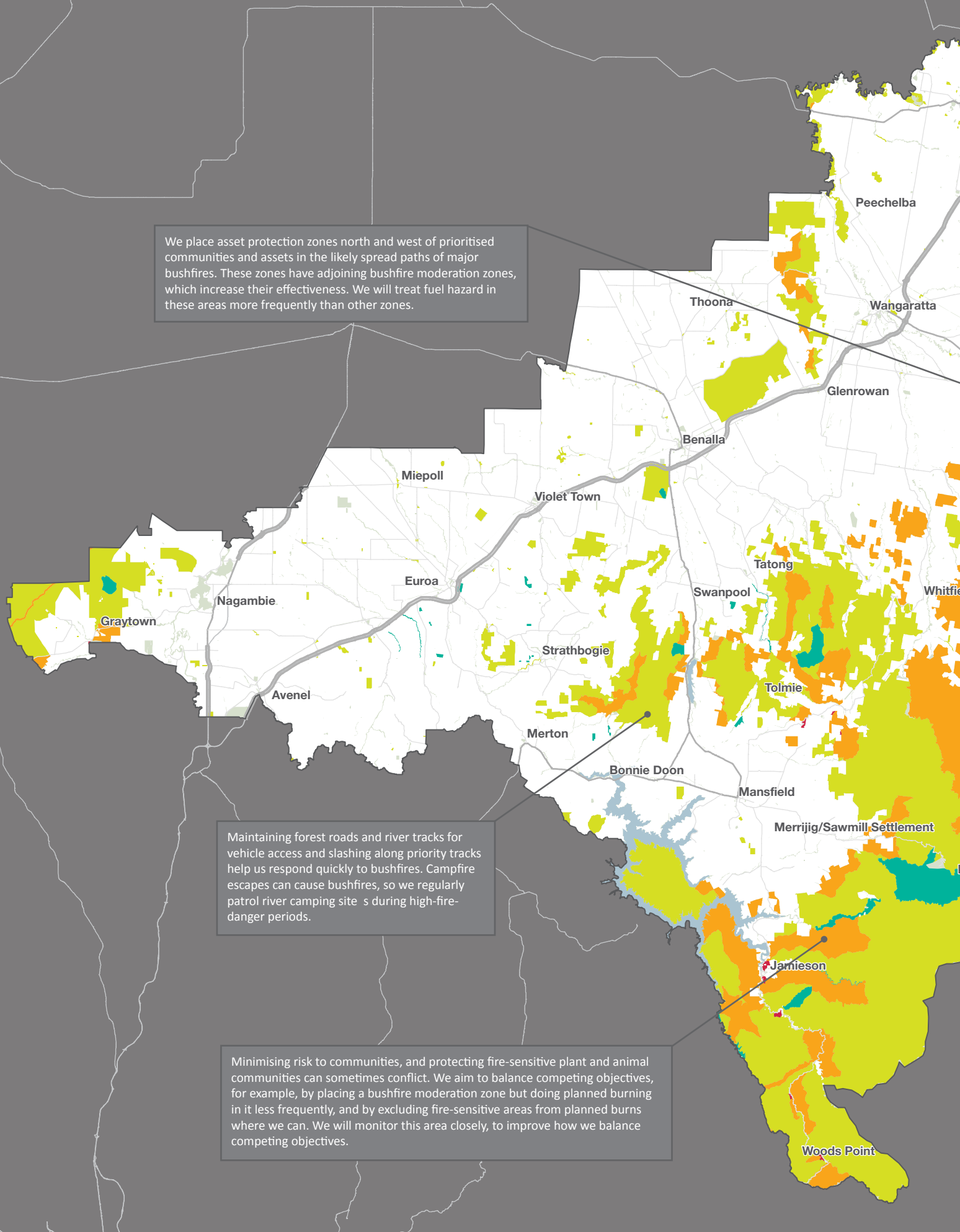
One way DELWP measures the effectiveness of the fuel management strategy is by how well it reduces residual risk. PHOENIX RapidFire allows us to simulate the reduction in residual risk at any particular location, at a particular point of time, if we reduce fuel load at the ignition points and along the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

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 reaccumulates in forests burnt in 2003, 2006–07, 2009 and 2013, residual risk to life and property does not return to pre-2003 levels, but is kept below 60%
- through to 2050, we continue to reduce the residual risk to life and property, while maintaining a balanced approach to protecting other assets.

