

Position paper: Fuel reduction by planned burning, Lorne 2024-2026

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This paper represents my attempt to develop an independent, informed position on fire strategy, particularly planned burning, in the Lorne region of the Otways. Although written for my own benefit, others are welcome to use it. It is a live document - this version is July 2024.

...Victorians ought not be surprised by bushfire. It is a constant in our landscape. Yet every time a major bushfire event occurs, it seems that many in the community are caught unawares as if by something new and unprecedented. A demand for answers, a search for what went wrong and who to blame inevitably seem to follow. [20]

Summary

This review examines the role of the State in mitigating bushfire risk to human lives and property, specifically focusing on fuel reduction on public land in the Lorne region of the Otway Ranges, known for its tall forests. The effectiveness of fuel reduction in reducing the frequency, extent and/or severity of bushfires is contested by some scientists. Even where fuel reduction protects life and property, that gain comes with an environmental cost. Plans for fuel reduction by burning the forests around Lorne are for fires every 5-8 years, an interval that is too short for the survival of existing ecosystems. The conversion of these ecosystems to new ones amounts to destruction of the forests as we know them and is difficult to reconcile with the conservation objectives of a National Park.

The present emphasis on fuel reduction over-rates preservation of human constructs at the expense of ecological considerations. To address this imbalance, risk reduction could be shifted to other options including measures to reduce the likelihood of ignitions and prioritising the development of emerging technologies.

Introduction and context

Significance of Otways

The Otway Ranges are smaller than the ranges in the east of Victoria and differ from them in ecologically significant ways (Appendix 1). According to the Atlas of Living Australia [8], the tall forests of the Otways are home to about 90 species classified as threatened by either or both of the Commonwealth Environment Protection and Biodiversity Conservation Act [10] and Victoria's Flora and Fauna Act [14]. .

Plans to burn most forest in Lorne region

This paper was prompted by Forest Fire Management Victoria's (FFMV, Barwon South West region) release of its planned burns for 2024-6. In the Lorne region, these plans show burns extending 5-9 km inland from the sea and 5-10 km from the inland plains towards the sea, leaving an approximately 2.5 km wide, unburnt strip in the middle (Figure 1). I estimate that 70% of the area bounded by a quadrilateral with apices at Cinema Point, Separation Creek, a bit west of the southern tip of the West Barwon Reservoir and Boonah, is designated for burning. Given the scale (24,000 ha, 59,000 acres) and timing involved, these burns are unlikely to qualify as mosaic burns, which are generally preferred on ecological grounds, either in terms of their geographic distribution or timing.

Sources of information

The scale of operations led me to question the values and principles that guide FFMV fuel reduction plans. In seeking answers, I have found copious information on Victorian Government websites, including that of FFMV. These resources, however, are sometimes difficult to cite because of their interactive nature, changes of name, or withdrawal. There is a substantial body of external, peer reviewed information, but it is frequently in

subscription-only journals, limiting access to the general public.^a FFMV and other government instrumentalities sometimes commission work from external bodies.

Given these constraints and time considerations, this review is necessarily limited. My focus is on planned burns in the vicinity of Lorne and south to Wye River. I intend to revise this document as new information comes to my attention.

Where are the planned burns?

Definition

Planned burns are also known as control or prescribed burns. They are intentionally lit fires.

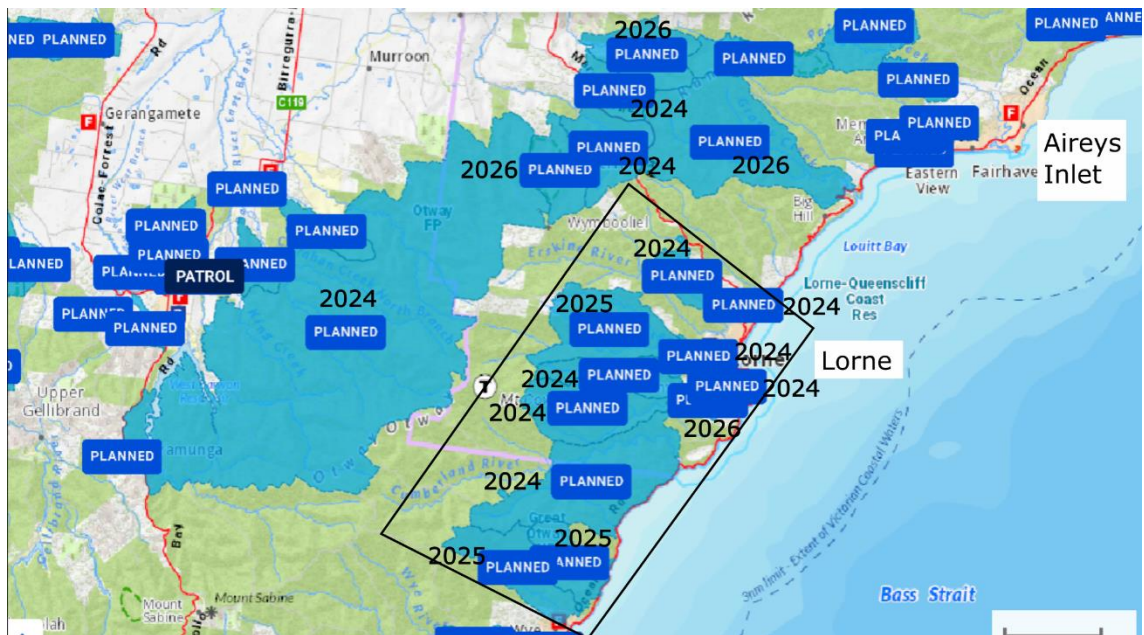


Figure 1. Burns (in blue) planned for the Otway Ranges between Anglesea and Wye River from 2024 to 2026, as viewed 4/2/2024 [51]. I have inserted the years in which burns are due to be carried out. The quadrilateral identifies the area that is the main focus of this review.