Map 4: Fuel management strategy



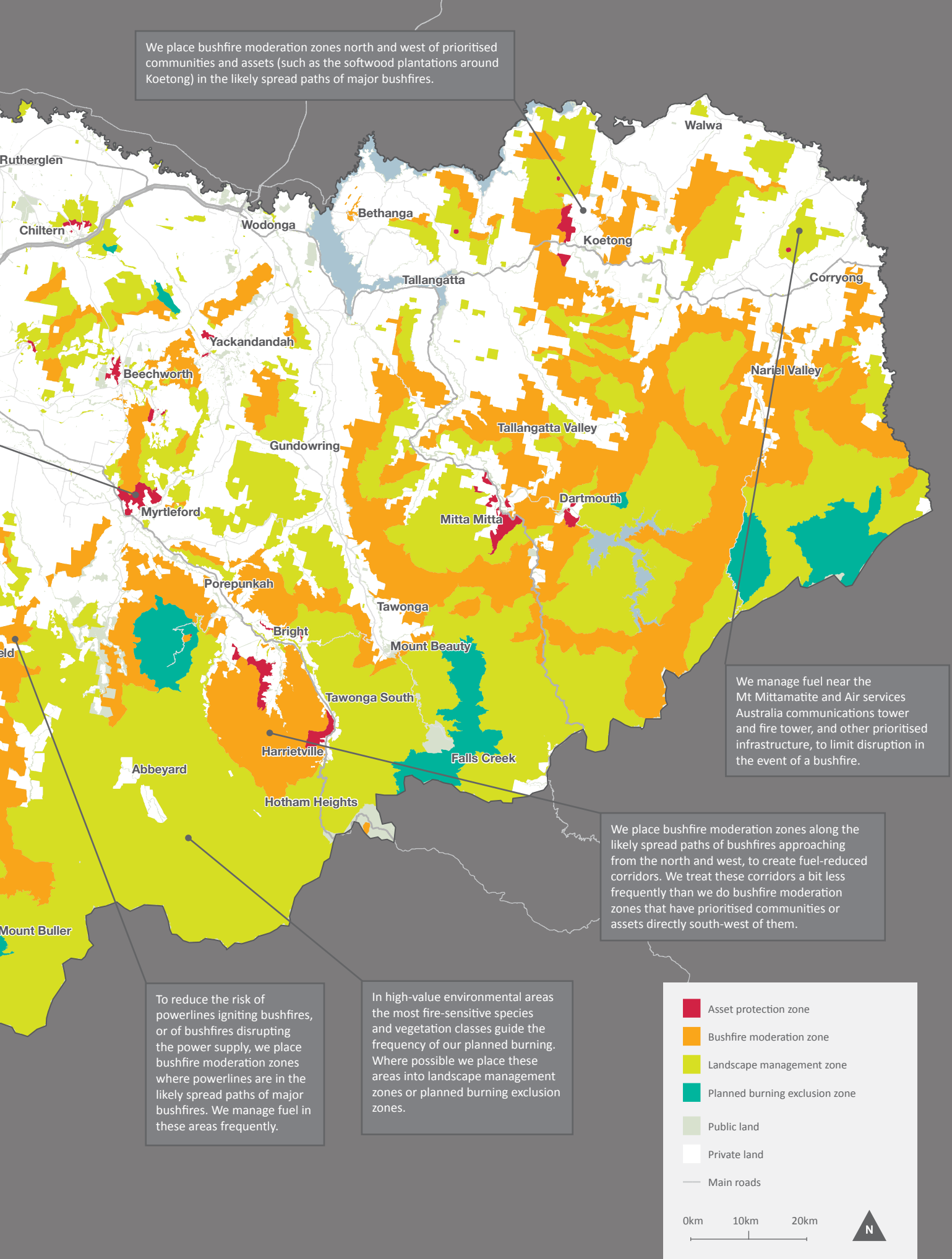


Figure 1 shows measured and expected residual risk in our landscape from 1980 through to 2050. It shows residual risk (the blue line and shaded darker blue area) decreased after the 2003 Alpine fire to 55%, returning to 60% by 2006. The 2006–07 bushfires then reduced residual risk to 43%, while the 2009 fires resulted in a further reduction to 40%, a historic low. Residual risk subsequently rose evenly as fuel reaccumulated on burnt areas. By implementing our fuel management strategy on public land, residual risk can be maintained on average at 46% toward 2050.

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. However, continuous improvement in our planning methods and operations should see residual risk decrease towards the lower end of the indicated range.

The figure shows (the green dotted line) that planned burning on public land could theoretically reduce residual risk to as low as 10%. However, this would require us to treat all public land every year, which is not realistic. It is also not possible to treat all areas of public land because some areas are inaccessible, because it is not safe to manage fuels on some, because fire-sensitive ecosystem areas could be threatened

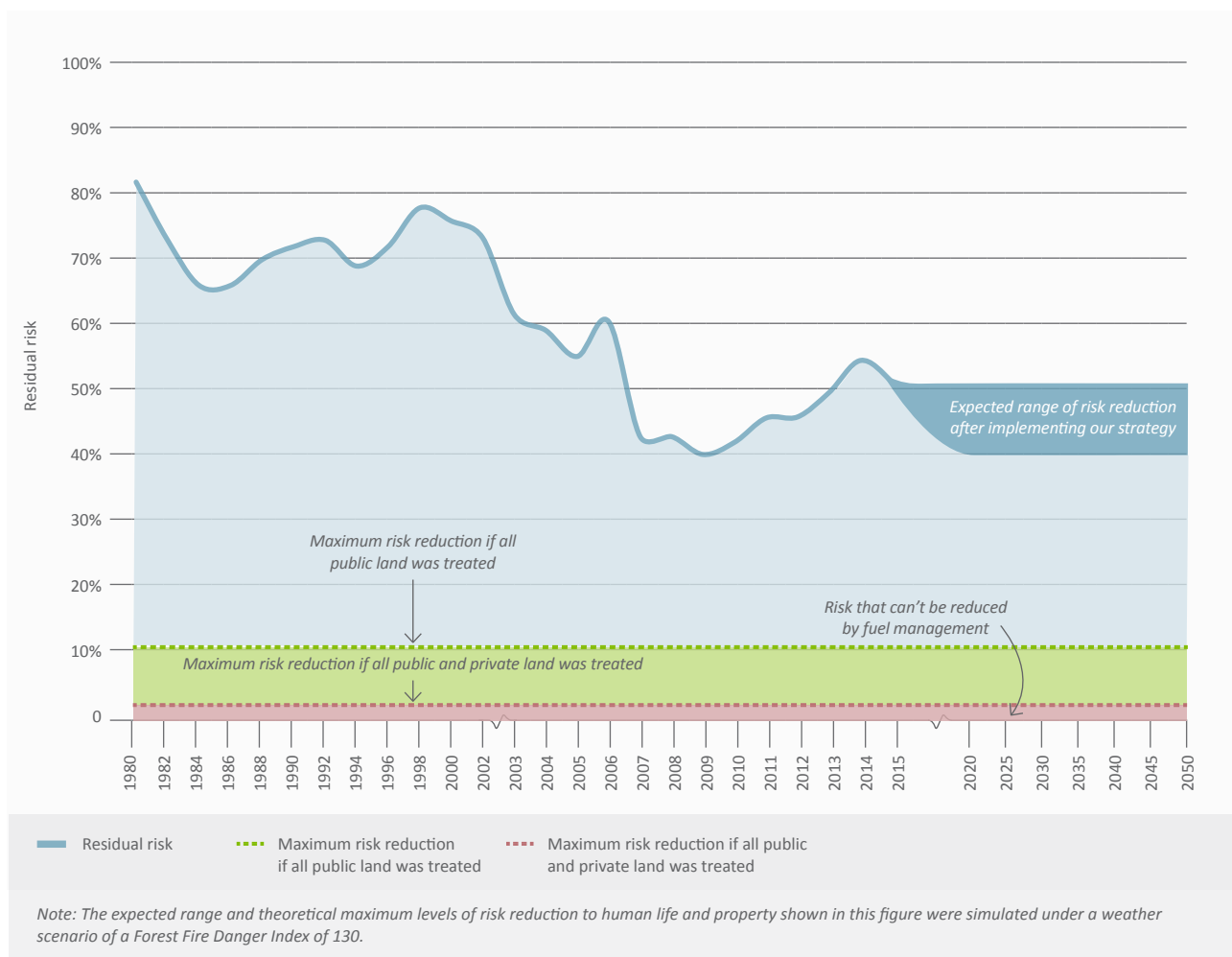
by repeated burning, or for other reasons (such as fuel and weather conditions limiting the number of days in any given year we can safely do planned burning). Also, in some areas, the environmental damage that would result would outweigh any small temporary reductions in risk we achieved. For example, wet forest is usually too wet to burn in most seasons, and particularly in planned burning periods. It does not burn unless there are extended periods of dryness (such as during droughts) but it is neither safe nor practical to do planned burns during those times.