Amendments as of 15/3/2024 do not affect planned burns in the focus area [43]. However, the amendments indicate that the band around the town previously called a ‘strategic fuel break’ is now a ‘mechanical fuel treatment’. Strategic fuel breaks are limited to 40 metres wide. Parts of the mechanical fuel break are more than 1 kilometre wide, suggesting that the 40 metre restriction no longer applies.

Fire management zones

FFMV accommodates differing environments, priorities and constraints by categorising public lands into four zones [52].

1. Asset protection.^b This zone encompasses substantial areas around towns. Most of the planned burns between the Cumberland River and the Deans Marsh Road (Figure 1) are in this zone. It includes planned burns north of the Deans Marsh Road that extend inland to Benwerrin and north to approximately Reedy Creek.
2. Bushfire moderation. Encompasses the western slopes of the ranges opposite Lorne, and most of the planned burns between the Cumberland River and Wye River (Figure 1).

^a I gratefully acknowledge the assistance of writers who have provided copies of their work

^b The term ‘asset protection zone’ seems to have undergone a change of meaning. In 2016 it referred to a strip of land about 40 m wide in which canopy and understorey vegetation was reduced by about 50% [53]. These are now called strategic fuel (or fire) breaks.

3. Landscape management. The main ridge of the Otway Ranges north of Wye River to Fairhaven, not currently designated for burning (Figure 1).
4. Planned burn exclusion. Starting inland from Wye River and extending south. FFMV says it encompasses the wet forests of the Otway Ranges [52].

Operations in the asset protection zone are entirely directed to human interests, aiming ‘*To provide the highest level of localised protection to human life, property and community assets*’. Environmental considerations play a role in the landscape management and exclusion zones. Objectives in the landscape management zone range from the uninterpretable (‘to promote ecological resilience’) to specific goals such as ‘promotion’ of particular species.

Will all of the blue areas be burnt?

Initially, FFMV advised me that after completion of burns in the asset protection zone surrounding Lorne, 80-90% of each designated area will be affected by fire. Burns in the more distant bushfire moderation zone of the western slopes are expected to be more fragmented and a closer approximation to ‘mosaic burns’ [FFMV, 4/03/2024]. Subsequently, information from FFMV was that as little as 30% of some areas would be affected [FFMV, 7/6/2024]. There may be no contradiction in the two sets of advice if the 30% applies specifically to the western slopes.

On-ground preparations in the asset protection zones suggest that extensive burning is anticipated, with the primary objective of property protection.

Fire history of the Lorne region

What was the ‘original condition’?

The region I am considering is Gadubanud (Eastern Maar) country and predominantly made up of tall forests. It excludes the wetlands and heaths of the Otway Ranges and most woodlands except those in a narrow coastal strip. While acknowledging that information is scarce, studies indicate that these tall forests were poor sources of food and too steep, cold and wet for continuous occupation. But first peoples did move through these forests along defined paths [29, 33, 34]. There is evidence from other parts of Victoria that first peoples designated the tall forests ‘not for burning’ [24], with the possible exception of fires used to maintain paths. At European settlement, the tall forests of the Otways, like those in other parts of Victoria, were dense and sometimes described as ‘impenetrable’ [34, 37].

Bushfire history, from 1939

Not all histories of bushfire provide maps and most do not include minor bushfires, but with those limitations in mind, it is possible that the last major fire to affect the entire area around Lorne and south to Wye River was Black Friday in 1939. Subsequently, Ash Wednesday (1983) burned northern parts and the Wye River bushfire (2015) affected the south. In Lorne, approximately 16 houses were destroyed in 1939 and 52 in 1983. Although other fires have been reported, they do not seem to have involved loss of life or property [48]. The Otway Ranges have not experienced the multiplicity of large bushfires that have affected eastern Victoria since 2000.

Planned burns and critical, unburnt forest

Long-unburnt (undisturbed) forest is critical habitat that is becoming increasingly scarce [5, 13, 30]. An area inland and south of the Cumberland River camping ground that has not experience bushfire since 1939 may be an example of such habitat. Parts, however, have been subject to planned burns [54], and further burns are scheduled. In addition, logging has disturbed the forest. Nonetheless, it would be reckless to burn this area without first carrying out careful surveys to determine if old, unburnt forest is present.

What types of forest will be burned?

Will wet forest be burned?