The figure also shows (the red dotted line) that fuel management on private land could further reduce residual risk, theoretically reducing it to below 5%. This 5% is from fuel hazard on private land which cannot be treated by fuel management. In areas near priority communities with little public land that can be safely burned, fuel management by private land owners and managers is key to reducing bushfire risk.

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.

That there is a small amount of risk which cannot be treated by fuel management highlights the importance of other bushfire management strategies for prevention, preparedness, response and recovery.

Figure 1: Residual risk 1980–2050





DELWP and PV crews supervising a planned burn© Amy Warnock

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.

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 against radiant heat and ember attack 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, or because we cannot burn it safely (such as wet forests).

Map 4 shows the location of FMZs in our landscape.

In asset protection zones, we aim to reduce the fuel hazard by planned burning or other methods about every 5–7 years, over about 9300 ha. If fuel accumulates and the fuel hazard increases more rapidly, we will burn more frequently.

In bushfire moderation zones, we aim to reduce the fuel hazard about every 8–15 years over about 375 000 ha. We will burn areas within this zone that have higher bushfire risk (due to their location or fuel load) or are on the likely spread paths of bushfires, more frequently. In the other areas of these zones, we will also consider ecological objectives.

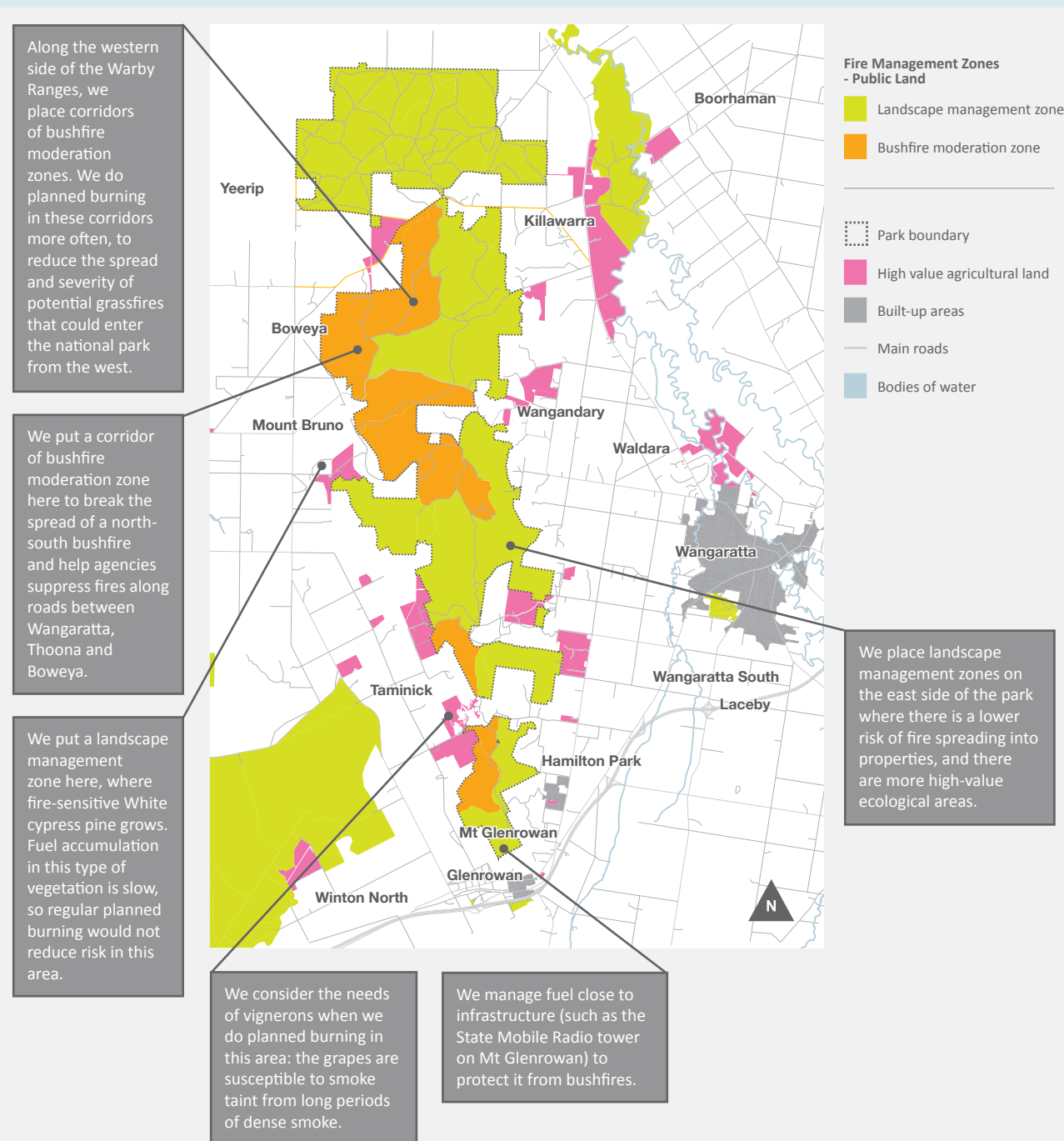
In landscape management zones, we will do planned burning mainly to maintain and improve ecosystem resilience, but also to reduce the fuel hazard, over about 750 000 ha. We will use the tolerable fire interval of fire-sensitive vegetation in these zones to determine the frequency of planned burning. This means that in particular areas of these zones the frequencies of burning may be very different (varying from 15 to more-than-50 years), acknowledging that some areas are more fire-sensitive than others, and that some also contribute to reducing risk to communities and assets.

Fire management zones in the Warby-Ovens National Park

The Warby Ranges are in the Warby-Ovens National Park, west of Wangaratta. The ranges' vegetation includes the Granitic hillslopes, Grassy/heathy dry forest and Box ironbark forest ecological fire groups. Most of this area is long-undisturbed by fire. The ranges also contain fire-sensitive ecological areas, Aboriginal cultural sites, recreation areas and infrastructure including communications and fire towers. Fire-sensitive fauna in the area include the Lace monitor, Carpet python and Regent honeyeater. There is expanding peri-urban development east of the park, and agricultural areas including for grazing, cropping, orchards and vines.