FFMV documents suggest that the fire exclusion zone to the west and south of Wye River protects the wet forests of the Otways. As a bushwalker, however, I found it hard to believe that all of the Otway’s wet forests were squirrelled away in the exclusion zone. To verify my impressions I re-walked routes within the planned burn areas. Based on tree height and the presence and abundance of particular plant species [4], I conclude that the forests of Figures 2, 4, 8 and 11 — all within planned burns — are indeed wet forests.



(a) Remnant stump from the days of selective logging. Pockets cut into the stump supported platforms, enabling cutters to avoid the widest, buttressed part of the trunk. An end to logging on public land in the Otways was declared in 2002 and came into effect in 2008. The stump is within the Lorne - Henderson Track burn.
(b) Mountain ash. This species is one of the world’s tallest trees. The northern limits of its distribution in the Otway Ranges fall within the asset protection zone of Lorne. This tree is within the Lorne - Henderson Track burn.

Naturekit identifies wet forests within planned burns, EVC

Maps of Victorian vegetation in Naturekit, currently maintained by the Victorian Department of Energy Environment and Climate Action (DEECA), confirm that the planned burns include wet forests and a small amount of rainforest [55]. In fact, wet forests make up nearly half of the total area (Figure 3).

Another class of forest called cool temperate mixed forest is not shown in Figure 3 but may occur along the margins of rainforest. This type of forest is thought to be wet forest in the process of becoming cool temperate rainforest [36]. Both cool temperate mixed forest and cool temperate rainforest are listed as threatened under the Victorian Flora and Fauna Guarantee Act [14].

Wet forests, classed as EVC 201 ‘...take a long time to recover from fire. They do not need regular fire to maintain ecosystem health’ [52]. They are damaged by even low severity fires if these occur more frequently than every 30 to 80 years [6].

Lorne’s dry forests, classed as EVC 45, are expected to persist provided major disturbances, such as bushfires, are separated by intervals of at least 30 years [55].

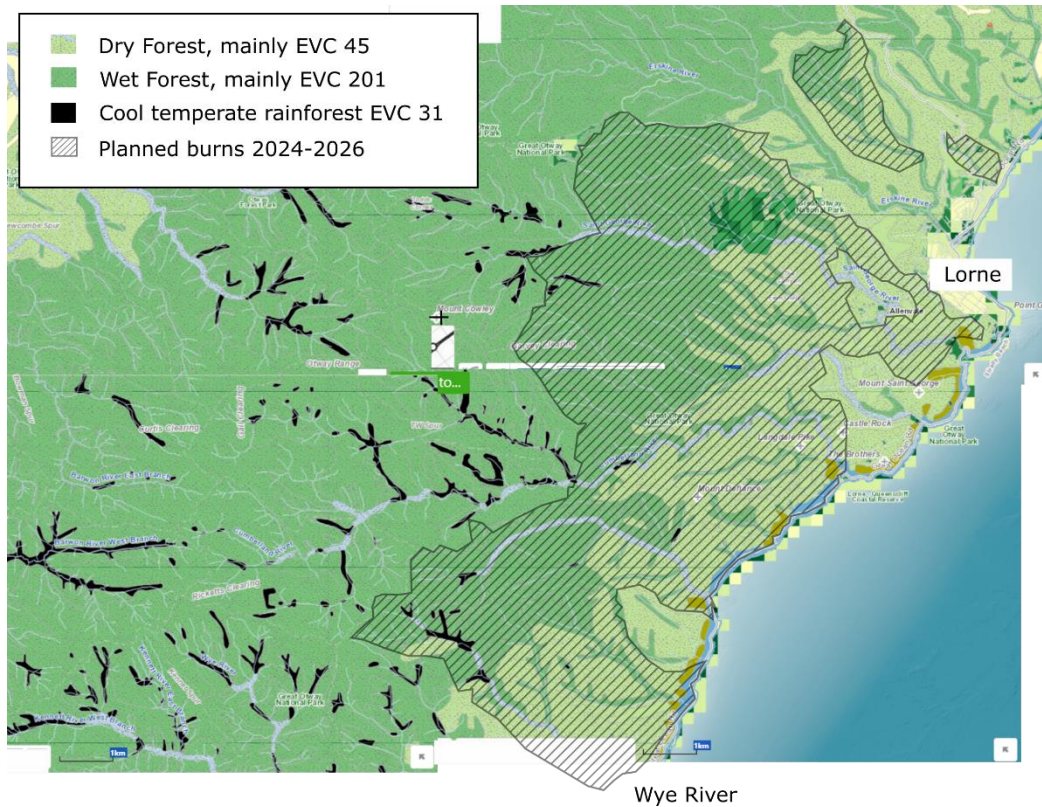


Figure 3. The main types of forest in the Lorne region, with burns planned for 2024-2026 superimposed. ‘EVC’ refers to ecological vegetation class. Data from Naturekit [55].

Forest reclassification for fire planning purposes, EVD, TFI

Produced as a guide for fire authorities, another classification of Victorian vegetation defines ‘tolerable fire intervals’ (TFIs) for ‘ecological vegetation divisions’ (EVDs), assuming that management’s aim is to conserve existing ecological communities [6]. Tall mist forest (EVD 12) is identified as the main type of forest in the Lorne area. The interval between even low severity^c fires in these forests should be at least 80 years. We also have small areas of other types of forest, with tall mixed forest (EVD 7) being the most tolerant of fire. It should be without fire for intervals of at least 8 years.^d

In another Victorian government classification of forests designed to assist forest fire managers, the term ‘foothills forest’ is inexplicably applied to a grouping of six different types of forest, one of which is also called foothills forest [23]. The reason given for grouping these forests is that they are all made up of tree species that reshoot after fire. Minimum TFIs for low severity fires among members of the family ranged from 8 to 25 years, with a mean of 14 years. FFMV has been running workshops on ‘foothills forest’ at Forrest in 2024. Forrest is close to some types of forest included in the foothills forest family (eg Forby forest, foothills forest in the strict sense, dry woodland) but it is also close to tall mist forest which is not included in the family.

Burn frequency and forest conversion

FFMV intends to burn the asset protection zones around Lorne every 5-8 years. The longest interval between burns of other parts is 13 years in the bushfire moderation zone [16]. Regardless of the forest classification applied, the burns planned for Lorne are more frequent than the shortest intervals consistent with forest conservation. An FFMV report

^c Defined as fires that do not scorch the canopy
^d Other types of forest in the Lorne area are: foothills forest (EVD8, TFI maximum 100, minimum 10), Forby forest (EVD 9, TFI max 150, min 15), moist forest (EVD 10, TFI max 150, min 25), riparian (EVD 11, TFI max 120, min 30), closed forest (EVD 13, TFI max infinite, min 80)

indicates that about 25% of public land in the Barwon South West region is burned more often than recommended [15].

Although understorey plants are the main target of planned burns, frequent burns will inevitably, and intentionally, accelerate the demise of old trees (see later) and kill seedlings and young saplings resulting in ecosystem conversion. In the immediate vicinity of Lorne, the aim is to convert the dry forest of Queens Park to grassland [FFMV 7/6/2024]. Some wet forest will be converted to dry forest (Figure 4), and some dry forest to woodland. Local extinctions seem inevitable.

Ecosystem conversions don't necessarily result in less flammable vegetation. They reduce risk to humans and their structures by making the forest more accessible to fire crews [FFMV 7/6/2024].



(a) Unburnt, wet forest is on the left of the track. On the right, swordgrass dominates the groundcover following a planned burn (probably in 2015-2019 [54]). Photographed in 2024 in the Lorne - Cora Lynn Creek planned burn.
(b) Regeneration of some understorey species after a planned burn probably in the interval 2010-2014 [54]. This area is scheduled for reburning in 2024. A hollow-bearing tree beside the track is marked (hollow circles) for protection by clearing vegetation from around its base. Photographed in 2024 in the Lorne - Five-mile Track planned burn.

FFMV operations, tracks, strategic fuel breaks, mechanical thinning

FFMV preparations for burning include reopening the almost entirely overgrown Henderson Track to management vehicles. In addition, the Cumberland Track has been partially reopened at a time unknown to me. Some tracks, such as Sharps Track have been upgraded to be open and trafficable by conventional vehicles. It is possible that this track work was originally justified as part of the offset for environmental losses associated with construction of the strategic fuel break and access tracks^e. They are now marked as areas in which mechanical clearing has occurred [43]. Informal tracks mark some boundaries of planned burns and are frequently very steep and susceptible to erosion.

Recently most of the strategic fuel break around Lorne has been renamed 'mechanical clearing'. This reclassification may allow the clearing of wider swathes than the 40 metre limit that applied to the strategic fuel breaks – in places mechanical clearing is more than a kilometre wide [43].

^e Offsets usually have to be like for like, but governments, and probably others, sometimes succeed in claiming a general benefit as an offset for ecosystem losses.

Protection and fate of hollow trees

Hollow-bearing trees that happen to occur along tracks, and are not considered a risk to fire crews, are protected from planned fires by clearing vegetation from around their bases (Figure 4b). For every such tree along a track, however, there must be 10-100+ within the forest that are not protected. Hollows provide entry points for fire, making hollow trees susceptible to immediate collapse, or later failure as a consequence of general weakening and increased wind loads in the thinned forest. Trees deemed dangerous after fires are cut down in the process of making planned burns safe (Figures 5 & 6).



Figure 5. April 2024. Hollow-bearing trees in dry forest destroyed by the 2024 Lorne - Seymour Street planned burn (Qdos to Teddy's Lookout). Along 300 metres of the walking track, I counted 15 hollow-bearing and previously living trees that had collapsed. A further 11 hollow-bearing, living trees were felled post-fire.



Figure 6. April 2024. Hollow-bearing survivors of the Lorne – Seymour Street planned burn

Do hollows matter?

Hollows are indicators of a forest's age and complexity, typically developing in trees that are 100 or more years old. Hollows form through the combined action of biological agents such as termites, and physical agents such as fire and wind. Threatened animals such as Leadbeaters possum and greater gliders, depend on hollows. Due at least partly to their high cuteness factor, these two species were central to the successful campaign to end the logging of native forests on public land in Victoria [56].

Neither greater gliders nor Leadbeaters possum inhabit the Otways, but yellow-bellied gliders and gang gang cockatoos do, and both species depend on hollows (Figure 7). They are listed under the Flora and Fauna Guarantee Act (Victoria) [14], and the Environment Protection and Biodiversity Conservation Act (Commonwealth) [10].