The area is at-risk from fast-moving grassfires entering the ranges from the west and then potentially dropping embers onto Wangaratta or Glenrowan. Simulations also show that on high-fire-danger days, properties on the west side of the ranges close to the forest are at risk because while the forest could slow the rate of spread, the fuel load would increase the fire's intensity. This was the case near Boweya in December 2014 when a grassfire ignited by lightning near Lake Rowan travelled west through farmland and reached the Warby Ranges. A planned burn in 2014 helped reduce the fire's spread once it reached the national park. Without the planned burn, the fire could have spread further and may have threatened the communities east of the ranges.

Map 5: Fire management zones in the Warby-Ovens National Park



Fire operations planning

Each year we produce an updated fire operations plan for each fire management district 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 management on public land, including areas of lower risk
- address factors such as public safety and access
- identify how specific assets within or adjacent to burn areas will be protected.

The actual residual risk reduction we achieve across the landscape depends on the extent to which we can implement our fire operations plans: the amount of burning and other fuel management we can conduct (given the weather and other operational constraints), the location and arrangement of these fuel 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 recognise that planned burning can affect communities, assets and the environment. 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 threatened species. For example, we minimise mechanical disturbance and limit planned burning in spring in locations with threatened orchids and burrowing reptiles.

DELWP will ensure our fire operations planning process:

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



A helicopter water drop at a hard-to-access site © DELWP



Firefighters igniting a planned burn © Darren Skelton

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

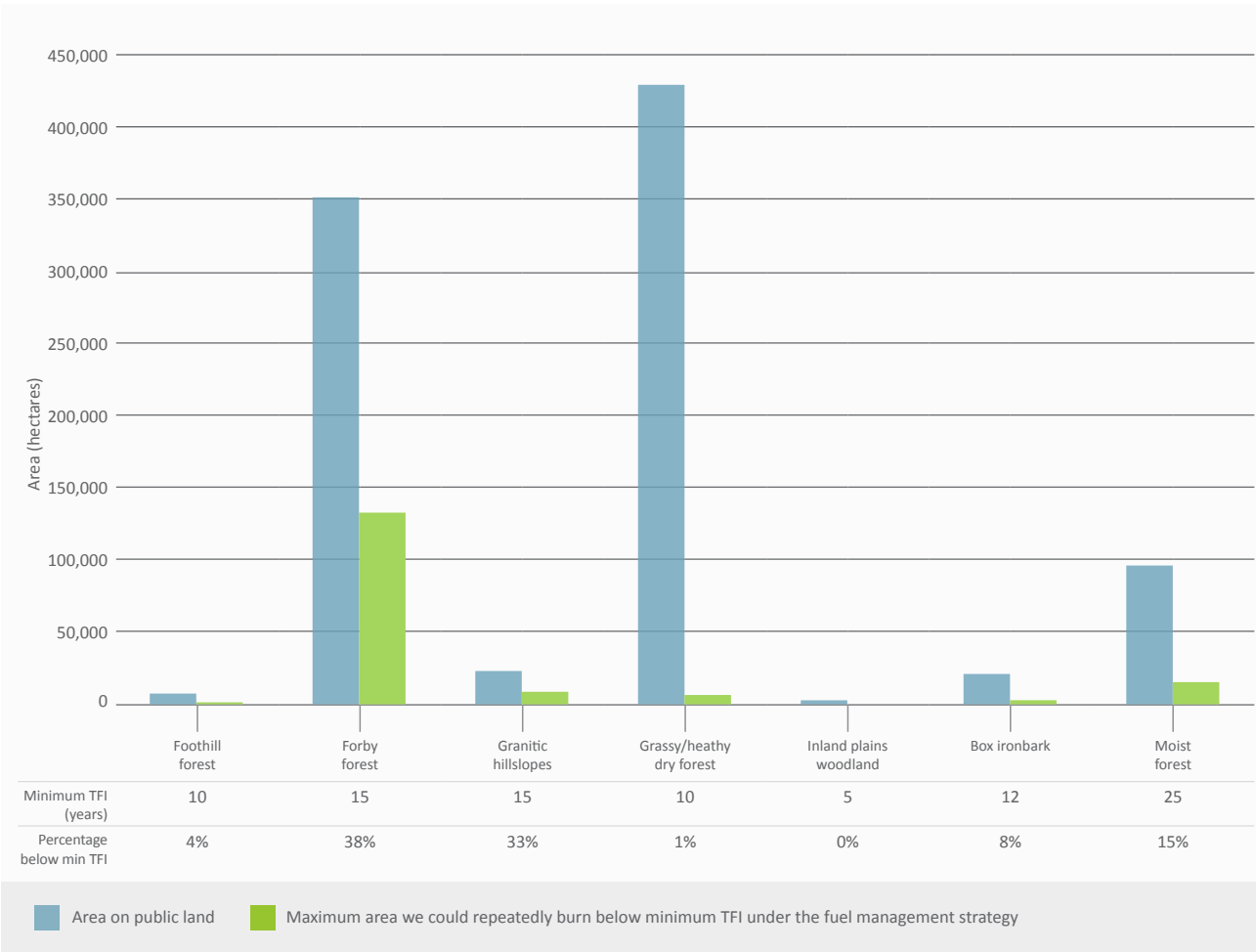
of species and in the type of vegetation in the EFG. It may also increase the risk of weed invasion, erosion and the loss of nutrients in the soil. We are currently investigating ways to better understand the impacts of burning outside the minimum and maximum TFIs.