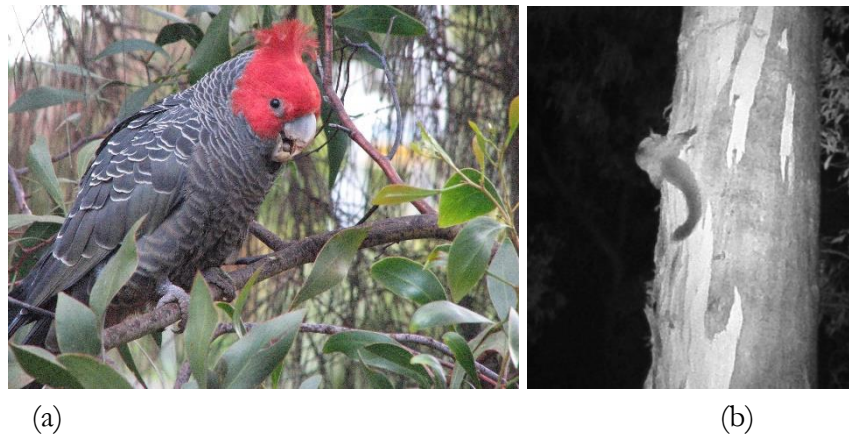


Figure 7. Threatened species photographed within a stone's throw of the Lorne-Seymour Street planned burn (a) Gang gang cockatoo (male) eating seeds of a blackwood. (b) Yellow-bellied glider feeding on sap of a blue gum.

Limited protection of very large trees

Very large trees are also protected by FFMV, but again only along tracks (Figure 8). In 2018, the State government committed to *protect[ing] all large, old trees greater than two-and-a-half metres in diameter across Victoria*, including trees within the forest [49]. The trees in Figure 8 have a basal diameter of 2.8 metres or more. I have seen no evidence that large trees within the forest are being protected from burns and mechanical disturbances. In another part of the Otways some have been felled by FFMV during mechanical clearing (Nisbet, personal communication 2024)



Figure 8. Trees with basal diameters of more than 2.5 metres.^f (a) Narrow-leaf peppermint (a eucalypt) with a basal diameter of 2.9 metres on a ridge in the Lorne - Sharps Track planned burn. The yellow dots identify it as a tree to be retained. (b) Manna gum, basal diameter 2.8 metres on a drainage line in the Lorne - Cora Lynn Creek planned burn. Not protected.

What do planned burns achieve?

Intent

Planned burns are a part of bushfire risk management – usually measured as the risk to human constructs. No one claims that the bushfire risk can be completely eliminated. Fire professionals agree that during the most severe of weathers, uncontrollable bushfires will occur and that no amount of preparatory burning will alter this situation (eg [6, 28]).

There is also agreement that climate change will increase bushfire risk and has probably already done so [18, 30]. While bushfires will continue to occur, not all of them are severe fires [23]. Similarly, not all planned burns are low severity fires [47], and high severity fires are not necessarily more detrimental to ecosystems than lower severity ones [19, 23]. But the general proposition underlying the fuel reduction program of FFMV is that planned burns are very low severity burns that reduce the likelihood of more damaging, severe bushfires.

Joint fuel management program (JFMP) – residual risk

The ‘target’ of fuel management techniques used in the Otway region (planned burning, strategic fire breaks, mulching and mechanical thinning) is a ‘residual risk’ of 60 [16].^g I interpreted 60 as being an agreed endpoint for risk reduction, but according to a new webpage, residual risk is forecast to drop to 40 by 2026 if the Joint Fuel Management Program is implemented [43]. What is the endpoint, or isn’t there one?

Despite loss of human lives being the highest priority, human life does not appear to be factored into the modelling of residual risk,^h nor are measures other than fuel reduction taken into account. An easy, albeit simplistic, way of understanding residual risk is in terms of housing. Consider a hypothetical bushfire that, in the absence of fuel reduction measures, would damage 100 houses. If fuel reduction could reduce that number to 60 houses, then the residual risk would be 60 and the strategy’s aim achieved – unless the target is a moving one.

^f I have mostly avoided the term ‘old growth’ because its meaning varies. Many of the trees photographed are old-growth in the sense that they are large and hollow bearing. These are also called habitat trees by conservationists and over-mature by foresters. Senescent is another term applied.

^g The target for residual risk in most of Victoria is a less exacting 70

^h Human life, tourism, agriculture etc are not ignored, but they don’t appear to be a part of the residual risk calculation

Given that 70-80% of the houses in Lorne are not primary residences, we can estimate that of the 60 houses damaged in the hypothetical bushfire, about 15 would be permanently occupied and 45 be secondary residences, such as holiday houses and investment properties.

Strategy is blind to tenure, value and end use.

In principle, FFMV draws up its plans without regard to whether land is publicly or privately owned; its operations are ‘tenure blind’ [16]. In practice, the plans released for our region exclude private land (Figure 1). It is not clear to me whether FFMV can themselves impose fuel reduction measures on private land, but it is likely that the Shire Councils can do so on their behalf [57].