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, and the area of each we expect to repeatedly treat by planned burning below their minimum TFI under the fuel management strategy. Due to extensive bushfires in the last 15 years, our landscape currently has a high proportion of EFGs under TFI.

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



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, 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 7600 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.



We engage with stakeholders and the community in all aspects of strategic bushfire management planning © 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 monitoring activities need to be done—and where and when they 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 all aspects of 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 in our landscape will be guided by the statewide monitoring, evaluation and reporting framework. These activities will measure changes to:

- residual risk, by assessing fuel hazard in asset protection zones
- ecosystem resilience, by assessing key habitat attributes (especially in areas where we intend to do planned burning) and key plant and animal species.

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
- 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 growth stage diversity 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 and Box ironbark forest)
- the effect of our fuel management strategy on other assets in the landscape.

We will report to the community regularly. We will report annually on fuel management activities (in the fuel management report); 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, convection strength and fire danger indexes as experienced at different elevations, and by developing better measures for ecosystem resilience and environmental assets. We also plan to improve how we identify and rate public administration assets and social (including cultural heritage) assets.



Fire fighters climbing Razorback Ridge at Mt Hotham, an area accessible only by foot and air
© 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 in which we frequently manage fuel and which contain fire-sensitive threatened species and native vegetation (such as Warby-Ovens National Park and Reef Hills State Park) and areas of particular ecosystem importance but which have low-frequency fuel management (including Chiltern-Mt Pilot National Park, Mount Buffalo National Park and areas of the Alpine National Park).

We will also monitor and conduct research in long-undisturbed areas of our landscape to confirm their condition and extent, so we can better understand their importance for ecosystem resilience.

We aim to use vegetation growth stages as one of several measures of ecosystem resilience. Major bushfires since 2002 have resulted in a large-scale shift from older to younger native vegetation. Less growth stage diversity reduces habitat for plants and animals, and may reduce the ecosystem's capacity to resist damage and maintain its basic structure and type.

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.

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.

Wildfire Project – An integrated spatial application and dataset designed to help protect Victoria's assets from wildfire and undertaken by the Office of the Emergency Services Commissioner in collaboration with Spatial Vision Innovations Pty Ltd, CFA, the Department of Environment, Land, Water and Planning and the Municipal Association of Victoria.

Customer Service Centre 136 186

www.delwp.vic.gov.au