Presumably, the monetary value of infrastructure and perhaps also housing is incorporated in cost-benefit analyses and influences the State budget allocation for bushfire prevention. However, the number of houses, rather than their value, appears to be the main consideration at the local level and the status of a house as a primary or secondary residence does not seem to be a factor. FFMV uses infrastructure, particularly the hospital, to counter doubts about planned burning [FFMV 7/6/2024]. They imply that fuel reduction guarantees the hospital’s survival, but deny any guarantee if challenged.

Residual risk and natural environment

Residual risk specifically focuses on human constructs. It does not weigh the predicted gain to humans from fuel reduction against damage to the natural environment. However, planned burns are also justified on the basis that by preventing severe bushfires, they protect natural environments too. Much of the debate about the environmental consequences of planned burns is specific to particular ecosystems. Biologists have often been divided about their role, neatly illustrated by the title of one article, *Burning for biodiversity or burning biodiversity?* [31]

Do planned burns reduce bushfire risk?

Entrenched positions

The effects of fuel reduction in forests on their subsequent susceptibility to bushfires has attracted attention over the last couple of decades. The debate centres on an extreme form of fuel reduction, namely logging. Individuals and institutions have taken entrenched, and often political, positions based on the ecological and/or commercial value of forests. VicForests, a former State-owned forest corporation and member of the bushfire management sector [50],ⁱ lost the ecological, legal and political argument – logging should now have ended on public land. Logging was opposed on both ecological and economic grounds. The same players, and similar disagreements about the ends to which forests should be managed, feature in current debates about fuel reduction strategies in forests.

Intuitively obvious or simplistic?

The assumption underlying planned burns and other methods used by FFMV is that fuel reduction reduces the flammability of forests, resulting in fewer and less severe bushfires. This appealing proposition is probably unquestioned by most people because it seems intuitively obvious. However, it is highly contested. Given that scientific findings are often counter-intuitive – such as the revelation that the Sun does not revolve around the Earth – the assumption warrants examination.

Fuel reduction and common experience

At the level of common experience, we know that temperature, windspeed, rainfall and the spacing of washing on a clothesline affect drying. Other things being equal, the more widely spaced the clothes, the faster they will dry. By analogy, the less dense the vegetation in a forest, the more rapidly it will dry and become flammable. Of course, other things are rarely equal. In the hottest and windiest weather, spacing will have no discernible effect on the rate of drying, just as in the worst weather fuel reduction has little effect on bushfires. Between these extremes are many scenarios, in some of which fuel reduction alleviates the spread and/or severity of bushfires and in others accentuates them.

ⁱ VicForests was disbanded in 2024. Reports suggest many of the staff were reemployed in bushfire management [35].

Bush walking is another common experience. Walkers will have noted that immediately after burning the forest looks less susceptible to bushfire (Figure 5). Later on, regeneration and colonisation of plants often result in a dense, green understorey. Later still, some plants die of excessive competition or old age (colonisers are often short-lived), leaving behind a lot of fine fuel (aka kindling). At this stage the forest looks more, not less, flammable (Figure 9).



(a)

(b)

Figure 9. (a) Regrowth in 2024 following a planned burn, probably conducted in 2020-2021.^j

Taken in the Lorne – Cora Lynn Creek planned burn.

(b) Dead regrowth photographed in 2020 following a past planned burn, probably between 2010 and 2014. Photographed within the Lorne - Five Mile Track planned burn.

Is fuel reduction supported by science?

In 2014, three scientists published a peer-reviewed article full of probit regressions and other complex analyses that, despite their complexity, seemed to make much the same point as observations from clotheslines and bushwalking [40]. Using data from the Victorian 2009 bushfires in mountain ash forests, they found that the likelihood of canopy fires was low in the first seven years after logging, peaked after 15 years and then declined again. These changes were attributed to rapid regeneration of vegetation following disturbance, followed by natural thinning as stands aged.

The researchers stand by their finding that substantial disturbances can, a few years later, result in a higher, not lower, likelihood of bushfire relative to undisturbed forest [25]. Supporting work can be found in other ecosystems [46] and countries [19, 42]. Although a surprising number of Australians in related fields remain silent, a few vehemently oppose the finding. In a speaking engagement, one scientist appears to have dismissed it as ‘magical thinking’ [1]. Counter findings have been published [3].

Planned burns, forest regeneration and fuel loads

A major problem with the work just outlined is that the studies are of forest regeneration and bushfire risk after fuel reduction by logging, not by planned burns. My brief exploration of fuel accumulation following planned burns in forests in a similar rainfall zone to ours, suggests that growth after planned burns restores pre-fire fuel loads in about seven years [45]. Some components of the fuel load even overshoot the pre-fire values. Another finding was that the assumptions about fuel used in some computer models are likely to be incorrect [45].

Fuel load, generally defined as everything burnable from below ground to tree tops, involves concepts outside the scope of this review. But just as washing dries at different rates depending on its position on the clothesline, the arrangement of items and their size,

^j Uncertainty derives from my inability to confidently distinguish between the shades of grey used to identify past burns [54]

thickness, and the type of fabric, so too do different components of the total fuel load have different flammabilities and effects on bushfire [45].

Victoria's Auditor General [58] noted that more research into fuel loads in the years following planned burns is needed.

Modelling –
predicting
outcomes

Computer models represent an attempt to integrate all the factors and interconnections that influence the outbreak and spread of bushfires. Phoenix Rapid Fire is the model in current use, but it will be replaced by a new model called SPARK developed by CSIRO [50]. Although models don't provide definitive answers, their construction highlights deficiencies in our knowledge, such as fuel accumulation [58].

Summary to
date

At this stage it is unclear to me to what extent planned burning protects lives and property against damaging bushfires. There is a case to be made that the tall, wet forests may act as barrier to fire rather than being a fire hazard in themselves. Authorities appear not to need firm evidence to prioritise human lives and property over other species, systems and processes. This prioritisation applies through much of the Otways, irrespective of the declaration of National and Forest Parks.

It is also apparent that branches of government involved in various aspects of fire preparedness are staffed by people who strongly believe in their ability to decide what is best and to manage ecosystems towards the desired result. They sometimes use simplistic arguments to win their point with non-specialist audiences. For instance, by emphasising that fire is a natural feature of Otways landscapes they create the impression that planned burns are an essential, ecological intervention.

Climate change complicates the situation but doesn't seem to alter anyone's predilections about planned burning.

Fires, ecosystems and climate change

Outlook for
forests under
climate change
is grim

Climate change is expected to increase both the number of days of fire weather and the severity and extent of fires. Higher mean temperatures and extremes are one part of the equation and lower rainfall, although much less certain, is another factor [5]. In the worst-case scenarios, mega fires could mean that forests as we know them become things of the past [1, 9, 17]. Will we be able to rein in climate change before it is too late for forests? Some argue that we should give up on conservation and start creating new, less flammable ecosystems through management [1].

Long-term,
releases of CO₂
following
planned burns
may exceed
those from
bushfires

As of now, in 2024, and notwithstanding controversy about forests and carbon credits [21], the ability of forests to capture and store carbon is regarded as important for mitigating climate change. Fire, mainly by releasing carbon from storage in forests into the atmosphere as carbon dioxide, contributes to climate change. Although this contribution can be massive in severe bushfires, it nonetheless represents only 7 to 16% of the total carbon originally present [22, 44]. Provided fire doesn't return too soon, this contribution is transient — the carbon dioxide released is mopped up again by regrowth. In other words, as long as burning is balanced by regrowth, there is no net contribution to atmospheric levels of carbon dioxide.

Individually, planned burns release less carbon dioxide than bushfires because they are usually less severe [44]. However, if the long-term result of planned burns is conversion of dense wet forest to dry forest, we could change the amount of carbon stored from around 400-1500 tonnes per hectare to 120-150 tonnes per hectare [11, 22], a reduction of 60 to 90% and a permanent addition to atmospheric carbon dioxide.

Given the current emphasis on forests in climate change mitigation strategies, I find it difficult to see how the management of forests around Lorne fits with Victoria's emissions targets.

Ecosystems, parks or property?

Ecosystems or human constructs

We are in the midst of a mass extinction caused by human beings – is this a truism or a claim worth debating? Whether or not we accept that we have entered a new era, the Anthropocene, there seems to be little doubt that the extinction rate is unusually high and will continue to be so unless we change course [38]. The Australian government acknowledges that our mammals are not doing well.

"Our current approach has not been working. If we keep doing what we've been doing, we'll keep getting the same results. Australia is the mammal extinction capital of the world. The need for action has never been greater." Tanya Plibersek, Commonwealth Minister for Environment and Water [59]

Australians support action to protect biodiversity, recognising its importance to human lives and its intrinsic value [12]. Visitors to Victoria's coast list natural values as the main attraction [60]. Great Ocean Road communities have hesitated to adopt house protection measures if those measures impinge on the natural environment [53].

With bipartisan support, the Great Otway National Park was created in 2005 by merging the Lorne Angahook State Park and others with the Otway National Park. The purpose of the enlarged park was to *'conserve and protect biodiversity, natural landscapes and natural processes.'* The Great Ocean Road Coast and Parks Authority was established to *'...manage, protect and foster resilience of the natural, cultural and heritage values...'*[61].

With this evidence of a problem, and the support and infrastructure to address it, it is disheartening that our priority remains protection of human assets to the exclusion of natural ones, even when those assets are only secondary dwellings.

Opportunities foregone – pests

In 2020-21 the direct cost of bushfire fuel management in Victoria was \$155 million.^k Parks Victoria staff are active participants in planned burns, as evidenced by the presence of staff and cars. However, in other aspects of park management, staff and funding often appear inadequate.

The fuel reduction works that make the forest more accessible to fire crews, also makes it more vulnerable to invasive pests. Parks Victoria seems unable to amass the resources needed to effectively combat existing weeds (eg blackberry, ivy — Figure 10) and feral animals (eg deer, foxes), let alone cope with higher rates of invasion.

^k https://www.ffm.vic.gov.au/_data/assets/pdf_file/0031/547807/Summary_Infographic_2020-21.pdf. It is not completely clear to me what is included in this estimate. The costs don't include aspects of fire management/prevention such as powerline safety which has a fuel management component



Figure 10. Preparations for planned burning include marking this old tree for retention. The ivy is also retained. Photographed in the Lorne – Cora Lynn Creek planned burn.

Opportunities foregone – walking tracks

Funding is also needed for servicing users of the park. There is a substantial backlog of work on walking tracks. Signs continue to direct walkers to the Cora Lynn Carpark despite it being closed about 10 years ago, others are illegible or barely standing (Figure 11). A rotten platform closed the Upper Kalimna Falls walking track at least 5 years ago and a rotting bridge could lead to closure of the Canyon Track (Figure 11).¹



(a)

(b)

Figure 11. Failure of structures along walking tracks. (a) Propped-up sign identifying Jebbs Pool on the Cumberland River. Photographed March 2024. (b) Rotting bridge on the Canyon Track, Lorne. Photographed June 2024 (E Cummings)

¹For balance, after 5-10 years closed, the track joining the Kalimna Falls track and the Canyon track has just been reopened.

Conclusion and Options

Bushfire risk management by fuel reduction threatens ‘biodiversity, natural landscapes and natural processes’ in a National Park created to protect these things. Continual reduction of residual risk, which seems to be FFMV’s aim, will exacerbate environmental damage. We need, as a matter of urgency, to find a balance between human uses and nature.

Fuel reduction as practiced around Lorne may be an extreme example of FFMV’s methods. It is implied in the Draft Bushfire Strategy for 2024-34, that 1.5 km is a common width for asset protection zones [50]. In 2023, 3 km was mentioned [41]. But the Lorne asset protection zone extends much further. Would a narrower zone still achieve an acceptable level of residual risk while reducing environmental damage?

Protecting human life and property is the priority of fire authorities in Victoria, but other arms of government have different responsibilities including environmental stewardship. Individuals also bear responsibility for their own safety and the security of their dwellings and investments. If we choose to live or invest in a bushfire zone, to what extent should we expect support from the State? To what extent are we justified in laying waste to the environment to protect secondary dwellings?

If high levels of protection come at the expense of the environment and the wider community, by demanding protection we may be inadvertently contributing to pressures to prohibit housing in bush settings.

Are there less damaging options that will provide us with an adequate level of protection?

Reducing ignitions, holidays, closures, evacuations

Fuel only burns if ignited. People are responsible for most bushfires ignitions [18, 39, 48]. Reducing the presence of people in forests during fire danger periods should protect lives and property by reducing ignitions. Our options include:

- Shifting the main holiday period out of the main fire danger period. Is it *...truly absurd...that... thousands of holidaymakers* [head] *directly into forests and national parks right in the middle of [the] peak bushfire season* [2].
- Closing bush roads, instead of opening them, to public vehicles in the bushfire season
- Closing walking tracks at agreed levels of fire danger, such as extreme and catastrophic
- Closing major roads at agreed levels of fire danger, or at lower levels if bushfires are already burning
- Compulsory evacuation. Although Victorian legislation does not permit this for people with a ‘*a pecuniary interest in the land or building or in any goods or valuables on the land or in the building*’ [26], it is a reality in Canada and some Australian States. It seems to work in Canada.

Planning

Are the structures we build to protect ourselves from fire maladaptative? In other words, by generating emissions and demanding environmental destruction for their protection, are they worsening climate change and biodiversity decline? Should our settlements be made up of replaceable modules?

Unmanned, new & remote technologies

Our best hope of preserving the tall forests and protecting human assets seems to lie in early detection of ignitions and prompt responses. Remote sensing technologies, artificial intelligence and robotic and unmanned fire-fighting equipment are options we should actively investigate (eg [27, 28]). They should be given priority in the allocation of funds.

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I know that the formatting of items in this reference list is inconsistent. My aim is to provide sufficient information for the sources to be tracked down.

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Appendix 1. Biodiversity and the Otway Ranges

Although several rundowns of the biogeography of the Otway Ranges surely exist, I have not found them. The Otways seem to be under-studied by comparison with Victoria's eastern ranges. Are the Otways of any particular significance or are they just like those eastern ranges?

Area and geomorphology

The Otway Ranges are much smaller than the eastern ranges, being only about 15 km wide in the Lorne region. They belong to the same geomorphological framework as the Strzeleckis, and have many common features, including tall forests. But the Otways have long been separated from the Strzeleckis and other eastern ranges, leading to significant ecological differences [7].

Species and ecosystems

Some of these differences are obvious, for example, we do not have, and probably never did have, sassafras, wonga vines, Leadbeaters possum or greater gliders. Does the presence or absence of these and other species affect the functioning and evolution of ecosystems? We don't have lyrebirds either, and lyrebirds are classed as 'ecological engineers' that modify or create ecosystems by virtue of shifting tonnes of soil every year. Does their absence mean we have niches occupied by species that are rare in the east, or are we simply less diverse?

Indigenous species

Our yellow-bellied gliders are thought to be remnants of a western Victorian population that was once much more widespread. This sub-population is distinct from populations in the east of the State [32].

A search of the Atlas of Living Australia [8] for species in an area roughly corresponding to the planned burns from Grassy Creek to Wye River and inland from them (Figure 1), revealed 19 species that are not (yet) reported elsewhere. Some of these species are fungi. All the animals are invertebrates, including beetles, weevils and a mosquito.